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PRODUCTIVITY MEASUREMENT IN AIRCRAFT MAINTENANCE ORGANIZATIONS

THESIS

Billy J. Gililland, Captain, USAF

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THESIS

Presented to the Faculty of the School of Systems and Logistics of the Air Force Institute of Technology Air University In Partial Fulfillment of the Requirements for the Degree of Master of Science Degree in Logistics Management

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September 1990

Approved for public release; distribution unlimited

PREFACE

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I would like to acknowledge the help of my advisor, Major Jacob Simons, for his patience and guidance in this endeavor. This thesis is dedicated to Jackson L. and Sheila C. Gililland who taught me that with God's help all things are possible and whose example has been and continues to be my inspiration. Above all, I would like to thank Jenny Gililland for her unwavering love and support.

TABLE OF CONTENTS

•

	Page
Preface	ii
List of Figures	vii
List of Tables	viii
Abstract	ix
I. Introduction	. i
General Issue	. 1
Problem Statement	. 3
Justification	. 3
Research Objectives	. 4
Research Questions	. 4
Scope and Limitations	. 5
Summary	. 6
II. Background	. 7
Productivity - Historical Perspective	. 8
Early Influences	. 9
Scientific Management	. 13
Human Relations	. 17
Refinement and Synthesis	. 19
Summary	. 21
Productivity - Three Common Definitions	. 22
The Accountant's View	. 23
The Engineer's View	. 25

-

	The Manager's View	28	
	Summary	32	۰
	Trends	32	
	Total Quality Control.	33 (r
	The Theory of Constraints	39	
	Chapter Summary	45	
111.	Literature Review	47	
	Introduction	47	
	Productivity in the Federal Government	48	
	Productivity in the DoD	51	
	Productivity in the Air Force	56	
	Productivity in MAC Maintenance	61	
	DCM	61	
	P & S	62	
	MIS & A	63	
	QA	65	
	Previous Research	66	
	Measurement Methods	67	
	Macro Measurement	68	
	Micro-Measurement	70	
	Integration	71	ŧ
	Application	72	
	Conclusion ,	74	

IV.	Methodology
	Introduction
	Stage 1: Background Study
	Stage 2: Interviews
	Stage 3: Detailed Data Collection and Analysis 80
	Summary
v.	FINDINGS AND ANALYSIS
	Introduction
	Current Productivity Measurement
	Interview Conduct
	Interview Findings
	Statistical Analysis and Findings
	A Priori Logical Analysis
	Measurement Categories
	Correlational Analysis
	Summary
VI.	Conclusions and Recommendations
	Introduction
	Conclusions
	Further Discussion
	Current Productivity Management
	Application of Private Sector Trends to Research
	Findings
	Recommendations

v

Suggest	ed Research Efforts
Summary	
Appendix A:	Presidential Order for Productivity Improvement
Appendix B:	Department of Defense Productivity definitions and Reports
Appendix C:	MAC Formulas for Performance Measures 131
Appendix D:	MAC Maintenance Performance Standards 133
Appendix E:	Research Interview Instrument
Appendix F:	Correspondence Concerning MAC Performance Reporting
Appendix G:	MAC Productivity Measures
Appendix H:	Correlation Matrix for MAC Productivity Measures
Appendix I:	Stepwise Regression Analysis Output 144
Bibliography	
Vita	

vi

List of Figures

Figure		Page	
1.	The Hockey Stick Phenomenon	41	
2.	Stepwise Regression Analysis for Productivity Measures	84	
3.	A Priori Logical Model for MAC Productivity Measures	93	
4.	A Comparison of the Logical Model Before and After Correlational Analysis	99	
5.	Comparing the A Priori Model with the Final Logical Model for MAC Aircraft Maintenance		
	Units	106	

List of Tables

••

٠

4

Table				Page
1.	Multi-factor Productivity	• •	•	30
2.	MAC Productivity Measures	••	•	94
3.	Comparison of Stepwise Regression Results A MAC Productivity Measures		•	103

Abstract

This research was undertaken to explore productivity measuremer, in aircraft maintenance units and to examine the relation lips of the measures used to evaluate a unit's productivity. Review of current literature and regulatory guidance concerning productivity measurement provided the basis for the development of an interview questionnaire. A questionnaire was administered to DCMs and chiefs of analysis at ten MAC wings. Additionally, managers in the maintenance management, cost and manpower divisions at headquarters MAC were interviewed. From these interviews, information concerning current productivity measurement methodology was gathered and thirteen measures were identified for analysis. Of the thirteen measures evaluated, eight produced the strongest explainable model reflecting maintenance productivity. Manhours per flying hour was the predominant output when viewed as a result of the influence of mission capable rates and maintenance scheduling effectiveness. Cannibalization rates, delayed discrepancies (both awaiting parts and awaiting maintenance) and the average number of aircraft possessed were the inputs which appeared to contribute most significantly to mission capable rates and maintenance scheduling effectiveness.

ix

PRODUCTIVITY MEASUREMENT IN AIRCRAFT MAINTENANCE ORGANIZATIONS

I. Introduction

General Issue

"Our productivity is the wonder of the world." This remark was made by President Dwight Eisenhower during his inaugural address, January 20, 1959. In the late 1950's the United States was indeed the world's industrial leader. We had vanguished the powers of totalitarianism in the second World War and successfully defended the first open challenge of communism to a democratic nation in Korea. Labor productivity growth was material and consistent. From the end of World War II until the mid 60's national labor productivity, in terms of the percentage of the populace employed and the gross national product, progressed at an annual average rate of 3.2%. However, the national growth rate slowed dramatically after 1965 and during the decade of the seventies with the average advance barely exceeding one percent. Productivity appeared to reach the worst point in the years between 1978 and 1982 when labor productivity actually deteriorated by an average of 0.2% per year. Although we experienced a slight comeback in the

80's, compared to other industrialized nations, the U.S. has not fared well (1:4-7).

Our labor productivity rate has been exceeded by virtually every other industrialized country in the world. With the current federal budget deficits of over 200 billion dollars, many economists are forecasting a major economic recession in the 1990's (2:35).

The economic outlook is not good for the U. S. Meanwhile the world is on the threshold of epic change. Eastern Europe is moving rapidly towards increased democratization as the Soviet empire is crumbling in the face of economic reality. The perception of a greatly reduced threat to national security has Congress demanding a smaller piece of the budget for Defense. Consequently, the Department of Defense is scrambling to salvage a viable defense plan in the face of a resounding claim by entitlement minded congressmen for the so-called "peace dividend" (3:43).

Air Force Secretary Donald B. Rice, during an interview conducted in the early part of 1990, suggested that the Air Force of the 1990's would be substantially smaller. The Secretary also pointed out that the U.S. has always maintained a clear advantage in the air war and remarked, "we don't want to contemplate" fighting under any other condition (4:12). Because of the reality of economic constraints, productivity is a major concern to the Air

Force, the DoD and the United States as a whole. In public organizations, productivity improvement has become increasingly important as the demand for quality services has increased faster than the tax revenues that support them. Many methods to enhance productivity have been examined, but little progress has been made. The absence of a widely accepted definition of productivity and specific measurement criteria has greatly frustrated the effort (5:5).

Problem Statement

Productivity in general, and specifically in service organizations is difficult to define. Therefore, measuring productivity is equally difficult. The Air Force has implemented Department of Defense productivity enhancement initiatives; however, it is unclear how performance efforts are affected by these initiatives.

Justification

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Executive Order 12552, Productivity Improvement Program For The Federal Government, establishes a government wide program to improve the quality, timeliness, and efficiency of government services. President Reagan set a goal of a 20% productivity increase by 1992 (6:1). Air Force Regulation 25-3 reflects the attempt by the Department of the Air Force to support this goal. One of the objectives of the Productivity Enhancement Program, as

outlined by this regulation, is to provide productivity data for use by functional managers at all organizational levels (7:2).

Aircraft maintenance is the most manpower intensive activity in the U. S. Air Force. It is the largest facet of logistics in terms of money, manpower, facilities or any other resource one might consider (8:17.23). Therefore, productivity measurement in aircraft maintenance is of extreme importance. In order to ensure achievement of the Air Force productivity goals the reliability and validity of productivity measures in aircraft maintenance organizations must be evaluated.

Research Objectives

Explore productivity measurement in United States Air Force aircraft maintenance organizations in order to:

1) Identify the measurement methods in use.

2) Understand the relationships among the various productivity measures.

3) Evaluate the effect of maintenance productivity measurement on the accomplishment of Air Force productivity objectives.

Research Questions

1) Are aircraft maintenance managers familiar with the Air Force guidance concerning productivity measurement?

2) What methods of productivity measurement have been specified by regulation for aircraft maintenance organizations?

3) Which of the specified methods of productivity measurement are actually implemented?

4) Are there methods of productivity measurement used by aircraft maintenance organizations other than those specified by regulation?

5) What are the nature and strengths of the relationships among the measures implemented by aircraft maintenance organizations?

6) Of the measures implemented by aircraft maintenance organizations, which contribute most significantly to explaining maintenance productivity?

Scope and Limitations

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The scope of this research is limited to the Military Airlift Command's aircraft maintenance organizations. The following limitations apply to this research:

a) Various results may not apply to commands outside the scope of this project.

b) The complexity of the construct of "productivity" may confound the data based on differences in perceptions of those being interviewed, because the research itself is largely concerned with clarifying that very construct.

c) Interview input is limited to three areas: Major Command Division offices, wing level Deputy Commander's for Maintenance and their maintenance data analysis offices.

d) Individual data values from the Consolidated Aircraft Maintenance System for Airlift are subject to errors in accuracy.

Summary

This introductory chapter discussed the importance of productivity measurement in the DOD, the difficulty in determining the reliability and validity of productivity measurement data, the justification and scope of the research, and the research questions to be examined and answered.

Chapter II, Background, describes the development of productivity as a concept and a practical measure of performance. The background chapter provides a basic understanding of productivity in the context of history, common definitions and emerging application in industry.

II. Background

Before proceeding with an evaluation of productivity measurement in any environment, it is necessary to have the clearest possible understanding of productivity as a concept and as a performance measurement in practice. A review of industry related literature will equip the reader with a knowledge base from which to begin to evaluate the productivity measurement in a military environment. This chapter provides background information concerning productivity in the context of history, common definitions and emerging applications in industry.

A historical perspective of productivity measurement provides valuable insight into the relationship between changes in the national socio-economic structure and the changes in application of productivity measurement. Of particular interest is the motivation behind the changes that have occurred.

Examination of common definitions of productivity helps to clarify the concept in view of the many different ways the term is used. In this chapter productivity is defined from the perspectives of the accountant, engineer, and manager. A brief explanation of each definition is presented to reinforce understanding and to exhibit practical application.

As with any area of study and application, new concepts emerge over time. This chapter explores the most recent conceptual changes in the area of productivity measurement. The Total Quality Management (TQM) application of W. Edwards Deming and the Theory of Constraints as developed by Eliyahu Goldratt are examined. Deming's applications of TQM in service organizations are of particular interest as are Goldratt's views concerning efficiency and effectiveness. Together, these concepts serve to enhance the knowledge base used to examine productivity measurement as practiced by the Department of Defense and to later use as an analysis tool for qualitative evaluation.

<u>Productivity - Historical Perspective</u>

Current management thinking can best be understood in light of its historical development (9:2). Productivity as a management concept has evolved concurrently with the major trends in management. Although not specifically defined until the early twentieth century, productivity has always been a natural estimate of the success of a perceived effort. Early philosophers such as Plato and Aristotle taught many principles relating to management and the concern for the effective use of resources (10:385). The progression of management thought and its relation to the development of the productivity concept may be divided into

four periods: (1) early influences, (2) scientific management, (3) human relations, and (4) refinement and synthesis.

<u>arly Influences.</u> Mosaic law is among the earliest of recorded history. It reflects an attempt to control the behavior of the Jewish society and to instruct the people concerning daily life. It could be said then, that the Ten Commandments of the Bible were the first recorded management principles. From the Ten Commandments, the Levitical law developed specific instructions for success. The principle was that as the people prospered individually they would return a portion to God through his emissaries, the priests. This served two purposes; to keep the effort focused on pleasing God and to build the infrastructure of the society.

> "Bring the whole tithe into the storehouse, that there may be food in my house. Test me in this," says the Lord Almighty, "and see if I will not throw open the floodgates of heaven and pour out so much blessing that you will not have room enough for it." (11:923)

The principle of increased blessing as a follow-on to diligent effort is prevalent throughout the Bible. Early philosophers mought to explain this principle in the absence of a God figure or to relate work and reward to man-centered precepts. Aristotle's "Organon" of logic, translated by Boethium (479-525 A.D.), became the basim for medieval thought. Logic means the art and method of correct thinking (12:1:6). The logician investigates the evidence of a

relation between premises and conclusions in arguments. If the conclusion follows from, or is implied by the premise, the reasoning is correct; otherwise, it is incorrect (13:5). It soon became universally accepted that a productive society was one which worked hard and managed its resources correctly. The methods by which this was achieved varied greatly; but, for the most part, the age prior to scientific management was a period of tremendous extremes. The Roman Empire, the Roman Catholic Church and the early feudal system were examples of centralized management and the dependence upon authority and, even force, to maintain a productive society (14:617). The unifying thought of this age was the logical premise that hard work brought reward on earth and in heaven.

By the Fifteenth Century and with the development of the merchant city states, trade prospered in Europe. In order to defend the growing merchant fleets, naval fleets also grew. In 1436, Venice opened its own shipyard for the purpose of defense. The shipyard was known as the Arsenal; and by the Sixteenth Century, the Arsenal of Venice was probably the largest industrial plant in the world (15:78). It was here that history first records the use of assembly lines, standardization, warehousing, cost control and the close supervision of personnel. Warehouses were arranged along a canal so that the galleys could be brought to the equipment. All rigging and deck equipment was standardized

so that few items had to be specially fitted. It was necessary not only to build new ships, but to repair or refit ships already in use. The Arsenal kept many items warshoused for this purpose. Personnel at the Arsenal were closely supervised, particularly concerning working hours and output. This close supervision along with the development of an efficient system to track the cost of inventory contributed to one of the most sophisticated organizations of that era. The modern organization, however, did not emerge until the late Eighteenth Century and the period known as the Industrial Revolution (16:434-442).

In the Sixteenth Century a period of tremendous change began to sweep Europe. Reformation of the, then dominant, Roman Catholic Church created an environment of new thinking and forever changed the acceptance of domination based on religious dogma. The advent of Protestantism and the doctrines of Martin Luther and John Calvin placed an emphasis on the freedom of man to seek God independent of the church. Along with this freedom came a new sense of nationalism in Europe and a new competitive spirit based on the Calvinistic belief that one's election into the kingdom of God was made sure by hard work. This belief is what has become known as the Protestant work ethic (17:400-405).

Because of the Reformation, the cultural climate in Europe favored the growth of commerce and industry. In

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particular, the English government was especially open and sensitive to the development of commerce. The English social values favored achievement and profit-making. In addition, England had ample supplies of coal and iron, essential ingredients of the industrialized society (18:115,117).

Before the development of the steam engine, England had a number of small but thriving industries in such areas as textiles and iron products. The introduction of the steam engine made it possible for the expansion of these industries by lowering production costs. As the markets expanded due to lower costs, there was a need for more production, machines, workers, and more capital to finance expansion. All these changes demanded new management practices and larger organizations. This industrial growth changed the culture in favor of expansion because of the implied promise of prosperity. These cultural changes came about as a result of the shift from home manufacturing to large scale factory production - the Industrial Revolution (19:41-45).

The Industrial Revolution continued and was transported to the United States in the late Eighteenth Century. The bountiful supply of raw materials and encouragement by the new representative government fed the development of industry and the need for more sophisticated forms of management. The idea continued to be the transformation of

effort into reward. The development of interchangeable parts by Eli Whitney for the manufacture of firearms and the potential use of standardization to increase productive capacity grew at an ever increasing rate and perhaps culminated in the assembly line techniques developed by Henry Ford in the early Twentieth Century (20:216-235).

Scientific Management. In the early Twentieth Century, the United States was an industrial powerhouse. The national attributes which so ably transferred the Industrial Revolution from Europe continued to fuel the American industrial machinery. The national prosperity brought with it a re-examination of the concept of the nature of work and the relationships between labor and management. A new philosophy of management became widely accepted. This philosophy was based on the assumption that very few workers could handle or even wanted a high degree of autonomy on their jobs. Therefore, the simpler the task, the greater the output--this was the philosophy that started the Scientific Management Movement (21:93). Frederick Taylor is considered by many to be the man responsible for scientific management; although, in recent years his role has been somewhat disputed (20:37). Nevertheless, Taylor's book, "The Principles of Scientific Management," had a tremendous effect on management thought of that day and it continues to hold a very important place in management education.

It was Taylor and his contemporaries who first introduced the term "productivity" as a word describing industrial efficiency (22:312).

Taylor proposed that managers increase productivity by using four basic scientific principles:

 Developing a true science of management to determine the most efficient method for performing each task.

2. Selecting the workers carefully and scientifically so that workers were given responsibility for performing the tasks for which they were best suited.

 Educating and training workers scientifically to perform tasks in the best prescribed manner.
Arranging close cooperation between those who

plan the work and those who do it to assure that all the work would be performed in strict accordance with the principles derived from scientific analysis.

Taylor believed that these principles would benefit the organization and the workers.

Taylor's work was shop-oriented and included many studies of methods to increase the output of individual workers. He was criticized as being just another "time study analyst" and this criticism led to his appearance before a special United States House Comm — charged with .

investigating the principles of the scientific management school. Taylor defended his ideas as the beginning of a mental revolution on the part of both workers and managers:

> "The great revolution that takes place in the mental attitude of the two parties under scientific management is that both sides take their eyes off the division of the surplus as the allimportant matter, and together turn their attention toward increasing the size of the surplus until this surplus becomes so large that it is unnecessary to quarrel over how it shall be divided. They come to see when they stop pulling against one another, and instead both turn and push shoulder to shoulder in the same direction, the size of the surplus created by their joint efforts is truly outstanding." (23:63)

Taylor sought to eliminate the raw exercise of authority by making managers subject to rules and discipline as much as the workers. Management's job was to place the right worker in the right job according to scientific selection. Management "from the hip" gave way to the science of each task.

Frank and Lillian Gilbreth made significant contributions to scientific management in the fields of motion and time study (22:44). Henry Gantt studied habits in industry and developed improvements in Taylor's piece rate system. Gantt also made a substantial contribution to management planning and control processes through the development of scheduling charts which related facts to significant units of time (22:48). Harrington Emerson wrote two important books on the subject of efficiency. His work

emphasized the importance of correct organization in the effort to achieve high productivity. He set forth a number of principles of efficiency which still apply (22:44-56).

With the growth of scientific management came the development of administrative management. As a result of greater efficiency in industry, organizations grew and became more complex. Because of this great growth, the need for an overall understanding of the management process became apparent. Henry Fayol, a French industrialist became one of the first and most prominent contributors to administrative management thinking. Fayol analyzed the manager's job in terms of universal commonalities. He identified five management functions: planning, organizing, commanding, coordinating and controlling. These functions are still widely used as one means of understanding the manager's tasks (24:4). The combination of scientific and _ administrative management served to place more emphasis on the skill of the manager and one's ability to get the best Unfortunately, scientific and effort from the wor administrative management tended to become one-sided. With the emphasis given to changes in methods and organization design for the sole purpose of improving productivity, little thought was given to the worker and his or her wellbeing (25:53).

It was during this period that productivity became synonymous with efficiency. The ratio of input to output of

workers and processes became the prominent measure of performance. Continuous improvement in the efficiency of each step of the process of a plant became the organizational goal, and the desires of the worker were given ever-decreasing emphasis. The early 1900's was a period of plenty in the United States and the hunger for more drove the industrial machine to greater technology and less consideration for the human interests involved.

The excesses of the age in the market place and in the human arena lashed back at the American economy and the people. The vision of Taylor and others for a "new idea of cooperation and peace being substituted for the old idea of discord and war" in management/worker relations was never realized (26:211).

Human Relations. While scientific management was becoming the watchword for American industry, new studies were being developed that would drastically change the perception of the worker's role in industry and the methods by which organizations could become more productive (26:212). It became increasingly apparent that factors other than money motivated people and some employees were "self-starters" who did not need to be closely supervised.

The human relations school of thought had its beginnings in the late 1930's and the early 1940's. The basic idea was that worker performance is related to psychological and social factors rather than the physical

environment. It revolutionized management thinking by focusing attention on the components of a job and worker satisfaction on the part of the employee (27:3). Attention shifted away from the scientific measurement of piece work toward a better understanding of the nature of interpersonal and group relationships on the job.

The human relations movement soon attracted wide attention in both academic and industrial circles. Many organizations revised their management approach to increase emphasis on the human factor (28:6). However, many proponents of human relations drew inferences from their research that were difficult to support. For example, some equated morale in an organization with productivity. Morale describes a person's satisfaction with membership in an organization. Productivity is related to many factors such as discipline, control and motivation, but in the total mix of these factors, morale may be relatively insignificant. No clear relationship appears to exist between morale and productivity (29:24).

One reason academia and industry gave such credence to the theory of human relations was that its effects were studied in a more "scientific" manner than were those of scientific management. Comparative studies such as those conducted at the Hawthorne Plant utilized experimental designs and drew conclusions based on the outcome of manipulation within these designs. Where the scientific

managers were concerned with efficiencies, the human relationists studied behavior associated with efficiencies. They went a step further in their research by asking <u>why</u> things happened.

The human relations movement sought to respond to the excesses of the previous decades. The national economy was beginning a slow comeback from the Great Depression. Many people had experienced joblessness, while a very few remained economically solvent. Labor unions were a fact of life in the late Thirties and people were demanding fair treatment by industry and the protection of their rights by the government. However, human relations could not solve all the problems of management and by the late 1950's serious signs of disillusionment were widespread in industry. Some authorities even recommended returning to a philosophy of benevolent authoritarianism (30:82-90).

Refinement and Synthesis. In the late 1950's, managers began to understand that no single set of laws can be applied to all management problems. The methods of scientific management and human relations continued to advance into such areas as motion and time study, operations research and industrial relations. In addition, new concepts began to evolve by combining these approaches.

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The last forty years have seen an advance in technology unlike any in history. These technological advances have allowed scientists and managers to create increasingly

complex organizations and perform detailed analyses based on volumes of information. The contingency and systems approaches to management are two major concepts to emerge from this era (31:55).

Contingency theory recognizes that every organization exists in a unique environment. It attempts to analyze and understand the relationships between the organization and its environment with the purpose of taking specific management actions necessary to deal with problems. The contingency approach is analytical and situational and seeks to develop the most practical answer to the question (31:371).

The systems approach gives managers a way of looking at the organization as a whole that is greater than the sum of its parts. The term "system" refers to a series of interrelated and interdependent parts: in a system, any interaction of the parts affects the whole. A system has inputs, processes and outputs. There is constant feedback between the environment and the system. This allows for very accurate analysis tools. Managers can observe the effect of changes within the system based on the effects on its various parts. For example, in a manufacturing organization where the goal is to ship as many products as possible, a manager can observe the effect of robot installation on overall productivity and its effect on transportation and material handling. The manager may find

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it is best to not install robots or to install a small number of robots because the increased cost of material handling and transportation overcomes the benefits of the increased sales. Ideally, the systems approach would view the effect on all parts of the organization and make the decision by optimizing the effect on the whole organization (32:16).

During this refinement and synthesis period, productivity measurement has also become more complex. It is still thought of as a ratio of output to input in most cases, yet the number and importance of variables which make up the measurement differ within and among organizations.

Despite the advances in technology and the increased emphasis on productivity measurement, the late Sixties and the decade of the Seventies were periods of economic decline in the United States. A world recession, meager recovery and return to recession were major contributors to this decline. Additionally, the petroleum crisis and world competition spurred by technology also had a detrimental effect on the American economy. The net result has been a renewed search for productivity enhancement initiatives (34:135).

<u>Summary.</u> This section of background provided a historical perspective of productivity. We have learned that there has always been a concern for productivity in industry. From biblical times until the present, we have

sought to define, measure and enhance our ability to produce goods and services. The methodology and concern for productivity measures have continued to change based on the changes in the national economy and advances in technology. It seems that during periods of relative affluence American industry was content to stay with whatever seemed to be working. However, the major advances in management thought and productivity measurement have come as a result of hard times. Desperation seems to be the best stimulus for creative thought.

With each advance in technology and change in management concepts, we have become increasingly diverse. Today, there are still many different ways to view productivity and to apply measurement methods to assess performance. Hopefully, we have learned from history the importance of embracing new concepts without falling prey to faddish enthusiasm. The next section will examine three of the most common definitions of productivity in industry today.

Productivity - Three Common Definitions

What is productivity? This basic question has been pondered by government and industry since the term was first used in the early part of the Twentieth Century. Not only has the definition changed based on management trends, but also productivity may be defined according to the

occupational background of the observer. In this section of the literature review, three common definitions of productivity are examined. First, the accountant's view of productivity is examined to provide an understanding of the cost accounting tools used to measure financial performance in organizations. Second, the engineer's perspective of productivity provides a scientific view in terms of machine efficiency and the attempt to apply this definition to complex organizations. Lastly, the manager's definition of productivity seeks to integrate all performance indicators into one basic measurement of multi or total factor productivity.

The Accountant's View. Accounting furnishes information which management needs in order to operate a business efficiently and meet its responsibilities to the owners of the enterprise, creditors, employees, government and the general public (35:32). Therefore, the accountant concerns himself with the financial welfare of the organization. Financial performance is measured and reported in three basic formats:

- 1. Historical reports
- 2. Current performance reports
- 3. Future performance reports

Historical reports summarize all transactions carried on by an organization in the past. They are used to make general, overall appraisals of the success of past

operations. Current performance reports pertain to activities that are taking place at the time of the report. They measure the current efficiencies of certain key activities or operations at various levels of the organization. These reports aid in the control of the daily functions of the enterprise. Future reports are financial forecasts used to plan future operations. Together these reports say to the accountant, "This is what we have done in the past, this is how it is affecting our current performance and based on these trends, this is what we should do in the future." This is the basis for the cost accounting system which is prevalent in American industry (36:10.11-10.22).

Cost accounting is one aspect of general accounting procedures concerned with reporting and analyzing detailed cost information for internal management decisions. It provides answers to the following questions:

 What kinds of costs are the company incurring?
What is the cost per unit and in total, for each of the different types of products manufactured or sold?

3. What portion of total cost is assignable to ending inventories and what portion to operating expenses?

4. What amount of cost is each department head or other manager responsible for?
5. How do the changes in output, product mix, climate, or other operating conditions affect the amount of costs?

The answers to these questions give managers insight into the cost-benefit ratio of their decisions (37:387-388). This type of financial data provides a primary source of input for decision making. In fact, cost accounting has been so fully integrated into productivity concepts that it is, many times, the only system for measuring performance. The idea is that if an organization minimizes the costs associated with all of its activities, the effect is maximum benefit in the form of higher profits (38:17). Most other definitions of productivity have become subordinate to this basic ratio expressed as:

	Output	Total Profit
Productivity =		
-	Input	Total Cost

The accountant holds to the definition of productivity as a measure of efficiency and translates the ratio into dollars and cents (38:32).

The Engineer's View. Engineers are usually the technical problem solvers in an organization. They provide the human link between the scientist and the manager (39:1). Engineers most often work at the firm level where they design and implement work processes. Consequently, the engineer's perspective is typically limited to a micro view of productivity. The mechanical or industrial engineer is

usually concerned with efficiencies in working groups or processes rather than the performance of the organization as a whole. Like the accountant, the engineer believes that efficient processes will yield an efficient organisation (40:65-87).

The engineering approach to productivity is derived from the basic definition of mechanical efficiency:

Mechanical Efficiency = $\frac{E}{E + L}$

In this formula, E is the energy output of the machine and L is the energy lost in performing the output (41:422). For example, the efficiency of an electric motor is the ratio between the power delivered by the motor to the machinery which it drives, and the power it receives from the generator. If a motor receives 50 kilowatts from a generator and the output is only 47 kilowatts, then the machine is 94% efficient.

$$\frac{E}{E + L} = \frac{47 \text{ kw}}{50 \text{ kw}} = 94\%$$

A subtlety in this concept is the notion that perfect efficiency can never be better than 100%. While this may be true in the physical sense, financial efficiencies can and should exceed 100% so that an organization may show a profit (41:423). This subtlety indicates a potential barrier in the conceptual understanding of productivity in an organization. While the accountants are looking for a

department with higher financial productivity in the form of reduced cost and accelerated throughput, the engineers may be convinced that the processes are at their peak efficiency.

Another way an engineer may view productivity is derived from the absolute efficiency formula:

Absolute Efficiency =
$$\frac{E}{E1}$$

In this formula, E is the energy output of the machine and E1 is the total potential output. This formula is useful to the engineer when calculating efficiency in classes of machinery where the total potential output is much larger than that represented by the amount actually used to operate the machine (41:425). This concept has been extensively developed in the field of industrial engineering which is concerned with methods for calculating potential output standards. The practice of work measurement applies this principle to answer two basic questions:

1. What is the best way to do a particular job?

- 2. When this best method is used, what is the standard evel of output to be expected, given the ...oduction environment, materials, labor force,
-?

Work measurement and methods time measurement are the engineer's answer to the application of absolute efficiency to output efficiency or the productivity of an organization (41:36-39).

Output Efficiency =

Actual Output

Potential Output

Considerable advances have been made in applying work measurement techniques to many different working environments. When engineered standards are not available or feasible, there are many other methods to define potential output. Some of these methods are the use of performance history, technical estimates made by knowledgeable individuals, or statistical samples (42:188-190).

While accepting the basic understanding of productivity as a ratio of output to input, the engineer's definition differs from the accountant's in terms of this perspective of the organization. Although both agree that efficient pieces contribute to an efficient whole, they differ somewhat on how this is to be achieved. The accountant looks for efficient costs where the engineer is inclined toward mechanical processes. The manager's task is to integrate these concepts into a broader and more useful definition of productivity.

The Manager's View. Productivity, in the view of American managers, is the relationship between the output of an organization and it's required inputs. While this definition is similar to those of the accountant and engineer, there is an important conceptual difference. Managers are concerned with the total health of an

organization, including the welfare of the employees, the quality of products and the impact on the community and environment. This broad view of the organization has given rise to a definition of productivity which is much larger in focus than those already seen (44:23). Unlike the straightforward view of the productivity of a mechanical device, the complexity of an organization suggests a need for a macro-approach to measurement.

Three basic levels of productivity measurement are: (1) partial measure, (2) multi-factor, and (3) total factor (33:304). The three measures are differentiated based on the range of inputs included. If there is only one input, this is referred to as partial productivity. If there is more than one input, but not all available inputs are used, the result is multi-factor productivity. If all inputs are considered, the measure is called total factor productivity. The accepted belief in industry is that the more inputs one can consider when measuring productivity, the more useful the information will be. With the proliferation of computer systems in the United States, managers have a great deal of information with which to work (33:305).

A useful indicator of an organization's effectiveness in addressing productivity is the total productivity measure. Total productivity is defined as total output divided by the sum of all the inputs: (45:106)

Output

Total Productivity = ______ Labor + Materials + Capital + Energy

Management's task is to bridge the gap from physical measures of operational control to the "big picture" needs of the entire organization. Productivity measures are needed for effective strategic planning: a strategic business plan is incomplete if productivity improvement is not an integral element of the plan.

One approach to measurement is illustrated by a report from a total performance measurement system developed by the American productivity center.

	Performance Indexes (%)		Effects on Profit		
Input	Profit- ability	Product- tivity	Price Recovery	Profit- ability	Product- Price tivity Recovery
Labor	91.5	112.0	81.7	\$(3,307)	\$3,511 \$(6,818)
Material	88.3	97.9	90.3	(3,099)	(478) (2,621)
Energy	87.8	113.6	77.3	(460)	367 (827)
Capital	106.4	100.7	107.7	2,196	261 1,935
Total	95.5	104.2	91.7	\$(4,670)	\$3,661\$(8,331)

Table 1 Multi-factor Productivity (46:312)

The first three columns provide indexes of profitability (productivity x price recovery), productivity (outputs / inputs) and price recovery (the degree to which increases in unit costs of inputs are recovered by increases in selling prices), and for each of the major inputs and in total. By examining the "total" line, one can conclude that

a 4.5% decline in profits (100-95.5) resulted from a large drop in price recovery (the company was not able to get through increases in input costs to the customer) which was partially offset by a 4.2% increase in total productivity. The last three columns of the report provide the dollar impact of the changes in the indexes. This information shows that a large percentage drop in the productivity of a minor input may be of less consequence than a smaller decline in a major input. A measurement system like this enables management to grasp the productivity performance of a company and its major components. It strengthens the planning process by making the long range impact of productivity and price recovery easy to understand (46:314).

While measurement is integral to the productivity management process, it is not a cure-all. There is no perfect system of measurement. Many activities within an organization are difficult to quantify and, in fact, may elude measurement altogether. For example, service organizations and government agencies produce outputs that are difficult to measure and where profit is not the objective. How does one measure customer service or national security? The manager must strive to balance the effect of these intangibles on organizational effectiveness. The total productivity measure is an attempt to control the

broad concept of productivity by examining as many of the components of an organization as possible.

Summary. Productivity is defined in many different ways. The background of the observer and the level of responsibility one has in an organization are key determinants as to how one may view productivity and the measurement application one may attempt to implement. This section has examined three of the most common definitions of productivity. These different, yet associated views, help point out the complexity of productivity management.

Trends

Corporate America is constantly looking for "better margins," meaning larger profit. Increasing productivity in industry is one way of increasing profits; therefore, concern for industrial productivity enhancement has been on the rise. The major reason for the increase in concern of late is a result of the drastic economic slowdown of the 1970's. The conditions which contributed to this slowdown included a world recession, a meager recovery, another recession, extensive drought and the petroleum crisis. While the United States was increasing its national debt to survive, foreign competition, spurred by technological advances, was taking over traditionally American markets (47:61). In the 1980's, the American economy became increasingly service-oriented as the United States left more and more of the manufacturing to other countries (48:64).

Once again desperate times have created an environment ready for new ideas.

Two men have emerged with ideas which are changing the way Americans view business and productivity. In this section, the Total Quality Management concepts of W. Edwards Deming will be discussed in general and as they relate to service organizations. Also, the Theory of Constraints developed by Eliyahu Goldratt is examined. Together, these concepts represent prominent influences in current management thought and productivity concepts.

Total Quality Control. William Edwards Deming was born in the United States in 1900. At the age of fifty, he was invited to Japan to help revive its war-torn economy, but not until the 1980's was his expertise recognized in the United States. Today, "The Deming Management Method" is taught in most universities and industry is applying the Total Quality Control (TQC) concept proposed by Deming in an effort to regain the competitive position once held by the U.S. (49:3).

The basic premise of the Deming philosophy is that productivity increases with quality improvement and that low quality means high cost and loss of competitive position. Regardless of the particular view of productivity held, this philosophy is applicable.

For years, there has been a perceived conflict between quality and productivity in American industry. If quality

was increased, productivity dropped off or vice versa. The consensus of management was to strike the balance by making quality standards only as good as they had to be, while pushing for as much production as possible (50:1). The fallacy of this tradeoff has been demonstrated by a loss of competitive position to foreign sources, especially in manufactured goods. The clear message from Japan and Germany is that quality products translate into increased market share. The predominant messenger for quality has been and remains W. Edwards Deming.

As a statistician, Dr. Deming has continuously sought to develop sources of improvement. Understanding that statistical evaluation is not a cure-all for quality problems, he concluded that what was needed was a change in basic management philosophy, but a philosophy which made effective use of statistical methods for quality control. Dr. Deming developed this philosophy as described in "The Fourteen Points" and " The Seven Deadly Diseases"(50:23). These items explain how to create an environment conducive to increased productivity and how to avoid the obstacles that thwart productivity.

"The Fourteen Points of Management"

- 1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
- 2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to

the challenge, must learn their responsibilities, and take on leadership for change.

- 3. Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
- 4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.
- 5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
- 6. Institute training on the job.
- 7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.
- 8. Drive out fear, so that everyone may work effectively for the company.
- 9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.
- 10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.
- 11a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
 - b. Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.
- 12a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The

responsibility of supervisors must be changed from sheer numbers to quality.

- b. Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective.
- 13. Institute a vigorous program of education and self-improvement.
- 14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

"The Seven Deadly Diseases"

- 1. Lack of constancy of purpose to plan product and service that will have a market and keep the company in business, and provide jobs.
- 2. Emphasis on short-term profits: short-term thinking (just the opposite from constancy of purpose to stay in business), fed by fear of unfriendly takeover, and by push from bankers and owners for dividends.
- 3. Evaluation of performance, merit rating, or annual review.
- 4. Mobility of management; job hopping.
- 5. Management by use only of visible figures, with little or no consideration of figures that are unknown or unknowable. (Peculiar to industry in the U.S., and beyond the scope of this book.)
- 6. Excessive medical costs.
- 7. Excessive costs of liability, swelled by lawyers that work on contingency fees. (50:23-35)

Simply reviewing the framework behind the philosophy is not enough. To understand its application, it must be viewed at work in an organization. Because of the expansion of service industries in the American economy, application of the Deming Method will be viewed in the service sector.

A service organization is one which earns a profit by providing a convenience to a customer. Service organizations include restaurants, hotels, bars, banks, hospitals, maintenance and government agencies. Six out of seven people in the American labor force are engaged in service industries; therefore, it is obvious that for the quality of life to be improved in the United States, we must be concerned with the quality and productivity in services (51:185).

In his book, "Out of Crisis," Dr. Deming cites an example of TQC application in the municipal services of Madison, Wisconsin. In 1984, there were so many complaints about the quality of service in the Motor Equipment Division that morale had seriously declined. As a result, the mayor decided to transform the management of the division to emphasize improvement in the quality of customer service.

The mechanics employed in the division, through surveys and informal discussions, collected data concerning the major customer complaints. They found the overriding complaint to be excessive downtime of vehicles. The mechanics drew a flow diagram of the process for the repair of vehicles and collected data to determine how much time was needed to complete each step of the process.

By comparing the costs associated with major repair and the costs of simple maintenance procedures implemented to prevent major repairs, they justified the institution of a comprehensive maintenance program.

The application of the Deming method as these mechanics learned it, greatly improved the quality and productivity of their workcenter. Dr. Deming goes on to suggest that the same method can be applied in any fleet of vehicles. The emphasis was to create an environment which promoted the idea of doing things right the first time (50:245-247).

The U.S. quality movement has been slow to take hold. Total Quality Management is present at only a handful of leading U.S. companies and, for the most part, companies are implementing the concept on an independent basis. However, this philosophy is catching on and as the success of its implementation has grown, so has the call for more information. The nation's manufacturers, as well as service organizations in both the public and private sectors, are investing in TQM as a means to make "Made in America" a guarantee of quality once again (49:8-16). As Deming states in his book, "Quality, Productivity and Competitive Position":

"The benefits of better quality through improvement of the process are not just better quality and the long-range improvement of market position that goes along with it, but greater productivity and much better profit as well." (51:3)

TQM brings together both the contingency and systems concepts of organizational management. It recognizes that every organization exists in a unique environment, and it attempts to view the organization as a whole greater than the sum of its parts. Productivity may, in this sense, be thought of as the effectiveness with which the resource inputs such as personnel, materials, machinery and information are translated into customer oriented outputs. Today, these outputs involve all the relevant marketing, engineering and service activities of the organization rather than just the activities of the laborers (52:389).

The output of service organizations is a level of perceived customer satisfaction. TQM is particularly well suited to explain and enhance this output because quality is a determination made by the customer. It is based upon the customers experience with the service measured against his or her requirements (52:6). Whether the service provided is a fast meal, electricity or national defense, the customer is the one who measures the quality of output and who thereby effects the organization's productivity.

The Theory of Constraints. Another emerging management philosophy in America industry is known as The Theory of Constraints (TOC). Initially implemented in the form of a production scheduling software, it has now developed into a comprehensive school of thought. Dr. Eliyahu Goldratt began by examining jobs scheduled through

the manufacturing process while considering the limitations of facilities, machines, personnel or anything that caused a system to fall short of its performance objectives. TOC tells us that if we can identify the system constraint, learn how to exploit it, and then subordinate all other activities to maximize the efficiency of the constraint, the system's profit earning performance will increase dramatically (51:120-132).

TOC was developed in answer to the major problems facing manufacturing in the United States. Goldratt boiled these problems down to the general failure of the traditional cost accounting system predominant in American industry and the resulting emphasis on efficiencies. He believes that cost accounting as a performance measure is no longer valid because it forces managers to concentrate on local measures such as machine efficiency or direct labor hours. Therefore, cost accounting deals with only the local expense of actions and not the impact of these actions on the overall organization (53:37). The belief has always been that if each part of the process is efficient, the entire process will be effective.

Goldratt describes the problem faced by industry with an illustration known as "the hockey stick phenomenon." This phenomenon is a result of organizations rushing to meet quotas at the end of a time period. It is referred to as a hockey stick because the production process, when viewed

graphically, looks like a hockey stick with a flat bottom and rapidly rising handle. The cause of the problem is that organizations use two sets of measures. As seen in figure 1, at the start of the period, efficiencies driven by cost accounting policies are used to determine how well standards are being maintained. These local measurements encourage releasing large amounts of material to minimize process setups and forcing each machine to reach its maximum efficiency. As the period continues, the organization becomes driven by another system of performance measurement: the pressure to sell products becomes the overriding concern. To ensure the quotas are met or a profit is shown, overtime is authorized, employees work weekends and general panic takes over the organization. As the end of the period passes, the cost accounting measures come back into use and efficiencies are once again the watchword (54:34).

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The General Theory of Constraints suggests that each organization must define its goal and then realize that everything contributing to the goal is productivity and everything not contributing to the goal is counterproductive. According to Goldratt, productivity is all the actions that bring a company closer to its goals. He goes on to say that the goal of any firm is to make money (54:71-75).

Productivity is frequently viewed as a measure of output per labor hour, but this measurement does not ensure the organization will make money. For example, extra output can be produced and not sold, making this output excess inventory. If the product has not been sold, it has not made any money for the organization and, may in fact accrue additional expenses. Likewise, if each machine in a process is producing pieces at maximum efficiency, but these pieces do not come together as a product, then these efficiencies do not translate into profit (55:44-51).

TOC is based on the idea that to adequately measure an organization's performance, the evaluation should be made from a financial perspective and from an operational perspective.

In financial terms, organizations keep track of net profit, return on investment and cash flow. Goldratt defines each of these measurements, respectively, as an absolute measurement in dollars, a relative measure based on

investment and a survival measurement. To evaluate an organization's performance, all three of these measures should be used. Viewing only one or two without the others will present a misleading picture of the organization's financial health. For instance, a company may show a high net profit but have a very low return on investment. Net profit and ROI may be high and the company could still go bankrupt because of a lack of cash flow to pay its bills (55:54).

Operational measures translate financial measurements into ideas that can be easily grasped at the productive level. It is not an easy task to motivate people on the shop floor by selling corporate financial goals. Recognizing this, the TOC has defined three operational measures which serve as guidance to those responsible for a firm's performance. Throughput is the rate at which money is generated by the system through sales. <u>Inventory</u> is all the money that the system has invested in purchasing things it intends to sell. Operating expenses include all the money that a system spends to turn inventory into throughput. With these three measurements, a company can determine how well it is meeting its goal. The operational goal then becomes to increase throughput while simultaneously reducing inventory and operating expense (56:55,56).

The critical factor in the Theory of Constraints is the absolute importance of measuring the right things. Organizational effectiveness is the dominant measure while efficiency is only a part of the overall picture. The success of the Japanese can be attributed to their measurement of organizational effectiveness based on longterm performance and not short-term financial reports or local performance measures.

In the Toyota Kanban system, the performance of a worker is based on <u>meeting the schedule</u> for the product each day and maintaining the flow of material as opposed to maximizing the number of parts produced. Worker idle time is an important part of the Kanban system. The idle time of workers provides time to clean work areas, conduct training and accomplish preventive maintenance. The Japanese recognize that the importance of a resource should be evaluated based on the system's performance and not local efficiencies (57:56).

The success of Dr. Goldratt's theory in practice offers strong evidence as to its validity. The important fact to note is that, like the Total Quality Management theory of W. Edwards Deming, TOC is based on the idea of continuing improvement. It is not simply a mechanical formula for success in manufacturing. The General Theory of Constraints is intuitive and applies in practice to any business venture. An organization must know its goal and subordinate

all activities to that goal. The greatest challenge may be the development of a solid performance measurement system. Efficiency and effectiveness measures for an organization should exhibit a direct cause and effect relationship, not a correlation relationship. Efficiencies should be used very cautiously and great - ... should be taken when identifying how these efficiencies = ... ect the productivity of the firm (59:57).

Chapter Summary

In this chapter, we have examined productivity both conceptually and practically. We have developed a background concerning productivity in the context of history, common definitions and current management trends.

We have seen the development of productivity in direct relation to changes in economies and political structures. Each step through history has added to the complexity of management as an impetus to motivate production. History describes a five thousand year series of swings in the productivity pendulum---always seeking a balance between the inherent right of the individual to a quality life and the overpowering momentum of progressive economies.

The advances of science and technology have given rise to increasingly complex definitions of productivity. We have defined productivity in the view of the accountant, the engineer and the manager. Each view seeks to answer the question, "What is productivity?" We believe that once we

answer this question, we can manipulate it to our advantage. Instead, we see that the definitions offered by different viewpoints may conflict and can serve to confound the issue rather than clarify it.

Finally, we discussed the management trends in American industry and how they are changing the concept of productivity once again. Total Quality Management and the Theory of Constraints are philosophies of management which go back to the basics and at the same time utilize science and technology. Perhaps together, they have found the balance we have long sought. By combining statistical quality control and capacity planning with fundamental policies concerning goal planning and quality of life, we can almost begin to see an advantage for both the worker and the manager without extreme sacrifice for either.

III. Literature Review

Introduction

Having established a national, if not world concern for productivity growth in the preceding chapter, this literature review examines the federal government's approach to defining, measuring and managing productivity. Additionally, productivity research conducted within the Air Force and specifically dealing with aircraft maintenance is examined. The background study, accomplished in Chapter II, revealed that productivity as a management concept has continually changed throughout history and that it can be viewed differently depending on the perspective or technical orientation of the observer. The purpose of this chapter is to understand how the Department of Defense views productivity and how it translates this view into objectives to be accomplished by military organizations. The review of current research literature in this area establishes research trends and describes the attempts to apply the research conclusions to productivity in aircraft maintenance units.

The Executive Order for productivity improvement and resulting Department of Defense directives are first reviewed to establish basic definitions and guidelines for productivity improvement. Next, the Air Force Productivity Enhancement Program, governed by AFR 25-3, is presented.

This shows how the Air Force attempts to operationalize the concepts defined by the higher headquarter agencies. The Military Airlift Command regulations concerning maintenance management and performance standards are then introduced in order to exhibit published guidelines for managing productivity in an aircraft maintenance environment. Finally, a summary of the productivity research conducted in the Air Force is reviewed. Defense Technical Information Center (DTIC) annotated bibliographies and individual studies are evaluated to determine the current state of research in this area and to emphasize the need for a specific look at the methods used to manage productivity in Air Force aircraft maintenance units.

This review focuses on the relationship between productivity management and the Department of Defense. Except where necessary, specific detail has been omitted. The larger publications, such as AFR 25-3 and MACR 66-1 are generalized. The purpose is to point out how the concern for productivity is evident in a military environment and how that concern is or is not passed on to the aircraft maintenance units of the Military Airlift Command.

Productivity in the Federal Government

In February 1986, President Reagan released Executive Order 12552, entitled, <u>Productivity Improvement Program for</u> <u>the Federal Government.</u> The purpose of this order is to establish a government-wide program to address what many see

as a productivity crisis in the United States. Labor costs per unit of output and the annual inflation rate since 1960 have risen rapidly. As the rate of increase in money income exceeds the rate of gain in worker productivity, the resulting rise in labor costs essentially reduces the number of items that can be produced. (59:655) Because of the unique role of the federal government in the national economy, it is critical that federal agencies be mindful of this crisis and lead American industry in the pursuit of productivity and economic growth (60:165).

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Since the administration of President Franklin Roosevelt, the federal government has become a major factor in the national economy. Use of federal tax revenues to fund government services is common practice. Some economists argue that government injection of capital into the economy is the only way the nation has been able to maintain economic growth (59:268-270). These same economists feel that the only sure method for overcoming the current federal budget deficit is to increase the nation's productivity. The methods proposed for doing this differ greatly, but the important fact to note is that the federal government is seemingly seeking to take the lead in this endeavor.

"The goal of the program shall be to improve the quality and timeliness of service to the public, and to achieve a 20 percent productivity increase in appropriate functions by 1992." (6:1)

Productivity is defined, in this order, as the efficiency with which resources are used to produce a government service or products at specified levels of quality and timeliness. (6:1) The order proceeds in very general terms to define services, measurement systems and performance standards. The complete executive order can be viewed as a source document in Appendix A. The important fact to be gained for this review is that this order gives no specific guidance for measuring and reporting an organization's productivity. Each federal agency must define its function as related to the entire federal system and establish its own measurement and reporting criteria. One must then wonder how, if each agency is allowed to measure productivity differently, the resulting improvement can be monitored at the federal level. Will the combined improvement contribute a similar increase in national productivity? If so, how is this to be measured?

In terms of the national economy, productivity is synonymous with "labor productivity." Labor productivity is measured in terms of worker output and is reported by the Bureau of Labor Statistics. It measures, on the average, what a worker produces per hour of work and is considered to be a good indicator of the trend in the growth rate for the nation's standard of living. (60:23) Next, we will review the Department of Defense directives which establish the policy for DOD productivity measurement and we will see how

subordinate functions are to report productivity data to the Secretary of Defense and then to the Bureau of Labor Statistics.

Productivity in the DoD

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The Department of Defense is responsible for providing the military forces needed to deter war and protect the security of our country. Each military department is organized separately under a civilian secretary and functions under the direction, authority and control of the Secretary of Defense. The secretary of a military department is responsible for <u>efficient</u> operation of the functions performed within the department and as they relate to the entire DoD (61:174).

DoD directive 5010.31, <u>DoD Productivity Program</u>, establishes policy, applicability and scope for fulfilling the requirement of the President's productivity program. It applies to all DoD components, but is specifically addressed to the support functions of these organizations. In essence, the policy is meant to focus management attention on increasing defense outputs in keeping with the defense preparedness mission (62:1). The program is established as a labor oriented program and is, therefore, focused on labor cost savings as well as reduction in unit cost of operations. It directs the establishment of productivity goals and a planned approach to productivity enhancement.

As part of the planned approach, the program emphasizes work measurement and statistical methods to measure workforce efficiency. It also suggests an aggressive and cohesive program to improve workforce motivation and the quality of working life (62:2).

Overall responsibility for the program is assigned to the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics). Additionally, the Assistant Secretary of Defense (Comptroller) is assigned the responsibility to ensure that productivity efforts are integrated into DoD resource management systems. These responsibilities, at both levels, are carried out by the issuance of further policy guidelines and more detailed definitions of terms (62:34). At this point, the number of DoD directives affecting the productivity program grows rapidly. Rather than attempt to review each one, we will remain fixed on the basic purpose which, at this point, is to show how the productivity program translates into measurement criteria and how the program continued down through the Department of the Air Force.

DoD Directive 5010.32 is the <u>Productivity Enhancement.</u> <u>Measurement. and Evaluation Operating Guideline and</u> <u>Reporting Instruction.</u> It is a general guideline and like 5010.31 applies to all DoD components. This instruction,

however, specifies the goals, general guidelines and reporting requirements for the head of each component (63:1-4).

The establishment of annual productivity improvement goals consistent with DoD planning and programming guidelines, and the subdivision of these goals by major Command prior to the beginning of each fiscal year are the basic goals for each department head. Additionally, each component must implement a program which addresses specific minimum provisions (63:2). The following is a summary of these provisions:

A. Priority emphasis on productivity enhancement at all echelons.

B. Maximum use of existing resource system in productivity measurement and evaluation.

C. Systematic reviews of major functions to effect methods improvement and appropriate use of labor performance standards where used.

D. Effective capital investment planning.

E. Development and appropriate use of productivity evaluation indicators.

F. Accumulation of productivity data by major commands and operating agencies.

G. Utilization of productivity and performance data in the development of requirements and allocations of manpower and fund resources.

H. Optimum effective use of standard time data in the development and updating of labor performance standards.

I. Adequate staffing and training of personnel to sustain a viable Productivity Program.

J. Periodic field reviews to assess program effectiveness.

K. Productivity measurement and evaluation. (63:3)

Although the directive provides more specific guidance than seen before, it is clear that each component maintains a basic autonomy when establishing measurement criteria. Enclosures and additions to the directive provide explanations for the provisions listed above. They address productivity measurement and evaluation, fast pay-back capital investment opportunities, definitions of terms, and reporting procedures. Of these, the information important to this review is that addressing measurement, evaluation and reporting.

Enclosure #3 of 5010.34 structures the measurement and evaluation of productivity by major program or functional area to disclose trends on a year-to-year basis. This requires the establishment and use of summary level indicators intended to represent true measures of the primary mission of each functional area. The data needed to accomplish measurement and evaluation is to be gathered from existing data systems or the modification of existing systems (63:3,4).

Section VI of enclosure three lists functions and suggested indicators for measurement and evaluation. The following is an excerpt from this section pertaining to maintenance:

No. <u>Title/Scope</u>

4

Suggested Indicators

- E.11 <u>Intermediate Maintenance Activities</u> Number of end This area covers personnel engaged items processed in maintenance and repair of equipment at installation level.
- E.12 <u>Depot Maintenance Activities</u> Number of end This area covers personnel engaged items processed in depot level maintenance and repair of equipment. (63:48)

This by no means limits maintenance organizations to this indicator nor does it list all types of maintenance activities. However, the list continues the objective of the program to measure labor productivity at a minimum. The reporting guidelines in Enclosure #4 continue on this basic objective. The forms used to report productivity data to the Bureau of Labor Statistics is sectioned into input/output figures and man-year summaries for each component. Samples of report forms and definitions of terms used in this directive are exhibited in Appendix B.

The DoD Directives addressing productivity are very general and deal mainly with labor efficiency. The purpose is to manage labor resources within DoD components to meet the national productivity objectives. However, in establishing the guidelines for the component agencies the productivity picture rapidly expands to include resources other than labor. Each component must build upon the

rudimentary guidelines of the directives to establish more specific productivity programs while seeking to remain consistent with the national goal. The Air Force's Productivity Improvement Program is one attempt to do this.

Productivity in the Air Force

Air Force Regulation 25-3, <u>Air Force Productivity</u> <u>Improvement Program</u> (PIP), provides the framework for focusing and coordinating all productivity related programs in the Department of the Air Force. It applies to all Air Force units and activities including Air Force Reserve and Air National Guard and is intended to implement DoD Directive 5010.31 and DoD Instruction 5010.32 (7:1).

The regulation defines productivity as a measure of an organization's performance and includes both efficiency and effectiveness.

"Productivity is doing things right (efficiency) and doing the right things (effectiveness)." (7:4) The program objectives are to establish productivity awareness and promote the use of productivity planning, improvement, research, recognition and workforce motivation programs. Additionally, the program seeks to improve organizational effectiveness and efficiency and maintain a measurement system to evaluate performance (7:4).

Policy goals focus on total factor productivity improvement. The regulation reflects the recognition by the Air Force of the importance of monitoring labor

productivity, but includes other factors such as equipment, process, energy, materials and facilities. The policy is to direct consideration of these factors toward supplementation of the existing planning, programming and budgeting system. Employing approved cost factors and data gathered by accepted work measurement methods makes it easier to defend requirements during Program Objective Memorandum (POM) and budget reviews. The use of existing management structures and the involvement of personnel are emphasized for productivity improvement. The regulation establishes as policy, avoidance of arbitrary reduction in resources, claiming that any reduction in resources should be accompanied by either a corresponding decrease in workload or a more efficient means of workload accomplishment (7:4,5).

Responsibility for implementation of AFR 25-3 is assigned to various offices at Air Staff and Major Command level. The Director of Maintenance and Supply is simply tasked to provide functional assistance for Productivity Enhancing Capital Investment Programs (PECI). Major commands are to appoint a productivity principle to serve as a focal point for productivity, take part in PECI programs, implement a Productivity Improvement Program and identify the productivity impact for submitted initiatives. Procedures for accomplishing these tasks are described in other chapters of the regulation. Eather than examine these

in detail, we will look first at guidelines for productivity measurement and then at how the Air Force provides input to the Federal Productivity Measurement Project.

Chapter 2 of AFR 25-3 outlines PIP guidelines. The purpose of this chapter is to assist organizations in establishing and implementing PIP programs. This is the only direct reference to productivity measurement in the regulation. Here, organizations are encouraged to develop procedures for collecting and analyzing productivity data, but only in very general terms. It encourages micro and macro measurement systems which make effective use of available data and are simple in structure. (7:10)

"The particular measurement system selected depends on the scope and depth of the productivity effort being measured and the specific needs of management." (7:10)

At this point we see that the major commands are still left much to their own devices for effecting measurement and evaluation programs.

The Air Force does have a role in the annual measurement of federal productivity as outlined in DoD Instruction 5010.34. Chapter 5 of AFR 25-3 describes this role and provides instruction for the Air Force Functional Offices of Primary Responsibility (OPR). The Air Staff productivity office provides data to the Bureau of Labor Statistics concerning trends in labor productivity for the public. Functional OPR's must report input/output data and man-year summaries to Air Staff which verifies the

information, compiles it and submits it to the Bureau of Labor Statistics (7:31). The only OPR related to aircraft maintenance required to report as part of this program is the Depot Maintenance function at Headquarters, Air Force Logistics Command (7:60).

MAC Regulation 173-1 provides guidelines for the establishment of management performance standards. The objective of the MAC Management System as outlined by this regulation is to improve the Command's performance and effectiveness by identifying and resolving potential problems and encouraging corrective action. The responsibility for this program is given to the DCS/Comptroller and to the cost function at each level of management (65:1).

The performance standards are developed and monitored by the MAC Performance Standards Committee. This committee consists of representatives from each directorate at the Headquarters level. They review all standards annually and request data necessary to develop new standards. The published standards which apply to the aircraft maintenance field are:

1) Home Station Launch Reliability

2) Enroute Launch Reliability

For a detailed look at these standards and how they are derived, see Appendix C. As stated earlier in this section,

3) Aircraft Mission Capable Goals (65:5-13)

a cohesive program for managing productivity information is not maintained at the Major Command level in the Air Force. MAC looks at productivity in various ways and includes productivity in the general "performance indicator" grouping (66:1).

There are three separate directorates at the headquarters MAC level which yield productivity information, and each one views productivity in a different way. The Programs and Resources Directorate is concerned with manpower and quality of life issues. It is in this directorate that the MAC Productivity Division is located. The MAC Comptroller views productivity issues in strict terms of cost accounting and measures it in terms of the efficient use of funds. The Logistics Directorate, of which aircraft maintenance is a large part, views productivity in terms of providing weapon systems in support of the airlift mission. Effective use of logistics resources is their major concern (66:1).

It is at this point that the Productivity Program for the DOD has the potential to loose cohesion. As the program is tracked to the major command level, the MAC supplement to AFR 25-3 is less than one half page in length and refers only to item additions to the basic regulation. There is no consolidated program for productivity in MAC and the MAC productivity office in the Hanagement Engineering Division
is concerned only with Fast Payback Capital Investment (FASCAP) and the suggestion program. (66:2)

General H. T. Johnson, the Commander in Chief of MAC has recognized the need for a single channel of information concerning productivity and has tasked LTC Hayden of the Policy and Doctrine division to establish a Total Quality Management (TQM) office for this purpose. LTC Hayden envisions the TQM program, Action Eagle, as an umbrella for all productivity programs. Its purpose is to establish an audit trail for productivity initiatives and bring them all together under the general measure of customer satisfaction (67:1).

Productivity in MAC Maintenance

MAC Regulation 66-1, Volumes I - VI set up the maintenance management system for all MAC activities which perform on- equipmentand off-equipment maintenance of aircraft and aircraft support equipment. Together, they provide the Wing level guidance to maintenance managers and their staffs for directing and controlling subordinate maintenance activities in compliance with command maintenance policies and operating instructions (68:1) Duties and responsibilities for all managers and guidelines for all workcenters are contained in these volumes. Volume II deals specifically with maintenance management and the Deputy Commander for Maintenance (DCM) (68:2).

DCM The MAC DCM has the overall responsibility for planning, scheduling, directing and controlling the maintenance function for a given Wing. Authority for achieving this responsibility is delegated to squadron commanders and various staff functions. Productivity planning and measurement take place at each of these levels for the purpose of meeting mission objectives. However, the DCM staff functions of Plans and Scheduling (P & S), Quality Assurance (QA) and Management Information Systems and Analysis (MIS & A) have the responsibility to report to the DCM concerning the ability of the maintenance organizations to meet mission requirements within specified limits of quality and timeliness (68:1-106).

<u>P & S</u> Plans and Scheduling is the DCM staff function tasked with representing the DCM in negotiations with the operations scheduling function to produce a flying and maintenance schedule which makes the most efficient use of resources (68:20). The operational planning cycle is accomplished through a series of scheduling meetings where the requirements of the operational mission are reconciled with scheduled and unscheduled maintenance to be accomplished.

Planning begins with a comparison of the unit's quarterly flying hour allocation against the projected airframe availability. The quarterly projection is then broken down into monthly planning schedules which reconcile

the maintenance capabilities to known operational requirements. Weekly meetings are held by maintenance and operations to review the past week's accomplishments and refine the coming week's schedule.

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Additionally, maintenance must plan long-range to ensure the proper and effective use of maintenance resources (68:20). The Maintenance Planning Cycle considers the planning and support of mission requirements, particularly the availability and serviceability of facilities, tools and equipment, and material. Long-range planning is needed to support future requirements such as Programmed Depot Maintenance (PDM) schedules, Time Compliance Technical Orders (TCTO), Quality Assurance activities and scheduled exercises (68:20).

Plans and Scheduling maps out the function of the maintenance complex for a given period of time. Production planning starts here, but it must be tracked and evaluated and compared to some standard before it translates into a performance indicator such as productivity (68:21).

<u>MIS & A</u> This function provides information to the DCM to evaluate how well the unit is meeting its requirements for flying and maintenance. The information gathered from data systems within the maintenance complex is analyzed to yield answers to questions posed by maintenance managers such as:

A. Were operations requirements realistic?

B. What were the causes of deviations from the operational and/or maintenance schedule?

C. Are particular systems or equipment items negatively impacting performance goals?

D. Are enough qualified maintenance personnel available to meet mission requirements? (68:106)

"The analysis process is defined as the methodical conversion of raw data into a form useful for managerial control. It begins when the data are first assembled and ends when they are applied for decision making or control." (68:106)

The overall objective is to provide information which will be used by maintenance managers to improve the maintenance operation. This is accomplished by viewing maintenance management reports, looking for trends and managing the information systems (68:80).

The information analyzed by MIS & A can be reported individually to concerned supervisors or directly to the ⁻ DCM. MAC Reg 66-1 requires the MIS & A section to publish a maintenance digest which summarizes the performance of the maintenance complex for the preceding month. Again, the overall objective is to improve the maintenance operation by analyzing maintenance data (68:83).

Each unit must publish a maintenance digest each month and send a copy to the MIS & A office of the Logistics Maintenance Management Division at Headquarters MAC. At a minimum the digest must have the following information:

Home Station Air Abort Rate
Labor Hour/Flying Hour

- 3. Base Self-Sufficiency Capability
- 4. Top Ten Man-Hour Consumers
- 5. Top Ten Failures by Work Unit Code
- 6. Delayed Discrepancies/Average Possessed Aircraft
- 7. Cannibalization/Departure Rate (68:83)

Attachment #1 of MAC Reg 66-1 Volume II contains the formulas required to compute these measurements and others which may assist maintenance management in evaluating performance. Of these, only one refers directly to productivity. Productivity as defined by this formula measures the man hours documented in the Maintenance Data Collection System against the total available time to perform maintenance. For this formula and the others suggested for use by Attachment #1, see Appendix C.

QA The quality of maintenance is the concern of every individual working in the maintenance complex. The DCM tasks the Quality Assurance staff function with the responsibility of assessing equipment condition and personnel proficiency. This is accomplished through the Wing Quality Assurance Program (QAP) (68:62,64).

The QAP provides information to the DCM based on samples of unit equipment and personnel performance gathered by the inspection process. QA performs Quality Verification Inspections (QVI), Support Equipment Technical Inspections (SETI), Special Inspections (SI), document file inspections for aircraft, acceptance inspections for depot returns and personnel observations. Together these inspections and

their evaluation provide a general view of the quality of maintenance performed by a unit.

QA is the primary technical advisor in a maintenance unit and it assists unit workcenters in the resolution of quality problems. It also assists the MIS & A section in developing a monthly condition summary. The summary includes trend analysis of inspections and personnel evaluations, a synopsis of inspection performance and Detected Safety Violations (DSV) by workcenter, and recommended corrective action (68:83).

QA is an important function in the management of a maintenance unit. The level of quality maintained in an organization reflects directly in its ability to produce (51:21). MAC's concern for quality is obvious in the emphasis which is placed on evaluating performance at the unit level, but for the most part, the quality information is not passed on to the Major Command. The information is routed to the Wing commander at the discretion of the DCM (58:62-71).

Previous Research

The Defense community has been studying productivity concepts and seeking to improve productivity performance for some time. Since the subject is included in many different fields of study, productivity related literature is found in many disciplines including engineering, accounting, economics, psychology, operations research and management.

Additionally, research has been conducted in many different types of organisations and at different organizational levels. There are studies of productivity at the DOD level as well as at the Major Command level. Large groups have been studied as have individuals and small working groups (69:68-80). Productivity improvement methods are usually tailored to meet the needs of specific functional areas or individual organizations. Those interested in productivity improvement must find the information for their particular problem from among hundreds of studies. For this reason, this review will be limited to the literature pertaining directly to productivity management in aircraft maintenance units.

Measurement Methods Productivity measurement has been approached in a number of ways. Some attempts to measure productivity in aircraft maintenance units have been constructed around multivariate effectiveness models. This approach to the study of organizational effectiveness attempts to build models which focus on relationships between important variables as they jointly influence organizational success. Such integrative models are generally comprehensive and attempt to account for a larger proportion of the variance in effectiveness. Additionally, they typically hypothesize how the variables under study relate to one snother (69:73).

<u>Macro Measurement</u> In a study contracted by the Office of Naval Research in 1975, 17 multivariate models of organizational effectiveness were reviewed (70:10-13). The models were evaluated in terms of their basic evaluation criteria, their normative or descriptive nature, generalizability and derivation. Aircraft maintenance units were among the organizations to which the models were applied. Of the problems noted with this approach, the most significant were related to the overall relevance of the findings and the level of analysis performed.

The questions asked by the researchers were, "Do the models enhance the understanding of the daily activities of organizations" and "do they enable managers to make predictions which may affect productivity?" The study concluded that if such models do not contribute to the understanding of organizational structures, processes or behavior, they are of little value. Those considered to be most useful examined relationships between important variables within a systems framework capable of enhancing the understanding of organizational dynamics (70:13,14).

The study also noted that among models little integration was made between macro and micro models of performance and effectiveness. For example, a study may concentrate on organizational models or human factors within an organization, but seldom are the two levels examined as they contribute to another. Most models dealt exclusively

on the macro level, ignoring the relationships among individual measures and productivity. The authors considered it of paramount importance to be able to tell managers in specific terms how they can improve their organization's effectiveness, thereby improving productivity. They felt the ability to make meaningful recommendations was not improved by looking at only the overview (70:14).

Suggestions for future work focused on the examination of operative goals. This involves identifying the intended goals of the organization as opposed to its "official goals" and then measuring the degree to which the intended goals are being achieved. The contention is that such an approach reduces reliance on value premises about what an organization should be doing and relies instead on what it is actually trying to do (70:15). The challenge, of course, is to identify the measures of goal achievement in quantitative terms.

Selection of the most significant variables from among the countless inputs into a productivity model is a problem addressed by a large body of research. Between 1972 and 1980, the Air Force Human Resources Laboratory either contracted or participated in approximately 120 studies dealing with productivity measurement. From those reviewed for this research, the majority were concerned with identifying valid measures to be evaluated. One such study

conducted by Arizona State University dealt specifically with Air Force maintenance organizations (69:65-109). Of the studies reviewed, none dealt with analyzing current productivity measurement methodology in the aircraft maintenance environment. Instead, the studies concentrated on establishing new measurement methods.

Micro-Measurement The Arizona State University Department of Industrial Management Systems Engineering was contracted by the Air Force in 1980 to develop a planning model for Air Force Maintenance Organizations. Performance prediction equations for maintenance squadrons were generated using stepwise, multiple regression analysis. Three independent survey instruments were administered to samples of up to 180 maintenance technicians for the purpose of identifying dependent and independent variables to be used in the model development. Two basic variables were identified as model outputs; technician performance rate (speed of work) and performance quality. The models integrated 48 predictor variables related to performance, organizational structure, job tasks and personal characteristics. The resulting models provided predictions of squadron performance while emphasizing the significant factors which contributed to maintenance effectiveness (71:15-35). The study concentrated on the micro view of productivity as seen by the technicians involved in the

daily maintenance activities. The view of the wing and command level managers were not considered in this research (71:45).

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Integration In October 1980, the Air Force Human Resources Laboratory released a study by the Maryland Center for Productivity and Quality of Working Life which identified productivity measures at both the organizational and individual level. The object - of the study were to: clarify the meaning of productivity as it applies to Air Force Organizations, describe and critique different productivity measurement methods, and to describe a productivity measurement methods, and to describe a procedure for generating productivity measures in Air Force Organizations.

The study resulted in several conclusions significant to productivity measurement in aircraft maintenance units. Among these was the assertion that an organizational productivity measurement plan should include multiple measures of both efficiency and effectiveness. Additionally, efficiency and effectiveness measures should be developed for the key facets of mission performance. Recognizing the unlimited number of possible productivity measures, the study suggested care should be given to the selection of those measures which are judged to be most useful to a particular organization (5:76-82). In keeping with the research objectives, the study developed a methodology for generating productivity indicators. The

results were incorporated into future studies and have been applied in various forms at Air Force organizations. However, the study did not address the usefulness of existing measures of productivity as they relate to desired productivity improvement.

Application In 1987 the University of Houston's Department of Psychology and Institute for Organizational Behavior Research conducted a field study using many of the precepts defined by earlier work (5:19-43). Robert Pritchard led a research team in developing a productivity measurement system to be tested at five operational units in the aircraft maintenance and supply functions of an Air Force base. The productivity measures derived from the system were used as a basis for feedback to the units. The feedback was presented to each unit and used for the purpose of setting goals and defining incentives (72:35-41). Results proved to be an effective way to measure and improve productivity. The study concluded that feedback increased productivity substantially and that goal setting enhanced productivity even more. However, incentives did not seem to improve productivity over what had already been gained. The conclusions most important to this research were those pertaining to the development and application of measures in the aircraft maintenance unit.

The Communication/Navigation (Com/Nav) branch of an Avionics Maintenance squadron was the test unit for the

aircraft maintenance function. Meetings were held with the Com/Nav supervisors to identify outputs and methods of measurements. The outputs were called products and could be measured both qualitatively and quantitatively. For example, the supervisors considered one product to be the quality of repair. They chose to measure the success of providing this product by examining the number of items that were returned immediately after repair, and by examining the percentage of quality control inspections passed by the workcenter.

After developing a list of products and indicators, they established contingencies. The term contingency refers to the relationship between the amount of the indicator and the effectiveness of that amount of the indicator. This concept was derived from an earlier work by Tuttle dealing with productivity (5:76-103). Referring again to the product, quality of repair, and its indicator, percentage of passed quality inspections, contingencies establish the best and worst level of performance expected in that area. Once these performance limits are established for an indicator, they are viewed in relation to the affect on the overall effectiveness of the workcenter. In this way, each indicator is ranked according to its impact on organizational performance.

The system worked quite well when tested. Productivity, as defined by the contingencies, improved

dramatically. However, a follow-up study on the same military organization concluded that supervisory interest had declined and the system had been discontinued (73:69-115).

The same approach to measurement and enhancement has been applied to other organizations, but only ones characterized by a highly controlled environment, such as a back shop or pure production function (74:1-18). These types of organizations are easier to study because of their controlled routine. However, the need still exists for an application in a more dynamic work environment. The study concluded that the primary reason for dropping the program was the assignment of new managers who did not see the program's merit. They said that it was too complicated and demanded too much additional time from supervisors who were already stressed for time. This follow up study, highlighted the need for an overall measure of productivity which would integrate the numerous measures in use, yet not serve to complicate an already exceedingly complex task.

Conclusion

Productivity management in the Federal Government and particularly in the DoD is a difficult task. The process begins by defining productivity in terms of labor output; however, at the operational level the definition becomes more complicated as the units seek to measure both efficiency and effectiveness. The resulting measures are

numerous and are considered under the umbrella of performance indicators in general. MAC does not appear to provide information to the Federal Productivity Measurement Project and the multi-factor approach to productivity measurement suggested by AFR 25-3 is implemented only at the Wing level.

The Maintenance Management System in MAC utilizes the measurement and analysis of maintenance data to monitor unit performance based on Command standards. However, Command performance standards address only a few areas which could be viewed as productivity concerns. The majority of the responsibility for the evaluation of performance and the development of standards is left to the operational units.

Many studies have been done on productivity measurement. Those studies conducted in the military environment have, for the most part, been concerned with the micro view--understanding what makes individual workers more productive. The underlying idea is that if individual productivity is enhanced, organizational productivity improvement is sure to follow (5:61-73). Having the technician's view is indeed important; however, they have a very limited view of the overall mission of a unit. A more useful approach for evaluating productivity would be to identify pertinent measures based on the desired outputs of maintenance managers in relation to higher headquarters

objectives. Once this assessment is made, one could then test the relationships between the individual measures of productivity and the overall productivity objectives of the unit.

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IV. Methodology

Introduction

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This chapter describes the method of research used to answer the research questions presented in chapter one. The purpose of this research was to explore the manner by which aircraft maintenance units measure productivity, identify the measurement methods in use and to understand their application. In order to accomplish a complete study of the problem as stated in the introductory chapter, the research was conducted in three stages. The first stage consisted of a background study and review of literature dealing with productivity management, both in general and more specifically within the DoD. The second stage of research consisted of telephone interviews with maintenance managers in MAC. The interviews were conducted to gain an understanding of management attitudes toward productivity measurement and to identify the specific measures implemented by the MAC wings. Finally, specific measurement data, identified by the interviews, were statistically analyzed. These exploratory efforts provided the information necessary to understand the theoretical relationships of the identified measures and suggest alternative methods for productivity measurement in aircraft maintenance units.

Stage 1: Background Study

The background study was conducted to identify the development of productivity management through historical review of management concepts, various definitions of productivity and current applications within the private sector. Implicit in the background study was the identification of measurement methods and their application as a part of productivity management. The sources for the background study were management texts, and journal articles.

After establishing an understanding of productivity management in the private sector, the researcher reviewed government documents establishing guidelines for productivity management within the public sector and specifically within the DoD. Directives and regulations were reviewed through each level of management from the Office of the President of the United States to the MAC aircraft maintenance units at the wing level. Additionally, DTIC documents were reviewed in order to determine what other research had been done in the area of productivity management within the DoD and specifically what research pertained to Air Force aircraft maintenance. The purpose of the literature review was to offer a comparison of productivity management methods in the DoD and to identify the measurement criteria at each level of command.

Stage 2: Interviewa

Having developed a baseline of productivity management measures and applications in both the private sector and the DoD, the next logical step in the research was to determine how these measures were actually being applied within the MAC maintenance units. An interview instrument was developed and tested for this purpose. The researcher chose to use a structured interview but used open ended questions so that each answer could be explained fully and to ensure the respondent understood each question. The interview instrument was reviewed by AFIT faculty and revised to improve its content validity. A pretest of the instrument was then conducted at the 2750th Test Wing at Wright-Patterson AFB, Ohio. The Wing DCM and the chief of the maintenance analysis section were interviewed and further revisions made to the instrument. These revisions were intended to ensure the respondents understood productivity terms as defined by the Air Force. This strengthened the construct validity of the instrument. The resulting set of questions is included as Appendix E.

After initial interviews at the MAC headquarters to determine the flow of productivity information within the command, the comptroller, programs and resources and logistics directorates were contacted. Telephone interviews were scheduled with these directorates to establish how each interacted with the wings to monitor the command's

productivity and to determine how the information from each directorate came together at the headquarters level.

Telephone interviews were then conducted with maintenance managers at ten MAC wings. The individuals contacted were Deputy Commanders for Maintenance or their designees and the Chiefs of the Wing Maintenance Analysis sections. The purpose of the interviews was to identify the measures in use at the wing level and to understand how the broadly defined concepts presented in the background study and literature review were actually being implemented. The DCM interviews gave an indication of the direction productivity management in each Wing was taking while the interviews with the Chiefs of Maintenance Analysis indicated specifically how these directions were being pursued. Stage 3: Detailed Data Collection and Analysis

Evaluation of the measures specified in stage two as

being used at the Wing level to manage productivity was conducted in three parts; data collection, quantitative analysis and qualitative analysis. The purpose of this analysis was to identify those measures most significant for the assessment of an aircraft maintenance units productivity.

It was necessary as part of this analysis to categorize each identified measure as either an input or an output. As stated in chapter III, the DOF definition of productivity is a ratio of inputs to outputs. Outputs are defined as the

final products produced or services rendered in a measurable functional area. Inputs are defined as the amount of resources utilized to produce an output (63:34). Because it was unclear which of the identified measures was intended to be the best indicator of a unit's productivity, each measure categorized as an output was used as the dependant variable in a series of regression equations. The remaining measures functioned as independent variables.

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From the information gathered by the telephone interviews, the thirteen most commonly used measures were identified. Of the ten wings interviewed, six were chosen to contribute data because they were networked into a central database management system monitored at HQ MAC. This made the data collection easier to accomplish because it could be gathered at one location. The remaining wings utilized local data systems which would have to be accessed. individually. The time constraints of this research precluded gathering data from these wings.

Using the information gathered in the interviews and the researcher's personal experience of ten years in MAC aircraft maintenance, a logical model was developed. The purpose of the model was to categorize the thirteen measures as either inputs or outputs according to the DOD productivity definition and to establish the relationships among them. The model was then verified and validated through review by a total of five students and instructors

at AFIT with experience in the aircraft maintenance career field. Suggested changes were made to the model based on their input and logical explanations were developed for each association of measures within the model. The basic intent was to establish preliminary theory as to how each measure contributed to the overall assessment of productivity within the maintenance units.

A correlation matrix of all the variables was programmed in the System for Elementary Statistical Analysis (SAS). The resulting associations served to either confirm or question the relationships among the measures first purposed by the logical model. Additionally, conclusions were drawn to identify redundant measures by logical interpretation of the matrix. The basic rationale for identifying redundancy was that if two measures were highly correlated with a third, and the two measures were highly correlated with each other, then the measures might be redundant (or collinear). Those measures seeming to indicate redundancy were then logically evaluated to determine if both assessed the same aspect of productivity. If so, the redundant measures were considered as candidates for elimination from the productivity models.

The next step was to revise the model to include only those measures which contributed best to the assessment of productivity. This step was performed by confirming the findings of the correlation analysis with an additional test

using stepwise regression. To confirm the validity of the basic ascumption concerning redundant measures, all measures were regressed to each output measure. Stepwise regression using the backward elimination procedure was performed for the purpose of retaining only those measures which most significantly explained the variation of each output measure. The backward elimination process was used because it began with all the measures and eliminated each one as it was tested by itself and in interaction with the others. If more than one independent measure contributed in the same manner to the output measure, only that which contributed most significantly would be retained in the model. The measures which remained in the model were assumed to contribute the most to the explanation of the output (dependent) measure.

A stepwise regression was performed for each of the six measures identified as outputs. The model which was indicated to be most useful to explain the relationships of the various measures was compared to the original logical model. As the relationships of the variables were either confirmed or questioned, logical explanations were sought for practical validation. The output measure and contributing measures which tested most useful were determined to represent "The Productivity Hodel." The most significant output measure was substituted for productivity and the contributing measures were determined to be the best

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inputs to productivity in the context of this study. Finally, the revised model was tested for interaction among the measures and residual analysis was performed. The analysis of the residual plots for each measure confirmed or questioned the validity of the final logical model and further established the model's



Figure 2 Stepwise Regression Analysis for Productivity Measures.

usefulness. Figure 2 demonstrates the logical flow of the preceding analysis.

The critical interpretation of the information gathered from the qualitative and quantitative analysis of the research data was accomplished by comparing the research findings to the information in the background study and literature review. A final comparison of the analysis results to what was learned about productivity in the public

sector established the basis for conclusions and recommendations concerning the stated problem in keeping with the research objectives.

SUMMARY

This study was conducted to explore the method of productivity management in aircraft maintenance units in the Military Airlift Command. The background study and literature review established the level of concern for productivity management in both the private and public sectors of the economy. Additionally, the methods of productivity management employed in the DOD and the U.S. Air Force were explored with emphasis on the identification of the required measurement methods as they are implemented at each level of command. Having established a baseline of information, maintenance managers from ten MAC wings were interviewed to identify how productivity is measured at the wing level and to establish how these measures are utilized for productivity management. As a result of these interviews, thirteen measures were identified and statistically analyzed. Simple correlation and stepwise regression were used to establish the relationships among the variables and to eliminate redundancy. The remaining measures were evaluated as to their logical usefulness for the explanation of productivity in aircraft maintenance units.

V. FINDINGS AND ANALYSIS

Introduction

This chapter presents the answers to the research questions posed in chapter I. The sources used to gather data consisted of a background study, literature review and telephone interviews. The review of regulatory guidance provided a view of current methodology for productivity measurement in the Military Airlift Command. Telephone interviews conducted with MAC maintenance managers confirmed the measurement methods actually used at the Wing level and established the flow of productivity information to the Major Command headquarters. Once the measurements were identified, six months of data for each measurement was gathered from the various wings and analyzed to determine the relationships among the measures as they effect productivity in aircraft maintenance units.

Current Productivity Measurement

Productivity management in the Federal Government is concerned with labor output. The presidential order which serves as the primary guidance for productivity improvement defines productivity as the efficient use of government resources to produce a desired output in the form of goods and services. Each DOD component gathers labor hour data and reports it to the Bureau of Labor Statistics to be used in conjunction with data from the private sector. Together

these data inputs yield a national productivity figure for a given year.

Productivity data from the DOD components are gathered by functional area from existing data systems. Those gathered to measure Air Force aircraft maintenance productivity are primarily in the areas of intermediate and depot maintenance actions. These data are gathered from the Air Force Logistics Command and indicated by the number of items processed. The data is routed through the Air Staff where it is verified, compiled and submitted to the Bureau of labor Statistics.

In addition to the macro measurement of labor productivity, each Major command is responsible for establishing productivity goals and developing programs for managing productivity in compliance with AFR 25-3. The maintenance management system in MAC utilizes the measurement and analysis of maintenance data to improve unit performance based on Command standards. The Command standards deal specifically with departure reliability and mission capable rates. The responsibility for development and evaluation of performance standards which contribute to the effective and efficient performance of the operational mission is left to the operational units.

Each operational wing in MAC must comply with MACR 66-1 which establishes the maintenance management system. Included in this regulation are a number of suggested

measures to assist in performance evaluation and enhancement.

Because of the broad definition of productivity as a measure of both efficiency and effectiveness, several measures are used by each wing maintenance activity. It is up to the unit to define the measures which help to evaluate the accomplishment of unit objectives.

Interview Conduct

Telephone interviews were conducted with wing level maintenance managers and directorate level managers at HQ MAC. Wing Deputy Commanders for Maintenance or those whom they designate and Chiefs of the maintenance data analysis sections were asked a series of questions to establish the level of familiarity with productivity initiatives in the Air Force, identify specific productivity measures used by aircraft maintenance units and to explain their opinions concerning productivity management at the wing level. Managers within the comptroller, programs and resources and logistics directorates were asked the same series of questions to establish the flow of information from the wings to the HQ and how the information is used once received.

Twenty three interviews were conducted. Three were conducted within the Directorates at HQ MAC while the remaining twenty were split evenly among DCM's and Chief's of analysis at ten MAC Wings. The following narratives are

summaries of the responses dealing specifically with the research questions as presented in chapter I.

Interview Findings

Research Question 1: Are aircraft maintenance managers familiar with Air Force guidance concerning productivity measurement?

Finding 1: Fifty percent of those interviewed were not familiar with AFR 25-3, the Air Force Productivity Enhancement Program. Of those familiar with the regulation, the majority thought of it as a continuation of the Model Installation and Suggestion programs. There was no detailed knowledge of regulatory guidance for the measurement of productivity at either the Major Command or Wing level.

When asked which aspect of productivity concerned them most, efficiency or effectiveness, the responses varied by functional grouping. The DCM's responded overwhelmingly that effectiveness was the primary issue in productivity measurement. The maintenance data analysts and HQ level managers felt both issues were of equal importance. In general, all groups agreed that efficiency would become increasingly important with the current defense reduction.

Thirteen of the twenty three respondents considered productivity measurement to be an important issue. They believe quantitative measurement of maintenance data to be the only valid method of tracking the overall performance of a unit. Those who did not consider productivity measurement

to be an important issue cited problems with the Maintenance Data Collection System. Many felt the MDC system was too subject to error for the resulting measures to be truly valid. The respondent from the Comptroller Directorate explained that aircraft maintenance had little input to the command level productivity picture. He claimed productivity is a function of cost and is measured by the ratio of cost per unit of support. Although the aircraft maintenance function does factor into the cost of support, productivity management emphasis is placed on cost management as opposed to the individual support processes.

Research Question 2: What methods of productivity measurement have been specified by regulation for aircraft maintenance units?

Finding 2: The respondent from the Comptroller Directorate was the only one from the HQ level aware of a specified measure for aircraft maintenance productivity. Supply cost per flying hour is the input associated with aircraft maintenance. It is reported by the Resource manager at each wing to HQ MAC. The DCM's did not have specific knowledge of required measures, but felt that departure reliability and mission capable rates were the measures of greatest concern to MAC. The maintenance data analysts referred to MACR 66-1, Volume II as listing the requirements for productivity measurement. Paragraph 4-14 of this regulation lists seven reports which must be

generated for inclusion in the monthly maintenance digest. These reports are viewed by maintenance managers as meas res of productivity. For the remainder of this study the reports will be referred to as productivity measures. The required measures of productivity are:

- 1. manhour per flying hour
- 2. cannibalization actions per aircraft
- 3. awaiting maintenance discrepancies
- 4. awaiting parts discrepancies
- 5. maintenance air aborts
- 6. base self sufficiency
- 7. high component failures/work hour consumers

Research Question 3: Which of the specified methods of productivity measurement are actually implemented?

Finding 3: The purpose of this question was to discover if the measures actually in use at the wing level were consistent with regulatory guidance; therefore, only wing level responses were recorded. The majority of respondents in both functional groups at the wing level stated that all required measures were reported and used by maintenance managers. The remaining respondents agreed that all required measures are reported, but they asserted that their actual use is situational. For example, if awaiting maintenance discrepancies exhibit an upward trend over time, only then do they become an item of interest. They also cautioned that no measure should be used in isolation for

productivity measurement. All respondents agreed that the measures in use must be viewed together as in the multi-factored approach.

Research Question 4: Are there methods of productivity measurement used by aircraft maintenance organizations other than those specified by regulation?

Finding 4: There are measures in use in addition to those required by regulation. Mission capable rates and departure reliability rates, although not included in the list of required measures, are reported by every MAC wing. Departure reliability has been the traditional measure of effectiveness in MAC. However, in an effort to standardize the measure of effectiveness across commands in the Air Force, mission capable rates have been increasingly emphasized. Appendix F exhibits the correspondence between the Department of the Air Force and HQ MAC which established the requirement for this emphasis. Appendix G lists the measures gathered and reported by each wing interviewed.

Statistical Analysis and Findings

Research Question 5: What are the nature and strength of the relationships among the measures implemented by aircraft maintenance organizations?

Finding 5: To answer this question the thirteen most common measures used by MAC aircraft maintenance units were chosen and categorized as either input or output measures contributing to an overall measure of productivity as

explained in chapter IV. A logical model was developed from these measures and validated by the statistical analysis of data gathered in each measurement area.

<u>A Priori Logical Analysis.</u> The logical model presented in Figure 3 is a representation of the thirteen productivity measures most used by MAC. In parenthesis, between each measure, is a negative or positive symbol which represents the logical relationships among the measures.



Figure 3 A Priori Logical Model for MAC Productivity Measures

The absence of a symbol between measures (e.g. 1 and 7) indicates that the relationship was not apparent to the researcher.

OUTPUT		
Nomenclature	Variable name	
labor hour/flying hour	ner1	
mission capable rate	msr2	
repeat /reaccurring	7	

Table 2 MAC Productivity Measures

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INPUT	
training reliability	msr12
enroute reliability	msrl1
homestation reliability	msr10
maintenance air aborts	msr9
maintenance scheduling effectiveness	msr8
repeat/reoccurring discrepancies	nsr7
mission capable rate	msr2
labor nour/ilying nour	D\$LT D\$LT

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Nomenclature	Variable name	
cannibalization	msr3	•
awaiting maintenance discrepancies	msr4	
awaiting parts discrepancies	msr5	
average possessed aircraft	msr6	
base self sufficiency	mer13	

<u>Measurement categories.</u> The preceeding table exhibits the thirteen measures chosen for analysis. The nomenclature and corresponding variable name is identified for each measure. Additionally, the table exhibits how each measure was categorized as input or output in terms of its contribution to the basic productivity definition.

Recognizing the complexity of the relationships among the measures shown, the model in Figure 3 is simplified to show those relationships that are most obvious. The model assumes that the measures positioned at the lower levels of the figure contribute to those positioned above them. The measures at the bottom of the figure are considered to be the basic inputs which contribute to each measure above as indicated by the connecting lines. The measures at the top of the figure are the final outputs of the model.

Base self sufficiency (msr13) is the measure of a units ability to repair assets and return them to use. Msr13 and the average number of possessed aircraft (msr6) represent the basic model inputs. These measures will affect all other measures in the model, either directly, as in msr5 or through other measures, as in msr1.

Awaiting parts discrepancies (msr5) are aircraft discrepancies which have been troubleshot by maintenance personnel, but cannot be repaired until a specific part is received from supply. This measure represents the responsiveness of the supply system to maintenance

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requirements. It is directly affected by mar13 and mar6. The number of possessed aircraft at any given time (mar6) will affect the number of awaiting parts discrepancies by increasing or decreasing the demand for parts from supply. F rthermore, as the base intermediate repair facilities eturn more items to use (mar13) the demand on supply is reduced which in turn reduces the number of awaiting parts discrepancies.

The average number of aircraft possessed by a wing (msr6) and the awaiting parts discrepancies (msr5) contribute to the number of discrepancies awaiting maintenance (msr4). Discrepancies awaiting parts become awaiting maintenance once the parts are received and until the repair task is completed. Also, because an aircraft system may be awaiting parts for one component while other components in the system also require maintenance, the repair of the entire system (all bad components) may not be accomplished until the part in question is received. Each aircraft possessed by a wing represents some potential number of maintenance tasks. The number of tasks increase or decrease with the number of aircraft possessed (msr6) as do the number of discrepancies awaiting parts (msr5) and maintenance (msr4).

Manhour per flying hour (msrl) represents the maintenance effort expended to sustain an aircraft for one hour of flight. The model indicates that awaiting
maintenance discrepancies (msr4) and the number of cannibalization per aircraft (msr3) have a direct affect on msr1. These measures represent the total maintenance effort. All awaiting maintenance discrepancies represent potential manhour consuming tasks. Likewise, every completed task was at one time recorded as an item awaiting maintenance. Therefore, an increase in msr4 will cause in increase in msr1.

Cannibalizations are a result of the inability of supply to provide the needed parts. An increase in msr5 may result in an increase in msr3 as parts are taken from other aircraft to make up for the lack of parts in the supply system. These cannibalization actions add to the manhour per flying hour rate for a given wing.

The next level of relationships in the model is somewhat unclear. The model shows that msrl contributes to mission capable rates (msr2) via repeat/reoccurring discrepancies (msr7), maintenance scheduling effectiveness (msr8), and maintenance air aborts (msr9). However, it is unclear whether the net relationships are positive or negative. For example, does more maintenance effort (msrl) decrease the number of repeat/reoccurring discrepancies (msr7), or does the increased requirement for maintenance suggested by a higher manhour per flying hour rate increase repeat/ reoccurring discrepancies? Maintenance scheduling effectiveness (msr8) measures a unit's ability to meet the

periodic maintenance schedule. Maintenance air aborts (msr9) are those aircraft which must return to base because of maintenance problems encountered after takeoff.

Measures seven, eight and nine directly affect the mission capable rate (msr2). As repeat/reoccurring discrepancies and maintenance air aborts increase, a unit's ability to provide mission capable aircraft is decreased. However, maintenance scheduling effectiveness positively affects mission capable rates. Aircraft are required to be inspected and maintained at certain intervals. The aircraft cannot be declared mission capable if these periodic inspections and the resulting maintenance is not completed.

The upper portion of the model represents the final output of the total maintenance effort. Departure reliability rates are the traditional measure of maintenance productivity in MAC. Homestation, enroute and training departure reliability are represented in the model as msr10, msr11 and msr12 respectively. Mission capable rates (msr2) impact each of the departure reliability rates for any given wing. The more aircraft a unit has ready to perform the required mission, the more likely the aircraft will takeoff on time. On time takeoffs are the bottom line measure of a units productivity in terms of effectiveness.

<u>Correlational Analysis.</u> Figure 4 exhibits a comparison of the a priori logical model and the same model after correlational analysis. The numbers on the right-hand model

represent the actual strength and nature of the original relationships. The correlation matrix from which these figures were extracted is presented in Appendix H.



Figure 4 A Comparison of the Logical Model Before and After Correlational Analysis

It is readily apparent that associations assumed to be logical in the priori model are not uniformly upheld by the correlational analysis. Ten of the thirteen posited relationships appeared to be either strongly or marginally supported. However, the a priori model suggests a positive relationship between msr6 and msr5, while the correlation analysis exhibits a negative relationship between these measures. This relationship indicates that awaiting parts discrepancies increase as average possessed aircraft decrease. Likewise, the relationships shown between msr2 and msr7, and msr2 and msr9 after correlational analysis do not agree with the general understanding of these measures.

The correlations suggest that the associations between these measures are positive. In other words, as repeat/ reoccurring discrepancies and maintenance air aborts increase, the unit's mission capable rates seem to increase.

Another observation to be made from the comparison of these models is the relatively weak correlations among some measures. The a priori model is based upon the assumption that these measures have significant associations. Logic suggests that the association between average possessed aircraft and awaiting maintenance discrepancies is reasonably strong. As a unit possesses more aircraft the requirement for maintenance tasks will most likely increase which will in turn increase the number of awaiting maintenance discrepancies. However, the correlational analysis shows the association between these measures to be very weak. Instead, the strongest association with awaiting maintenance discrepancies seems to be cannibalization.

In light of these counter-intuitive findings, the analysis suggests that the associations between the measures are either much more complex than originally thought or that many of the measures may provide redundant information. After viewing the correlation matrix presented in Appendix H, redundancies appeared possible between the following pairs of variables:

mission capable rates and cannibalization
 (-.552)

cannibalization and awaiting parts
 discrepancies (.664)

3. enroute and training reliability (.348)

The above information suggests that mission capable rates, cannibalization and awaiting parts discrepancies may largely overlap in terms of the information they convey to managers. Having understood that awaiting parts discrepancies are an indication of supply's ability to provide the needed parts to maintenance, it follows that cannibalization and mission capable rates may be considered follow-on indicators of supply support.

Reliability rates measure the overall effectiveness of a units maintenance effort. Traditionally, homestation reliability has been the primary performance indicator for a MAC wing. However, homestation reliability can be manipulated by the local maintenance managers. Cannibalization of parts, replacing aircraft with scheduled spares and expediting priority tasks are all ways of ensuring high homestation reliability rates.

Enroute reliability is more of an indication of an aircraft ability to perform the mission because it is not subject to the same level of manipulation. Therefore, enroute reliability rates may be a better indicator of the quality of maintenance performed at homestation as it

sustains the aircraft in the system. Training reliability has the lowest priority at homestation. A high training reliability rate also indicates high quality maintenance. If the low priority missions are reliable, then the overall reliability of the unit's aircraft will likely be high as well. Consequently, both training and enroute reliability rates may be good indicators of a unit's maintenance effectiveness and quality level.

Research Question 6: Of the measures implemented by aircraft maintenance organizations, which contribute most significantly to explaining maintenance productivity?

Finding 6: Stepwise regression was used to evaluate the model which best described a maintenance units productivity. Redundant measures do not appear in the resulting models because the stepwise elimination of the measures will retain only those that are most significant. Several models were tested. Table 3 exhibits the dependant variable, the significant measures, R-square and global F values for each model tested. The regression analysis output is presented in Appendix I.

The information in Table 3 exhibits the most significant measures for each of the output measures identified. Of the eight models tested, manhour per flying hour has the highest R square and global F values. The R square value of 95% represents the fraction of the sample variation of the dependent variable that is attributable to

DEPENDANT VAR. (productivity)		CANT MEASURES		Global F (prob>F)
manhour/flying hr (msr1)	Base	1,3,4,5,6 msr2 msr8	0.959	79.63 (0.0001)
mission capable rates (mgr2)	Base	1,2,3,6 mar3 mar4 mar5 mar6	0.734	13.48 (0.0001)
repeat/reoccurring discrepancies (msr7)	Base	1,2,3,4,6,7 msr2 msr4 msr6	0.828	17.90 (0.0001)
maintenance sched effectiveness (msr8)	Base	3,6,7 msr5	0.562	13.84 (0.0001)
maintenance air aborts (msr9)		none	0	0
homestation rel. (msr10)	Base	6 msr5 msr6 msr13	0.429	5.84 (0.0013)
enroute rel. (mar11)	Base	1,3,4,5,6 msr4	0.588	5.73 (0.0003)
training rel. (msr12)	Base	1,3,6 msr3 msr4 msr5 msr13	0.515	6.08 (0.0001)

Table 3 Comparison of Stepwise Regression Results for MAC Productivity Measures

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the dependant variables in the regression model. In general, the larger the R square value is, the better the model fits the data. The global F statistic is the result of the test of global usefulness for each model. According to the information in table 3, 80% of the variability of the data is explained by the manhour per flying hour model with a 99% level of confidence. The form of this model is shown as:

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productivity: msr1 = 71.27 + 125.45 b1 - 19.16 b3 -
22.58 b4 - 32.09 b5 - 31.99 b6 - .4718
msr2 + .1317 msr8
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Not surprisingly, this equation seems to indicate that the model is highly dependant on differences among the various bases from which the data was gathered. This suggests that factors unique to a given base strongly affect the productivity of a unit. Identifying these factors is an area for future research. The information of interest to this study is the indication that mission capable rates and maintenance scheduling effectiveness are the measures which best explain manhour per flying hour and may therefore be the most useful indicators of a unit's productivity. However, mission capable rates and maintenance scheduling effectiveness are among the measures classified as outputs. Therefore, it is important to address these measures in the context of the inputs which contribute to their development. If managers understand which inputs are most significant to

these measures, they may be able to control their effect on the unit's productivity.

Table 3 indicates that mission capable rates are most significantly affected by cannibalization rates (mar3), awaiting maintenance and awaiting parts discrepancies (mar4 and msr5) and average possessed aircraft (msr6). Additionally, maintenance scheduling effectiveness is affected most significantly by the number of discrepancies awaiting parts (msr5). These measures are indicated by the models determined to be the third and fourth most significant models in the table. When these relationships are combined with those identified in the manhour per flying hour model, a more complete model emerges. The R square and global F values are not as strong for these models as for the manhour per flying hour model which substantiates the supposition that other measures contribute to the overall output from a subordinate level.

Figure 5 shows the logical model resulting from this analysis in comparison to the a priori logical model. Further piecewise additions to this model would seem inappropriate due to the rapidly decreasing statistical significance of the regression models produced and an absence of apparent rationale for how these models relate to each other or to the overall model produced thus far. The final logical model exhibits the three output measures most significant from among the seven shown a priori. Four of

the original five inputs remain. Understanding which outputs are most significant and identifying the contributing inputs may enable the maintenance manager to more effectively focus on areas which enhance productivity.



Figure 5 Comparing the A Priori Model With The Final Logical Model for MAC Aircraft Maintenance Units

Summary

The research conducted to support this study provided significant insight into productivity measurement in MAC aircraft maintenance units. MAC requires each unit to publish a monthly maintenance digest containing at least seven management reports. Each unit publishes additional reports according to local concerns and includes them with

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the ones required by MAC. These reports are collectively viewed as productivity indicators and used for trend analysis.

Thirteen of the most commonly used productivity measures were chosen for statistical analysis. An a priori logical model was developed to explain the currently assumed associations of the measures as they relate to maintenance productivity. The assumed associations of the measures were largely, but not completely supported by the statistical analysis. Regression models were developed to isolate the measures which best explain productivity as defined by the DOD and stepwise elimination reduced the contributing measures to those most significant. A combination of three regression models produced a revised overall productivity model.

Chapter VI, Conclusions and Recommendations, will further explain the outcome of this research. Based on the literature review, responses to interviews, and statistical analysis, conclusions are drawn and recommendations made. Also, suggested topics for further research in the area of aircraft maintenance productivity are addressed.

VI. Conclusions and Recommendations

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Introduction

This research effort was undertaken to explore productivity measurement in aircraft maintenance units. specifically focusing on the Military Airlift Command. This chapter details the conclusions drawn from the findings and analysis of the research questions presented in chapter one. The conclusions are based on effective compliance with regulatory guidance as well as integration of current DOD productivity measurement methodology with industrial trends. Further discussion of the conclusions provides additional insight into the problems faced by MAC in the effective measurement and management of aircraft maintenance productivity. Additionally, the current trends in productivity management as discussed in the background chapter are briefly applied to the research findings. Recommendations are made for the improvement of productivity measurement in aircraft maintenance units and for future research to be conducted in this important area. Conclusions

1. Aircraft maintenance managers in MAC are not familiar with the Air Force guidance concerning productivity measurement. Therefore, measurement methods and application are inconsistent and do not support the intent of the

Productivity Improvement Program for the Federal Government as directed by the President.

2. The seven reports required by MACR 66-1 Volume II for inclusion in the monthly maintenance digests of each MAC wing were used as sources for productivity information in this research. However, there are no specific productivity indices for aircraft maintenance in use in MAC. Instead, the information reported is used together as a kind of multi-factor measure of performance in general. The significance assigned to each measure in performance evaluation is not consistent among the wings and there is no clear guidance in this regard established from within the Major Command.

3. Each wing gathers data and reports information in addition to that which is required by MACR 66-1. These reported measures may indicate the information important to the local maintenance managers. The application of these measures to the productivity management of a wing is not dictated by MAC. However, these measures are included in the digest forwarded to the numbered Air Forces and headquarters.

4. The nature and strength of the relationships among the measures implemented by aircraft maintenance organizations are not readily apparent. There is no regulatory guidance available to managers for critical interpretation of these relationships as they apply to

109

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productivity. Therefore, emphasis placed on management initiatives as a result of the information yielded by these measures may be inconsistent with the intent of the Air Force Productivity Improvement Program. This research attempts to establish the nature and strength of the relationships in the absence of regulatory guidance. The results of this effort were presented in Chapter V, Findings and Analysis.

5. Of the thirteen measures evaluated, eight produced the strongest explainable model reflecting maintenance productivity. Manhours per flying hour was the predominant output when viewed as a result of the influence of mission capable rates and maintenance scheduling effectiveness. Cannibalization rates, delayed discrepancies (both awaiting parts and awaiting maintenance) and the average number of possessed aircraft were the inputs which which appeared to contribute most significantly to mission capable rates and maintenance scheduling effectiveness. By understanding the relationships among these measures and monitoring their interaction, a manager may be better able to positively influence a maintenance unit's productivity.

Further Discussion

<u>Current Productivity Management.</u> As stated in the first conclusion, MAC maintenance managers are not familiar with the Air Force guidance concerning productivity measurement. Although they recognize a need for managing

issues of both efficiency and effectiveness, for the most part they are concerned with mission effectiveness only. In the words of one DCM, "The bottom line is providing the airframes necessary to launch the required missions on time."

There is not a clear method for relating the various productivity measures to an evaluation of the overall performance of a MAC wing. Although MACR 173-1 specifies the standards for particular measures, there is no current guidance for viewing the relationships of the numerous measures used in the command and the assumed associations of the measures are not fully supported by the quantitative analysis of this research. Instead, non-intuitive associations emerge for consideration in the evaluation of maintenance productivity.

There is not a standardized method to evaluate . maintenance productivity as defined by the Air Force. The effectiveness measure used most often is departure reliability. It not only impacts the operational mission, but this research suggests it also contributes significantly to a unit's ability to meet the maintenance schedule. If aircraft depart homestation on time and continue through the enroute system as scheduled, their timely return to homestation allows the maintenance schedule to proceed as planned. This, in turn, contributes to the preventive

maintenance effort necessary to provide reliable aircraft to the user.

Mission capable rates have been identified by the DOD as the measure of a maintenance unit's effectiveness which should be standardized across commands. It is the measure used to justify spare parts acquisition for the weapon systems and is, therefore, of great concern to the Major Commands. This research suggests that a high mission capable rate contributes significantly to a unit's productivity as measured by manhours per flying hour.

Efficiency is a secondary concern to many unit level maintenance managers. Because of the perception of unlimited resources available through ACIF funding, budget concerns are minimal. Instead, efficiency is viewed in the context of quality. Maintenance air aborts seem to be the quality indicator most significant to Major Command level managers, while wing Maintenance managers are also concerned with repeat/reoccurring discrepancies.

Product. _ty measurement methodology in the DOD remains consistent until it reaches the major command level. Both the DOD and Air Staff measure productivity in terms of labor hours and the cost associated with providing defense services to the American public. However, the major commands do not report this information to Air Staff. Instead, the maintenance productivity indicator is reported as units processed through the depots and subsystems

processed through intermediate level shops at the various wings. This information is reported by the Air Force Logistics Command (AFLC) through retrieval of data from the Maintenance Data Collection System. The command level productivity measures are multi-factored and serve primarily as spares level justification rather than indications of performance. The lack of association of the command level maintenance productivity measures with the higher headquarters summary of manyears by functional element creates a lack of continuity in the overall productivity enhancement programs as outlined in AFR 25-3 and DOD directive 5010.34.

Application of Private Sector Trends to Research Findings. The relationships among the measures identified by this research can be viewed from the perspective of Goldratt's Theory of Constraints. Because the periodic maintenance schedule must be met before aircraft are considered mission capable, these scheduled maintenance activities can be identified as the constraint in the process of providing mission capable aircraft to the user. The maintenance manager must decide how to exploit this In other words, how can the maintenance constraint. schedule te most effectively met without changing the existing flow? Once this question has been answered all activities could be subordinated to maximizing the flow of aircraft through scheduled maintenance activities. Goldratt

113

defines productivity as all the actions that bring a company closer to its goal (38:58). If the goal of an aircraft maintenance unit is to provide a service to the user, manhour per flying hour may be the best measure of all the activities undertaken to meet the goal. Having more than the required number of aircraft mission capable is similar to having finished inventory stockpiled in an industrial environment. The additional airframes represent more manhours expended, but do not contribute any more to meeting the mission objectives or "the goal".

Deming's emphasis on quality as it affects productivity is also relevant to this research. The identified quality indicators, repeat/reoccurring discrepancies and maintenance air aborts, are briefed by exception and are subject to influences from areas beyond the control of maintenance. For example, maintenance air aborts are highly dependent on the aircrews. One crew may fly an aircraft with a malfunction when another crew would abort the mission. The decision of whether to abort or not is totally up to the aircraft commander. An increase in maintenance air aborts or repeat reoccurring discrepancies indicates a problem already exists, whereas analysis of manhour per flying hour rates may provide information for preventive action. The emphasis should then become doing things right the first time. Tracking manhour per flying hour rates in relation to quality inspections might yield a useful composite measure of a unit's productivity.

Recommendations

1. MAC aircraft maintenance managers should become familiar with guidance concerning productivity measurement at the command level as it contributes to the total productivity improvement effort.

2. The MAC supplement to AFR 25-3 should be expanded to provide specific guidance for productivity enhancement initiatives for the airlift environment. These initiatives should be consistent with higher headquarters guidance and conform to the intent of the Productivity Improvement Program in the Federal Government.

3. Measurement criteria should be standardized throughout the command and sufficiently detailed to limit the chance for inaccurate data reporting.

4. Each wing should focus on monitoring and reporting manhours per flying hours, mission capable status, maintenance scheduling effectiveness, cannibalization rates, delayed discrepancies and the average number of possessed aircraft when evaluating aircraft maintenance productivity.

Suggested Research Efforts

Three areas appear to provide great potential for identifying and enhancing productivity measures for aircraft maintenance units. First, a continuation of the methodology of this research in the other Air Force Major Commands would

serve to further validate the research findings. However, any further research of this nature should work with a larger data set. Because of the exploratory nature of this research, the data was limited to a six month period. Future research efforts in this area should seek to obtain as much data as possible.

A second area for future study is the effect of the different base environments on the measure of productivity. This research indicted that productivity performance was highly dependant on differences among the bases being measured. Empirical studies are warranted to identify the characteristics of the different bases which contribute to productivity.

Another area of study which would be very significant to aircraft maintenance processes in general, is an application of Goldratt's Thoughtware simulation software to the findings of this study. The simulation of a typical maintenance process at the wing level and the manipulation of the subordinate processes utilizing the Theory of Constraints will test the validity of the findings of this study and may suggest more useful methods of productivity management than those which are currently being used.

SUMMARY

This research was undertaken to explore productivity measurement in aircraft maintenance units and to examine the

relationships of the measures used to evaluate a unit's productivity. Review of current literature and regulatory guidance concerning productivity measurement provided the basis for the development of an interview questionnaire. A questionnaire was administered to DCMs and chiefs of analysis at ten MAC wings. Additionally, managers in the maintenance management, cost and manpower divisions at headquarters MAC were interviewed. From these interviews, information concerning current productivity measurement methodology was gathered and thirteen measures were identified for analysis. Analysis of the interview responses and measurement data gathered from six MAC wings resulted in conclusions and recommendations for improved abilities to understand and measure productivity in aircraft meintenance units.

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THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release

February 25, 1986

EXECUTIVE ORDER

PRODUCTIVITY INPROVEMENT PROGRAM FOR THE FEDERAL GOVERNMENT

By the authority vested in me as President by the Constitution and laws of the United States of America, including the Budget and Accounting Act of 1921, as amended, and in order to establish a comprehensive program for the improvement of productivity throughout all Executive departments and agencies, it is hereby ordered as follows:

Section 1. Ibere_is_beraky_established_a_gaussement-wide-progray_to improve the quality, timeliness, and efficiency_ef_services.provided.by_the_ federal government. The goal of the program shall be to improve the quality and timeliness of saryica_to_the_public__ and to achieve a 20 percent productivity increase in appropriate functions by 1992. Each Executive department and agency will be responsible for contributing to the achievement of this goal.

Sec 2. As used in this Order, the term:

(a) "Productivity" means the <u>efficiency</u> with which resources are used to produce a government service or product at specified levels of quality and timeliness;

(b) "Services" means these functions and activities performed by the federal government to achieve program objectives;

(c) "Common agency functions" means these functions which are found in more than one agency, such as avarding grants or leans to individuals or institutions, providing direct benefit payments, processing claims, or furnishing health care;

(d) "Common government functions" means these functions that are common to every agency, such as administrative services;

(e) "Measurement system" means both the spatific measures used to determine whether standards of quality, timeliness, and efficiency of services are being met, and the procedures for the collection and reporting of data resulting from application of productivity measures;

(f) "Organizational performance standard" means a statement which suantifies and describes the desired level of quality, timeliness, and efficiency of services to be provided by an organization;

(g) "Management review" means the review by the Director of the Office of Management and Budget as part of the budget process, of agency accomplishments and plans for management and productivity improvements;

Appendix B: Department of Defense Productivity Definitions and Reports

5010.34 (Encl 3) Aug 4, 75

DEFINITIONS

The following definitions apply to the DoD Productivity Program. Other useful definitions are contained in the Glossary of Terms in Appendix 4, DoD Manual 5010.15.1-M (reference (e)).

- A. <u>Organizational Element</u>. A major command or operating agency of a DoD Component, e.g., Army Materiel Command (AMC), Air Force Audit Agency.
- B. <u>Organizational Sub-Element</u>. A subordinate command or operating agency of an organizational element, e.g., U.S. Army Missile Command.
- C. <u>Field Element</u>. A base, installation or depot of an organizational sub-element, e.g., Letterkenney Depot.
- D. <u>Agency Productivity Principal</u>. The primary contact between an agency and the productivity project team (BLS, OMB, GAO, CSC and the JFMIP).
- E. <u>DoD Productivity Principal</u>. The individual in the CASD(I&L) who is responsible for (1) providing overall technical assistance and coordinating DoD efforts on productivity
- enhancement, measurement and evaluation, (2) submitting DOD productivity data input to BLS and the JFMIP and (3) coordinating, within DOD, productivity requirements initiated by other Federal agencies.
- F. DOD Component Productivity Principal. The individual in a DoD Component who is responsible for (1) coordinating productivity efforts within his component and (2) the timely preparation of productivity reports and response to other productivity data requirements levied on his component.
- G. OSD Functional Area Productivity Representatives. Individuals on the OSD staff who are responsible for productivity matters in their respective areas.
- H. <u>Measurable Areas</u>. The functions/operations of an organizational element, organizational sub-element, or field element for which at least one final output and corresponding manyear inputs can be quantified.
- <u>Non-Measurable Areas</u>. The functions/operations of an organizational slement, organizational sub-element, or field element for which no final outputs and/or corresponding manyear inputs can be quantified.
- J. <u>Outputs</u>. The final products produced or services rendered in a measurable functional area by an organizational element, organizational sub-element, or field element.

- K. <u>Inputs</u>. The amount of resources (all types) utilized or consumed to produce an output.
- L. Labor Input. The amount of labor resources utilized or consumed to produce an output.
- M. <u>Manyear of Labor Input</u>. A manyear of labor input for this program constitutes 2,080 paid hours. (This includes regularly scheduled time, overtime, and leave time for all types of employees.)
- N. <u>Measured Manyears</u>. The total manyears (civilian and military) expended in a measurable area by an organizational element, organizational sub-element, or field element. Measured manyears can be two types:
 - 1. <u>Direct Manyears</u>. The manyears in a measurable area which are charged directly to the final outputs of the area.
 - 2. <u>Indirect Manyears</u>. All other manyears in a measurable area such as those expended on clerical, typing, secretarial, supervision, executive direction, and general services.
- O. Unmeasured Manyears. The total manyears (civilian and military) expended by an organizational element, organizational sub-element or field element in nonmeasurable areas (areas in which no final outputs and corresponding manyears of input can be quantified).
- P. <u>Compensation</u>. The total wage costs incurred to produce a product or render a service. Such costs include direct payroll costs plus other direct wage costs such as the Government's contribution for retirement, social security, health insurance, and life insurance. Compensation does not include separation costs such as severance pay and terminal leave payments.
- Q. <u>Effectiveness Measurement</u>. Comparison of current performance against pre-established mission objectives (goals). If the right mission objective (goals) are established, effectiveness measurement discloses whether an activity does the right thing at the right time -- it compares what an activity or group of individuals actually accomplish in relation to an assigned mission.
- R. Efficiency Measurement. Comparison of current performance against either a pre-established standard or actual performance of a prior period. Efficiency measurement discloses how an activity or group of individuals performs during a current period in relation to either: (1) a standard established for a job or task which they have responbility for accomplishing; or (2) the level of performance achieved for the job or task in a previous period. Efficiency measurement may be based upon manpower, monies or a combination of both.

5010.34 (Encl 4) Aug 4, 75

PRODUCTIVITY REPORTING

Teneral. Productivity reporting to OSD is an integral element of the JoD Productivity Program. It is necessary in order to satisfy a government-wide requirement levied on all executive departments and agencies and to provide data for internal DoD management purposes. Specifically each DoD Component will submit annually to the QASD(I&L) the following exhibits and data:

Exhibit A - Summary of Manyears by Organizational Elements - This exhibit will be used to recap the manyear data for each organizational element of the reporting Component. For the "Year-end Strength" show the number of personnel authorized at end of FY. For the "Paid Civilian Manyears" show the manyear data reported on Exhibit A-1 of the report submitted under the provisions of OMB Circular No. A-93. For the "Measured Manyears" show the total manyears measured (Paid Civilian, Military, and Indirect Hire Foreign Nationals) for each organizational element.

Exhibit B - Summary of Measured Manyears by Function - This exhibit will be used to recap the measured manyears by function of the reporting Component. The manyear data for each function must agree with the data reported on Exhibit C for each function.

<u>Exhibit C - Input/Output Data</u> - This exhibit will be used to report quantitative input/output data. A separate exhibit will be prepared for each function covered by productivity measurement.

<u>bit C-1 - Description of Indicators</u> - This exhibit will be used to tibe new indicators established during a reporting period and to revise the description (as necessary) of any indicators reported in a prior period.

Exhibit D - Revision of Input/Output Data Submitted in Prior Years - This exhibit will be used to report changes in input/output data which were submitted in a prior year and the reasons necessitating the change.

Exhibit E - Productivity Data Verification, Analysis and Outlook - This exhibit will be used to report (1) whether the agency productivity listing (provided from BLS data bank) is correct, (2) whether the productivity indices are representative, and (3) the productivity outlook for the future. A separate exhibit will be submitted for each function.

Exhibit E-1 - Changes Required in BLS Listing - This exhibit will be used to report changes which should be made in the BLS data bank.

Exhibit E-2 - Productivity Analysis - This exhibit will be used to explain productivity indices which are not considered representative and to describe factors which caused either an increase or decrease of more than 5% in productivity.

5010.34 (Encl 4) Aug 4, 75

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II. Reporting Due Dates. Each DoD Component will adhere to the following due dates for submission of exhibits and data:

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Exhibit

Due Date

A & B	120 days after and of FY
C, C-1, & D	90 days after end of FY
E, E-1, & E-2	21 days after receipt of Agency Listings

Attachments - 8

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- Exhibit A Summary of Manyears by Organizational Element
 Exhibit B Summary of Measured Manyears by Function
 Exhibit C FY 197_Input/Output Data
 Exhibit C-1 Description of Indicators
 Exhibit D Revision to Input/Output Data Submitted in Prior Years
 Exhibit E FY 197_Productivity Data Verification, Analysis, and Outlook
 Exhibit E-1 Changes Required in BLS Data Bank
 Exhibit E-2 Productivity Analysis

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		Foreign Nationals			5010.34, Aug 4, (Att 1 to Encl	75 4)	
	Heasured Hanyears	Paid Civilian Military		·			
MIZATIONAL ELEMENT	ł	Paid Civilian Manyears Total Basic Premium Total C					
EXHIU SUMMARY OP MANYEARS BY M124 (DoD Component)	Fiscal Year	Year-end Strength Total Civilian Military					
		Organizational Element 1.	2°	°, .∎		Total	

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		HIBIT B LED MANYEARS BY FUNCT	rion	5010.34, (Att 2 t	Aug 4, 75 o Encl 4)	•
	(DeD	Component)	•			
	Pines	al Year 107_				۶
	FUNCTION	Paid	HANYBARS	Indirect Mire		
<u>Ho</u> r	Title		Hilitary	Poreian Matimala		
۸.	Modical 1 - Nospitals 2 - Glinics					
3.	Communications 1 - Base Communications 2 - Defense Communications					
c.	Accounting, Finance, Auditing 1 - Base Acctg & Finance 2 - Central Acctg & Finance 3 - Internal Auditing 4 - Contract Auditing					
D.	Education, Training, Personnel Nanagement 1 - Professional Education 2 - Dependent Education 3 - Military Training 4 - Civilian Personnel Mgt. 5 - Military Personnel Mgt.					
	Logistics 1 - Local Procurement 2 - Central Procurement 3 - Contract Administration - Local Transportation - Depot Transportation - Single Manager Trans. 7 - Notor Vehicle Operations 8 - Local Supply 9 - Depot Supply 10 - Invariory Control 11 - Intermediate Maintenance 12 - Depot Maintenance 13 - Motor Vehicle Maintenance 14 - Real Property Maint. 15 - Dining Facilities 16 - Comissery Operations 17 - Leundry and Dry Cleaning 18 - Printing	·				
7.	Specialised Manufacturing 1 - Maps 2 - Clothing 3 - Wespons 4 - Munitions					•
G.	Other 1 — Personnel Security 2 — Personnel Support & Admin.					•
	TOTAL					

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5010.34, Aug 4, 75 (Att 3 to Encl 4)

EXHIBIT C

FY 197_ INPUT/OUTPUT DATA

(DoD Component)

		-	(Function +	Number and Title))		
۸.		ect Manyear ndicator	:5	Output Quantity (000)	Manyear Inputs (000)	<u>Compet</u> (00	nsation 00)
	1.						
	2.						
	3.						
	4.						
	5.						
в.	Ind	Total Dire irect Manye	act Manyears Bars				
c.	Tot	al Manyears	1,		م د د د م رب		
D.	Bre	akdown of I	ianyears		میں بنا مزید		
	1.	Paid Civil	lian Manyears				
•	2.	Military H	Manyears				
	3.		Hire Foreign L Manyears				
		Total Many	Years				
L.	Oth	er Data					
	1.	Did any s during the		lity or process cl	hanges occur	<u>Yes</u>	<u>No</u>
	2.			pital expenditure current year perf		حفقي	
	3.	Did ary s the year?		duct mix changes of	occur during		
	4.			nge in the ratio on ntracted out occur			
	NOT	E: Frovide	a complete exp	planation for each	h "yes" answer	•	

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EXHIBIT C-1 DESCRIPTION OF INDICATORS

(DoD Component)

(Function - Number and Title)

Indicator

Description



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EXHIBIT D REVISION 7 PUT/OITPUT DATA SUBMITTEL PRIOR YEARS

5010.34, Aug 4, 75 (Att 5 to Encl 4)

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5010.34, Aug 4, 75 (Att 5 to Encl 4)

Yes No

EDHIBIT E FY 197 PRODUCTIVITY DATA VERIFICATION, ANALYSIS AND OUTLOOK

(DoD Component)

(Function - Number and Title)

A. Productivity Data Verification

 Does the data shown on the Agency Productivity Listing agree with Exhibit C data as submitted?
 If "no" complete Exhibit E-1.

B. Productivity Analysis

1. Total manyear Productivity Index

Current Yr. Prior Yr. Change

2. Is the "Current Year" index representative of the productivity trend for this function.

If "no" or if the change exceeds 3% (either increase or decrease) complete Exhibit E-2.

C. Productivity Outlook

NASHING AND SHARE SHOW AND

1. Productivity goal for next year _____

2. Briefly describe (a) actions underway or planned to increase productivity during the next year and (b) known factors which will influence the productivity of this function during the next year.

	ECHIBIT E-1 CHANGES REQUIRED IN ELS DATA BANK	5010.34, Aug 4, 75 (Att 7 to Encl 4)
	(DoD Component)	
	(Function - Number and Title)	
۸.	Agency listing not in agreement with Exhibit C. Revis	s as follows:
	Output Input	Compensation

IT OR

To Tron

Tron

Current Year	Exhibit C de	ita incorr	ect. Revi	se as fol	lovs:	
	Output		Input		Compensation	
<u>ldicator</u>	Tran	Io	From	Ie	from	Ie

Reason for Changes (Provide Concise Explanation)

Indicator

в.

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5010.34, Aug 4, 75 (Att 8 to Encl 4)

(no)

(yes)

EXHIBIT E-2 PRODUCTIVITY ANALYSIS

(DoD Component)

(Function - Number and Title)

A. Productivity Index

Direct Manyear Productivity Index

Total Manyear Productivity Index

- B. Productivity Analysis
 - 1. Are the "current" year" indexes representative of the productivity trends for the function?

If "no" provide concise explanation.

2. Briefly describe the factors or conditions which caused a productivity change of more than 5% during the current year.

Appendix C: MAC Formulas for Performance Measures

MACR 00-1, Vol 11 Attachment 1 14 March 1989

A1-14. Forwales. For use by all units. These formulas are mandatory when the applicable factor is referenced or used.

ATTRITION RATE - MAINT CANX RATE + NONMAINT MATERIEL CANX RATE + OPS CANX RATE + HHQ CANX RATE + OTHER CANX RATE + WEATHER CANX RATE.

NOTE: Use four years of weather cancellation data for month being forecast if available; otherwise, as much as available. (If four years' data is not available, start accumulation toward that point. For other elements use past dis-months' data.)

- b. MISSIONS/BORTIES TO SCHEDULE
- C. LABOR HRS PER FLYING HR
- d LABOR-HRS PER MISSION/SORTIE
- L ENGINE SHUTDOWN RATE
- I. UNSCHEDULED I ENG CHANGE RATE
- S. TEST CELL REJECT RATE
- L. CANNIBALIZATION PER DEPARTURE RATE
- NOTE: Action takes T for the following type canno only: Aircraft to sizeraft. Aircraft to engine. Engine to sizeraft.
 - L OVERTIME RATE
 - J. PRODUCTIVITY
 - LABOR HOUR UTILIZATION RATE
 - L BASE REPAIR CAPABILITY RATE
 - B. AVG POSE ACPT

2222223111117-24-31212

MISSIONS SORTIES REQUIRED

TOTAL DIRECT MDC LABOR-HRS BY MDS

(AIRFRAME, ENGINE & APU/GTC SED) VLYING HOURS BY MDS

TOTAL DIRECT MDC LABOR-HRS BY MDS

- (AIRPRAME, ENGINE & APU/GTC SED) TOTAL HENEFORTIES FLOWN BY HDS
- TOTAL ENGINES SHUTDOWN 200 FLY HAS X NUMBER OF ENGS ON ACFT
- TOTAL UNSCHEDULED CHANGES ± 00 TOTAL ENGINES CHANGED
- TOTAL TEST CELL REJECTS x 100 TOTAL ENGINES TESTED
- MICAP CODE 4 + MICAP CODE x 100 TOTAL UNIT OWNED ALACKAPT DEPARTURES FROM HOME STATION
 - TOTAL DIRECT OT EXPENDED CAT LAB \$ AND 4 MINUS COMPTIME = 100 TOTAL DIR LABOR HOURS EXPENDED (INCLUDE OVERTIME)

TOTAL DIRECT LABOR

- MDC HRS (INCLUDE OVERTIME) ± 100
 ACTUAL AVAILABLE LABOR HOURS (100 LABOR HRS ASGN + OVERTIME - INDIRECT LABOR HOURS)
- TOTAL DOCUMENTED MDC = 100 TOTAL (100) LABOR HOURS ASSIGNED + OVERTIME
- = (<u>BEE T.0. 00-30-8</u>)
- POSS HRS (AFR 65-110) HEE IN MONTH (54 X DAYS/MONTH)

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MACR 00-1, Vol 11 Attachment 1 14 March 1999

- ACPT UTILIZATION
- DROPPED OBJECT
 RATE
- P. POD RATE (ENGINES)
- 4. AVG SORTLE LENGTH
- r. AVG TRAINING MISSION LENGTH
- AVG OPERATIONAL MISSION LENGTH
- L MAN-HOURS PER LDG (EN BOUTE)
- 2. AVG CANNIBALIZATION LABOR HOURS
- v. HOME STATION AIR ABORT RATE

W. DELAYED DISCREPANCIES PER POSSESSED AIRCRAFT

A-6. Standarda:

a. Coefficient of correlation should be 96 for all predictions.

b. Confidence intervals will be computed to not greater than 2.0 SDs.

A1-16. Instructions for Proparing the BCS: MAC-LGM(M) 7105 Plans and Scheduling is OPR for this report. The report consists of three parts. A sample format follows this attachment. Part I provides the wing's recommended maintenance commitment for the next three months. Part II is where the unit will identify projected problem areas that may interfere with their ability to commit the goal airframes and what assistance may be needed. Part III is a report of actual airframes provided by day during the provious calendar month.

- NOTE: The following shframe commitment roise are goals for generating airframes: C-5 = 60%; C-141 = 72%; C-150 = 60% weakday, 35% weakand/holiday; and 1 SOW, H-48 = 60% weakday, 30% weakand/holiday. These represent the peromagnes of possessed airframe that should be committable. Five percent should be added to the above goals for "Operations/HHQ (higher beadquarters) tasked sparse, operations ground trainers, Air Training Command field training detachments for maintenance training, or to other non-maintenance agencies for non-flying requirements."
- NOTE: 443 MAW will not exhest this report. 25 AP

- HOURS FLOWN + By dertiments AVG FOSS ACFT-FLY DAYS/MONTH
- DROPPED OBJ INCIDENTS ± 1000 UNIT WORLDWIDE DEPARTURES
- FLYING HOURS X / OF ENGINES
- / FLYING HOURS
- TRAINING HISSIONS FLOWN
- I FLY HRS. OPERATIONAL MSN SYM OPERATIONAL MISSIONS FLOWN
- MDC LABOR HOURS BY MDS (EN ROUTE)
 TOTAL LANDINGS BY MDS (EN ROUTE)
- TOTAL LABOR HRS FOR CANNS BY SRD TOTAL NUMBER OF CANNE BY SRD
- TOTAL UNIT AIRCRAFT ABORTING BACK TO BACK TO HOME STATION = 100 TOTAL UNIT AIRCRAFT DEPARTURES FROM HOME STATION
 - DELAYED DISCREPANCIES AVERAGE POSSESSED AIRCRAFT

units (encopt 1 80W) will not submit this report.

- NOTE: Reports will be supt to errive at NAF/LOM and HHQ/LOM no later than the seventh day of the month. If compliance is not posable, telephonically advise MAF/LOM of reason for delay. NAF advise HHQ/LOM of any reasons for neucompliance by the eighth day of the month.
- NOTE: NAF/LGM is action OPR for all assistance requests. Requests for assistance will be submitted by MAC NAF to the appropriate HHQ LGMM as a separate request.

A. Part I. Section 1. Recommended committable sirframes per day for the first month of the reporting period.

NOTE: Include the calendar days and figures for all of the first month. Include weekends and holidays.

Lines A/AA: Colendar days.

Lines B/BB: Adjusted projected possessed algoraft determined IAW AFR 65-110. If applicable, do not include TF coded algoraft here, or in Part III.

1. (CONUS units) Subtract deploying rotation sieraft and one ROTE spare from possessed three workdays prior to scheduled departure.
MACR 173-1 S0 July 1989

Chapter 3

COMMAND MANAGEMENT ITEMS AND PERFORMANCE STANDARDS

Purpose: This chapter identifies the command management items which form the basis for the MAC Management Sys-tem. An integral part of this chapter is the standards which provide the means for determining performance levels and status of key resources. Except for the mission performance management items which have joint operations, logistica, and air transportation OPRs, items are arranged functionally.

Item No 1-1-HOME STATION DEPARTURE RELIABILITY

Rew 8.

Transportation **b**.

- Operations L
- d. Logistics

HQ MAC OPRe: DOC/LGMW/TRKM

HQ MAC OCR: DOCB

PURPOSE: To monitor the operational mission departure reliability from home stations. This provides a method to measure and evaluate logistics reliability of aircraft performance, support capability for operational missions, and aircrew, transportation, and operations center functions. It also supplies a basis for decisions on airframe management,

SOURCE OF DATA: Military Air Integrated Reporting System (MAIRS)/Airlift Implementation and Monitoring Sys-Lema (AIMS).

BASIC DIRECTIVE: MACR 55-5, volume III.

F" 'J.UATION CRITERIA: All C-5, C-141, C-180, or operational support skills (OSA) departures meeting the following are included in this item.

- The mission type as defined by the second character of the mission identifier prefix must be: (1) Channel (B, K, Q, L, N, J, V) or

- (2) SAAM (W, A) or (3) Exercise, JA/ATT (M, R) or
- (4) Miscellapsous (D, H, G).
- b. The departure station must be the operator's (unit's) home station.
- The departure station code must be an "O" or "P"
- d. Exception. OSA departures with the first character of the mission identifier suffix erual to "Z" or "T" are excluded.
- e. The third character of the mission identifier prefix must be alphabetic.

EVALUATION PERIOD: Monthly.

MAC STANDARDS:

<u>C-5 Home Station</u> Rew Transportation Operations Logistics	Escaliant 100-92.0 100-98.0 100-98.0 100-98.0	Setiefectory 91.5-64.0 97.5-96.0 97.5-96.0 98.5-87.0	<u>Merrica)</u> 83.5-78.0 96.5-96.0 95.5-96.0 84.5-86.0	Unesticfectory Balow 78.0 Balow 96.0 Balow 96.0 Balow 86.0
C-141 Home Station Raw Transportation Operations Logistics	100-95.0 100-95.0 100-95.0 100-95.0	94.9-87.0 97.9-96.0 97.9-96.0 94.9-90.0	84.9-84.0 96.9-95.0 96.8-96.0 89.8-86.0	Balow 84.0 Balow 95.0 Balow 95.0 Balow 88.0
C-130 Home Station New 7 reportation ions ice	100-06.0 100-06.0 100-06.0 100-06.0	96.8-85.0 97.8-96.0 97.8-96.0 96.8-38.0	84.9-77.0 96.9-95.0 95.9-95.0 87.9-84.0	Balow 77.0 Balow 96.0 Balow 96.0 Balow 84.0

MACR 173-1 20 July 1989

- b. Either:
- (1) The departure station code is "C", "D", "R", "S", "K", or "J", er
 (2) The departure station code is "O" or "P" and the departure station is not the operator's (unit's) home station.
 c. The third character of the mission identifier prefix must be alphabetic.

EVALUATION PERIOD: Monthly.

DEFINITIONS:

a. C-5, C-141, and C-180: En route reliability performance is measured at each an route station by type aircraft. These reliability evaluations represent on route station performance by type aircraft.

MAC STANDARDS:

C-5 Route Stations Raw	Excellent	Setisfactory 88.9-67.0	Marginal 66.9-59.0	Unsetisfectory Below 59.0
Transportation	100-98.0	97.9-96.0	96.9-98.0	Below 93.0
Operations	100-98.0	97.9-94.0	93.9-92.0	Below 92.0
Logistics	100-91.0	90.9-77.0	76.9-78.0	Below 78.0
C141 En Route Stations				
Raw	100-93.0	97.9-83.0	82.9-77.0	Below 77.0
Transportation	100-98.0	97.9-96.0	95.9-96.0	Below 95.0
Operations	100-98.0	97.9-96.0	95.9-95.0	Below 95.0
Logistics	100-97.0	96.9-90.0	89.9-87.0	Below 87.0
C-130 En Route Stations				
Raw	100-96.0	95.9-81.0	80.9-75.0	Below 75.0
Transportation	100-98.0	97.9-96.0	95.9-95.0	Below 95.0
Operations	100-98.0	97.9-96.0	95.9-93.0	Below \$3.0
Logistics	100-98.0	97.9-89.0	88.9-85.0	Below 85.0

MPUTATION: En route station departure reliability will be computed expersiely for each functional category (operatransportation, logistics, and raw) by aircraft type.

uperations, transportation, and logistics reliability will be computed as follows:

Total En Route Station Dep - No. Functional Dev by Type* X 100 = % Reliability Total En Route Station Departures

*Operations deviations are those coded 2XX with an X prefix.

Transportation deviations are those coded 3XX with an X prefix.

Logistics deviations are those coded 7XX, 8XX, or 8XX with an X prefix.

Raw departure reliability will be computed as follows:

Total En Route Sta Dep - Total En Route Sta Deve X 100 - % Raw Reliability Total En Route Station Departures

**Total en route station deviations include operations, transportation, and logistics deviations, plus miscellaneous deviations and mission required delays.

- Miscellaneous deviations are those coded 1XX with as X prefix.

- Mission-required delays are those coded 500 with as X prefix and are directed/validated by MAC NAF or HQ MAC (ALCC for theater-assigned assets), as necessary, to improve overall MAC mission execution. Delays coded 500 will be included in MAC NAP and MAC-wide systems reliability figures, but count as "on-time" departures in individual departure station reliability figures.

UNITS EVALUATED: 40. 62. 63. 436. 437. 438. 449 MAWE 314. 317. 374. 435. 463. 518 TAWe***; 313. 316 TAGe; 614 MAG: 810 MAS.

3 TAW provides \$13 TAG reporting through consolidated command post.

STATIONS EVALUATED: All a route at 134 saited by MAC mission-identified alteraft.

MACR 173-1 30 July 1989

OSA Home Station (Detechment)	Excellent	Satisfactory	Merrinal	Ussetisfectory
Rew	100-97.0	0.9-89.0	H.9-H. 0	Below \$4.0
Transportation	100-98.0	97.9-96.0	95.9-95.0	Below \$6.0
Operations	100-98.0	97.9-96.0	95.9-95.0	Below 95.0
Logistics	100-08.0	97.9-94.0	93.9-92.0	Below 92.0

COMPUTATION: Home station departure reliability will be computed separately for each functional category (operations, transportation, logistics, and raw) by aircraft type.

Operations, transportation, and logistics reliability will be computed as follows:

Total Home Station Dep - No. Functional Dev by Type* X 100 = % Reliability Total Home Station Departures

Raw departure reliability will be computed as follows:

Total Home Station Dep . Total Home Station Deves X 100 = % Raw Reliability Total Home Station Departures

*Operations deviations are those coded 2XX with an X prefix.

Transportation deviations are those coded SXX with an X prefix.

Logistics deviations are those coded 7XX, 8XX, or 9XX with an X prefix.

• Total home station deviations include operations, transportation, and logistics deviations, plus miscellaneous deviations and mission required delays.

Miscellaneous deviations are those coded 1XX with an X prefix.

- Mission-required delays are those coded 500 with an X prefix and are directed/validated by MAC NAF or HQ MAC (ALCC for theater-assigned assets), as necessary, to improve overall MAC mission execution. Delays coded 500 will be included in MAC NAF and MAC-wide systems reliability figures, but coust as "on-time" departures in individual departure station reliability figures.

UNITS EVALUATED: 60, 62, 63, 436, 437, 438, 443 MAWs; 314, 317, 374, 435, 463, 513 TAWs***; 313, 316 TAGs; 310 MAS; 616 MAG; 375 AAW; OSA units.

***513 TAW provides 313 TAG reporting through consolidated command post.

Item No 1-2-EN BOUTE STATION DEPARTURE BELIABILITY

- a. Raw
- b. Transportation
- c. Operations d. Logistics

HQ MAC OPRA: DOC/LOMW/TR

PURPOSE: To monitor the operational mission departure reliability from an route stations. This provides a method to measure and evaluate logistics reliability of aircraft performance, support capability for operational missions, and air-crew, transportation, and operations center functions. It also supplies a basis for decisions on airframe management.

SOURCE OF DATA: Military Air Integrated Reporting System (MAIRS)/Airlift implementation and Monitoring System (AIMS).

BASIS DIRECTIVE: MACR 55-3, volume III.

EVALUATION CRITERIA: All C-6, C-141, or C-130 departures meeting the following criteria are included in this item. a. The mission type as defined by the second character of the mission identifier prefix must be

- (1) Chappel (B. K. Q. L. N. J. V) or
- (2) SAAM (W, A) or
- (3) Exercise, JA/ATT (M, R) or
- (4) Miscellaneous (D, H, G).

MACR 173-1 30 July 1980

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INS No 13-CO ORIGINATING MISSION DEPARTURE RELLABILITY

HQ MAC OPRE DOLO

HQ MAC OCR: DOCB

PURPOSE: To monitor the operational mission departure reliability for originating C-0 missions. This provides a method to measure and evaluate logistics reliability of aircraft performance, support expability for originating missions, and aircraft and operations conter functions. It also supplies a basis for decisions on airframe management.

SOURCE OF DATA: Military Air Integrated Reporting System (MAIRS/Aircraft Implementation and Menitoring System (AINS).

BASIC DIRECTIVE: MACR 65-3, volume 111.

EVALUATION CRITERIA: C-9 departures with the second character of the mission identifier prefix not equal to "U", "S", "E", or "C" and the departure station code equal to "O" or "P" are included in this item.

EVALUATION PERIOD: Monthly.

MAC STANDARDS:

Rew	Ezcelient	Betisfectory	<u>Merstaal</u>	Unsetisfactory
	100-99.0	Be.9-95.0	94.9-91.0	Below \$1.0
Transportation	100-09.0	96.9-97.0	96.9-96.0	Below 96.0
Operaticea	100-99.0	98.9-97.0	96.9-96.0	Below 96.0
Logistice	100-99.0	98.9-97.0	96.9-96.0	Below 96.0

COMPUTATION: Originating mission departure reliability will be computed separately for each functional category toperations, transportation, logistics, and raw).

Operations, transportation, and logistics reliability will be computed as follows:

Total Originating Man Dep - No. Functional Day by Type[®] X 100 = % Reliability Total Originating Mission Departures

*Operations deviations are those coded 2XX with an X prefix. Transportation deviations are those coded 2XX with an X prefix.

Logistics deviations are those coded 7XX, 8XX, or 9XX with an X prefix.

Raw departure reliability will be computed as follows:

Total Orig Men Dep-Total Orig Men Dev** X 100 = % Rew Reliability Total Originating Mission Departures

**Total origination mission deviations include operations, transportation, and logistics deviations, plus missellaneous deviations and mission required delays.

- Miscellansous deviations are those coded 1XX with an X prefix.

- Mission Required Delays are those coded 800 with an X prefix, and are directed/validated by MAC NAP or HQ MAC (ALCC for theater assigned assets), as accessary, to improve overall MAC mission execution. Delays coded 800 will be included in MAC NAP and MAC-wide systems reliability figures, but count as 'on-time' departures in individual departure station reliability figures.

Item No \$9-AIRCRAFT MISSION CAPABLE OLO GOALS

HQ MAC OPR: LOMM

FURPOSE: To provide a meaningful measure of marit for reviewing already status rates.

SOURCE OF DATA: RCS: HAF-LEY(M)7508 (MMICS) and/or HAF-LEY(M)8509 (CAMS) Status Report.

136

BASIC DIRECTIVE: AFR 65-110.

EVALUATION PERIOD: Monthly.

MAC GOALS:		
Alecraft	Percent	
C4	0.0	
Č-141	76.0	
C-190	70.0	
~10-		

Appendix E: Research Interview Instrument

Structured Interview Questionnaire Productivity in Aircraft Maintenance

Demographics:

Name of interviewee:

Rank or paygrade:

Job title:

Job description:

Organizational level:

Questions:

- 1. Are you familiar with the Productivity Enhancement Program governed by AFR 25-3? If yes, how do you
 - see the aircraft maintenance environment

contributing to this program?

READ DEFINITION OF PRODUCTIVITY FROM AFR 25-3: Productivity is the menasure of an organizations performance. It's not only "efficiency" (the ratio of inputs to outputs), but also "effectiveness" (to what extent the output satisfies mission objectives). Put another way productivity is concerned both with "doing things right "(efficiency) and "doing the right things (effectiveness)

- 2. Of the aspects of productivity defined by AFR 25-3, which are you most concerned with, efficiency, effectiveness or both?
- 3. Do you feel aircraft maintenance productivity measurement is an important issue? (why or why not?)
- 4. What is your regulatory guidance for gathering and reporting productivity measures?

- 5. What methods of productivity measurement have been specified for aircraft maintenance by the regulatory guidance?
- 6. Of the methods specified, which ones do you actually use?
- 7. If there are specified measures not used, why are they not used? (what are their weaknesses?)
- 8. Where is the data for the specified measures gathered?
- 9. How often is this data gathered?
- 10. To whom is this information reported?
- 11. How often is this information reported?
- 12. What are you required to report to the next level? (be specific!)

NOTE: the distribution of the monthly summary is important and the measures contained.

- 13. Is there additinal information reported which is not required? (If so, why?)
- 14. Are there methods of productivity measurement used on aircraft maintenenace organizations other than those specified by the regulations? (if so, why?)
- 15. If answer to 14 is yes return to questions 9 through
 - 11.
 - 9a.

10a.

11a.

- 16. At what point do the budgetary and operational aspects of aircraft maintenace meet?
- 17. How much control does maintenace management have over the allocation of funds for aircraft maintenace?
- 18. What affect would move direct control of the maintenace budget by maintenace management have on their productivity?
- 19. How do you use aircraft maintenance productivity information for management decision making?

Appendix F: Correspondence Concerning MAC Performance Reporting



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Dear Duane:

Sometime ago I asked to see a comparison of MC rates across the Ail Force. I was somewhat surprised to see that MAC is not only quite a bit lower than TAC and SAC, but also that, with the exception of the C-I+I, there has been no noticeable improvement since FY 81. In fact, the C-3 has remained the same and the C-130 has declined.

What causes one to "raise his eyebrows" is that MAC seemingly has so much more going for it than do either TAC or SAC-that is, you have enjoyed fuller spares funding, including OWRM, for a longer period; you have had AMS for the C-3, whereas TAC and SAC are just now struceling to implement the rudiments of CAMS.

I believe this issue is of more than just academic interest. With the increasing pressure on the spares budget (only 60% funded for FY 88), the question is being asked whether full spares funding really makes a difference. In MAC's case, the apparent answer would necessarily be "No."

I realize that there are ways to rationalize the MAC anomaly. I also am aware, after talking to Don Logenis, that MAC's measure of effectiveness is enstime departures. However, as I explained to Don, when reports get circulated around this building and over to the Hill, the indicators which appear are uniform across commands and generally consist of MC, FMC, TNMCS and TNMCM (i.e., TM+B+M, TS.B.S) and CANN rate.

According to Don, MAC basically keeps an aircraft in maintenance status from the time it lands until it flies again. I strongly recommend that you rethink this policy, at least in terms of how you record the time. My view is that, no matter how conservative and orthodox you might be with regard to the definition of FMC (Fully Mission Capable), such compunctions need not apply to your definition of MC (Mission Capable). For the latter, it is not necessary to have every spot of corrosion repaired, every east fully uphalstered, every routine TCTO incorporated, etc.

My plea to Don, and to you, is that you give some serious thought to this matter. Somehow MAC needs to demonstrate in terms of the commonly accepted indicators that we have gotten more beng for all of the MAC spares bucks that we have about since FY \$1. Otherwise, there are going to be some long, hot summers shead.

LIC MCCENTANN, H Deputy Assidual Sacial ry



CE OF THE COMMANDER IN CHIEF MILITARY AIRLIFT COMMAND SCOTT AIR PORCE SASE, ILLINGIS 62226-6001

16 May 1986

Mr Lloyd K. Mosemann, 11 Deputy Assistant Secretary (Logistics 6 Communications) Office of the Secretary of the Air Porce Washington, DC 20330-1000

Dear Lloyd

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I understand your concern in comparing airlift performance indicators against MC rates in other commands. Considerable money has been expended to support spares in recent years, and we need to show that the impact is positive.

Our mussure of airlift effectiveness has historically been on-time departures. However, following your conversation with Don Logeais, we have begun a review of MC and CANN rates to redefine our criteria for measuring mission capability. Don will present his findings to the MAC Council and then plans to bring a presentation to you and the Air Staff.

We'll work with your office to find a convenient time. I look forward to your thoughts.

SINCERLY

DUANE H. CASSIDY General, USAP

Appendix G: MAC Productivity Measures

ALC:

Beasures				NAC Viege	I					
logaired	62ad	63 rd	314th	31764	37523	43766	438tb	413m	446th	463rd
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Additional			•	•		•	• 			•
	_						_			
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flying bour program					1		I	I	1	2
Bissies Capable status	I	1	1	I	1	I		1	I	I
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Total man bour cost maintainability							I			
Baistesaace offectivesess			I							
Vork cester productivity			I			1				X
Cass response time			I						1	
Aircraft stilisation		I							1	
lepent/ rescurring discrepancies	I	I	1	I	1	1	5	I	1	1

Productivity Seasures

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Appendix I: Stepwise Regression Analysis Output

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						The	5 SAS 1	lystem	16:4	7 Thureday	, July	12, 1990 1
035	B1	32	33	B4	85	36	B 7 1	Ionth	MSR1	MSE2	MSR3	MSE4
1	1	0	0	0	0	0	0	1	\$2.40	70.50	52.60	6.00 13.00
2 3	1	0	0	0	0	0	0	2 3	97.90 88.00	67.11 74.33	45.50 56.60	9.00
4	1	Ó	0	0	0	Ó	Ō	4	90.60	67.79	61.80	13.00
5	1	0	0	0	0	0	0.	5	56.20	75.26 75.87	61.70 44.60	8.00 7.00
7	ō	ĭ	ŏ	ŏ	ŏ	ŏ	Ó	ī	32.00	60.52	46.60	26.00
8	0	1	0	0	0	0	0	23	35.20 56.80	73.11 81.55	49.40 43,20	19.00 18.00
9 10	ŏ	1	ŏ	ŏ	ŏ	ŏ	ŏ	4	59.50	84.81	32.00	27.00
11	0	1	0	0	0	0	0	5 6	54.40 64.70	74.16 73.39	43.00	25.00 23.00
12 13	0	1	01	0	0	0	ŏ	1	21.90	84.88	48.10	16.32
14	0	0	1	Ō	0	0	0	2	26.58	85.07	59.31	12.26
15 16	0	0	1	0	0	0	0	3	26.08	83.60 85.09	70.71 52.52	16.64 18.40
17	ŏ	ŏ	ī	0	0	0	Ó	5	26.64	84.23	55.28	18.71
18	0	0	1	0 1	0	0	0	6 1	24.02 21.10		35.65	16.25 9.30
19 20	0	ŏ	ŏ	1	ŏ	ŏ	ŏ	2	19.30		17.60	9.50
21	Ō	0	0	1	0	0	0	3	20.80		23.70 14.80	11.14 13.30
22 23	0	0	0	1	0	0	0	4 5	22.30 25.10		23.90	13.10
24	ŏ	ō	ō	ī	õ	0	0	6	19.30	80.76	20.10	10.10
25 26	0	0	0	0	1	0	0	1 2	10.20 21.70		51.70 91.60	14.60 14.80
40	-	-	-	-	-	•	-					-
OBS	MSRS		MSR6	MSR7		MSR8	MSR9			R11 MSR1 0.0 93.		
1 2	15.00		6.7 6.8	10 5		83.30 91.90	9.00		-	0.0 93. 0.0 88.		
3	18.00)	6.9	9		96.90	0.00			0.0 96.		,70
4	22.00		6.7 6.6	3 5		00.00	1.80			0.0 96. 0.0 91.		, 93
6	22.00		6.6	8		00.00	0.00) 0.	0	0.0 92.	5 99	40
7	21.00		13.5	21 15		94.70	0.70			0.0 93.		.70 .30
8	18.00		13.0	9		93.90	0.60			0.0 96	2 97	. 70
10	27.00	5	9.4	8		00.00	0.60			0.0 96. 0.0 91.		.70 .93
11 12	16.00		10.4	29 18		89.10	2.40			0.0 91. 0.0 92.		. 40
13	9.9	5	48.3	52		97.40	2.00			5.7 96.		. 89
14	9.5		49.6	100 87		00.00	0.70)5.6 93.)4.3 9 6.		. 80 . 90
15 16	10.7	2	49.2	131		98.90	2.30) 98.	0 8	14.4 94.	7 99	. \$2
17	10.5		48.4	90 103		96.50	2.80)4.3 96.)4.5 98.		, 83 , 92
18 19	11.3		30.5	75		88.50	3.70			5.6 95.	6 99	. 60
20	5.9	Ó	29.3	82		79.40	1.70)4.2 94.)5.4 91.		. 89 . 59
21 22	6.7 6.3		28.9	86 89		83.10 72.60	1.1			15.0 97.		. 33
23	7.5	6	29.6	78		81.50	1.3	100	.0 1	6.0 92.		. 68
24 25	7.0		31.2	64 18		76.40 96.97	0.9)5.6 97.)4.5 93.		.72 .30
26	19.7		45.9	28		77.42	1.6	5 89	.0 1	5.8 88	6 80	. 40
						TI	he SAS	System	16:	:47 Thursd	ıy, July	12, 1990 2
035	B 1	82	83	84	85	36	87	MONTH	MSR	L MSR2	MSR3	MSR4
27	0	0	0	0	1	0	0	3	10.4		72.80	
28	0	0	0	Ö	1	0	0	4	17.1		96.90 76.00	
29 30	0	0	0	0	1	0	0	5	19.3		\$3.00	
30	v	•	•	•	•	•	-	2				

31	0	0 0	0	0 1	0	1	14.30 7	8.39	85.00	18.30
32	õ	ŏŏ		õ î	ŏ				72.00	14.20
33	Ö	õ õ		ŏ ī	ŏ				57.90	15.20
34	ŏ	ŏŏ		ŏī	ŏ				25.20	17.80
35	ō	ŏŏ		Ŏ Ī	ŏ				25.50	23.80
36	ō	õ õ	ŏ	ŏ ī	ō				27.90	21.90
37	Ó	0 0		Ö Ö	1				86.00	24.00
38	ŏ	Č Ő		ŏŏ	ī				15.00	31.00
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42	ō	ŏŏ		ōō	ī .				91.00	23.00
43	-1 .	-1 -1	-1	-1 -1	-1				48.00	19.00
44		-ī -ī		-1 -1	-1				50.00	21.00
45	-1 -	-1 -1	-1	-1 -1	-1				36.00	15.00
46	-1 -	•ī •ī	•Ī	-1 -1	•Ī				38.00	18.00
47	-1 -	-1 -1	-1	-1 -1	-1	5 3	25.90 8		40.00	19.00
48	-1 -	-1 -1	-1	-1 -1	-1	6 8	21.00 8	6.78	44.00	12.00
										_
OBS	MSR5	MSR6	MSE7	MSR6	MS29	MSR10	MSE11	MSR12	MSE15	J
27	17.20	46.9	51	82.81	1.00	96.4	93.4	95.5	89.60	a
28	17.60	47.0		98.04	2.46	91.4	94.1	94.0	85.50	
29	18.30	44.9		97.22	1.97	94.7	93.4	94.4	68.9	
30	14.60	45.6				94.5	94.9	98.9	91.6	-
31	17.60	42.9		99.24	0.80	95.5	95.0	95.5	99.9	
32	16.60	43.8		98.45		97.7	94.6	94.7	100.00	
33	16.30	43.8		97.80	0.00	96.6	93.9	97.2	100.00	
34	16.90	42.4		100.00		99.1	95.3	99.0	99.90	
35	17.20	41.9		96.59	0.00	95.5	96.4	95.5	99.70	
36	16.20	41.7		99.30		95.4	95.8	98.2	99.70	
37	22.00	35.5	91	75.60	0.90	94.1	90.1	87.2	95.60	Ď
38	26.00	34.5	67	71.60	1.70	96.2	92.9	87.6	97.10	9
39	24.00	34.2	76	87.50	0.00	95.0	93.4	92.1	94.60	0
40	26.00	34.3	98	55.70	0.00	96.9	67.2	92.9	94.00	D
41	29.00	32.3	135	81.00	1.20	94.0	95.1	88.4	95.50	0
42	30.00	31.0	102	85.20	5.60	94.1	93.0	94.5	95.70	D
43	17.00	29.6	59	64.40		95.0	96.2	96.0	95.6(
44	17.00	29.9	43	93.90	1.20	96.4	95.6	94.5	97.10	
45	13.00	30.4	63	91.00	0.00	95.8	95.5	96.3	94.6	
46	15.00	29.8	87	92.30	1.10	95.2	93.4	92.5	94.00	0
47	15.00	30.0		84.60	0.00	93.8	96.0	94.6	95.5(
48	14.00	27.2	80	80.00	1.10	97.6	95.2	96.6	95.70	
				T	he SAS S	lystem	16:47 T	hursday,	July 12	
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Backward Elimination Procedure for Dependent Variable MSE2

Step 0 All	Variables Ent	ered B-square	. 0.76415656	C(p) = 19.0	000000
	DF	Sum of Squares	Hean Square	T	Prob>P
Begression	18	1436.16717550	79.78706531	5.22	0.0001
Brfor	29	443.24765575	15.28440192		
Total	47	1879.41483125			
	Parapeter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	t	Prob>P
INTERCEP	80.94416366	45.04227782	49.36041927	3.23	0.0827
B1	-25.46732019	13.47054736	54.63166797	3.57	0.0687
82	-12.35107798	10.64610214	20.57201915	1.35	0.2554
B3	19,08009408	9.14597008	\$6.51964460	4.35	0.0459
D4	3.24481016	3.97766001	10.17118884	0.67	0.4213
B5	2.48876359	9.77892998	0.98999515	30.0	0.8009
36	8.89419035	6.63463589	27.46800400	1.80	0.1905
37	0.05769106	4.92142378	0.00210031	0.00	0.9907
MONTH	0.24799270	0.46807928	4.29029751	0.28	0.6003
MSR1	0.04255920	0.07852921	4.48924028	0.29	0.5920
MSR3	-0.08454768	0.05495764	35.98591531	2.35	0.1358
MSR4	-0.60731827	0.26029670	83.20392220	5.44	0.0268

MSR5	0.52014015	0.37849223	28.86524646	1.89 0.1799
MSR6	-0.39799769	0.55762456	7.78620355	0.51 0.4811
MSR7	-0.05908912	0.03883001	35.39391043	2.32 0.1389
MSR8	0.01041938	0.09219182	0.19523023	0.01 0.9108
MERO	0.09279231	0.43658106	0.69046649	0.05 0.8332
MSR12	-0.11634671	0.29797424	2.33023212	0.15 0.6991
MSR13	0.26136317	0.41449510	6.07712885	0.40 0.5333
Bounds on a	condition number:	200.437,	12692.27	
Step 1 Vi	riable 37 Removed	E-square	= 0.76415544	C(p) = 17.00013742
-		•		
	D7	Sum of Squares	Hean Square	f Prob>f
		•	-	
Regression	n 17	1436.16507519	84.48029854	5.72 0.0001
Brror	30	443.24975606	14.77499187	
Total	47	1879.41483125		
	Parameter	Standard	Type II	
Variable	Satimate	Brror	Sum of Squares	T <dors t<="" td=""></dors>
			-	
INTERCEP	80.80241942	42.65973238	53.00779351	3.59 0.0479
D1	-25.39800014	11.89976943	67.30529000	4.56 0.0411
B2	-12.30104416	9.58913817	24.31375592	1.65 0.2094
83	19.04453454	8.48325785	74.46336204	5.04 0.0323
84	3.27240557	3.15238286	15.92148532	1.08 0.3075
85	2.45335409	9.14439910	1.06349970	0.07 0.7903
36	8.86694452	6.10976561	31.11903586	2.11 0.1571
MONTH	0.24837509	0.45909399	4.32454210	0.29 0.5925
HSR1	0.04277063	0.07514548	4.78644193	0.32 0.5735
MSR3	-0.08426208	0.05375321	36.30636286	2.46 0.1275
		The SAS Sys	tes 16:47 Th	ursday, July 12, 1990
		•		4
MSR4	-0.60681999	0.25248694	85.34325133	5.78 0.0226
MSR5 -	0.52249842	0.31521266	40.59662307	2.75 0.1078
MSR6	-0.39507393	0.49035398	9.59101540	0.65 0.4268
MSR7	-0.05893481	0.03591666	39.78132472	2.69 0.1113
KSR8	0.01010843	0.08680949	0.20033649	0.01 0.9081
HSR9	0.09407068	0.41563702	0.75684574	0.05 0.8225
MSR12	-0.11658267	0.29229739	2.35041928	0.16 0.6928
HSR13	0.26168351	0.40664266	6.11862847	0.41 0.5248
Bounds on a	condition number:	160.3374,	9772.265	
Step 2 Vi	ariable MSR8 Remov	ed R-square	= 0.76404885	C(p) = 15.01324467
	DF	Sum of Squares	Hean Square	I Prob>I
Legression		1435.96473870	89.74779617	6.27 0.0001
Error	31	443.45009255	14.30484170	
Total	47	1879.41483125		
	Parameter	Standard	Type II	
Variable	Estimate	Irror	Sum of Squares	f Prob>f
INTERCEP	81.27739173	41.78319235	54.12767042	3.78 0.0609
D1	-25.57257211	11.61561432	69.33420061	4.85 0.0353
82	-12.38274156	9.41004921	24.77039231	1.73 0.1979
B 3	19.22953847	8.19949752	78.67672973	5.50 0.0256
B4	3.12053547	2.82389764	17.46800870	1.22 0.2776
85	2.60849125	8.90172280	1.22832613	0.09 0.7715
36	8.98601750	5.92697231	32.85151194	2,30 0.1396
MONTH	0.24794630	0.45171607	4.30990039	0.30 0.5870
MSR1	0.04402969	0.07317078	5.17963332	0.36 0.5517
MSR3	-0.08629373	0.05002736	42.56242580	2.98 0.0945
HSR4	-0,61428054	0.24030555	93.47359705	6.53 0.0157
MSR5	0.52901163	0.30523476	42.96803592	3,00 0.0930
MSR6	-0.39845470	0.48164273	9.79018588	0.68 0.4144

MSR7	-0.05936187	0.03515586	40.78520645	2.85	0.1013
MSR9	0.08797112	0.40570977	0.67256203		0.8298
HSE12	-0.11873894	0.28703150	2.44799349		0.6820
MSE13	0.27062673	0.39291914	6.78606587		0.4961
nakto	4.21002013	0.39497974	. (. (0.47	0.4301
Sevede es					
	condition number:	,			
********		*************		***********	
Step 5 \	Ariable MSES Remo	ved Bramer	0.76369099	C(p) = 13.09	724783
		•			
	DF	Sum of Squares	Hean Square	7	Prob>P
Regressio	on 15	1435.29217667	95.68614511	6.89	0.0001
Irror	32	444.12265458	13.87883296		
Total	47	1879.41483125			
	Parameter	Standard	Type II		
Variable	Estimete	Error	Sum of Squares	1	Prob>P
INTERCEP	82.40445453	40.83662445	56.51381872	4.07	0.0521
B1	-26.01797019	11.26102538	74.08732210	5.34	0.0275
		The SAS Sy	st en 16:47 Th	ursday, July	12, 199
B2	-12.85546474	9.01668197	28.21207362	2.03	0.1636
B3	19.74835271	7.72496316	90.70304455	6.54	0.0155
B4	3.09367353	2.77885308	17.20167512	1.24	0.2739
B5	2.96805512	8.61469116	1.64746974	0.12	0.7327
B6	9.20156231	5.75535441	35.47577948	2.56	0.1197
MONTH	0.23051740	0.43783818	3.84709687		0.6022
MSE1	0.03963467	0.06925252	4.54602837	0.33	0.5711
MSR3	-0.08468371	0.04873102	41.91232468	3.02	0.0919
HSR4	-0.61076576	0.23616115	92.82936730	6.69	0.014
MSR5	0.52628994	0.30040103	42.59908276	3.07	
MSR6	-0.43062121	0.45135318	12.63312454	0.91	0.3472
MSR7	-0.05795572	0.03403419	40.24527704	2.90	0.0983
MSR12	-0.10930863	0.27946088	2.12334142	0.15	0.6983
MSR13 ·	0.26181696	0.38494955	6.42008645	0.46	0.5013
Bounds on	condition .number:	144.6181,	7919.491		
	condition number:				
*******				C(p) * 11.10	503548
*******		d R-square			3503548 Prob>P
itep 4 V	Variable 35 Removed DF	d R-squar Sun of Squares	e = 0.76281441 Hean Square	7	Prob>P
itep 4 V Regressio	Variable B5 Removed DF Dn 14	d R-squar; Sun of Squares 1433,64470693	• = 0.76281441 Hean Square 102.40319335	7	Prob>1
tep 4 V Regressio Brror	Variable B5 Removed D7 Dn 14 33	d R-square Sun of Squares 1433.64470693 445.77012432	e = 0.76281441 Hean Square	7	Prob>1
********	Variable B5 Removed DF Dn 14	d R-squar; Sun of Squares 1433,64470693	• = 0.76281441 Hean Square 102.40319335	7	Prob>1
Regressio Brror	Variable B5 Removed DF Dn 14 33 47	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125	• • 0.76281441 Mean Square 102.40319335 13.50818559	7	Prob>1
Regressio Regressio Reror Total	Variable B5 Removed DF Dn 14 33 47 Parameter	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard	• • 0.76281441 Mean Square 102.40319335 13.50818539 Type II	P 7.58	Prob>1
tep 4 V Regressio Brror	Variable B5 Removed DF Dn 14 33 47	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125	• • 0.76281441 Mean Square 102.40319335 13.50818559	7	Prob>1
tep 4 V Regressio Brror Total Variable	Variable B5 Removed DF Dn 14 33 47 Parameter Estimate	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Error	• = 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares	F 7.58 F	Prob>1 0.0003 Prob>1
tep 4 V Regressio Error Total Variable INTERCEP	Variable B5 Removed DF Dn 14 33 47 Parameter Estimate 84.45614624	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Broor 39.85698920	• = 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912	F 7.58 F 4.49	Prob>1 0.0003 Prob>1 0.0411
tep 4 V Regressic Rrror Total Variable INTERCEP B1	Variable B5 Removed DF DF 14 33 47 Parameter Estimate 84.45614624 -23.12042951	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Srror 39.85698920 7.38812852	• = 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159	F 7.58 F 4.49 9.79	Prob>1 0.0001 Prob>1 0.0411 0.0037
tep 4 V Regressio Error Total Variable INTERCEP B1 B2	Variable B5 Removed DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sum of Squares 40.65275912 132.28784159 69.65430249	F 7.58 F 4.49 9.79 5.16	Prob>1 0.0001 Prob>1 0.0417 0.0037 0.0298
tep 4 V Regressio Error Total Variable INTERCEP B1 B2 B3	Variable B5 Removed DF DF Parameter Betimate 84.45614624 -23.12042951 -10.17150328 17.92693343	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Error 39.85698920 7.38612852 4.47929514 5.55692947	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sum of Squares 40.65275912 132.28784159 69.65430249 140.58508935	F 7.58 F 4.49 9.79 5.16 10.41	Prob>1 0.0003 Prob>1 0.0411 0.0037 0.0298 0.0028
tep 4 V Regressic Error Total Variable INTERCEP B1 B2 B3 B4	Variable B5 Removed DF DF Parameter Setimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Bror 39.85688920 7.38812852 4.47929514 5.55692947 2.60778353	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098	F 7.58 F 4.49 9.79 5.16 10.41 1.69	Prob>1 0.0003 Prob>1 0.0417 0.0298 0.0298 0.0298 0.0298
tep 4 V Regressio Rrror Total Variable INTERCEP B1 B2 B3 B4 B6	Variable B5 Removed D7 D7 D7 Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38612652 4.47929514 5.55692947 2.60778353 4.41176722	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098 43.90025555	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25	Prob>1 0.0003 Prob>1 0.0417 0.0037 0.0028 0.0028 0.0028 0.0028
tep 4 V Regressic Error Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH	Ariable B5 Removed DF DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.36902822 7.95330439 0.29826435	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60	Prob>1 0.0003 Prob>1 0.0417 0.0037 0.0028 0.0028 0.0028 0.0028
tep 4 V Regressic Error Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH	Variable B5 Removed D7 D7 D7 Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38612652 4.47929514 5.55692947 2.60778353 4.41176722	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098 43.90025555	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25	Prob>1 0.0003 Prob>1 0.0417 0.0037 0.0298 0.0028 0.2027 0.0808 0.4451
Regressic Rror Total Variable INTERCEP B1 B2 B3 B4	Ariable B5 Removed DF DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.36902822 7.95330439 0.29826435	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098 43.90025555 8.07013342 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60	Prob>1 0.0003 Prob>1 0.0413 0.0037 0.0298 0.2021 0.0028 0.2021 0.0028 0.2021 0.0028 0.2021 0.0028
tep 4 V Regressic Rrror Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH HSR1 MSR3	Variable B5 Removed DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.28628435 0.04160924	d R-squares Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06808718	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.8508935 22.81415098 43.90025555 8.07013342 5.04482183 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37	Prob>1 0.0001 Prob>1 0.0411 0.0037 0.0298 0.0028 0.2027 0.0808 0.4451 0.5453 0.0607
Regressic Rror Total Variable INTERCEP B1 B2 B3 B4 MONTH HSR1 HSR3 HSR4	Variable B5 Removed DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.08955384 -0.64435021	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06808718 0.21221326	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sun of Squares 60.65275912 132.28784159 69.65430249 140.58508935 22.81415098 43.9002555 8.07013342 5.04482183 51.17778671 124.53628811	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22	Prob>1 0.0003 Prob>1 0.0411 0.0031 0.0298 0.0028 0.0028 0.0028 0.0028 0.0028 0.0028 0.0028 0.0041 0.5453 0.0602 0.0041
Regressio Rror Total Variable INTERCEP B1 B2 B3 B4 HONTH HSR1 HSR3 HSR4 HSR5	Variable B5 Removed DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.68955384 -0.64435021 0.55177311	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06808718 0.21221328 0.28723896	• • 0.76281441 Mean Square 102.40319335 13.50818559 Type II Sum of Squares 40.65275912 132.28784159 69.65430249 140.58508935 22.81415098 43.90025555 8.07013342 5.04482183 51.17778671 124.53628811 49.84612417	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 5.25 0.60 0.37 9.22 3.69	Prob>1 0.0003 Prob>1 0.0417 0.0037 0.0298 0.0028 0.0028 0.0028 0.0028 0.0028 0.0028 0.0037 0.0800 0.0602 0.0047 0.0634
Regressic Rror Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH MSR1 MSR1 MSR3 MSR4 MSR5 MSR6	Variable B5 Removed D7 D7 D7 Parameter Setimate 84.45614624 -23.12042951 -10.17150328 17.3269343 3.38902822 7.95330439 0.28626435 0.04160924 -0.08955384 -0.64435021 0.55177311 -0.29697831	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Error 39.85698920 7.38612852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06608718 0.21221326 0.28723896 0.22767351	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 40.68278912 132.28784159 69.66430249 140.5850835 22.81415098 43.90025555 8.07013342 5.04482163 51.1777871 124.5362831 49.84612417 22.98377940 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22 3.69 1.70	Prob>1 0.0003 Prob>1 0.0417 0.0037 0.0028 0.0028 0.0028 0.0028 0.0028 0.0028 0.0047 0.0634 0.0047 0.0634
Regressic Brror Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH MSR1 MSR3 MSR4 MSR5 MSR6 MSR7	Ariable B5 Removed DF DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.0895384 -0.64435021 0.55177311 -0.29697831 -0.05778141	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38612852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06608718 0.04600891 0.21221328 0.28723896 0.22767351 0.03357294	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.5850835 22.81415098 43.90025555 8.07013342 5.04482183 51.1777871 124.5328811 49.64612417 22.98377940 40.01239562 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22 3.69 1.70 2.96	Prob>1 0.0003 Prob>1 0.0417 0.0298 0.0298 0.0298 0.2027 0.0806 0.4451 0.5453 0.0634 0.0634 0.0047 0.0634 0.2011 0.0946
Regressic Error Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH MSR1 MSR3 MSR4 MSR5 MSR6 MSR7 MSR12	Ariable B5 Removed D7 D7 D7 Parameter Setimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.68955384 -0.64435021 0.55177311 -0.29697831 -0.05778141 -0.09853932	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06808718 0.04600891 0.21221328 0.28723896 0.22767351 0.03357294 0.27397399	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sun of Squares 60.65275912 132.28784159 69.65430249 140.65508935 22.81415098 43.90025555 8.07013342 5.04482183 51.17778871 124.5322811 49.84612417 22.86377940 40.01239562 1.74742059 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22 3.69 1.70 2.96 0.13	Prob>1 0.0001 Prob>1 0.0417 0.0037 0.0028 0.0028 0.2027 0.0808 0.4451 0.5453 0.0634 0.0634 0.2011 0.0946 0.7214
Regressic Brror Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH MSR1 MSR3 MSR4 MSR5 MSR6 MSR7	Ariable B5 Removed DF DF DF Parameter Estimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.0895384 -0.64435021 0.55177311 -0.29697831 -0.05778141	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38612852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06608718 0.04600891 0.21221328 0.28723896 0.22767351 0.03357294	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sum of Squares 60.65275912 132.28784159 69.65430249 140.5850835 22.81415098 43.90025555 8.07013342 5.04482183 51.1777871 124.5328811 49.64612417 22.98377940 40.01239562 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22 3.69 1.70 2.96	Prob>1 0.0001 Prob>1 0.0417 0.0037 0.0028 0.0028 0.2027 0.0808 0.4451 0.5453 0.0634 0.0634 0.2011 0.0946 0.7214
Regressio Brror Total Variable INTERCEP B1 B2 B3 B4 B6 MONTH MSR1 MSR3 MSR4 HSR5 MSR6 HSR7 MSR12 HSR13	Ariable B5 Removed D7 D7 D7 Parameter Setimate 84.45614624 -23.12042951 -10.17150328 17.92693343 3.38902822 7.95330439 0.29828435 0.04160924 -0.68955384 -0.64435021 0.55177311 -0.29697831 -0.05778141 -0.09853932	d R-square Sum of Squares 1433.64470693 445.77012432 1879.41483125 Standard Brror 39.85698920 7.38812852 4.47929514 5.55692947 2.60778353 4.41176722 0.38591230 0.06808718 0.04600891 0.21221326 0.28723896 0.22767351 0.03357294 0.27397399 0.31504154	 • • 0.76281441 Hean Square 102.40319335 13.50818559 Type II Sun of Squares 60.65275912 132.28784159 69.65430249 140.65508935 22.81415098 43.90025555 8.07013342 5.04482183 51.17778871 124.5322811 49.84612417 22.86377940 40.01239562 1.74742059 	F 7.58 F 4.49 9.79 5.16 10.41 1.69 3.25 0.60 0.37 3.79 9.22 3.69 1.70 2.96 0.13	

Step 5 V	ariable MSE12 Rem	oved R-square	- 0.76188464	C(p) = 9,27	936253
	DF	Sum of Squares	Hean Square	7	Prob>F
Regressio	in 13	1431.89728634	110.14594510	8.37	0.0001
Brfor	34	447.51754491	13.16228073		
Total	47	1879.41483125			
	-		• • ••		
	Parameter	Standard	Type II	reday, July	12 1860
		The SAS Sys		rocky, July	£, 1990
Variable	Estimate	Brfor	Sum of Squares	7	Prob> F
INTERCEP	77.51170116	34.41871712	66.75385156	5.07	0.0309
B1	-22.73171369	7.21446809	130.67330353	9.93	0.0034
32	-10.12164680	4.41945469	\$9.03926109	5.25	0.0283
B3	17.72787437	5.45804590	138.85774645	10.55	0.0026
B4	3.42920209	2.57181578	23.40117125	1.78	0.1913
B6 Month	7.82956468 0.27293357	4.34165287 0.37453157	42.80516615 6.98985547	3.25 0.53	0.0802 0.4712
MSR1	0.03897996	0.06682126	4.47903594	0.34	0.5635
MSR3	-0.08425163	0.04302153	50.47960999	3.84	0.0584
MSR4	-0.61618453	0.19469405	131.84006042	10.02	0.0033
MSRS	0.52753660	0.27562452	48.21704857	3.66	0.0641
MSR6	-0.30594536	0.22338804	24.68874729	1.88	
MSR7	-0.05564295	0.03261647	38.30696072	2.91	
MSR13	0.16323387	0.30361376	3.80459804	0.29	0.5943
-					
	condition number:	•	2522.888		
********	****************	•••••			
Step 6 V	ariable MSR13 Rem	oved R-square	. 0.75986028	C(p) = 7.52	828284
	DF	Sum of Squares	Mean Square	7	Prob>P
Regressio	on 12	1428.09268831	119.00772403	9.23	0.0001
Error	35	451.32214294	12.89491837		
Total	47	1879.41483125			
	Parameter	Standard	Type II		
Variable	Estimate	Brror	Sum of Squares	7	Prob> P
INTERCEP	95.80223811	5.16875289	4429.94533646	343.54	0.0001
B1	-25,13225945	5.60892686	258.89407609	20.08	0.0001
82	-11.78080149	3.13162049	152.48000097	14.15	0.0006
83	19.74183523	3.92912428	325.53831467	25.25	0.0001
34	3.82338667	2.43992802	31.66365270	2.46	0.1261
36	9.68844315	2.59914873	179.16960050	13.69	0.0007
MONTH	0.29740964	0.36795936	8.42420604	0.65	0.4244
MSR1	0.04633397	0.06473859	6.60527886	0.51	0.4789
MSR3	-0.08374710	0.04257222	49.90057619 138.32645041	3.87	0.0571
MSR4 MSR5	-0.62747685 0.52261831	0.19158186 0.27266051	47.37435871	10.73 3.67	0.0024 0.0635
MSR6	-0.39803279	0.14194009	101.40191302		0.0082
MSR7	-0.05293175	0.03189531	35.51381641	2.75	0.1059
Bounds on	condition number:	29.27671,	1368.673		
Step 7 V	Ariable MSE1 Remo	ved B-square	. 0.75634574	C(p) = 5.9	044099
		-		-	
	DF	Sum of Squares	Mean Square	1	Prob>P
Regressio	on 11	1421.48740944	129.22612813	10.16	0.0001
Brror	36	457.92742181	12.72020616		
Total	67	1879.41483125			
	9	et and and			
	Parameter	Standard The SAS Sys	Type II tem 16:47 Thu	uroday, July	12, 1990

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Variable	Setimate	Error	Sum of Squares	7	Prob>P
INTERCEP	97.29364269	4.69793371	5455.63526944	428.90	0.0001
B1	-23.61755090	5.15901639	266.58152884	20.96	0.0001
82	-11.85085673	3.10880473	184.84459589	14.53 25.60	0.0005 0.0001
83	19.74513219	3.90241313	325.64750361 27.38937383	2.15	0.1510
14 15	3.49094375	2.37902428 2.43482708	176.52583462	13.88	0.0007
b6 Monte	9.07037373 0.31581739	0.36456427	9.54592481	0.75	0.3921
MSR3		0.04189001	45.93431490	3.61	0.0454
MSR4	-0.07960348 -0.57398961	0.17520539	136.52346229	10.73	0.0023
MSR5	0.51243268	0.27043795	45.67015853		0.0662
MSR6	-0.43053710	0.13356419	132.17072589	10.39	
MSB7	-0.05117236	0.03158427	33.39053048	2.62	0.1139
		25.10851,	1092.893		
Step 8 Vari	Lable MONTH Remo	oved E-square	= 0.75126654	C(p) + 4.58	499436
		Sum of Squares	Mann Source		Prob>P
	Dr	SUB OI BUNKINS	and adams	-	
Regression	10	1411-94148454		11.18	0.0001
Brror	17	467.47334661	12.63441477		
Total	47	1879.41483125			
		Read and	Type II		
Variable	Parameter Setimate	Standard Srror		_	1 <do1< td=""></do1<>
		#1 LVL		•	
INTERCEP	98.02400578	4.60605144	5722.19238574	452.91	0.0001
B1	98.02400578 -23.84860925	5.13471335	272.55166393		0.0001
B2	-11.83286980	3.09823423	184.29213744		0.0005
B3	20.05890562	3.87244237	338.99997999		0.0001
B4	3.43961238	2.37025250	26.60632615		0.1552
B6	9.13173347 -0.09425911	2.42557535	179.07379732 76.95703086		0.0008 0.0183
		0.03819238	170.13085099		0.0008
MSR4 MSR5	-0.61587409 0.60423646	0.16783323 0.24796916	75.01940683		
MSR6	-0.43802522	0.13283396	137.38367283	10.87	0.0022
HSR7	-0.04106802	0.02925248	24.90216720		0.1687
	ndition number:		942.8148		

Stan G Var	Inhia MSE7 Read	ved R-square	0.73801659	C(p) = 4.2	1424798
	DF	Sum of Squares	Hean Square	1 7	Prob>P
	-		154.11547971	11.89	0.0001
Regression	9 38	1387.03931743 492.37551382	12.95725036		0.0001
Error Total	47	1879.41483125			
10021	••				
	Parameter	Standard	Type II		
Variable	Betimete	Brror	Sum of Squares		Prob>P
				489.20	0.0001
INTERCEP	95.59143483	4.32190193 4.38686357	6338.71163319 268.73154857		0.0001
B1	-19,97823101	4.38888357 The SAS Sy	aten 16:47 Th	ursday, July	
		1110 200 21			8
					-
32	-9.09824678	2.43992764	180.16664065		0.0006
33	17.06818874	3.27490226	351.95815872		0.0001
B4	1.35981049	1.87375037	6.82411223		0.4725
36	8.23418812	2.36951069	156.47215852		0.0013 0.0042
MSRJ	-0.11144472	0.03663679 0.16911097	119.89389604 158.94581693		0.0012
MSB4 MSR5	-0.59229750 0.52914927	0.24520650	60.34000017		0.0373
1385 M526	-0.37840867	0.12746143	114.20298572		0.0052
110 F 4					

Bounds on	oondition number:	17.82283,	633.3789		
Step10	Variable 34 Rem ove	d R-square	0.73438561	C(p) = 2.6	8072357
	DF	Sum of Squares	Hean Square	7	Prob>P
Regressi Brror Total	on 8 39 47	1380.21520521 499.19962604 1879.41483125	172.52690065 12.79999041	13.48	0.0001
Variable	Parapeter Estimate	Standard Error	Type II Sum of Squares	7	Prob>P
INTERCEP D1 D2 D3 D6 MSR3 MSR4 MSR5 MSR6	95.49207098 -18.40437289 -8.13073983 16.06233254 7.98233283 -0.10935338 -0.54993805 0.42457004 -0.34562555	4.29343864 3.79009746 2.03106056 2.94908186 2.32969096 0.03630096 0.15775237 0.19718593 0.11846247	6331.89563894 301.82203067 205.12756669 379.71103270 150.27013531 116.15498017 155.55550109 58.34121898 108.95814908	23.58 16.03 29.66 11.74 9.07 12.15 4.64	
Bounds on	condition number:	13.46705,	434.7935		

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All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination Procedure for Dependent Variable MSR2

	Variable	Number	Partial	Model			
Step	Repoved	In	R==2	R== 2	C(P)	7	Prob>P
1	B7	17	0.0000	0.7642	17.0001	0.0001	0.9907
2	msB8	16	0.0001	0.7640	15.0132	0.0136	0.9081
3	MSR9	15	0.0004	0.7637	13.0572	0.0470	0.8298
4	35	14	0.0009	0.7628	11.1650	0.1187	0.7327
5	MSR12	13	0.0009	0.7619	9.2794	0.1294	0.7214
6	MSR13	12	0.0020	0.7599	7.5283	0.2891	0.5943
7	MSR1	11	0.0035	0.7563	5.9604	0.5122	0.4789
8	MONTH	10	0.0051	0.7513	4.5850	0.7505	0.3921
9	MSR7	9	0.0132	0.7380	4.2142	1.9710	0.1687
10	34	8	0.0036	0.7344	2.6607	0.5267	0.4725
			The	SAS System	16:47 Thur	eday, July	12, 1990

Backward Elimination Procedure for Dependent Variable MSE7 •

Step 0 A	11 Variables 1	Intered R-square	• • 0.84219855	C(p) = 19.0	000000
	DF	Sum of Squares	Nean Square	7	Prob>F
Regression	18	50101.75979606	2783.43109978	8.60	0.0001
BILOI	29	9387.49020394	323.70655876		
Total	47	59489.25000000	••••••••		
	Paramete	r Standard	Type II		
Variable	Estimat	e Brror	Sum of Squares	7	Prob> I
INTERCEP	168.5014516	7 216.27236876	196.49736008	0.61	0.4422
B 1	-127.1292732	89 61.31384767	1391.63546080	4.30	0.0471
82	-78.8025097	4 48.04592090	827.15953254	2.56	0.1208
B 3	75.7212069	3 42.89220967	1008.85723685	3.12	0.0880
34	12.6641186	18.36427268	153.94088292	0.48	0.4959
B5	26.5322629	44.78316622	113.62410938	0.35	0.5581
B6	33.1319623	8 30.85741098	373.18729378	1.15	0.2918
B7	39.8622512		1122.65908953	3.47	0.0727
NONTH	3.5324261		949.31224868	2.93	0.0975
HSR1	0.1137967	•••••••	31.88173244	0.10	0.7559
MSR2	-1.2514416		749.60348503	2.32	0.1389

MSR3	0.11884688	0.26205677	66.57884890	0.21	0.6536
MSR4	-1.61919720	1.27040070	525.85927339	1.62	0.2126
MSR5	-0.23009569	1.79715484	5.30636914	0.02	0.8990
MSR6	-2.13191261	2.55820781	224.81156806	0.69	0.4115
MSR8	0.02521937	0.42433916	1.14338848	0.00	0.9530
MSR9	0.83893919	2.00468893	56.69156930	0.18	0.6787
MSR12	-1.35383306	1.35171301	324.72276985	1.00	0.3248
MSR13	1.90523786	1.88769193	329.75217513	1.02	0.3212
	ondition number:	199.1878,	12569.65		
Step 1 Va:	riable MSR8 Remo	ved R-square	= 0.84217832	C(p) = 17.00	353218
				_	
	DP	Sum of Squares	Near Square	1	Prob>P
Regression	17	50100.61640759	2947.09508280	9.42	0.0001
REFOR	30	9388.63359241	312.95445308		
Total	47	59489.25000000	••••••••		
	-				
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	1	Prob>P
_					
INTERCEP	168.57085089	212.64712971	196.66498508		0.4342
B1	-127.05168093	60.27329205	1390.56771047	4.44	0.0435
B2	-76.64975747	47.17360270	826.23695447	2.64	0.1147
B3	75.89463112	42.07613948	1018.19620120	3.25	0.0813
B4	12.50000775	17.85141629	153.44627314	0.49	0.4892
B5	26.65006147	43.98998673	114.86028883	0.37	0.5492
B6	33.21603322	30.30871248	375.87348626	1.20	0.2818
B7	39.47981229	20.07286300	1210.63340387		0.0585
MONTH	3.53417783 0.11806469	2.02798515 0.34947117	950.44806629 35.71893154	3.04	0.0916 0.7378
MSR1	A.11000408		iten 16:47 Thu	0.11	
		1114 <i>343</i> 471		areas, agay	10
					••
MSR2	-1.25052829	0.80846183	748.77120286	2.39	0.1324
MSB3	0.11474389	0.24856582	66.68949609	0.21	0.6477
MSR4	-1.63246953	1.22967303	551.55904396	1.76	0.1943
MSR5	-0.19994923	1.69521052	4.35384845	0.01	0.9069
MSR6	-2.11985725	2.50744326	223.68256756	0.71	0.4046
MSR9	0.33356970	1.96911153	56.08210933		0.6751
MSR12	-1.36039049	1.32463939	330.07526625	1.05	0.3126
MSR13	1.92780017	1.81815509	351.83845947	1.12	0.2975
Bounda on or	ondition number:	197.9355,	11702.46		

					'
Step 2 Va	riable MSR5 Remo	ved R-square	= 0.84210614	C(p) = 15.01	698216
				-	_ • =
	DF	Sum of Squares	Hean Square	T	Prob> f
Regression	16	50096.26255914	3131.01640995	10.33	0.0001
Error	31	9392.98744086	302.99959487	10.30	4.0001
Total	47	59489.25000000			
	••				
	Paraseter	Standard	Type II		
Variable	Estimate	Brror	Sum of Squares	7	Prob>F
			•••		
INTERCEP	169.89240601	208.94707053	200.31681585	0.66	0.4224
81	-126.58624630	59.17968178	1386.34027496	4.58	0.0404
B2	-75.62595329	45.62472856	832.49797308	2.75	0.1075
B3	76.00958732	41,39041712	1021.83127500	3.37	0.0759
34	13.92041686	12.96638254	349.22784932	1.15	0.2913
85	24.87291625	40.66658104	113.34963865	0.37	0.5452
36	32.62037008	29.40586124	372.86533438	1.23	0.2758
B7	38.31162962	17.17941794	1506.90685405	4.97	0.0331
MONTH	3.51501458	1.98905609	946.24206516	3.12	0.0870
MSR1	0.12601839	0.33740576	42.26734091	0.14	0.7113
MSR2	-1.27727271	0.76357181	847.83148571	2.80	0.1044
MSR3	0.10172778	0.21915559	65.28540598	0.22	0.6458

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HSR4	-1.70861940	1.02977574	834.15623941	2.75	0.1072
MS26	-2.03409269	2.36122402	224.85841228	0.74	0.3956
MSR9	0.87415997	1.90772185	63.62001576	0.21	0.6500
MSR12	-1.39458069	1.27181053	364.32125228	1.20	0.2813
MSR13	1.92453550	1.78879697	350.72909713	1.16	0.2903
	ndition number:		10054.6		
tep 3 Var	iable MSR1 Benc	ved R-square	0.84139563	C(p) = 13.14	1755517
	DP	Sum of Squares	Mean Square		Prob>f
		• .		-	
Regression	15	50053.99521823	3336.93301455	11.32	0.0001
Error Total	32 47	9435.25478177	294.85171193		
10141	• /	59489.25000000			
	Parapeter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	1	Prob>P
_			_		
INTERCEP	162.44368471	205.17751621	184.82034708	0.63	0.4344
B1	-124.69793936	58.16513694	1355,17910683	4.60	0.0397
		The SAS Sy	ren 16:47 Th	ureday, July	•
					11
32	-77.41868904	44.75734455	882.19919209	2.99	0.0933
83	77.27215126	40.69371321	1063.15116628	3.61	0.0666
55 84	12.72563326	12.39547892	310.76767438	1.05	0.3123
5	26.80899931	39.78883260	133.85742506	0.45	0.5053
36	31.13030714	28.73958381	345.94695744	1.17	0.2868
57	39.22512854	16.77423148	1612.30477634	5.47	0.0258
IONTH	3.44903867	1.95437723	918.29663206	3.11	0.0871
15R2	-1.26539987	0.75258231	833.58753074	2.83	0.1024
ISR3	0.11146583	0.21465316	79.50975372	0.27	0.6071
ISR4	-1.59143388	0.96753619	797.71253684	2.71	0.1098
ISR6	-2.19941610	2.28796621	272.47034559	0.92	0.3436
MSR9	0.66961117	1.80268253	40.68277142	0.14	0.7127
	0.66961117 -1.34691483	1.80268253 1.24826150	40.68277142 343.29918244	0.14 1.18	0.7127
MSB12		1.80268253 1.24826150 1.74477310	40.68277142 343.29918244 396.91910044	0.14 1.16 1.35	0.7127 0.2888 0.2545
MSB12 " MSB13	-1.34691483 2.02436178	1,24826150 1,74477310	343.29918244 396.91910044	1.16	0.2888
	-1.34691483 2.02436178 ndition number:	1,24826150 1,74477310	343.29918244 396.91910044 9121.395	1.16	0.2888
MSE12 " MSE13 ounds on co	-1.34691483 2.02436178 ndition number:	1,24826150 1,74477310 174,9195,	343.29918244 396.91910044 9121.395	1.16 1.35	0.2888 0.2545
ISE12 ISE13 Dunde on co	-1.34691483 2.02436178 ndition number:	1,24826150 1,74477310 174,9195,	343.29918244 396.91910044 9121.395	1.16 1.35 C(p) = 11.2	0.2888 0.2545
HSE12 MSE13 Dunde on co	-1.34691483 2.02436178 ndition number: iable MSR9 Remo	1.24826150 1.74477310 174.9195, ved R-square	343.29918244 396.91910044 9121.395 • • 0.84071177	1.16 1.35 C(p) = 11.2	0.2888 0.2545 7323311
ISB12 ISB13 Dunds on Co Lep 4 Var Regression	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF	1.24826150 1.74477310 174.9195, ved R-square Sum of Squares	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square	1.16 1.35 C(p) = 11.2' F	0.2888 0.2545 7323311 Prob>F
ISB12 ISB13 Dunds on Co Lep 4 Var Regression Brror	-1.34691483 2.02436178 ndition number: imble MSR9 Remo DF 14	1.24826150 1.74477310 174.9195, wed R-square Sum of Squares 50013.31244681	343.29915244 396.91910044 9121.395 - 0.84071177 Hean Square 3572.37946049	1.16 1.35 C(p) = 11.2' F	0.2888 0.2545 7323311 Prob>F
ISB12 ISB13 Dunds on Co Lep 4 Var Regression Brror	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47	1.24826150 1.74477310 174.9195, ved R-square Sum of Squares 50013.31244681 9475.93755319 59489.25000000	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282	1.16 1.35 C(p) = 11.2' F	0.2888 0.2545 7323311 Prob>F
ISB12 ISB13 Sunds on Co Lep 4 Var Legression Brror Total	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33	1.24826150 1.74477310 174.9195, wed R-square Sum of Squares 50013.31244681 9475.93755319	343.29915244 396.91910044 9121.395 - 0.84071177 Hean Square 3572.37946049	1.16 1.35 C(p) = 11.2' F	0.2888 0.2545 7323311 Prob>F
SE12 SE13 bunds on co tep 4 Var tegression Bror total Variable	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter	1.24826150 1.74477310 174.9195, ved E-square Sum of Squares 50013.31244681 9475.93755319 59489.2500000 Standard Error	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares	1.16 1.35 C(p) = 11.2' F 12.44	0.2888 0.2545 7323311 Prob>P 0.0001 Prob>P
SE12 SE13 bunds on co lep 4 Var legression Bror Total Variable INTERCEP	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate	1.24826150 1.74477310 174.9195, wed R-square Sum of Squares 50013.31244681 9475.93755319 59489.2500000 Standard	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type 11 Sum of Squares 241.01485620	1.16 1.35 C(P) = 11.2 P 12.44	0.2888 0.2545 7323311 Prob>F 0.0001
SE12 - ISE13 bunds on co cop 4 Var tegression Broor total Variable INTERCEP B1	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011	1.24826150 1.74477310 174.9195, ved E-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares	1.16 1.35 C(P) = 11.2' P 12.44 P 0.84	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662
SE12 SE13 bunds on Co sep 4 Var tegression Brror rotal Variable INTERCEP B1 B2	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14952282 Type II Sum of Squares 241.01485620 1697.66706551	1.16 1.33 C(p) = 11.2 F 12.44 F 0.84 5.91	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0208
ISB12 ISB13 Jounds on Co ISB13 ISB13 ISB14 ISB14 ISB14 ISB14 ISB14 ISB14 ISB14 ISB14 ISB12 ISB12 ISB12 ISB12 ISB12 ISB13 ISB14 ISB13 ISB14 IS	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485820 1697.66706551 1096.07023860	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593
ISE12 - ISE13 Jounds on Co ISE 4 Var Regression Brror Total Variable INTERCEP 31 33 34	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386086 -82.37320053 82.86516121	1.24826150 1.74477310 174.9195, wed R-squares 50013.31244681 9475.93755319 59489.25000000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485620 1697.66706551 1096.07023860 1416.56339459	1.16 1.33 C(p) = 11.2 P 12.44 P 0.84 5.91 3.82 4.93	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.0333
SE12 - ISE13 Junds on Co Lep 4 Var Regression Broor Total Variable INTERCEP B1 B2 B3 B4 B5	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091986	1.24826150 1.74477310 174.9195, wed R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Brror 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485620 1697.66706551 1096.07023860 1416.56339459 298.15754649	1.16 1.35 C(p) = 11.2' F 12.44 F 0.84 5.91 3.82 4.93 1.04	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.0333 0.3156
SE12 - SE12 - SE13 bunds on co tep 4 Var Regression Bror total Variable INTERCEP B1 B2 B3 B4 B5 B6	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.60386084 -82.37320053 82.86516121 12.44091988 29.76574363	1.24826150 1.74477310 174.9195, wed E-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528	343.29918244 396.91910044 9121.395 • • 0.84071177 Mean Square 3572.37946049 287.14982282 Type 11 Sum of Squares 241.01485620 1697.66706351 1096.0702386 1416.56339459 298.15754649 171.89111600	1.16 1.35 C(p) = 11.2 F 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0208 0.0593 0.3158 0.4468 0.2165 0.0160
SE12 - SE12 - SE13 bunds on co cop 4 Var tegression Broor rootal Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091988 29.76574363 34.21451182 40.75307010 3.31966932	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528 27.15230198 16.04825660 1.89781066	343.29918244 396.91910044 9121.395 • = 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485620 1697.66706351 1096.07023860 1416.56339459 298.15754649 171.8911600 455.9483853 1851.71094592 878.60189707	1.16 1.35 C(p) = 11.2' F 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.3156 0.448 0.2165
ISB12 - ISB13 Junds on Co Lep 4 Var Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 TONTH ISR2	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091986 29.76574363 34.21451182 40.75307010 3.31966932 -1.27837567	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852852 12.20910180 38.47194528 27.15230198 16.04825660	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14952282 Type II Sum of Squares 241.01485620 1697.66706551 1096.07023860 1416.56339459 298.15754649 171.89111600 455.94833653 1851.71094592	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0208 0.0593 0.3158 0.4468 0.2165 0.0160
ISB12 - ISB13 Jounds on Co Lep 4 Var Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH ISB2 ISB2 ISB2 ISB2 ISB2 ISB3 ISB3	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091988 29.76574363 34.21451182 40.75307010 3.31966932	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528 27.15230198 16.04825660 1.89781066	343.29918244 396.91910044 9121.395 • = 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485620 1697.66706351 1096.07023860 1416.56339459 298.15754649 171.8911600 455.9483853 1851.71094592 878.60189707	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45 3.06	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.3156 0.4448 0.2160 0.0898
HSB12 - HSB13 Dounds on Co Lep 4 Var Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH HSB2 HSB3	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091986 29.76574363 34.21451182 40.75307010 3.31966932 -1.27837567	1.24826150 1.74477310 174.9195, ved R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528 27.15230198 16.04825660 1.89781066 0.74188732	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485820 1697.66706551 1096.07023860 1416.56339459 298.15754649 171.8911600 455.94833653 1851.71094592 878.60189707 852.60786502	1.16 1.33 C(p) = 11.2 P 12.44 P 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45 3.06 2.97	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.3156 0.4448 0.2165 0.0160 0.0896 0.0942
HSB12 - HSB13 ounds on co tep 4 Var Regression Broor Total Variable INTERCEP B1 B3 B4 B5 B6 B7 HONTH HSR2 HSR3 HSR4 HSR6	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091985 29.76574363 34.21451182 40.75307010 3.31966932 -1.27837567 0.11073003	1.24826150 1.74477310 174.9195, wed E-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528 27.15230198 16.04825860 1.89781066 0.74188732 0.21182198 0.93136467 2.12925114	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 Type II Sum of Squares 241.01485620 1697.66706551 1096.07023860 1416.56339459 298.15754649 171.8911600 455.94833653 1851.71094592 878.60786502 78.46879548	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45 3.06 2.97 0.27 3.22 1.36	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.3156 0.4446 0.2165 0.0160 0.0896 0.0942 0.6046
HSB12 - HSB13 bounds on co tep 4 Var Regression Broor Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH HSR2 HSR3 HSR4 HSR6 HSR12	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091988 29.76574363 34.21451182 40.75307010 3.31966932 -1.27837567 0.11073003 -1.67059701 -2.48217750 -1.30461724	1.24826150 1.74477310 174.9195, wed R-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852852 12.20910180 38.47194528 27.15230198 16.04825660 1.89781066 0.74188732 0.21182198 0.93136467 2.12925114 1.22671387	343.29918244 396.91910044 9121.395 • • 0.84071177 Hean Square 3572.37946049 287.14982282 287.14982282 287.14982282 287.14982282 1697.66706551 1096.07023860 1416.56339459 298.15754649 171.89111600 455.94833653 1851.71094592 878.60189707 852.6078502 78.46879548 923.87268788 390.22954124 324.77898949	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45 3.08 2.97 0.27 3.22 1.36 1.13	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3662 0.0206 0.0593 0.3156 0.446 0.2165 0.0160 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942 0.0942
HSB12 - HSB13 ounds on co tep 4 Var Regression Broor Total Variable INTERCEP B1 B3 B4 B5 B6 B7 HONTH HSR2 HSR3 HSR4 HSR6	-1.34691483 2.02436178 ndition number: iable MSR9 Remo DF 14 33 47 Parameter Estimate 180.32475011 -131.80386084 -82.37320053 82.86516121 12.44091986 29.76574363 34.21451182 40.75307010 3.31966932 -1.27837567 0.11073003 -1.67059701 -2.48217750	1.24826150 1.74477310 174.9195, wed E-squares 50013.31244681 9475.93755319 59489.2500000 Standard Error 196.52830721 54.20707772 42.16196784 37.30852652 12.20910180 38.47194528 27.15230198 16.04825860 1.89781066 0.74188732 0.21182198 0.93136467 2.12925114	343.29918244 396.91910044 9121.395 • • 0.84071177 Mean Square 3572.37946049 287.14982282 Type 11 Sum of Squares 241.01485620 1697.66706551 1096.07023860 1416.56339459 298.15754649 171.8911600 455.94833653 1851.71094592 878.60189707 852.60788502 78.46879548 923.87268788 390.22954124	1.16 1.33 C(p) = 11.2 P 12.44 F 0.84 5.91 3.82 4.93 1.04 0.60 1.59 6.45 3.06 2.97 0.27 3.22 1.36	0.2888 0.2545 7323311 Prob>F 0.0001 Prob>F 0.3862 0.0206 0.0593 0.3158 0.4448 0.2165 0.0160 0.0896 0.0942 0.6046 0.0820 0.08221

	riable MSRJ Read	ved 2-square	* 0.83939272	C(p) = 9.51564029		
	DF	Sum of Squares	Hean Square	P	Prob>	
Regression	13	49934.84365133	5841.14181933	13.67	0.000	
Brror	34	9554.40634867	281.01195143			
Total	47	59489.2500000				
	Parameter	Standard	Type II			
		The SAS Sy	stem 15:47 Th	ursday, July	12, 19	
Variable	Estimate	Error	Sum of Squares	7	Prob>	
INTERCEP	205.09079233	188.98877296	330.93683267		0.285	
B1	-130.55569516	53.57257851	1668.90391733		0.020	
B2	-81.26204581	41.65590023	1069.41739797	3.81	0.059	
B3	81.77446959	36.84988804	1383.84649229		0.033	
B4	8.41748414	9.37568949	226.50770127		0.375	
B5	29.15390320	38.04094906	165.04999643		0.448	
B6	33.06596117	26.77246774	428.65736073	1.53	0.225	
	45.97226291	12.42940057	3844.29038548		0.000	
HONTH	3.27223703	1.87527175	855.62975836		0.090	
MSE2	-1.36798130	0.71405766	1031.37961945		0.063	
MSR4	-1.77342999 -2.36921784	0.90057166	1089.72355398		0.051	
MSR6 MSR12		2.09549735	359.22003300			
	-1.45169639	1.18118274	424.46530384		0.227	
MSR13	1.93286912	1.68454944	369.96629483	1.32	V.231	
	ondition number:		6941,148			
********				************		
tep 6 Va	riable 35 Remove	d R-square	• • 0.83661827	C(p) = 8.0	2551565	
•	DP	Sum of Squares	Hean Square	r	Prob)	
Regression		49769.79365490	4147.48280457		0.000	
Brfor	35	9719.45634510	277.69875272			
fotal	47	59459.25000000				
	Parameter	Standard	Type II			
Veriable	Parameter Estimate	Standard Brror	Type II Sum of Squares		Prob	
				7		
INTERCEP	Estimate	Error	Sum of Squares	P 1.23	0.27	
INTERCEP	Estimate 208.43654423	Error 187.82122613	Sum of Squares 342.00488926	F 1.23 9.97	0.27	
INTERCEP D1 D2	Estimate 208.43654423 -97.01704344	Error 187.82122613 30.71844940	Sum of Squares 342.00488926 2769.94675409	F 1.23 9.97	0.27	
INTERCEP D1 D2 D3	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521	Error 187.82122613 30.71844940 19.22916047	Sum of Squares 342.00486926 2769.94675409 2108.70415650	F 1.23 9.97 7.59 6.28	0.27 0.003 0.005 0.011	
INTERCEP D1 D2 D3 D4	Estimate 208.43654423 -97.01704344 -52.98844637	Error 187.82122613 30.71844940 19.22916047 24.14954570	Sum of Squares 342.00486926 2769.94675409 2108.70415650 1745.13891288	F 1.23 9.97 7.59 6.28 1.74	0.27 0.003 0.005 0.017 0.19	
INTERCEP D1 D2 D3 D4 D6	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665	F 1.23 9.97 7.59 6.28 1.74 0.96	0.27 0.003 0.005 0.01 0.19 0.33	
INTERCEP 01 02 03 04 06 07	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.\$4706053 19.57629664	Sum of Squares 342.00486926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26	0.27 0.003 0.005 0.015 0.195 0.33	
INTERCEP 81 82 83 84 86 85 87 40NTH	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350736	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.\$4706053 19.57629864 12.14348138	Sum of Squares 342.00486926 2769.94675409 2108.70415650 1745.13891288 463.93323665 266.17650501 3681.26806759	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00	0.27 0.003 0.017 0.19 0.33 0.000 0.012	
INTERCEP 91 92 93 94 96 97 MONTH 1582	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350738 4.08024492	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348136 1.54165770	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 268.17650501 3681.26806759 1945.22786804	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.38	0.27 0.003 0.017 0.19 0.33 0.000 0.012 0.012	
INTERCEP D1 R2 D3 D4 B6 D7 Month MSR2 MSR4	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350738 4.08024492 -1.29218803	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348136 1.54165770 0.70299457	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3651.26806759 1945.22786804 938.25615390	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.38 4.53	0.27 0.003 0.017 0.19 0.33 0.000 0.012 0.012	
INTERCEP D1 R2 D3 D4 D6 D7 Month M5R2 M5R4 M5R6	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14346136 1.54165770 0.70299457 0.88402606	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 268.17650501 3681.26806759 1945.22786804 938.25615390 1259.07064465	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.35 4.53 0.86	0.27 0.00 0.01 0.11 0.33 0.00 0.01 0.01 0.01	
INTERCEP D1 R2 D3 D4 B6 D7 MONTH MONTH MSR2 MSR4 MSR6 MSR12	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202 -0.99172633	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348136 1.54165770 0.70299457 0.88402608 1.07088630	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 268.17650501 3681.26806759 1945.22786804 938.25615390 1259.07064465 238.16113719	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.35 4.53 0.86 1.25	0.274 0.003 0.017 0.199 0.334 0.002 0.012 0.012 0.012 0.074 0.040 0.360 0.271	
INTERCEP 81 82 83 84 86 87 Month MSR2 MSR4 MSR6 MSR12 MSR13	Estimate 208.43654423 -97.01704344 -52.98644637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.28999076 1.22459409	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348138 1.54165770 0.70299457 0.88402608 1.07088630 1.15531272	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3681.26806759 1945.22786804 938.25615390 1259.07064465 238.16113719 346.21670670 212.44935347	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.36 4.53 0.86 1.25 0.77	0.040 0.360 0.27] 0.387	
INTERCEP D1 N2 D3 D4 D6 D7 MONTH MSR2 MSR4 MSR6 MSR12 MSR13 Dunde on Q	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350738 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.28999076 1.22459409 ondition number:	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629864 12.14348138 1.54165770 0.70299457 0.88402608 1.07088630 1.15531272 1.40007538	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3681.26806759 1945.22786804 938.25615390 1259.07064465 238.16113719 346.21670670 212.44935347 2011.952	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.38 4.53 0.86 1.25 0.77	0.274 0.003 0.017 0.193 0.012 0.012 0.012 0.012 0.074 0.040 0.271 0.387	
INTERCEP D1 N2 D3 D4 D6 D7 MONTH MSR2 MSR4 MSR6 MSR12 MSR13 Dunde on Q	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350738 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.28999076 1.22459409 ondition number:	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14346136 1.54165770 0.70299457 0.88402606 1.07088630 1.15531272 1.40007838 40.77612,	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3651.26806759 1945.22786804 938.25615390 1259.07064465 238.16113719 346.21670670 212.44935347 2011.962 = 0.83304705	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.38 4.53 0.86 1.25 0.77 C(p) = 6.6	0.274 0.003 0.017 0.199 0.334 0.012 0.012 0.012 0.012 0.012 0.012 0.027 0.387 0.387	
tep 7 Va	Estimate 208.43654423 -97.01704344 -52.98644637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.2899076 1.22459409 ondition number: riable MSR13 Rem DF	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348138 1.54165770 0.70299457 0.88402608 1.07088630 1.15531272 1.40007538 40.77612, www.etherational Construction E-squares	Sum of Squares 342.00486926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3681.26806759 1945.22786804 936.25615390 1259.07064465 238.16113719 346.21670670 212.44935347 2011.962 = 0.83304705 Mean Square	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.38 4.53 0.86 1.25 0.77 C(p) = 6.6 F	0.274 0.003 0.005 0.017 0.199 0.334 0.002 0.012 0.014 0.040 0.360 0.271 0.367 0.367 8181793	
INTERCEP B1 B2 B3 B4 B6 B7 MONTH MSB2 MSB12 MSB12 MSB13 ounds on Q tep 7 Va Regression	Estimate 208.43654423 -97.01704344 -52.98844637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.28999076 1.22459409 ondition number: riable MSR13 Rem DF 11	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629864 12.14348138 1.54165770 0.70299457 0.88402608 1.07088630 1.15531272 1.40007538 40.77612, www. R-squares 49557.34430143	Sum of Squares 342.00488926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3681.26806759 1945.22786804 938.25615390 1259.07064465 238.16113719 346.21470670 212.44935347 2011.962 = 0.83304705 Hean Square 4505.21311831	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.36 4.53 0.86 1.25 0.77 C(p) = 6.6 F 16.33	0.274 0.003 0.005 0.017 0.199 0.334 0.002 0.012 0.014 0.040 0.360 0.271 0.367 0.367 8181793	
INTERCEP B1 B2 B3 B4 B5 B7 MONTH MSR2 MSR4 MSR6 MSR12 MSR13 ounds on co top 7 Va	Estimate 208.43654423 -97.01704344 -52.98644637 60.53924521 11.28294680 19.16586531 44.21350736 4.08024492 -1.29218803 -1.88236202 -0.99172633 -1.2899076 1.22459409 ondition number: riable MSR13 Rem DF	Error 187.82122613 30.71844940 19.22916047 24.14954570 8.54706053 19.57629664 12.14348138 1.54165770 0.70299457 0.88402608 1.07088630 1.15531272 1.40007538 40.77612, www.etherational Construction E-squares	Sum of Squares 342.00486926 2769.94675409 2108.70415650 1745.13891288 483.93323665 266.17650501 3681.26806759 1945.22786804 936.25615390 1259.07064465 238.16113719 346.21670670 212.44935347 2011.962 = 0.83304705 Mean Square	F 1.23 9.97 7.59 6.28 1.74 0.96 13.26 7.00 3.36 4.53 0.86 1.25 0.77 C(p) = 6.6 F 16.33	0.274 0.003 0.005 0.017 0.199 0.334 0.012 0.012 0.012 0.012 0.012 0.025 0.025 0.385 0.385 0.385	

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The SAS System 16:47 Thursday, July 12, 1990 13

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Variable	E	stimate		Brror	Sum o	f Squares	P	Prob>F
	••• •					*******		
INTERCEP	331.41		124.12			.63827758		0.0113
B1		7611627		D94679		.42514036		0.0001 0.0001
82	-66.84			123774		. 88366846		0.0001
83	76.84	1727769		B02391		.71740977		0.0930
84	13.84	486062 067249		154061		. 52263307		0.0136
36	32.39	5067249		295678		.74457466		
B7 Month	47.01	014954		142407		.42561830		
	4.21 -1.2 -1.9	1422784		D01445 040806		.76468618		0.0771
MSR2	-1.2	/ 4401V1				. 22429644		
MSR4	-1.9	5164937	0.8/	49322				
MSR6 MSR12		9512280	1 12	100/ 99 002101	2210	. 18457085	8.40 0.94	0.3389
TIPRAG	-1.0	J1669V						
Bounds on	condition	number:	20.8	9922.	847.	8329		
				-				
Step 8	Variable H	SR12 Rem	oved 1	R-squer	• = 0.8	2869073	C(p) = 5.48	3240279
	DF		Sum of S		He			Prob 7
	57			dner ee				
Regressio	on 10		49298.18	973059			17.90	0.0001
Error	37		10191.06		275	.43406134		
Total	47		59489.25	000000				
	Pai	rameter	St	endard		Туре 11		
Variable	20	stimate		B LLOL	Sum o	f Squares		Prob> F
	232.5					.07484913		0.0022
B1		7527465		742431		. 35419123		0.0001
82	-65.8	1927370	10.80	375996		.89650749		0.0001
B3 .	74.6	0371508	15.10	947268		. 90603950		0.0001
B4	14.4	1758988	7.98	161509		.71382086	3.26	0.0790
B6	28.9	7250488	11.95	882539		.63763814	5.87	0.0204
87	48.7	5949894	11.51	241897		.89130239		6.0001
MONTH	3.7	9774847	1.46	618682		.95510960		
MSRZ	-1.3	5467220	0.69	362750	1000	.15837604	3.87	
MORG NORG	-1.0	69999099 11190 <i>09</i>	0.05		1203	.10136411	4.51	
пэко	-65.8 74.6(14.4 28.9 48.7(3.7) ~1.3(-1.8) -1.7	1119000	0.60	919/04	2606			0.0073
	condition	oumber ·	20	. 454	732.	6450		
All varia	bles left .	in the m	odel are	signifi	cant at	; the 0.10	00 level.	
			The	SAS Sy	stee	16:47 Th	urøday, July	
								14
•			1				Variable MSR	•
						e pendent	VALIAULA NOR	•
	Variable	Number	Partial	' No	del			
	Lesoved	In	R==2			C(p)	1	trop>t
1	MSR8	17	0.0000	0.8	422	17.0035	0.0035	0.9530
2	MSR5	16	0.0001	0.8	421	15.0170	0.0139	0.9069
3	NSR1	15	0.0007	0.8	414	13.1476	0,1395	0.7113
	MSR9	14	0.0007	0.8	407	11.2732	0.1380	0.7127
5	MS23	13	0.0013		394	9.5156	0.2733	0.6046
	D 5	12	0.0028	0.1	368	8.0255	0.5873	0.4487
	MSR13	11	0.0036		330	6.6818	0.7650	0.3877
8 :	MSR12	10	0.0044		1287	5.4824	0.9394	0.3389
			The	545 53	stee	16:47 Th	nursday, July	
								15
				-	•			
	Backward E	liminati	on Proced	ure foi	. Depend	ient Vária	DIE NSES	

Step 0

All Variables Entered

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E-square = 0.66913257 C(p) = 19.00000000

		fun of foundate	Maan Enverse		Benchal
•	DF	Sum of Squares	Hean Square	7	Prob>1
Regression	18	3635.21874816	201.95659712	3.26	0.0023
Irror	29	1797.51444351	61.98325667		
Total	47	5432.73319167			
Variable	Parameter Satimate	Standard Error	Type II Sum of Squares	7	Prob>l
INTERCEP	1.93778139	95.62199058	0.02545472	0.00	0.9840
Bl	3.69022942	28.74177839	1.02177166	0.02	0.8981
B 2	6.42708359	21.89832571	5.33925257	0.09	0.7712
B3	6.51013097	19.71471687	6.75884916	0.11	0.7430
34	-6.56769623	8.00920913	41.67937888	0.67	0.4189
35	4.54226257	19.69658403	3.29637821	0.05	0.8192
D6	3.17318158	13.75587063	3.29828421	0.05	0.8192
37	-15.35513897	9.49167084	162.21707087	2.62	0.116
MONTH	0.05239306	0.94711165	0.18967915	0.00	0.9563
MSR1	0.16866111	0.15582335	72.61715324	1.17	0.2880
MSR2	0.04225398	0.37386805	0.79172252	0.01	0.910
MSR3	-0.16324615	0.11101330		2.16	0.1522
MSR4	-0.51839203		134.03253748 52.53225700		
_		0.56309605		0.85	0.364
MSR5	1.19633481	0.75460720	155.78942797	2.51	0.123
MSR6	0.48535690	1.12912122	11.59017619	0.19	0.668
MSR7	0.00482900	0.08125236	0.21893576	0.00	0.953
MSR9	-0.21693684	0.87894195	3.77590111	0.06	0.806
MSR12	-0.25344628	0.59978746	11.96754901	0.18	0.675
MSR13	0.88533244	0.82416916	71.52443367	1.15	0.291
ounds on con	dition number:	202.6513.	13339.43		
		••••			
tep 1 Vari	able MONTH Ree	oved R-square	0.66909766	C(p) = 17.0	0306017
	DF	Sum of Squares	Mean Square	7	Prob»
Regression	17	3635.02906900	213.82523935	3.57	0.001
Brror	30	1797.70412266	59.92347076		A. 041
Total		T			
	47	5432.73319167			
			.		
Variable	47 Parameter Batimate	Standard	Type II Sum of Squares	7	Prob
Variable	Parameter Estimate	Standard Brror	Sum of Squares		•
Variable INTERCEP	Parameter Betimate 0.95304827	Standard Brror 92.37620510	Sum of Squares 0.00637830	0.00	0.991
Variable INTERCEP Bl	Parameter Batimate 0.95304827 3.25524741	Standard Error 37.37620510 21.18202924	Sum of Squares 0.00637830 0.85941160	0.00	0.991 0.905
Variable Intercep B1 B2	Parameter Batimate 0.95304827 3.25524741 6.01924778	Standard Error 37.37520510 27.18202924 20.27446598	Sum of Squares 0.00637830 0.85941160 5.28180681	0.00 0.01 0.09	0.991 0.905 0.768
Variable INTERCEP B1 B2 B3	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578	Standard Error 27.37620610 27.18202924 20.27446898 18.70105145	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407	0.00 0.01 0.09 0.13	0.991 0.905 0.768 0.718
Variable INTERCEP B1 B2 B3 B4	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615	Standard Brror 27.37620510 27.18202924 20.27446898 18.70105145 7.73559025	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452	0.00 0.01 0.09 0.13 0.74	0.991 0.905 0.768 0.718 0.396
Variable INTERCEP B1 B2 B3 B4	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186	Standard Error 27.37620610 27.18202924 20.27446898 18.70105145	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530	0.00 0.01 0.09 0.13	0.991 0.905 0.768 0.718 0.396
Variable INTERCEP B1 B2 B3 B4 B5	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377	Standard Brror 32.37620510 27.18202924 20.2744698 18.70105145 7.73559025 17.24624047 13.17903435	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564	0.00 0.01 0.09 0.13 0.74	0.991 0.905 0.768 0.718 0.396 0.772 0.801
Variable INTERCEP B1 B2 B3 B4 B5 B5 B5 B5 B5 B5 B5 B5 B5	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996	Standard Brror 32.37520510 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71	0.901 0.905 0.768 0.718 0.396 0.772 0.801 0.110
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482	Standard Error 22.37620810 21.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996	Standard Error 27.37620610 27.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.23393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280 0.904
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482	Standard Error 27.37620610 27.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01	0.991 0.905 0.768 0.718 0.396 0.772 0.110 0.280 0.904 12, 19
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397	Standard Brror 27.37520510 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stro	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stem 16:47 Thu	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 ursday, July	0.991 0.905 0.768 0.396 0.772 0.801 0.110 0.280 0.904 12, 19
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSR1 MSR2 MSR3	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397	Standard Brror 27. 37520510 27. 18202924 20. 27446598 18. 70105145 7. 73559025 17. 24624047 13. 17903435 9. 31031213 0. 15263708 0. 36582847 The SAS Strip 0. 10869913	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01 1rsday, July 2.27	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280 0.904 12, 191
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSR1 MSR2 MSR3	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397	Standard Brror 27.37520510 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stro	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stem 16:47 Thu	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01 1rsday, July 2.27	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280 0.904 12, 191
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1 MSB1 MSB2 MSR3 MSR4	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397	Standard Brror 27. 37520510 27. 18202924 20. 27446598 18. 70105145 7. 73559025 17. 24624047 13. 17903435 9. 31031213 0. 15263708 0. 36582847 The SAS Strip 0. 10869913	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 1rsday, July 2.27 0.87	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280 0.904 12, 19 12, 19
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1 MSB2 MSB2 MSB2 MSB3 MSB3 MSB4 MSB5	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482 0.04428397 -0.16380569 -0.51608578	Standard Error 22.37620810 21.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stri 0.10869913 0.55214124	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448	0.00 0.01 0.09 0.13 0.74 0.05 2.71 1.21 0.01 4rsday, July 2.27 0.87 2.63 0.20	0.991 0.905 0.768 0.718 0.396 0.772 0.801 0.110 0.280 0.904 12, 191 12, 191 0.142 0.357 0.115 0.455
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSR1 MSR2 MSR3 MSR4 MSR4 MSR5 MSR6	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482 0.04428397 -0.16380569 -0.51608578 1.19979341	Standard Error 22.37620610 21.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stri 0.10869913 0.55214124 0.73941194	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448 157.77456334	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01 1.21 0.01 1.30 1.37 2.27 0.87 2.63 0.20 0.01	0.991 0.905 0.768 0.772 0.801 0.110 0.904 12, 191 12, 191 0.142 0.357 0.655 0.655
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSR1 MSR2 MSR3 MSR4 MSR5 MSR6 MSR7	Parameter Batimate 0.95304627 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397 -0.16380569 -0.51608578 1.19979341 0.46534652	Standard Error 22.37620610 27.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36552847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448 157.77456334 12.16458148	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01 1.21 0.01 1.30 1.37 2.27 0.87 2.63 0.20 0.01	0.991 0.905 0.768 0.772 0.801 0.110 0.904 12, 191 12, 191 0.142 0.357 0.655 0.655
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSE1 MSE2 MSE2 MSE3 MSE4 MSE5 MSE6 MSE6 MSE9	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397 -0.16380569 -0.51608578 1.19979341 0.46534652 0.00619180	Standard Error 22.37620610 27.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36552847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448 157.77456334 12.16458146 0.39638552 4.26644537	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 1.21 0.01 1.5dmy, July 2.27 0.87 2.63 0.20 0.01 0.07	0.991 0.905 0.768 0.772 0.801 0.110 0.280 0.904 12, 191 0.1422 0.357 0.1422 0.357 0.555 0.555 0.791
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1 MSB2 MSB2 MSB3 MSB4 MSB5 MSB6 MSB7 MSE9 MSB12	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397 -0.16380569 -0.51608578 1.19979341 0.46534652 0.00619180 -0.22629079	Standard Brror 22.37620510 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36552847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029 0.84807109	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87608193 stem 16:47 Thu 136.08267367 52.35285448 167.77456334 12.16458146 0.39638352	0.00 0.01 0.09 0.13 0.74 0.09 0.05 2.71 1.21 0.01 1rsday, July 2.27 0.87 2.63 0.20 0.01 0.07 0.18	0.991 0.905 0.768 0.772 0.801 0.110 0.280 0.904 12,191 0.142 0.357 0.142 0.357 0.555 0.555 0.791 0.673
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSB1 MSB1 MSB2 MSB2 MSB3 MSB4 MSB5 MSB6 MSB7 MSB6 MSB7 MSB9 MSB12 MSB13	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482 0.04428397 -0.51608578 1.19979341 0.46534652 0.00619180 -0.22629079 -0.24864209 0.89747160	Standard Brror 27.37620510 27.18202924 20.27446898 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029 0.84807109 0.58352265	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448 157.77456334 12.16458148 0.39638352 4.26644537 10.88004787 79.10738319	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 1rsday, July 2.27 0.87 2.63 0.20 0.01 0.07 0.18	0.991 0.905 0.768 0.772 0.801 0.110 0.280 0.904 12,191 0.142 0.357 0.142 0.357 0.555 0.555 0.791 0.673
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSE1 MSE2 MSE2 MSE3 MSE4 MSE5 MSE6 MSE7 MSE9 MSE13 Ounds on con	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884998 0.16791482 0.04428397 -0.51608578 1.19979341 0.46534652 0.00619180 -0.22629079 -0.24864209 0.89747160	Standard Error 22.37620610 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029 0.84807109 0.58352265 0.78110728 275.3874,	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87808193 stom 16:47 Thu 136.08267367 52.35285448 157.77456334 12.16458148 0.39638352 4.26644537 10.88004787 79.10738319	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 1rsday, July 2.27 0.87 2.63 0.20 0.01 0.07 0.18	0.1423 0.357 0.1153 0.6555 0.9357 0.7914 0.6733
Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MSR1 MSR2 MSR3 MSR4 MSR5 MSR4 MSR5 MSR5 MSR5 MSR5 MSR5 MSR5 MSR5 MSR12 MSR12 MSR13 ounds on conv	Parameter Batimate 0.95304827 3.25524741 6.01924778 6.79714578 -6.65069615 5.03797186 3.34428377 -15.31884996 0.16791482 0.04428397 -0.51608578 1.19979341 0.46534652 0.00619180 -0.22629079 -0.24864209 0.89747160 dition number:	Standard Error 22.37620610 27.18202924 20.27446598 18.70105145 7.73559025 17.24624047 13.17903435 9.31031213 0.15263708 0.36582847 The SAS Stri 0.10869913 0.55214124 0.73941194 1.03282410 0.07613029 0.84807109 0.58352265 0.78110728 275.3874,	Sum of Squares 0.00637830 0.85941160 5.28180681 7.91622407 44.29393452 5.11351530 3.85865564 162.22612792 72.51951961 0.87608193 16:47 Thu 136.08267367 52.35285448 157.77456334 12.16458146 0.39638352 4.26644537 10.88004787 79.10738319 11295.23	0.00 0.01 0.09 0.13 0.74 0.09 0.06 2.71 1.21 0.01 1.21 0.01 1.21 0.01 1.37 2.27 0.87 2.63 0.20 0.01 0.07 0.18 1.32	0.991 0.905 0.768 0.772 0.801 0.110 0.280 0.904 12,199 12,199 0.1423 0.357 0.655 0.935 0.935 0.791 0.673 0.259

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Regression Error	16 31	3634.63268548 1798.10050619	227.16454284 58.00324214	3.92	0.0006
Total	47	5432.73319167			
	Parameter	Standard	Type II		
/ariable	Betimate	krror	Sum of Squares	T	Prob>7
INTERCEP	1.64953728	90.49270327	0.01927300		0.9856
B1	2.18886033	23.42607673	0.50639481	0.01	0.9262
82	5.30901809	18.00190729	5.04479634	0.09	0.7700
B3	7.44665489	16.63703136	11.62045285	0.20	0.6576
D4	-6.60363922	7.58932106	43.91502092	0.76	0.3909
5	5.44769015	16.22766779	6.53679475	0.11	0.7394
B6	3.64946975	12.42948695	5.00040753	0.09	0.7710 0.0862
87 18R1	-15.03296104 0.16837660	8.48199350 0.15006764	182.19877917 73.01997477	3.14 1.26	0.2705
HSR2	0.03669079	0.34800142	0.64476923	0.01	0.9167
15R3	-0.16328066	0.10675457	135.69029847	2.34	0.1363
15R4	-0.52615620	0.52938725	57.29737150	0.99	0.3280
15R5	1.20002082	0.72746317	157.83663534	2.72	0.1091
HER6	0.44035438	0.97012541	11.95091491	0.21	0.6531
15R9	-0.22490935	0.83420501	4.21620476	0.07	0.7892
HSR12	-0.25570838	0.56769783	11.76813726	0.20	0.6555
15R13	0.91619994	0.73433742	90.29037740	1.56	0.2215
	dition number:	159.8623,	9096.37	**********	
tep 3 Vari	able B1 Remove	d Resource	• = 0.66893149	C(p) = 13.0	762504
	DF	Sum of Squares	Mean Square	· · · · · · · · · · · · · · · · · · ·	
		ene of sdrfiet	uetu sõntte		Prob>F
Regression	15	3634.12629067	242.27503604	4.31	0.0003
TOT	32	1798.60590100	56.20646566		
otal .	47	5432.73319167			
	Parameter	Standard	Type II		
/ariable	Estimate	Stror	Sum of Squares	1	Prob>P
NTERCEP	6.61121580	72.13041360	0.47218490	0.01	0.9275
12	3.78409283	7.47838786	14.39109596	0.25	0.6163
		The \$A\$ \$y	sten 16:47 Th	ursday, July	12, 1990
3					
)4		5.40010547	147.84320414	2.41	0.1160
	8.91088910	5.49989552 7.40948861	147.54329413	2.63	0.1150
	-6.69433773	7.40948861	45.88017282	0.82	0.3730
15	-6.69433773 6.52935192	7.40948861 11.19456945	45.88017282 19.12104576	0.82 0.34	0.3730 0.5638
15 16	-6.69433773 6.52935192 4.74367607	7.40948861 11.19456945 4.10066436	45.88017282 19.12104576 75.21559191	0.82 0.34 1.34	0.3730 0.5638 0.2559
15 16 17	-6.69433773 6.52935192 4.74367607 -14.79616899	7.40948861 11.19456945 4.10066436 7.96819519	45.88017262 19.12104576 75.21559191 193.80497201	0.82 0.34 1.34 3.45	0.3730 0.5638 0.2559 0.0726
5 6 7 15 R 1	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546	0.82 0.34 1.34 3.45 1.34	0.3730 0.5638 0.2559 0.0726 0.2555
95 96 97 18R1 18R2	-6.69433773 6.52935192 4.74367607 -14.79616899	7.40948861 11.19456945 4.10066436 7.96819519	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440	0.82 0.34 1.34 3.45 1.34 0.01	0.3730 0.5638 0.2559 0.0728 0.2555 0.9346
95 96 97 1581 1582 1582 1583	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546	0.82 0.34 1.34 3.45 1.34 0.01 2.41	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306
5 6 7 15 R 1 15 R 2 15 R 3 15 R 4	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13	0.3730 0.5638 0.2559 0.0728 0.2555 0.9346
95 96 97 1881 1882 1883 1884 1884	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.18235238 -0.53818088	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203 0.50549048	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81	0.3730 0.5638 0.2559 0.0728 0.2555 0.9346 0.1306 0.2950 0.1036
15 16 17 18 R 1 18 R 2 18 R 3 18 R 4 18 R 5 18 R 6	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323	7.40948861 11.19456945 4.10066436 7.98819519 0.14677948 0.3272207 0.10463203 0.50549048 0.71167871	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2950 0.1038 0.3875
15 16 17 18 R 1 18 R 2 18 R 3 18 R 4 18 R 5 18 R 5 18 R 5 18 R 5 18 R 9	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.35844899	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.3272207 0.10463203 0.50549048 0.71167871 0.40913459	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2950 0.1036 0.3875
85 86 87 1981 1982 1983 1986 1985 1986 1989 19812	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.35844899 -0.24414498	7.40948861 11.19456945 4.10066438 7.96819519 0.14677948 0.3272207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2550 0.1036 0.3875 0.7610
85 86 87 15 R 1 15 R 2 15 R 3 15 R 4 15 R 5 15 R 6 15 R 9 15 R 1 15 R 1	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.35844899 -0.24414498 -0.26216749	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.85634623	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09 0.22	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.1306 0.2950 0.1036 0.3875 0.7610 0.6397
85 86 87 1581 1582 1583 1584 1585 1585 1589 15812 15812 15813 50unds on con	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.35844899 -0.24414498 -0.26216749 0.90757545 dition number:	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.3272207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090 29.34193,	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.55634623 90.02078026 2390.705	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09 0.22 1.60	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2950 0.1038 0.3875 0.7610 0.6397 0.2148
85 86 87 1981 1982 1983 1984 1985 1986 1989 19812 19813 ounds on con	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.3584899 -0.24414498 -0.26216749 0.90757545 dition number:	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090 29.34193, ved B-square	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.55634623 90.02078026 2390.705	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09 0.22 1.60	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2950 0.1038 0.3875 0.7610 0.6397 0.2148
85 86 87 1581 1582 1583 1584 1585 1585 1589 15812 15812 15813 50unds on con	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.35844899 -0.24414498 -0.26216749 0.90757545 dition number:	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.3272207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090 29.34193,	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.55634623 90.02078026 2390.705	$\begin{array}{c} 0.82\\ 0.34\\ 1.34\\ 3.45\\ 1.34\\ 0.01\\ 2.41\\ 1.13\\ 2.81\\ 0.77\\ 0.09\\ 0.22\\ 1.60\\ \end{array}$	0.3730 0.5638 0.2559 0.0726 0.2555 0.9346 0.1306 0.2950 0.1038 0.3875 0.7610 0.6397 0.2148
25 26 27 28 28 28 28 28 28 28 28 28 28	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.3584899 -0.24414498 -0.26216749 0.90757545 dition number:	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090 29.34193, ved B-square	45.88017282 19.12104576 75.21559191 193.80497201 75.36189544 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.55634623 90.02078026 2390.705 • 0.66886070	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09 0.22 1.60 C(p) = 11.07	0.3730 0.5638 0.2559 0.0728 0.2555 0.2555 0.2555 0.2555 0.2555 0.2550 0.1038 0.2950 0.1038 0.3875 0.7610 0.2148
85 86 87 1581 1582 1583 1584 1585 1585 1589 15812 15812 15813 50unds on con	-6.69433773 6.52935192 4.74367607 -14.79616899 0.16996054 0.02706732 -0.16235238 -0.53818088 1.19247323 0.3584899 -0.24414498 -0.26216749 0.90757545 dition number: able MSR2 Remo	7.40948861 11.19456945 4.10066436 7.96819519 0.14677948 0.32722207 0.10463203 0.50549048 0.71167871 0.40913459 0.79578417 0.55467723 0.71714090 29.34193, ved R-squares	45.88017282 19.12104576 75.21559191 193.80497201 75.36189546 0.38458440 135.32382538 63.71135605 157.80312578 43.14282673 5.29043384 12.55634623 90.02078026 2390.705 • 0.86886070 Hean Square	0.82 0.34 1.34 3.45 1.34 0.01 2.41 1.13 2.81 0.77 0.09 0.22 1.60 C(p) = 11.07	0.3730 0.5638 0.2559 0.0728 0.2555 0.9346 0.2950 0.1036 0.2950 0.1036 0.3875 0.7610 0.6397 0.2148 2382969 Prob>F

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Variable	Parapeter Estimate	Standard Stror	Type II Sum of Squares	7	Prob>F
	22.198.14	BIFOF	SAN OF SAMELAS	•	FLOOVE
INTERCEP	7.52751216	70.19402788	0.62692815	0.01	0.9152
12	3.93336868	7.14734126	16.51031813	0.30	0.5858
33	8.99617705	5.32046948	155.85876915	2.86	0.1003
14	-6.59: 5695	7.19761565	45.74716803	0.84	0.3663
85 86	6.28244338	10.62568637	19.05716737	0.35 1.39	0.5584
b 7	4.67734213 -14.93568056	3.9605110 8 7.66957265	76.03454983 206.73921823	3.79	0.2460
MSR1	0.17071426	0.14427508	76.32593669	1.40	0.2452
MSRJ	-0.16558869	0.09557054	163.65468685	3.00	0.0925
MSR4	-0.55148330	0.47196109	74.43333813	1.37	0.2510
HSR5	1.21204804	0.66100578	183.29234575	3.36	0.0757
MSR6	0.37128839	0.37280801	54.07137978	0.99	0.3265
HSR9	-0.23784741	0.78012303	5.06740735	9.09	0.7624
MSR12	-0.26158378	0.54622256	12.50251909	0.23	0.6352
MSR13	0.91532641	0.70021221	93.15534699	1.71	0.2002
bunds on com	dition number:	25.11874,	2013.873		
Step 5 Vari	able MSR9 Remo	ved B-squar	e = 0.66792794	C(p) = 9.1	0558415
	DF	Sum of Squares	Hean Square	t	Prob>P
Regression	13	3628.67429892	279.12879222	5.26	0.0001
Irror	34	1804.05889275	53.06055567		
Total	47	5432.73319167			
		64 - 0 do - 4			
	Parameter	Standard The SAS Sy	Type II stee 16:47 Th	ursday, July	12. 199
					10
Variable	Estimate	Error	Sum of Squares	7	Prob>T
		** *******		0.01	0 0401
INTERCEP B2	5.21593729 4.25202660	68.84623724 6.97555839	0.30456227 19.71540359	0.01	0.9401
B3	8.47965536	4.97580381	154.09966691	2.90	0.0975
B3 B4	-6.26394820	7.02044981	42.24139291	0.80	0.3785
B5	6.19532325	10.47920196	18.54570367	0.35	0.5583
B6	4.75973487	3.89821839	79.10519157	1.49	0.2305
B7	-15.46581761	7.36955107	233.68750720	4.40	0.0434
MSR1	0.18571104	0.13380971	102.20496012	1.93	0.1742
MSR3	-0.16744931	0.09409469	168.03829635	3.17	0.0841
HSR4	-0.55393858	0.46539985	75.71343185	1.43	0.2405
MSR5	1.24206453	0.64485512	196.85017609	3.71	0.0625
MSR6	0.40753539	0.34859830	72.51902235	1.37	0.2505
MSR12	-0.29055394	0.53067087	15.90650738	0.30	0.5876
MSR13	0.94335148	0.65483075	100.68211969	1.90	0.1774
ounds on con	dition number:	24.8351,	1775.372		
itep 6 Vari	able MSR12 Res	oved B-squar	• = 0.66500004	C(p) = 7.3	5221002
	DF	Sum of Squares	Mean Square	7	Prob>7
Regression	12	3612.76779154	301.06398263	5.79	0.0001
Brror	35	1819.96540012	51.99901143		
Total	47	5432.73319167			
	Parameter	Standard	B		
Variable	Estimate	Standard Error	Type II Sum of Squares	1	Prob>F
	. 10 4804000	A1 044444.5			
INTERCEP B2	~10.46943966 3.86593421	61.97332615 6.87005342	1.48399471	0.03	0.8668
83	3.80393421 8.58693280	4.92195836	16.46583571 158.26881303	0.32 3.04	0.5772
B4	-6.03998070	6.93806112	39.40850375	3.04	0.0898
B5	5.99590490	10.36757969	17.39201071	0.76	0.3899
86	4.94653130	3.84421939	86.09546571	1.66	
PV .	4.8403313V	9'0444TA3A	00.V¥340371	1.44	0.2066

87	-14.99063837	7.24469478	222.63587951	4.28	0.0460
-					
MSR1	0.18079758	0.13216620	97.30597070	1.87	0.1800
MSB3	-0.14921906	0.08712199	152.54155851	2.93	0.0956
MSR4	-0.49396169	0.44688578	63.53141898	1.22	0.2766
MSR5	1.15561459	0.61894045	181.26893686	3.49	0.0703
MSR6	0.35694617	0.33275102	59.83589105	1.15	0.2907
MSR13	0.83377879	0.64835306	85.99508766	1.65	0.2069
Bounds on	condition number:	24.8051,	1554.405		
********				********	
Step 7	Variable 32 Removed		0.66196918	C(p) = 5.62	2785975
	DP	Sum of Squares	Hean Square	1	Prob>P
	••		Here address	-	
Bernend	11				0 0001
Regressio		3596.30195583	326.93654144	6.41	0.0001
Brror	36	1836.43123583	51.01197877		
Total	47	5432.73319167			
•					
	Parameter	Standard	Type II		
	• • • • • • • • • • • •		ten 16:47 Th	vint veber	12 1990
					19
					14
	-	_		-	• • •
Variable	Estimate	Irror	Sum of Squares	1	Prob>P
INTERCEP	-16.46018178	60.46986161	3.77975348	0.07	0.7870
B3	9.83554955	4.35153225	260.60636457	5.11	0.0300
B4	-6.64583492	6.78865266	48.88820505	0.96	0.3341
B5	9.94336171	7.56117211	88.21864831	1.73	0.1968
B6	5.25978065	3.76742794	99.43002039	1.95	0.1712
B7	-15.33704652	7.14965536	234.73909406	4.60	0.0388
MSR1	0.14293720	0.11267459	82.09387153	1.61	0.2127
MSR3	-0.14265920	0.08531520	141.96624989	2.78	0.1039
MSR4	-0.29832955	0.27811464	58.69715007	1.15	0.2906
MSR5	1.06113653	0.59005262	164.98072683	3.23	0.0805
MSR6	0.20716596	0.19778656	55.96486009	1.10	0.3019
HSR13 -	0.93685361	0.61600934	117.98886897	2.31	0.1370
Several en		13 44807	024 0876		
pounds on	condition number:	13.44596,	924.0826		
		. .			
Step 8 1	Variable B4 Res oved	1 R-square	e = 0.65297036	C(p) = 4.4	L659219
	DT	Sum of Squares	Nean Square	7	Prob>T
Regressie	on 10	3547.41375078	354.74137508	6.96	6.0001
Repor	37	1885.31944089	50.95457948		
Total	47	5432.73319167			
10181	• /	9496'1991A101			
	_	/	-		
	Parameter	Standard	Туре 11		
Variable	Setimate	STFOT	Sum of Squares	1	Prob>P
			-	-	
INTERCEP	-10.09806775	60.08579183	1.43918361	0.03	0.8675
B 3	11.50967349	3.99917152	422.05511288	8.28	0.0066
B5	6.16224805	6.49660563	45.84463993	0.90	0.3490
36	5.23993104	3.76525323	98.68382748	1.94	0.1723
87	-20.76362609	4.51304876	1078.57306282	21.17	0.0001
MSR1	0.1703J072	0.10909110	124.17596787	2.44	0.1270
MSR3	-0.12700877	0.08396030	116.60109920	2.29	0.1388
MSR4	-0.32438822	0.27668207	70.04083965	1.37	
-		0.41526184			
MSR5	1.47128018		639.63164163		
MSR6	0.30469033	0.17077030	162.20934704		
MSR13	0.75441080	0.58681195	84.21726150	1.65	0.2066
Sounds on	condition number:	9.939649,	527.1538		
84 A	Vaniabla BE B	• • · · · · · - ·		C(-)	
stab A	Variable 35 Removed	a sednere	• • 0.64453176	C(D) = 3.1	044101
			M	~	
	DT	Sum of Squares	Hean Square	7	Prob>7

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158

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Regression	9	3501.56911085	389.06323454	7.66	0.0001
Brror	38	1931.16408082	50.82010739		
Total	47	5432.73319167			
	Parabeter	Standard	Type II		
Variable	Setimate	Error	Sum of Squares	7	Prob>?
INTERCEP B3	37.15145629 13.58859227	33.55539349 3.34069017	62.29634848 840.83758536		0.2752
83	13.20034441		sten 16:47 Th		
					20
36	7.15754473	3.17228441	258.71373609 1209.26808542	5.09 23.80	0.0299
B7 MSR1	-18.42933007 0.16078557	3.77803556 0.10848547	111.63145565	2.20	0.1466
MSR3	-0.15370168	0.07899930	192.37397011	3.79	0.0591
MSR4	-0.46884846	0.23068878	209.91701504	4.13	0.0491
MSR5	1.53796764	0.40872661	719.55523933	14.16	0.0006
MSR6	0.31216238	0.17036327	170.62582853	3.36	0.0747
MSR13	0.29255890	0.32708156	40.65838230	0.80	0.3767
	dition number:	5.672815,	299.0091		
			e = 0.63704780	C(p) = 1.8	1217911
	DF	Sum of Squares	Mean Square	7	Prob>P
	•				
Regression	8	3460.91072855	432.61384107	8.56	0.0001
Error Total	39 47	1971.82246312 5432.73319167	50.55955034		
10481	•/	3434.13318101			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	T	Prop>F
INTERCEP	66.30976087	7.93357938	3531.99258622	69.86	0.0001
	13.66001221	3.33116330	850.18518419	16.52	0.0002
B 6	8.15328334	2.96291202	382.85185985	7.57	0.0089
87	-18.63104334	3.76161865	1240.30365864	24.53	0.0001
ISR1	0.17678793	0.10872545	138.73065396	2.74	0.1057
HSR3	-0.15761172	0.07867579	202.90743066	4.01	0.0521
MSR4	-0.36588255	0.19940080	170.22870314	3.37	0.0742
MSR5	1.38701417	0.37130161	705.52326415	13.95	0.0006
MSR6	0.29394361	0.16870710	153.48450756	3.04	0.0893
	dition number:	5.546335,	233.862		
tepll Vari	able MSR1 Read	ved R-squar	e = 0.61151173	C(p) = 2.0	5037474
	D f	Sum of Squares	Mean Square	r	top>1
Regression	7	3322.18007459	474.59715351	8.99	0.0001
fror	40	2110.55311707	52.76382793		~~~~~
fotal	47	5432.73319167			
	Parameter	Standard	Туре 11		
Variable	Batimate	Brror	Sum of Squares	7	Prob>7
INTERCEP	75.93696345	5.51682776	9996.86664956	189.46	0.0001
83	16.07328375	3.06029801	1455.51966724	27.59	0.0001
6	7.09502355	2.95561241	304.05280489	5.76	0.0211
B7	-18.24005406	3.83517005	1193.49138071	22.62	0.0001
MSR3	-0.12835237	0.07832074	141.70675187	2.69	0.1091
MSR4 MSR5	-0.36721070	0.20369949	171.46957869	3.25	0.0790
13K) M526	1.48725466 0.07440169	0.37423766 0.10663692	833.32036411 25.68542487	15.79 0.49	0.0003
			4 4476401	~~~	
	A 4 - 4 - A				
ounds on con	dition number:	4.580649, The SAE Sy	139.9405	ursday, July	

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DF Sum of Squares Hean Square P Prob/F Regression String 41 3288.48464973 548.41577685 10.54 0.0001 Mariable Front 41 2138.23851184 52.10337807 10.54 0.0001 Variable Farameter Standard Type II F F F 0.0001 107BBC2P 78.1300066 4.6974355 15727.37128028 30.85 0.0001 51 17770057 2014256 1277.00127 201.85 0.0001 52 -16.0320012 2.0531490 127.00127 201.85 0.0001 53 -0.0302451 0.0537149 127.001269 2.05 0.0001 545.0 1.30033050 0.2072412 1040.7289771 20.03 0.0001 55.1 .33033050 0.2072412 1040.7289771 20.03 0.0001 56.011 Mariable HSE Requare + 0.58324399 C(p) + 0.52799655 57.07 42 2264.12418671 53.90771873 11.76 <t< th=""><th>Step12</th><th>Variable MSR6 Reg</th><th>ioved R-squar</th><th>e = 0.60678383</th><th>C(p) = 0.4</th><th>6476769</th></t<>	Step12	Variable MSR6 Reg	ioved R-squar	e = 0.60678383	C(p) = 0.4	6476769
Broom 41 2138.3384184 52.10337807 Total 47 \$432.73310167 Type II Variable Bstimate Standard Type II INTERCEP 78.13800665 4.49745855 15727.37124022 301.85 0.0001 BS 16.177050467 3.03745204 1478.00280127 22.37 0.0031 BS 16.177050467 3.03383100 1423.2581850 27.35 0.0001 BS -0.0920421 0.03383100 1423.2581850 2.0104 0.014 HRR -0.32187607 0.28723412 1043.72887771 2.01 0.1010 HRR -0.32187607 0.28723412 1043.72887771 2.01 0.1010 HRR -0.32187607 0.2872412 1043.7288771 2.01 0.1010 Bunds on condition number: 3.05043 82.01235 1.76 0.0001 Ercor Standard Type II Yariable Batimate Ercor Sum of Squares F Prob>F Nariable Standard T		DF	Sum of Squares	Hean Square	7	Prob>P
Broom 41 2138.3384184 52.10337807 Total 47 \$432.73310167 Type II Variable Bstimate Standard Type II INTERCEP 78.13800665 4.49745855 15727.37124022 301.85 0.0001 BS 16.177050467 3.03745204 1478.00280127 22.37 0.0031 BS 16.177050467 3.03383100 1423.2581850 27.35 0.0001 BS -0.0920421 0.03383100 1423.2581850 2.0104 0.014 HRR -0.32187607 0.28723412 1043.72887771 2.01 0.1010 HRR -0.32187607 0.28723412 1043.72887771 2.01 0.1010 HRR -0.32187607 0.2872412 1043.7288771 2.01 0.1010 Bunds on condition number: 3.05043 82.01235 1.76 0.0001 Ercor Standard Type II Yariable Batimate Ercor Sum of Squares F Prob>F Nariable Standard T	Regressi	on £	3298.49484973	649 A1877498	10.64	0.0001
Total 47 5432.73310167 Type II Variable Parameter Standard Type II Variable Estimate Error Sum of Squares F 14TBRCEP 76.13500066 4.49745855 1577.73120628 301.85 0.0001 15 7.0250422 2.6892671 24.37 0.001 15 7.03256425 2.6892671 2.65 0.001 188 -0.05287607 0.0539771 26.0289777 2.65 0.1246 1883 -0.032187607 0.2872412 1043.76867771 20.03 0.0001 HER3 -0.32187607 0.2872412 1043.76867771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235 21071873 11.76 0.0001 Step13 Variable HS3 1386.60000496 633.72180099 11.76 0.0001 Broor 42 2264.12418671 53.002177 25.90 0.0001 Broor 42 2264.12418671 53.002177 25.91						
Parameter Estimate Standard Error Type II Sum of Equares F ProbyF INTERCEP 10.13800066 4.40753855 15727.57128023 301.85 0.0001 81 1.17000407 2.0372836120 427.751280212 2.01.85 0.0001 81 1.17000407 2.0372836120 427.751280212 2.01.85 0.0001 81 1.17000407 2.03836100 425.28818400 2.7.5 0.0003 81 -0.08004201 0.03837101 123.6826407 2.01 0.1010 8188 -0.32187807 0.18723112 1043.7288771 2.03 0.0001 Bounds on condition number: 3.05043 82.01235 0.0001 0.0001 Broot Sum of Squares Hean Square 7 ProbyF Regression 5 3165.60000466 633.72180009 11.76 0.0001 Broot Sum of Squares F ProbyF ProbyF 0.0001 Variable 76.27400412 4.41188077 16113.0631700 298.91 0.0001 Broot				95.7433.841		
Variable Estimate Error Sum of Squaren P Prob>P INTERCEP 74.13500665 4.40745855 1577.57128628 301.85 0.0001 B3 16.17706547 5.03765243 452.33667200 8.86 0.0003 B7 -9.60320012 3.03834100 1425.25818560 21.35 0.0001 B88 -0.032187607 0.18937181 127.85564477 2.43 0.1248 MSRS -0.32187607 0.1975027 146.63268917 2.43 0.1248 MSRS -0.32187607 0.1975027 146.63268917 2.43 0.1248 MSRS -0.32187607 0.1975027 146.63268917 2.43 0.1248 MSRS 1.333056 0.12725412 1043.7288771 2.03 0.0001 Bounde on condition number: 3.05043 82.01235 0.52798656 DF Sum of Squares Hean Square F Prob>P Regression 5 3168.60000496 633.72180089 11.76 0.0001 <t< td=""><td></td><td></td><td>2425.12214101</td><td></td><td></td><td></td></t<>			2425.12214101			
B3 16.17760547 3.03745284 1478.00288127 22.37 0.0001 B4 7.0334628 2.6832473 452.3386720 452.3386720 452.3386720 4.68 0.0001 HSR3 -0.03024611 0.08037716 127.88186497 2.48 0.0001 HSR4 -0.03124610 0.08037716 127.88186497 2.48 0.0001 HSR4 -0.03124610 0.08037716 127.88186497 2.48 0.0001 HSR5 1.3303056 0.29723412 1043.72887771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235	Variable					frop>f
B3 16.17760547 3.03745284 1478.00288127 22.37 0.0001 B4 7.0334628 2.6832473 452.3386720 452.3386720 452.3386720 4.68 0.0001 HSR3 -0.03024611 0.08037716 127.88186497 2.48 0.0001 HSR4 -0.03124610 0.08037716 127.88186497 2.48 0.0001 HSR4 -0.03124610 0.08037716 127.88186497 2.48 0.0001 HSR5 1.3303056 0.29723412 1043.72887771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235						
B6 7.92394828 2.8832873 452.33667200 4.68 0.0053 B7 -16.03420012 3.63334100 123.25412680 2.45 0.0001 HSR3 -0.0302461 0.03037716 127.8554477 2.45 0.1240 HSR4 -0.32167607 0.18175027 146.63289917 2.81 0.0001 Bounds on condition number: 3.05043, 82.01235 0.0001 0.0001 Step13 Variable HSE3 Removed R-square + 0.56324399 C(p) = 0.52798656 DP Sum of Squares Hean Square F Prob>F Regression 5 3168.6000486 633.72180099 11.76 0.0001 Broor 42 2264.12418671 53.90771873 76 0.0001 Total 47 5432.73319167 73.60 0.0001 Variable Batimate Error Sum of Squares F Prob>F IVTSRCEP 76.27400412 4.41168677 16113.66431709 28.60 0.0001 B3 15.5605983 3.06324699 138.0302177 28.60 0.0001 B4						
B7 -19.03429012 3.63934190 1425.25818585 27.35 0.0001 HBR3 -0.09302451 0.05937716 127.8554477 2.45 0.1246 HBR4 -0.32167607 0.19175027 146.632289917 2.51 0.1010 HSR5 1.33033056 0.29723412 1043.72887771 20.03 0.0001 Bounds on condition number: 3.05043, 62.01235						
hBR3 -0.09302481 0.05837716 127.8856477 2.45 0.1246 HBR4 -0.32167607 0.19175027 146.63289817 2.81 0.1010 HBR5 1.3303056 0.29723412 1043.7288771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235 0.0001 Bounds on condition number: 3.05043, 82.01235 0.52799656 DF Sum of Squares Hean Square F Prob>F Regression 5 3168.60900496 633.72180099 11.76 0.0001 Broor 42 2264.12418671 53.00771873 50.0001 0.0001 Broor 42 2264.12418671 53.00771873 11.76 0.0001 Broor 54324399 1390.5002177 25.80 0.0001 B3 15.56095893 3.06354699 1390.5002177 25.80 0.0001 B4 -27455930 0.1824095 11.02417891 2.06 0.1587 B3 15.56095893 3.06354699 130.02477 25.80 0.0001 B7 -21.23579210						
HSR4 -0.32167607 0.19175027 148.43268917 2.81 0.1010 HSR5 1.33033056 0.29723412 1043.72887771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235 20.03 0.0001 Step13 Variable HSR3 Removed R-square + 0.55324399 C(p) + 0.52799656 P DF Sum of Squares Hean Square F Prob>F Regression 5 3168.60900496 633.72180099 11.76 0.0001 Total 47 3432.73319167 53.9071873 0.0001 Variable Estimate Error Sum of Squares F Prob>F Variable Estimate Error Sum of Squares F Prob>F INTERCEP 76.27400412 4.41168077 16113.66451709 288.01 0.0001 B3 15.5605983 3.06354699 1390.83002177 28.00 0.0001 B4 -0.2745533 0.1924869 110.0447891 2.06 0.0011 B5 9.21350039 2.60426036 57.42223743 17.76 0.0001						
HSR5 1.33033056 0.20723412 1043.72867771 20.03 0.0001 Bounds on condition number: 3.05043, 82.01235 Step13 Variable HSR3 Removed R-square = 0.58324399 C(p) = 0.52799656 DF Sum of Squares Hean Square F Prob>F Regression 5 3168.60900496 633.72180099 11.76 0.0001 Broor 42 2264.12418671 53.00771873 0.0001 0.0001 Total 47 5432.73319167 Sum of Squares F Prob>F Nariable Estimate Error Sum of Squares F Prob>F INTERCEP 76.27400412 4.41168877 16113.66431709 288.91 0.0001 B5 9.27475933 0.6324036 674.70295756 12.52 0.0100 B7 -21.23579291 3.4147458 2084.83393775 38.67 0.0001 HSR4 -0.27475933 0.18240696 11.02417801 2.06 0.567 B0unds on condition number: 2.593554, 48.7456 0.1587 16.38620651 13.84 0.0001						
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Error 42 2284.12418871 53.90771873 Total 47 5432.73319167 Type II Variable Parameter Standard Type II Variable Batimate Error Sum of Squares F INTERCEP 76.27400412 4.41168877 16113.66431709 298.91 0.0001 B3 15.56095983 3.06354899 1390.83002177 25.60 0.0001 B6 9.21330039 2.60428035 574.70285756 12.52 0.0001 B7 -21.23579291 3.41474458 2084.83393775 38.67 0.0001 B7 -21.0379293 0.19284969 111.02417891 2.06 0.1587 HSR4 -0.27675933 0.19284969 197.4223743 17.76 0.0001 Bounds on condition number: 2.595654, 48.7456 48.7456 17.76 0.0001 Error 43 2375.15482505 764.38620651 13.84 0.0001 Error 43 2375.1483561 55.23600850 1.84 </td <td>Research</td> <td>~~ K</td> <td>3188 60000408</td> <td>811 77180099</td> <td>11 76</td> <td>0.0003</td>	Research	~~ K	3188 60000408	811 77180099	11 76	0.0003
Total 47 5432.73319167 Parameter Variable Parameter Bstimate Standard Broor Type II Sum of Squares F Prob>F INTERCEP 76.27400412 4.41168877 16113.66431709 298.91 0.0001 B3 15.56095983 3.06354899 1390.83002177 25.80 0.0001 B6 9.21330039 2.6042038 674.70297156 12.52 0.0010 B7 -21.23579291 3.41474458 208.433393775 38.67 0.0001 MSR4 -0.27675933 0.19284989 111.02417891 2.06 0.1587 MSR5 1.08798540 0.22815991 957.42223743 17.76 0.0001 Bounds on condition number: 2.593654, 48.7456	-				41.70	0.0001
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B7 -21.88474043 3.42611680 2253.72414880 40.80 0.0001 MSR5 0.95166369 0.24299349 847.22744272 15.34 0.0003 Bounds on condition number: 2.550136, 31.94136 31.94136 31.94136	-					
Bounds on condition number: 2.550136, 31.94136			Z.62878303	720.23609277	13.04	
Bounds on condition number: 2.550136, 31.94136	B 7		3.42611680	2253.72414890	40.80	
	MSR5	0.95166369	0.24299349	847.22744272	15.34	0.0003
						•••••

All variables left in the model are significant at the 0.1000 level.

Summary of	Backward	Elimination	Procedure 1	or i	Dependent	Variable MSR8
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	Variable	Number	Partial	Model			
Step	Removed	In	R**2	2=+2	C(P)	1	Prob>f
1	MONTH	17	0.0000	0.6691	17.0031	0.0031	0.9563
2	HSR7	16	0.0001	0.6690	15.0095	0.0068	0.9357
3	B1	15	0.0001	0.6689	13.0176	0.0087	0.9262
4	HSE2	- 14	0.0001	0.6689	11.0238	0.0068	0.9346
5	MSR9	13	0.0009	0.6679	9.1056	0.0930	0.7624
6	MSR12	12	0.0029		7.3622	0.2998	0.5876
7	32	īī	0.0030		5.6279	0.3167	0.5772
8	34	10	0.0090		4.4166	0.9584	0.3341
9	35	9	0.0084	0.6445	3.1562	0.8997	0.3490
10	MSR13	8	0.0075	0.6370	1.8122	0.8000	0.3767
11	MSR1	7	0.0255	0.6115	2.0504	2.7439	0.1057
12	MSRG	6	0.0047	0.6068	0.4648	0.4868	0.4894
13	MSR3	5	0.0235	0.5832	0.5280	2.4545	0.1249
14	HSR4		0.0204	0.5628	0.3192	2.0595	0.1587
		-		SAS System		reday, July	12, 1990
			•				23

Backward Elimination Procedure for Dependent Variable MSE9

Step 0 A	11 Variables Ent	ered R-square	= 0.35556169	C(p) = 19.0	000000
	DF	Sum of Squares	Mean Square	7	Prob>F
Regression	18 I	44.17497303	2.45416517	0.89	0.5948
Brior	29	80.06499364	2.76086185		
Total	47	124.23996667			
	Parameter	Standard	Type II		
Variable	Estimate	Strop	Sum of Squares	2	Prob> P
INTERCEP	18.51179685	19.88623139	2.39241684	0.87	0.3596
B1 -	-8.04124419	5.88106680	5.16153589	1.87	0.1820
82	-7.38098961	4.42090594	7.69575642	2.79	0.1058
B 3	7.29735750	3.94220803	9.46012436	3.43	0.0744
34	-2.05070027	1.66688264	4.17867898	1.51	0.2285
B 5	5.82758246	4.01758180	5.80887558	2.10	0.1576
36	3.72623120	2.82225171	4.81274423	1.74	0.1971
87	2.81044913	2.02550026	5.31534584	1.93	0.1758
MONTH	-0.20636109	0,19619101	3.05451394	1.11	0.3016
MSR1	-0.05397441	0.03201184	7.84872835	2.84	0.1025
MSR2	0.01676132	0.07886079	0.12472078	0.05	0.8332
MSR3	0.01012516	0.02421427	0.48273209	0.17	0.6789
MSR4	0.00451931	0.12056250	0.00387939	0.00	0.9704
MSR5	-0.13626758	0.13407810	1.90426992	0.69	0.4130
M526	-0.48091540	0.22176187	12.98399370	4.70	0.0385
MSR7	0.00715523	0.01709780	0.48351690	0.18	0.4787
MSR8	-0.00966281	0.03914988	0.16818641	0.06	0.8068
MSR12	0.10695154	0.12541135	2.00791373	0.73	0.4008
MSR13	-0.09045073	0.17657060	0.72448938	0.26	0.6123
Bounds on c	ondition number:	175.4978,	12325.72		
Step 1 Va	riable MSR4 Remov	ved R-square	= 0.35553047	C(p) = 17.00	140514
	DF	Sum of Squares	Mean Square	7	Prob>P
Regression	17	44.17109364	2.59829963	0.97	0.5087
Brror	30	80.06887303	2.66896243		
Total	47	124.23996667			
	Parametor	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	r	Prob>P

AND I THE TOWN IN THE REAL PROPERTY OF

3.11519809 5.70562184 1.17 0.2886 2.14 0.1541

et e

18.84835177 17.44623729 -8.10405293 5.54270810

تعفة شنصينا برايطين وجزاري والاحجام أشرين بعرا

INTERCEP

B1

والمحادثات والمتحاد والمتحاد والمحادثة

B2	-7.37667981	4.34523481	7.69197434	2.88	0.0999
83	7.33570883	3.74323313	10.25021273	3.84	0.0594
34	-2.04066707	1.61763879	4.24740496	1.59	0.2168
B5	5.78941134	3.82116088	6.12661556	2.30	0.1402
36	3.74940081	2.70751607	5.11828085	1.92	0.1763
B7	2.82240175	1.96667219	5.49687895	2.06	0.1616
HONTH	-0.20581129	0.19235831	3.05533583	1.14	0.2932
MSR1	-0.05349832	0.02889133	9.15140363	3.43	0.0739
		The SAS Sys	it on 16:47 Th	iraday, July	
					24
MSR2	0.01558598	0.07114509	0.12809172	0.05	0.8281
MSR3	0.00975797	0.02177279	0.53608495	0.20	0.6572
MSR5	-0.13300588	0.13677086	2.52404450	0.95	0.3386
MSRG	-0.48047205	0.21772947	12.99703479	4.87	0.0351
HSR7	0.00700752	0.01635825	0.48977554	0.18	0.6714
MSRÖ	-0.00991084	0.03793905	0.18213374	0.07	0.7957
MSR12	0.10558175	0.11795589	2.13836027	0.80	0.3779
MSR13	-0.09126022	0.17230373	0.74871434	0.28	0.6003
	••••				
	ndition number:	174.9986,	10896.58		
***********		******************	*************		
Step 2 Var:	able MSR2 Repo	vat Bramina	. 0.35449947	C(D) + 15 A	1780070
		ved h-syunta			
	DF	Sum of Squares	Mean Square	2	Prob>P
				-	
Regression	16	44.94300191	2.75268762	1.06	0.4254
Error	31	80.19696475	2.58699886		
Total	47	124.23996667			
	Parameter	Stendard	Type II	_	
Variable	Estimate	Brfor	Sum of Squares	r.	Prob>P
	10 64301005				
INTERCEP B1	19.54301805 -8.43369673	16.89017345 5.25200026	3.46346884 6.67087372	1.34 2.58	0.2561 0.1185
B2 .	-7.62911495	4.12483223	8.84976985	3.42	0.0739
B3	7.60654217	3.47851540	12.37037689	4.78	0.0364
B4	-2.00901409	1.58624081	4.14976941	1.60	0.2148
85	5.94062551	3.70014328	6.66842861	2.58	0.1185
B6	3.86303130	2.61624646	5.64021141	2.18	0.1499
B7	2.79854574	1.93326816	5.42096823	2.10	0.1578
MONTH	-0.20293718	0.18894064	2.98448030	1.15	0.2911
MSR1	-0.05398750	0.02835916	9.37552957	3.62	0.0663
MSR3	0.00912612	0.02124695	0.47728215	0.18	0 5705
MSR5	-0.13171760	0.13452985	2.47997062	. V6	J. 335'
MSR6	-0.48978276	0.21023669	14.04061735	5.43	0.0235
MSR7	0.00629203	0.01578087	0.41126034	0.16	0.6925
MSRS	-0.00911671	0.03718107	0.15553520	0.06	0.807
MSR12	0.10701921				0.3632
				0.26	0.6161
MSE13	-0.08455425	0.16693893	0.66366955		
	ndition number:	168.3307,	9655.062		
		168.3307,			
Bounds on con	ndition number:	168.3307,	9655.062		
Bounds on con	ndition number:	168.3307,	9655.062		
Bounds on con	ndition number: iable MSR8 Remo	168.3307,	9655.062 - 0.35324757	C(p) = 13.10	
Bounds on con Step 3 Var	ndition number: iable MSRS Remo DF	168.3307, ved R-square	9655.062 - 0.35324757	C(p) = 13.1(P)413644 Prob>F
Bounds on con Step 3 Var: Regression	ndition number: iable MSR8 Remo DF 15	168.3307, ved B-squard Sum of Squares 43.88746671	9655.062 = 0.35324757 Mean Square 2.92583111	C(p) = 13.1(P	0413644
Bounds on con Step 3 Var: Regression Error	ndition number: iable MSR8 Remo DF 15 32	168.3307, ved R-square Sum of Squares 43.88746671 80.35249995	9655.062 = 0.35324757 Mean Square 2.92583111	C(p) = 13.1(P)413644 Prob>F
Bounds on con Step 3 Var: Regression	ndition number: iable MSR8 Remo DF 15	168.3307, ved B-squard Sum of Squares 43.88746671	9655.062 = 0.35324757 Mean Square 2.92583111	C(p) = 13.1(P)413644 Prob>F
Bounds on con Step 3 Var: Regression Error	dition number: Mable MSR8 Remo DF 15 32 47	168.3307, ved R-square Sum of Squares 43.88746671 80.35249995 124.23996667	9655.062 = 0.35324757 Hean Square 2.92583111 2.51101562	C(p) = 13.1(P 1.17)413644 Prob>F
Bounds on con Step 3 Var: Regression Error Total	ndition number; iable MSR8 Remo DF 15 32 47 Parameter	168.3307, ved E-square Sum of Squares 43.88746671 80.35249995 124.23996667 Standard	9655.062 = 0.35324757 Mean Square 2.92583111 2.51101562 Type II	C(p) = 13.1(P 1.17	0413644 Prob>P 0.3452
Bounds on con Step 3 Var: Regression Error	dition number: Mable MSR8 Remo DF 15 32 47	168.3307, ved E-square Sum of Squares 43.88746671 80.35249995 124.23996667 Standard	9655.062 = 0.35324757 Hean Square 2.92583111 2.51101562	C(p) = 13.1(P 1.17)413644 Prob>F
Bounds on con Step 3 Var: Regression Brror Total Variable	ndition number: iable MSR8 Remo DF 15 32 47 Parameter Estimate	168.3307, ved R-square Sum of Squares 43.88746671 80.35249995 124.23996667 Standard Brror	9655.062 = 0.35324757 Hean Square 2.92583111 2.51101562 Type II Sum of Squares	C(p) = 13.10 P 1.17 F	0413644 Prob>F 0.3452 Prob>F
Bounds on con Step 3 Var: Regression Brror Total Variable INTERCEP	ndition number: iable MSR8 Remo DF 15 32 47 Parameter Estimate 19.85636431	168.3307, ved R-squares Sum of Squares 43.88746671 80.35249995 124.23996667 Standard Brror 16.59258443	9655.062 9 = 0.35324757 Hean Square 2.92583111 2.51101562 Type II Sum of Squares 3.59600931	C(p) = 13.10 P 1.17 P 1.43	0413644 Prob>F 0.3452 Prob>F 0.2402
Bounds on con Step 3 Var: Regression Brror Total Variable	ndition number: iable MSR8 Remo DF 15 32 47 Parameter Estimate	168.3307, ved R-squares Sum of Squares 43.88746671 80.35249995 124.23996667 Standard Brror 16.59258443 5.16295352	9655.062 = 0.35324757 Hean Square 2.92583111 2.51101562 Type II Sum of Squares	C(p) = 13.10 P 1.17 P 1.43 2.72	0413644 Prob>F 0.3452 Prob>F 0.2402 0.1087

32	-7.67391165	4.05981709	8.97160346	3.57	0.0678
83	7.57296448	3.42439393	12.28043688	4.89	0.0343
34	-1.94330575	1.54030927	3.99683140	1.59	0.2162
85	5.85188412	3.62791954	6.53319403	2.80	0.1166
D 6	3.85384001	2.57727440	5.61455649	2.24	0.1446
B7	2.96563065	1.78242595	6.95121222	2.71	0.1059
	-0.20356364	0.18612824	3.00348387	1.20	0.2823
HONTH		0.02756097	10.04641386	4.00	0.0540
MSR1	-0.05512838				0.6138
MSR3	0.01036268	0.02033440	0.65212460		
MSR5	-0.13993131	0.12836484	2.98391937	1.19	0.2838
MSR6	-0.49393869	0.20645201	14.37332561	5.72	0.0228
MSR7	0.00617549	0.01554033	0.39652604	0.16	0.6937
MSE12	0.10799877	0.11416743	2.24699751	0.89	0.3513
MSR13	-0.09473554	0.15930025	0.88806017	0.35	0.5562
	ondition number:	•	8904.459		
		und Bunning		0(-) - 11 3	
atep e ve	riable MSE7 Remo	And tradutte	= 0.35005596	C(B) = 11.4	
		Sum of Poussos	Mana		Bachar
	DF	Sum of Squares	Hean Square	T	Prob>P
Barnat-Ir-	14				0 3940
Regression		43.49094067	3.10649576	1.27	0.2769
Error	33	80.74902599	2.44694018		
Total	47	124.23996667			
	_	• ·			
	Parameter	Standard	Type II	-	
Variable	Estimate	Brror	Eum of Squares	1	Prob>P
INTERCEP	20.02806183	16.37395954	3.66094980	1.50	0.2299
B1	-9.15872679	4.84249883	8.75295131	3.58	0.0674
B2	-8.15943294	3.82189039	11.15287548	4.56	0.0403
B3	7.94347998	3.25270391	14.59338023	5.96	0.0201
B4	-1.90749580	1.51792528	3.86411237	1.58	0.2177
B5	6.11016307	3.52339174	7.35880154	3.01	0.0922
B6	4.00488269	2.51635898	6.19808830	2.53	0.1210
b 7	3.22570645	1.63663442	9.50538431	3.88	0.0572
MONTH	-0.18293118	0.17644470	2.63015670	1.07	0.3074
MSR1	-0.05559339	0.02718251	10.23506136	4.18	0.0489
MSR3	0.01229854	0.01948873	0.97445943	0.40	0.5323
MSE5	-0.15032846	0.12405635	3.59308712	1.47	0.2342
MSR6	-0.50882507	0.20041781	15.77203517	6.45	0.0160
	0.10213870	0.11175726			
MSR12			2.04386638	0.84	0.3674
MSR13	-0.08215906	0.15411999	0.69537060	0.28	0.5975
Anumda an a		161 7365			
sounds on C	ondition number:	161.7305,	7735.707		
Rean & Ma	riable MSE13 Een	ovad 8	. 0.34445896		0087744
Step 5 Va	LIGULU HARTA ROB	naa vedatie		C(p) = 9.4	
	Df	Sum of Squares	Hean Square	7	Prob>P
	~		HARTA	•	
Regression	13	42.79557008	3.29196693	1.37	0.2219
Brror	34	81.44439659	2.39542343		
Total	47	124.23996667			
IOCET	•/	124.2300001			
	Parameter	Standard	Type II		
	Lar.and tal.	The SAS Sys		ursday, July	12 1000
		1114 849 878	1000 10-47 IN	ntadma) agaa	26
					20
No				-	
Variable	Entimate	Error	Sum of Squares	ſ	Prob>P
INTERCEP	14.29685903	12.21929568	3.27922499	1.37	0.2501
81	-9.40709552	4.76902435	9.32039506	3.89	0.0567
B2	-8.40528379	3.75381227	12.00997095	5.01	0.0318
B 3	7.88997190	3.21674862	14.41116066	6.02	0.0195
B4	-2.15949832	1.42717336	5.48446881	2.29	0.1395
85	7.02777054	3.04177217	12.78686482	5.34	0.0271
3 6	3.83039217	2.46857572	5.76734419	2.41	0.1300
B 7	3.23283116	1.61926030	9.54805701	3.99	0.0539
MONTH	-0.21925352	0.16103568	4.44049337	1.85	0.1823
novin					

MSR1	-0.05722041	0.02672478	10,98135902	4.58	0,0395
MSR3	0.01195016	0.01927164	0.92107011	0.38	0,5393
Mars	-0.14483081	0.12231864	3.35829570	1.40	0.2446
MSR6	-0.51909068	0.19737935	16.56781771	6.92	0.0127
MBR12	0.08367550	0.10513054	1.51747349	0.83	0.4316
	dition number:	160.2374,	\$809.511		
tep 6 Varia	able MSR3 Repo	ved B-square	• • 0.33704533	C(p) = 7.8	3324454
	DP	Sum of Squares	Hean Square	7	Prob>P
Regression	12	41.87449997	3.48954166	1.48	0.1774
Brfor	35	82.36546670	2.35329905		
Total	47	124.23996667			
	Parameter	Standard	Type II		
Variable	Betimate		Sum of Squares	7	Prob>P
					• -
INTERCEP	15.24603900	12.01597362	3.78855188		0.2129
B1	-8.84025770	4.63925820	8.54495699		0.0650
82	-8.11446958	3.69150766	11.37076917	4.83	0.0346
B3	7.56657822	3.14615652	13.61179878	5.78	0.0216
B4	-2.34848418	1.38193827	6.79634016	2.89	0.0921
B5	6.81331919	2.99535815	12.17578789	5.17	0.0292
B6	3.47193603	2.37874213	5.01332452	2.13	0.1533
B 7	3.52179479	1.53706076	12.35444227	5.25	0.0281
10nth	-0.22913211	0.15883050	4.89757619	2.08	0.1580
15 R 1	-0.05670487	0.02647593	10.79481794	4.59	0.0393
4444	-0.12496629	0.11700664	2.68436689	1,14	0.2928
1585					0.0143
	-0.49122040	0.19049655	15.64788628	6.65	0.0143
MSR6 MSR12 Hounds on cond	-0.49122040 0.06811735	0.10119104 151.9287,	1.06637132		
HSR6 HSB12 ounds on con	-0.49122040 0.06811735 dition number:	0.10119104 151.9287,	1.06637132 5974.188	0.45	0.5053
MSR6 MSB12 ounds on con	-0.49122040 0.06811735 dition number: able MSR12 Rem	0.10119104 151.9287,	1.06637132 5974.188 • 0.32846217	0.45 C(p) = 6.2	0.5053
MSR6 MSR12 ounds on cond tep 7 Varia	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11	0.10119104 151.9287, oved R-square Sum of Squares	1.06637132 5974.188 = 0.32846217 Hean Square	0.45 C(p) = 6.2 P	0.5053
MSR6 MSR12 ounds on con- tep 7 Varia Regression	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11	0.10119104 151.9287, oved R-square	1.06637132 5974.188 = 0.32846217 Hean Square	0.45 C(p) = 6.2 P 1.60	0.5053
MSR6 MSR12 ounds on con- tep 7 Varia Regression Error	-0.49122040 0.06811735 dition number: able MSR12 Rem DP	0.10119104 151.9287, oved R-square Sum of Squares 40.80812865	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988	0.45 C(p) = 6.2 P 1.60	0.5053
MSR6 MSR12 ounds on con- tep 7 Varia Regression Error	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47	0.10119104 151.9287, oved R-squares Sum of Squares 40.80812885 83.43183802 124.23996667	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106	0.45 C(p) = 6.2 P 1.60	0.5053
MSR6 MSR12 ounds on con- tep 7 Varia Regression Error	-0.49122040 0.06811735 dition number: able HSR12 Rem DP 11 36	0.10119104 151.9287, oved R-square Sum of Squares 40.80812865 83.43183802 124.23996667 Standard	1.06637132 5974.188 • = 0.32846217 Mean Square 3.70982988 2.31755106 Type II	0.45 C(p) = 6.2 P 1.60	0.5053 1949035 Prob>F 0.1404
MSR6 MSR12 ounds on con- tep 7 Varia Regression Error	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47	0.10119104 151.9287, oved R-square Sum of Squares 40.80812865 83.43183802 124.23996667 Standard	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106	0.45 C(p) = 6.2 P 1.60	0.5053 1949035 Prob>F 0.1404
HSR6 HSR12 ounds on con- tep 7 Varia Regression Error Total	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47	0.10119104 151.9287, oved R-square Sum of Squares 40.80812865 83.43183802 124.23996667 Standard	1.06637132 5974.188 • = 0.32846217 Mean Square 3.70982988 2.31755106 Type II	0.45 C(p) = 6.2 P 1.60 ursday, July	0.5053 1949035 Prob>F 0.1404 12, 1990
SR6 SE12 Dunds on con- tep 7 Varia Regression Broor Fotal Variable	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter	0.10119104 151.9287, oved R-square Sum of Squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn	1.06637132 5974.188 • • 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th	0.45 C(p) = 6.2 P 1.60 ursday, July 7	0.5053 1949035 Prob>F 0.1404 12, 199 2'
ISR6 ISB12 Dunds on con- tep 7 Varia Regression Error Fotal Variable INTERCEP	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter Estimate	0.10119104 151.9287, oved R-squares Sum of Squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Thu Sum of Squares	0.45 C(p) = 6.2 P 1.60 ursday, July 7 10.10	0.5053 1949035 Prob>F 0.1404 12, 199 2' Prob>F
ISR6 ISR12 Dunds on con- tep 7 Varia Regression Error Fotal Variable INTERCEP B1	-0.49122040 0.06811735 dition number: able HSE12 Rem DP 11 36 47 Parameter Estimate 21.85382498	0.10119104 151.9287, oved R-squares Sum of Squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Thu Sum of Squares 23.40155074	0.45 C(p) = 6.2 P 1.60 ursday, July P 10.10 4.02	0.5053 1949035 Prob>F 0.1404 12, 199 2' Prob>F 0.0030
ISR6 ISB12 Dunds on conv tep 7 Varia Regression Error Fotal Variable INTERCEP B1 B2	-0.49122040 0.06811735 dition number: able HSR12 Rem DP 11 36 47 Parameter Bstimate 21.85382498 -9.18023330	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996657 Standard The SAS Syn Error 6.87732884 4.57652443	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32	0.5053 1949035 Prob>F 0.1404 12, 199 2 Prob>F 0.0030 0.0524
ISR6 ISB12 Dunds on conv tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter Estimate 21.85382498 -9.18023330 -8.39522141	0.10119104 151.9287, oved R-squares 40.80812885 83.43183802 124.23996667 Standard The SAS Syn SFFOF 6.87732894 4.57652443 3.63990656	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Thi Sum of Squares 23.40155074 9.32535076 12.32858260	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32 6.48	0.5053 1949035 Prob>F 0.1404 12, 199 2 Prob>F 0.0030 0.0524 0.0270
ISR6 ISB12 bunds on con- tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter 8stimate 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.09022219	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551	0.45 C(p) = 6.2 P 1.60 ursday, July P 10.10 4.02 5.32 6.48	0.5053 1949035 Prob>F 0.1404 12, 199 2' Prob>F 0.0030 0.0524 0.0270 0.0153
ISR6 ISR12 Dunds on con- tep 7 Varia Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5	-0.49122040 0.06811735 dition number: able HSE12 Rem DP 11 36 47 Parameter Estimate 21.85382498 -9.18023330 -8.39522141 7.86877054	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.09022219 1.37033914	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32 6.48 2.85 5.55	0.5053 1949035 Prob>F 0.1404 12, 199 2' Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002
ISR6 ISR12 Dunds on con- tep 7 Varia Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5 B6	-0.49122040 0.06811735 dition number: able MSE12 Rem DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874	1.06637132 5974.188 5974.188 5974.188 5974.188 5974.188 3.70982988 2.31755106 Type II stem 16:47 Thu Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046	0.45 C(p) = 6.2 P 1.60 ursday, July 7 10.10 4.02 5.32 6.48 2.85 5.55 2.65	0.5053 1949035 Prob>F 0.1404 12, 1999 2' Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1126
ISR6 ISR12 Dunds on con- tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.3136851 6.97843492 3.77157093 3.28600884	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874 1.48520779	1.06637132 5974.188 5974.188 5974.188 5974.188 5974.188 5974.188 3.70982988 2.31755106 Type II 50.31755106 Type II 16:47 Thu 500 of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90	0.5053 1949035 Prob>F 0.1404 12, 1999 21 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.126 0.0334
HSR6 HSR12 Dunds on con- tep 7 Varia Regression Brror Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH	-0.49122040 0.06811735 dition number: able HSR12 Rem DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.28600884 -0.20221698	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874 1.48520779 0.15254350	1.06637132 5974.188 5974.188 s = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Thu Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064	0.45 C(p) = 6.2 P 1.60 ursday, July 7 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76	0.5053 1949035 Prob>F 0.1404 12, 1990 21 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1126 0.0344 0.1933
HSR6 HSR12 Dunds on conv tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH HSR1	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.28600884 -0.02221698 -0.05617343	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874 1.48520779 0.15254350 0.02626239	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064 10.60285497	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76 4.58	0.5053 1949035 Prob>F 0.1404 12, 1990 21 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1286 0.0334 0.1933 0.0393
HSR6 HSR12 ounds on conv tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 HONTH HSR1 HSR5	-0.49122040 0.06811735 dition number: DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.2860084 -0.20221698 -0.05617343 -0.12479344	0.10119104 151.9287, oved R-squares 40.80812865 63.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.09022219 1.37033914 2.96253720 2.31890874 1.48520779 0.15254350 0.02626239 0.11611426	1.06637132 5974.188 = 0.32846217 Mean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.0267051 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064 10.60285497 2.67695892	0.45 C(p) = 6.2 P 1.60 ursday, July P 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76 4.58 1.16	0.5053 1949035 Prob>F 0.1404 12, 1990 23 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1126 0.0334 0.1933 0.0393 0.2896
MSR6 MSR12 ounds on conv tep 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MONTH MSR1 MSR5	-0.49122040 0.06811735 dition number: able MSR12 Rem DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.28600884 -0.02221698 -0.05617343	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874 1.48520779 0.15254350 0.02626239	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064 10.60285497	0.45 C(p) = 6.2 P 1.60 ursday, July 7 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76 4.58 1.16	0.5053 1949035 Prob>F 0.1404 12, 1990 23 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1126 0.0343 0.1933 0.0393 0.2896
Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MONTH MSE1 MSE5 HSE6	-0.49122040 0.06811735 dition number: DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.2860084 -0.20221698 -0.05617343 -0.12479344 -0.50119456	0.10119104 151.9287, oved R-squares 40.80812865 63.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.09022219 1.37033914 2.96253720 2.31890874 1.48520779 0.15254350 0.02626239 0.11611426	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064 10.60285497 2.67695892 16.38894444	0.45 C(p) = 6.2 P 1.60 ursday, July P 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76 4.58 1.16	0.5053 1949035 Prob>F 0.1404 12, 1990 23 Prob>F 0.0030 0.0524 0.0270 0.0153 0.1002 0.0241 0.1126 0.0334 0.1933 0.0393 0.2896
MSR6 MSR12 counds on con- step 7 Varia Regression Error Total Variable INTERCEP B1 B2 B3 B4 B5 B6 B7 MONTH MSR1 MSR5 MSR6 Counds on con-	-0.49122040 0.06811735 dition number: DP 11 36 47 Parameter 21.85382498 -9.18023330 -8.39522141 7.86877054 -2.31186851 6.97843492 3.77157093 3.2860084 -0.20221698 -0.05617343 -0.12479344 -0.50119456	0.10119104 151.9287, oved R-squares 40.80812865 83.43183802 124.23996667 Standard The SAS Syn Error 6.87732884 4.57652443 3.63990656 3.0902219 1.37033914 2.96253720 2.31890874 1.48520778 0.15254350 0.02626239 0.11611426 0.18847142 151.0095,	1.06637132 5974.188 = 0.32846217 Hean Square 3.70982988 2.31755106 Type II stem 16:47 Th Sum of Squares 23.40155074 9.32535076 12.32858260 15.02670151 6.59628551 12.85931256 6.13065046 11.34468201 4.07265064 10.60285497 2.67695892 16.38894444	0.45 C(p) = 6.2 P 1.60 ursday, July F 10.10 4.02 5.32 6.48 2.85 5.55 2.65 4.90 1.76 4.58 1.16 7.07	0.5053 1949035 Prob>F 0.1404 12, 1990 23 Prob>F 0.0030 0.0524 0.0270 0.02524 0.0273 0.1002 0.0241 0.126 0.0334 0.1933 0.393 0.2896 0.0116

Regression	10	38.13116972	3.81311697	1.64	0.1339
Brror	37	86.10879694	2.32726478		
Total	47	124.23896667			
		-			
Variable	Parapeter	Standard	Type II	-	B
VEFIEDIU	Betimate	Error	Sum of Squares	7	Prob>F
INTERCEP	18.52383522	6.15269131	21.09489477	9.05	0.0047
B1	-8.37600014	4.52438532	7.97627246	3.43	0.0721
32	-7.96830247	3.62574130	11.24045244	4.83	0.0343
B3	7.88458983	3.09665643	15.08752359	6.48	0.0152
B4	-1.05008107	0.70821698	5.11633281	2.20	0.1466
B5	6.13671192	2.86312190	10.69147422	4.59	0.0387
B6	3.17746636	2.25677281	4.61351605	1.98	0.1675
B7 Month	1.99160045 -0.21850014	0.87089962 0.15210701	12.17065717 4.80231638	5.23 2.06	0.0280 0.1593
MSR1	-0.05795385	0.02626496	11.33070596	4.87	0.0336
MSR6	-0.45650958	0.18421306	14.29238678	6.14	0.0179
				••••	
Bounds on con	dition number:	143.6606,	4492.466		
**********					*******
Step 9 Vari	able B6 Resover	d R-square	s = 0.26978157	C(p) = 4.80	6014221
				-	Broks
	DP	Sum of Squares	Mean Square	7	Prob>f
Regression	9	33.51765367	3.72418374	1.56	0.1628
Brror	38	90.72231299	2.38742929		
Total	47	124.23996667			
	Parameter	Standard	Type II		
Variable	Estimate	B LLOL	Sum of Squares	T	Prob>f
	10	-	30 01000000		
INTERCEP B1	10.77810297 -2.24327904	2.79051658 1.23954565	35.61606709 7.81937544	14.92 3.28	0.0004 0.0782
DI	-2.2432/804	The SAS Sy		ursday, July	
•					28
B2	-3.10729796	1.12160095	18.32397043	7.68	0.0086
B3	3.83236152	1.15748815	26.17160467	10.96	0.0020
B4	-0.84795351	0.70242135	3.47919837	1.46	0.2348
B5	2.36432840	1.02230641	12.76979574	5.35	0.0262
B7	1.45067405	0.79161668	8.01752528	3.36	0.0747
Month MSR1	-0.10897946 -0.06307915	0.13239162 0.02634555	1.61770304 13.68634485	0.68	0.4156 0.0217
MSR6	-0.21318340	0.06459577	26.00333707	10.89	0.0021
	-0.8701040				
Bounds on con	dition number:	17.21949,	\$05.5925		
***********				**********	
Step10 Vari	able MONTH Rem	oved R-square	s = 0.25676078	C(p) = 3.44	608353
	NP	Sum of Squares	Mean former-	-	Beckie
	DT	som or squires	Mean Square	T	Prob>P
Regression	8	31.89995063	3.98749383	1.68	0.1333
Brror	39	92.34001604	2.36769272		•••
Total	47	124.23996667			
_	Parameter	Standard	Type II		
Variable	Estimate	B rror	Sum of Squares	T	Prob>f
tweetart	10 1910	~ ~ ~ ~ ~ ~ ~ ~ ~ ~			
INTERCEP	10.13194553	2.66674362	34.17814619	14.44	0.0005
B1 B2	-2.09822523 -2.98088737	1.22187408 1.10643619	6.98194859 17.18556164	2.95 7.26	0.0939
B3	3.70164838	1.14179501	24.88509960	10.51	0.0024
••					
84	-0.84081505	0.69945860	3,42138748	1.45	0.2366
104 105	-0.84081505		3.42138748 11.78671145	1.45 4.98	0.2366 0.0315
		0.69945860	3.42138748 11.78671145 7.58792048		
105	-0.84081505 2.25069081	0.69945860 1.00874687	11.78671145	4.98	0.0315

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	dition number:	16.86102,	434.1724		
tepll Vari	able 34 Removed	R-square	. 0.22922224	C(p) = 2.68	532970
	DP	Sum of Squares	Hean Square	7	Prob>P
Regression	7	28.47856315	4.06836616	1.70	0.1369
Brror	40	95.76140352	2,39403509		
fotal	47	124.23996667			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	frob>f
INTERCEP	8.74504314	2.41758559	31.32497306	13.08	0.0008
B1	-2.24638878	1.22238539	8.08507500	3.38	0.0735
32	-2.85520870	1.10759601	15.90902114	6.65	0.0137
B3	3.34950650	1,10969890	21.81131516	9.11	0.0044
85	2.08421023	1.00473778	10.30168096	4.30	0.0445
B7	0.99853055	0.71291594	4.69652425	1.96	• • • •
MSR1	-0.04484670	0.02195754	9.98674517		
MSR6	-0.18009747	0.06037484	21.30265952	8.90	0.0048
ounds on con	dition number:	15.00113,			
		THE BAD BYS	tes 16:47 Th	ureday, July	12, 199
	able B7 Resoved	**************************************	= 0.19142020		
cahir and				•••	-
	DE	Sum of Squares	Mean Square	1	frop>1
Regression	8	23.78203890	3.96367315	1.62	0.1668
Irror	41	100.45792777	2.45019336		
Total -	47	124.23996667			
	Parameter	Standard	Type II	_	
Variable	Estimate	Brfor	Sum of Squares	7	Prob> I
INTERCEP	6.77920373	1.99140325	28.39483218	11.59	0.0015
81	-1.59598673	1.14393377	4.76932758	1.95	0.1705
B2	-2.07152908	0.96702625	11.24361322	4.59	0.0382
83	2.85957182	1.06540622	17.65110576	7.20	0.0104
85	1.79143804	0.99421339	7.95508319	3.25	0.0789
MSR1	-0.02925889	0.01914889	5.72043220		0.1342
HSR6	-0.13393606	0.05117559	10.78300415	6.85	0.0124
ounds on con	dition number:	10.53096,	210.8752		
tepl3 Vari	able 31 femoved	l I-square	• 0.15303217	C(p) = 2.1	1391554
	DF	Sum of Squares	Nean Square	1	Prob>F
Regression	5	19.01271132	3.80254226	1.52	0.2049
Irror	42	105.22725535	2,50541084		
Total	47	124.23996667			
	Parabeter	Standard	Type II		.
Variable	Setimate	Brrer	Sum of Squares	1	Prob>f
	5.37142557	1.73607683	23.98392141		0.0035
	-1.29219134	0.79821891	6.56581408		0.1130
				5.91	0.0194
32	1.75811609	0.72343156	14.79718671		
INTERCEP B2 B3 B5		0.72343156 0.64197509	3.18619017		
82 83	1.75811609			1.27	0.2658
82 83 85	1.75811609 0.72395996	0.64197509	3.18619017	1.27 2.95	0.2658 0.0932 0.0288

Step14	Variable 35 Remo	oved E-squar	• = 0.12738671	C(p) = 1.2	6797190
		Sum of Squares			Prob>P
Regressi	on 4	15.82652115 108.41344552	3.95663029	1.57	0.1997
Brror	43	108.41344552	2.52124292		
Total	47	124.23996667			
	Paraset	er Standard	Type II		
Variable			Sum of Squares		Prob>F
INTERCEP	4.672277(06 1.62671834	20.79922438	8.25	0.0063
			sten 16:47 Th		
82	-0.794647	0.66730243	3.57534658	1.42	0.2403
33	1.708023(14.01884600	\$.56	0.0230
MSR1	-0.0288511	12 0.01889:	5.88054173	2.33	0.1340
MSRG	-0.066381	.03377	5.88054173 9.73694428	3.86	0.0559
Sounds on	condition number	er: 4.458811,	48.50641		
	*************				********
Step15	Variable B2 Remo	oved R-squar	e = 0.09860897	C(p) = 0.5	6298294
	DF	Sus of Squares	Hean Square	7	Prob>P
Regressi	on 3	12.25117457	4.08372486	1.60	0.2019
Error	44	111.98879210	2.54519982		
Total	47	124.23996667			
		er Standard			
Variable	Ist imat	te Error	Sum of Squares	7	Prob>P
INTERCEP	3.814747	50 1.46556293 84 0.52904366	17.24425887	6.78	0.0126
B3	1.1156830	84 0.52904366	11.31934107	4.45	0.0407
MSR1	-0.023301	16 0.01839414 31 0.02867230	4.08430612	1.60	
MSRG	-0.0448593	31 0.02867230	6.23019984	2.45	0.1249
	condition numbe				
Step16	Variable MSE1 Bo	seoved R-squar	• = 0.06573463	C(p) = 0.0	4234204
	DF	Sum of Squares	Hean Square	1	Prob>f
Legrenei		8.16686845	4.08343473 2.57£40218	1.58	0.2166
8rror	45	116.07309821	2.57£40218		
Total	47	124.23996667			
	Parabet	er Standard	Type II		
Variable	Setime		Sum of Squares	T	Prob>7
INTERCEP	2.106027	31 0.\$7690143	34.37508928	13.33	0.0007
83	0.848961		7.78784198		
MSRO	-0.015553	30 0.01705154	2.146035.2	0.83	0.3666
Bounda on	condition number	er: 1.110543,	4.44233		
			•••••		
\$t=p17	Variable M\$26 R	noved I-squar	• • 0.04846132	C(p) = -1.1	8035172
	Df	Sup of Squares	Nean Square	7	Prob>P
Regressi	on 1	6.02083733	6.02u83333	2.34	0.1327
Brror	40	118.21013333	2.56998116		
fotal	47	113.23996467			
	¥4: V	r Standard	Cype I1		
Variable	• • • •		Sum of Squares	1	t (dost
				•	

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INTERCEP	1.52416687	0.23138987 The SAS Sys	136.62003333 tem 16:47 Thu	49.27 0.0001 meday, July 12, 1990 31
83	0.70833333	0.46277975	6.02083333	2.34 0.1327
Bounds on	condition number:	1,	1	
Step18	Variable 33 Removed	i I-square	= 0.0000000	C(p) = -0.99957135
	Dr	sum of Squares	Hean Square	7 Prob>7
Regressi Error Total	on 0 47 47	G.00000000 124.23996667 124.23996667	2.64340355	• •
Variable	Parameter Setimate	Standard Brror	Type II Sum of Squares	Prob>P
INTERCEP	1.62416667	0.23467191	126.62003333	47.90 0.0001
Bounds on	condition number:	0,	0	

All variables left in the model are significant at the 0.1000 level.

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Summary of Backward Elimination Procedure for Dependent Variable HSR9

	Variable	Number	Partial	Model			
Step	Lenoved	In	R**2	2==2	C(p)	1	Prob> f
1	MSR4	17	0.0000	0.3555	17.0014	0.0014	0.9704
2	HSR2	16	0.0010	0.3545	15.0478	0.0450	0.8281
3	HSRS	15	0.0013	0.3532	13.1041	0.0601	0.8079
4	HSET	14	0.0032	0.3501	11.2478	0.1579	0.6937
5	MSR13	13	0.0056	0.3445	9.4996	0.2842	0.5975
6	HSR3	12	0.0074	0.3370	7.8332	0.3845	0.5393
,	MSR12	11	0.0086	0.3285	6.2195	0.4531	0.5053
8	HSR5	10	0.0215	0.3069	5.1891	1.1551	0.2894
•	36	9	0.0371	0.2698	4.8601	1,9824	0.1676
10	HONTH	8	0.0130	0.2568	3.4461	0.6776	0.4159
11	D4	7	0.0275	0.2292	2.6853	1,4450	0.2366
12	11	6	0.0378	0.1914	2.3864	1.9618	0.1690
13	b 1	5	0.0384	0,1530	2.1139	1.9485	0.1705
14	35	Ă	0.0256	0.1274	1.2880	1.2717	0.2658
15	12	i	0.0288	0.0986	0.5630	1.4181	0.2403
16	MSE1		0.0329	0.0657	0.0423	1.6047	0.2119
17	MSEG	1	0.0173	0.0485	-1.1804	0,8320	0.3666
18	B3	0	0,0485	0.0000	-0.9996	2.3428	0.1327
			The	SAS System	16:47 Thu	raday, July	12, 1990
							32

Backward Eligination Procedure for Dependent Variable HSB12

Step 0	All Variables	Satered B-square	. 0.59899214	C(p) = 19.9	000000
	67	Sum of Squares	Hean Square	1	Prob>P
Regressio	n 10	255.70911221	14.21050623	1.41	0.0170
Brsor	29	171,24338779	5.90494441		
Total	47	427.03250000			
	Farapet	er Standard	Type II		
Variable	Setima	te Brror	Sum of Squares	7	Prob>F
INTERCEP	63.844035	08 27.02843667	32.94690432	5.58	0.0251
91	-6.040439	91 8.50210445	2.79949529	0.47	0.4966
32	-2.093999	43 6.78784017	0.54696089	0,10	0.7588
33	3.329931	40 8.04886300	1.67368630	0.28	0.5985

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34	-0.25724130	2.50010727	0.06251438	0.01	0.9188
85	2.17567729	8.07155743	0.75823627	0.13	0.7227
B6	2.16975414	4.23054308	1.55326165	0.26	0.6119
37	-1.10728914	3.05205334	0.77723734	0.13	0.7194
MONTH	0.22850675	0.28924856	3.68528823	0.62	0.4359
MSR1	0.04203365	0.04843230	4.44774314	0.75	0.3926
MSR2	-0.04494915	0.11511876	0.90025708	0.15	0.6991
MERS	-0.05588877	0.03396909	15.95442877	2.71	0.1107
HSR4	-0.27429388	0.16880559	15.59101590	2.64	0.1150
MSR5	0.29280627	0.23662879	9.04151887	1.53	0.2259
MSR6	0.04635389	0.34952261	0.10385743	0.02	0.8954
MSR7	-0.02469616	0.02465749	5.92348178	1.00	0.3248
HSR8	-0.02414501	0.05713981	1.05436960	0.18	0.6757
HSR9	0.22874846	0.26823040	4.29453540	0.73	0.4008
MSR13	0.37522513	0.24986060	13.31692889	2.26	0.1440
Bounds on	condition number:	203.8343,	13326.87	**********	
Step 1	Variable B4 Remove	d R-square	0.59884575	C(p) = 17.0	1058679
	DP	sum of squares	Mean Square	1	Prob>7
Regressi	on 17	255.72659783	15.04274105	2.63	0.0099
Irror	30	171.30590217	5.71019674	••••	******
Total	47	427.03250000	4.1247 4 014		
	Parameter	Standard	Type II		
Variable		Error	Sum of Squares	7	Prob>7
INTERCEP	64.00842564	26.53364320	33.22801918	5.82	0.0222
B1	-5.95536577	8.59706364	2.74010793	0.48	0.4938
82	-1.96341893	6.52723069	0.51667696	0.09	0.7658
B3	3.19159752	5.95472042	1.64038035	0.29	0.5959
85	1.90645644	5.38772300	0.71498071	0.13	0.7259
96	2.10496756	4.11385915	1.49500639	0.26	0.6126
87	-1.29179538	2.42864085	1.61551849	0.28	0.5987
MONTH .	0.23411513	0.27934273	4.01083983	0.70	0.4086
MSR1	0.04343371	0.04570865	5.15594196	0.90	0.3496
HSR2	-0.04674458	0.11189643	0.99650883	0.17	0.6791
		The SAS Sy	ten 16:47 Th	uraday, July	12, 199
MSR3	-0.05544493	0.03313381	15.98939537	2.80	0.1047
MSR4	-0.27726259	0.16355586	16.40973018	2.87	0.1004
MSR5	0.30763875	0,18452914		2.78	0.1059
			15.87096090		
MSRG	0.05699681	0.32831460	0,17209637	0.03	0.8633
MSR7	-0.02503302	0.02403279	6.19539698	1.08	0.3051
HSR8	-0.02326589	0.05555794	1.00137814	D.18	0.6784
NSES	0.23505639	0,25678822	4.78459296		0.3673
MSR13	0.36781404	0.13827523	13.95541464	2.44	0.1285
	condition number:		11466.54		
*******		**************			
*******	Variable MSRS Remo	**************		C(p) = 15.02	8973124
ltøp 2	Variable HSR6 Remo DF	ved Resquare Sum of Squares	9 9 0.59844274 Hean Square	C(p) = 15.03 P	973124 Prob>F
)top 2 Regressi	Variable HSR6 Remo DF on 16	ved R-square Sum of Squares 255.55450147	• • 0.59844274 Hean Square 15.97215634	C(p) = 15.03 P	973124 Prob>F
ltøp 2	Variable HSR6 Remo DF	ved Resquare Sum of Squares	9 9 0.59844274 Hean Square	C(p) = 15.03 P	973124 Prob>P
ltop 2 Regressi Brror	Variable HSR6 Remo DF on 16 31	ved 2-square Sum of Squares 255.55480147 171.47799853	• • 0.59844274 Hean Square 15.97215634	C(p) = 15.03 P	973124 Prob>F
ltop 2 Regressi Brror	Variable HSR6 Remo DF on 16 31 47 Farameter	ved R-square Sum of Squares 255.55450147 171.4779853 427.03250000	• • 0.59844274 Hean Square 15.97218634 5.53184834	C(p) = 15.03 P	8973124 Prob>P 0.0055
Regressi Bror Total	Variable HSR6 Remo DF on 16 31 47 Parameter Stimate 66.02258794	ved R-square Sum of Squares 255.55450147 171.47798833 427.03250000 Standard	• • 0.59844274 Hean Square 15.97218634 5.53184834 Туре II	C(p) = 15.07 7 2.89 F	8973124 Prob>F 0.0055 Frob>F
Step 2 Regressi Brror Total Variable	Variable HSR6 Remo DF on 16 31 47 Parameter Stimate 66.02258794	ved E-square Sum of Squares 255.55450147 171.4779853 427.03250000 Standard Error	• • 0.59844274 Hean Square 15.97215634 5.53154834 Type II Sum of Squares	C(p) = 15.02 7 2.89 F 7.91	8973124 Prob>P 0.0055 Prob>P 0.0085
Step 2 Regressi Brror Total Variable INTERCEP	Variable HSR6 Remo DF on 16 31 47 Parameter Estimate	ved R-squares Sum of Squares 255.55450147 171.47799853 427.03250000 Standard Broor 23.48090543	• • 0.59844274 Hean Square 15.97215634 5.53154834 Type II Sum of Squares 43.73228007	C(p) = 15.02 7 2.89 7 7.91 5.39	B973124 Prob>F 0.0055 Prob>F 0.0085 0.0269
Regressi Bror Total Variable INTERCEP Bl	Variable HSR6 Remo DF on 16 31 47 Parameter Setimate 68.02258794 -7.33984288	ved R-squares Sum of Squares 255.55450147 171.47799853 427.03250000 Standard Brror 23.48090543 3.16035419	• • 0.59844274 Hean Square 15.97216634 5.53184824 Type II Sum of Squares 43.73228007 29.9365817	C(p) = 15.02 7 2.89 7 7.91 5.39	B973124 Prob>F 0.0055 Prob>F 0.0085 0.0269 0.0548

B6	2.74372843	1.81103945	12.69618187	2.30	0.1399
87	-1.14420267	2.24058602	1.44431319	0.26	0.6130
MONTH	0.21803422	0.25938239	3.90654449	0.71	0.4070
MSR1	0.04216857	0.04441250	4.98670880	0.90	0.3497
MSR2	-0.05041542	0.10814791	1.20209048	0.22	0.6444
MSR3	-0.05369532	0.03106623	16.52503874	2.99	0.0939
MSR4	-0.27737141				
		0.16097565	16.42285381	2.97	0.0948
MSR5	0.30249259	0.17926090	15.75088856	2.85	0.1016
MSR7	-0.02591207	0.02312288	6.94651965	1.26	0.2711
MSR8	-0.02201356	0.05421905	0.91184998	0.16	0.6875
Mser	0.22034968	0.23859013	4.71809397	0.85	0.3629
MSR13	0.36868816	0.20151256	14.02865380	2.54	0.1214
Bounds on con	dition number:	21.66736,	2063.47		
••••••	**************				
Step 3 Vari	able MSR\$ Remov	od R-square	= 0.59630743	C(p) = 13.16	415267
•	DF	Sum of Squares	Nean Square	7	Prob>F
Regression	15	254.64265149	16.97617677	3.15	0.0031
Error	32	172.38984851	5.38718277		
Total	47	427.03250000			
JOLEI	• (461+44694444			
	Paraseter	Standard	Ø		
Nontohla			Type II	-	Dack P
Variable	Estimate	Brror	Sum of Squares	7	Prob> P
INTERCEP	65.64849495	23.15462363	43.30477690	8.04	0.0079
B1	-7.10428379	3.06583564	28.92707855	5.37	0.0270
		The SAS Sys	stem 16:47 Thu	sreday, July	
					34
B2	-2.96849098	1.49680516	21.18861812	3.93	0.0560
83	3.75362303	1.90985752	20.80947298	3.86	0.0581
35	2.53420639	2.62182369	5,03313646	0.93	0.3410
36	2.52847711	1.70895563	11.79283411	2.19	0.1488
37	-0.73432483	1.97313584	0.74614660	0.14	0.7122
MONTH	0.21974174	0.25594161	3.97104686	0.74	0.3970
MSR1	0.03809321	0.04269507	4.28846176	0.80	0.3789
HSR2	-0.04949931	0.10670410	1.15930537	0.22	0.6459
MSR3	-0.05104579	0.02997413	15.62385925	2.90	0.0983
MSR4	-0.26526541	0.15611241	15.55421618	2.89	0.0990
MSR5	0.26954537	0.15774216	15.73004270	2.92	0.0972
MS27	-0.02570640	0.02281367	6.83996545	1.27	0.2682
MSR9	0.22744337	0.23482396	5.05386322	0.94	0.3400
NGR13	0.35453143	0.22586544	13.27307789	2,46	0.1263
		20.93714,	1749.377		
Step 4 Vari	able 37 Removed		0.59456014	C(p) + 11.3	2051230
	DF	Sum of Squares	Nean Square	1	Prob>P
Regression	14	253.89650489	18.13546463	3.46	0.0017
Strot	23	173.13599511	5.24654531		
Total	47	417.03250000			
	Parameter	Standard	Type 11		
Variable	Istinate	Error	Sum of Squares	7	trob>1
		9114f	and ar admired	r	+ 14971
		91.111044444	EL	10.66	0.0025
INTERCEP	68.94431510	21,11304909	\$\$.94\$92208		
B1	-7.67351586	2,62213268	44,93170404	8,56	0.0062
32	-3.07799734	1,44831550	22.09040444	4 - 52	0,0411
83	4.00423760	1.76372751	27.04256997	5.15	0.0298
35	2,11234445	2.33305082	4.30085204	0.82	0.3718
16	2.45454107	1.65303974	13.52962421	2.58	0.1178
MONTH	0.24058800	0.24645566	4.99970187	0.95	0.3361
MSR1	0.03963453	0.04193530	4.68661738	0.89	0.3515
MSR2	-0.05254474	0.10499158	1.31418390	0.25	0.4201
MSR3	-0.05465356	0.02799055	20.00264986	3.81	0.0594

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E2 Esecved Sum 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 4 5 9 1 6 2 2 6 3 3 4 5 9 1 6 2 6 8 9 4 5 5 7 5 6 3 1 6 9 8 0 9 4 5 2 9 8 0 9 4 5 2 8 9 9 1 6 2 8 9 1 7 2 1 9 1 7 1 9 1 9 1 1 9 1 1 9 1 1 9 1 9 1 9 1 1 9 1 9 1 9 1 1 9 1 9 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 9 1 9 1 9 1 9 1 9 9 9 9 9 9 9 1 8 9 8 9	E-square of Squares 252.58232099 174.45017901 127.03250000 Standard The SAS Sys		3.00 2.71 0.92 2.39 C(p) = 9.5 7 3.79 10.75 9.87 4.38 6.25 0.90 2.41 0.87 0.85	0.092 0.109 0.344 0.131 6306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
052525 170567 158426 number: 22 Removed Sum 2 ameter timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	0.01853631 0.23123854 0.21443132 15.72596, E-squares 252.58232099 174.45017901 427.03250000 Standard The SAS System Error 20.23219244 2.22946389 1.38731386 2.30263701 1.59768652 0.24192562 0.0215955 0.02569617	14.22804921 4.82288135 12.54540889 1296.378 • = 0.59149266 Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.0854128 4.61522484 12.35713573 4.46302126 4.35395356	2.71 0.92 2.39 C(p) = 9.50 F 3.79 Traday, July F 10.75 9.87 4.38 6.25 0.90 2.41 0.87 0.85	0.109 0.344 0.131 4306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
170567 158426 number: 22 Removed Sum 2 ameter timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	0.23123854 0.21443132 15.72596, E-Equares 252.58232099 174.45017901 627.03250000 Standard The SAS Sy: Error 20.23219244 2.22946389 1.38921691 1.3873138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	<pre> 6.82288135 12.84540889 1296.378 = 0.59148266 Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.1550533 50.82940009 22.38382266 32.06544128 4.8152248 4.8152248 4.815228 4.815228 4.8352358 </pre>	0.92 2.39 C(p) = 9.5 F 3.79 araday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.344 0.131 4306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
158426 number: 22 Eencoved Sum 2 ameter timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	0.21443132 15.72596, R-Squares 0.5 Squares 252.58232099 174.45017901 174.45017901 177.03250000 Standard The SAS Sys Brror 20.23219244 2.22946389 1.3873136 2.30263701 1.59768652 0.24192562 0.04135955 0.02569617	12.54540889 1296.378 • = 0.59149266 Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.0544128 4.6152246 12.35713573 4.46302126 4.35395356	2.39 C(p) = 9.5 F 3.79 ursday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.131 4306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.357
number: E2 Eemoved Sum Sum 2 1 2 2 2 3 4 3 4 5 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	15.72596, R-squares 252.58232099 174.45017901 27.03250000 Standard The SAS System Error 20.23219244 2.22946389 1.38921691 1.38731386 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	1296.378 • = 0.59149266 Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.0544128 4.61522484 12.35713573 4.46302126 4.35395356	C(p) = 9.54 F 3.79 F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	6306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
E2 Esecved Sum 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 4 5 9 1 6 2 2 6 3 3 4 5 9 1 6 2 6 8 9 4 5 5 7 5 6 3 1 6 9 8 0 9 4 5 2 9 8 0 9 4 5 2 8 9 9 1 6 2 8 9 1 7 2 1 9 1 7 1 9 1 9 1 1 9 1 1 9 1 1 9 1 9 1 9 1 1 9 1 9 1 9 1 1 9 1 9 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 1 9 1 9 1 9 1 9 1 9 1 9 9 9 9 9 9 9 1 8 9 8 9	E-Squares of Squares 252.58232099 174.45017901 27.03250000 Standard The SAS Sys Error 20.23219244 2.22946389 1.38921691 1.3873138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	<pre> = 0.59148286 Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.82940009 22.38382266 32.08544128 4.81522484 12.35713573 4.46302126 4.35395356 </pre>	C(p) = 9.54 F 3.79 F Insday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	6306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
E2 Esecved Sum 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 3 4 5 9 2 1 8 2 3 3 4 5 9 1 6 2 2 6 3 3 4 5 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 9 1 6 2 6 8 9 1 6 2 6 8 9 1 6 2 6 8 9 9 1 6 2 6 8 9 9 1 6 2 6 8 9 9 1 6 2 6 8 9 9 1 6 8 8 9 9 1 6 8 8 9 9 1 6 9 9 1 6 9 9 1 6 9 9 1 6 8 8 8 9 9 9 1 6 9 9 9 1 6 9 9 9 1 6 9 9 9 1 6 9 9 9 1 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9	E-square of Squares 252.58232099 174.45017901 527.03250000 Etandard The SAS Sy: Error 20.23219244 2.22946389 1.35921691 1.3573136 2.30263701 1.59768652 0.24192562 0.04135955 0.02569617	• = 0.59148266 Hean Square 19.42940931 5.13088762 Type II stom 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.08544128 4.8152246 12.35713573 4.46302128 4.35395356	C(p) = 9.54 F 3.79 F Insday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	6306883 Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
Sum ameter timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	of Squares 252.58232099 174.45017901 627.03250000 Standard The SAS Sy: Error 20.23219244 2.22946389 1.38921691 1.3873138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	Hean Square 19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.0554128 4.6152248 12.3573573 4.46302126 4.35395356	F 3.79 araday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	Prob> 0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	252.58232099 174.45017901 627.03250000 Standard The SAS Sys Error 20.23219244 2.22946389 1.38921691 1.3873138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	19.42940931 5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.0554128 4.61522484 12.35713573 4.46302126 4.35395356	3.79 arsday, July F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.000 12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
timate 448328 334599 162268 921888 405404 944357 563169 809969 944529 850839	27.45017901 27.03250000 Standard The SAS Sy: Error 20.23219244 2.22946389 1.38921691 1.3873138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	5.13088762 Type II stem 16:47 Thu Sum of Squares 55.15505333 50.62940009 22.38382266 32.08544128 4.81522484 12.35713573 4.46302128 4.35395356	F 10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	12, 19 Prob> 0.002 0.003 0.044 0.017 0.349 0.129 0.357
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448328 334599 162268 921888 405404 944357 563169 869969 944529 850839	20.23219244 2.22946389 1.38921691 1.38731136 2.30263701 1.59768652 0.24192562 0.04135955 0.02569617	55.15505333 50.62940009 22.36382266 32.08544128 4.61522484 12.35713573 4.46302126 4.35395356	10.75 9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.002 0.003 0.044 0.017 0.349 0.129 0.357
334599 162268 921888 405404 944357 563169 809969 944529 850839	2.22946389 1.38921691 1.38731138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	50.62940009 22.38382266 32.08544128 4.61522484 12.35713573 4.46302126 4.35395356	9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.003 0.044 0.017 0.349 0.129 0.357
334599 162268 921888 405404 944357 563169 809969 944529 850839	2.22946389 1.38921691 1.38731138 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	50.62940009 22.38382266 32.08544128 4.61522484 12.35713573 4.46302126 4.35395356	9.87 4.36 6.25 0.90 2.41 0.87 0.85	0.003 0.044 0.017 0.349 0.129 0.357
162268 921888 405404 944357 563169 809969 944529 850839	1.38921691 1.38731136 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	22.38382266 32.08544128 4.61522484 12.35713573 4.46302128 4.35395356	4.36 6.25 0.90 2.41 0.87 0.85	0.044 0.017 0.349 0.129 0.357
921888 405404 944357 563169 809969 944529 850839	1.38731136 2.30283701 1.59768652 0.24192562 0.04135955 0.02569617	32.08544128 4.61522484 12.35713573 4.46302128 4.35395356	8.25 0.90 2.41 0.87 0.85	0.017 0.349 0.129 0.357
405404 944357 563169 809969 944529 850839	2.30263701 1.59768652 0.24192562 0.04135955 0.02569617	4.61522484 12.35713573 4.46302126 4.35395356	0.90 2.41 0.87 0.85	0.349 0.129 0.357
944357 563169 809969 944529 850839	1.59768652 0.24192562 0.04135955 0.02569617	12.35713573 4.46302128 4.35395356	2.41 0.87 0.85	0.129
563169 809969 944529 850839	0.24192562 0.04135955 0.02569617	4.46302126 4.35395356	0.87 0.85	0.357
809969 944529 850839	0.04135955 0.02559617	4.35395356	0.85	
944529 850839	0.02569617			0.363
850839			3.70	
		24.15680183		
106742	0.14945786	14,47890486		
856163	0.01791554	13,04063928		
389276	0.22815388	4.50950578		
245511	0.20865883			0.143
	12.40247,	1020.308		
		• • 0.58128683		
Su	of Squares	Nean Square	Ţ	Prob>
2	248.22834743	20.66569729	4.05	0.000
	178.80413257	5.10868950		
anotor timeto	Standard Stror	Type II Sum of Squares	7	trob>
	20 14916516		• • • •	
				0.002 0.000
				0.062
				0.023
				0.430
585087				0.217
				0.322
				0.075
686685	0.11360674			0.044
	0.14817820		3.24	0.080
949740				0.107
783828		2.01660132		0.415
007546	0.20733029	12.04829256	2.53	0.120
nunberi	- · ·	721.0322		
	Amotor timato 700364 573510 512855 526622 655159 565087 183082 565087 183082 566485 564723 564723 564740 783528 507546 humber:	427.03250000 meter Standard timate Srror 780364 20.14316319 573510 1.38441225 512853 1.34259140 524642 1.35691483 65159 2.26078032 58007 1.22349657 183082 0.24076318 585665 0.11360874 564723 0.14817826 748740 0.01784798 73328 0.22212805 507546 0.20733029 number: 12.00573,	427.03250000 standard Type II timate Stror Sum of Squares 780364 20.14316319 53.34004754 573510 1.38441225 77.60324481 812853 1.34259140 18.91097047 826642 1.38691483 28.70139202 655159 2.26076032 3.25465303 835087 1.23345857 6.05061828 183082 0.24076318 5.154082875 82586 0.02545799 17.13822375 86685 0.11360874 22.20802104 84723 0.14817826 16.54346220 948740 0.01784798 13.95401087 78322 0.22212805 2.91660132 907546 0.20733029 12.94823256 9100051 12.00573, 721.0322	427.03250000 Ameter Standard Type JI Stror Sum of Squares P 700364 20.14316319 53.34004758 10.44 573510 1.38441225 77.60324481 15.19 313853 1.34259140 18.91097047 3.70 526642 1.35691603 28.70139202 5.62 655159 2.26076032 3.25465303 0.64 585067 1.22345857 0.05061525 1.58 183082 0.24076315 5.1540829 1.01 582665 0.11360874 22.20002104 4.35 584665 0.11360874 22.20002104 4.35 584665 0.22212606 2.91460132 0.57 703828 0.22212606 2.91460132 0.57 707546 0.20733029 12.4452256 2.53

spreasion 11 245.31176611 22.30106065 4.42 0.0003 rror 36 101.7373366 5.04778516 4.42 0.0003 stal 47 47.03250000 Type II 10:47 Thursday, July 12, 1900 ariable Estandard Type II 10:47 Thursday, July 12, 1900 30 ariable Estandard Type II 0.0014 3.0421470 18.68139649 60.05556675 11.90 0.0014 -5.207988640 1.37011585 75.476125364 3.360000 3.044435 0.0004 1 -5.45988640 1.37318457 7.46447734 1.48 0.2301 1.4588173 0.13207244 0.2380746 1.40040600 3.57 0.0617 183 -0.04776163 0.02380746 1.81720 2.2187744 3.42 0.0380 183 -0.02716100 0.01777224 1.2187744 3.42 0.0238 183 -0.02716200 0.01777224 1.2187744 3.42 0.0238 184 -0.2302744					_	
Fror 36 161.72073368 5.04778616 Parameter Standard Type II 15:47 Thuraday, July 12, 1900 ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares P Prob? ariable Estimate Error Sum of Squares 0.0314 0.0323 bit 1.64739624 1.21378426 7.4884734 3.42 0.0321 bit 0.22072440 0.230301 11.3373682 2.225 0.1427 ands on condition number: 11.73045, 636.1854 0.0002 0.17724 2.4847439 4.88 0.0002 tot		D7	Sum of Squares	Hean Square	P	Prob>F
Artan 47 427.03250000 Parameter Standard The SAS System Type II 18:47 Thuraday, July 12, 1990 38 ariable Estimate Error Sum of Squares P Prob/F Ariable Is 6821sto 18.6813859 60.05556878 11.60 0.0014 Ariable Is 6821sto 1.31718457 17.03324863 3.380 0.0744 Ariable Is 6850130 1.2373426447 3.480 0.23207284 0.480 Ariable 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.23207284 0.22207284 0.23207284 0.22207284 0.22207284 0.22207284 0.22207284 0.22207284 0.23720784 0.22207284 <	Regression				4.42	0.0003
The SAS System 16:37 Thureday, July 12, 1990 sriable Estimate Error Sum of Squares P roby rtsECSP 47.8821670 18.6813988 60.05556878 11.00 0.0014 -5.29789869 1.37013885 75.47812564 34.05 0.0004 1 -5.29789869 1.37013885 75.47812564 34.000 0.0014 1 -5.29788663 1.3718457 7.0382324 0.148 0.0014 1 1.5468139 2.21378426 7.48847734 1.48 0.2311 NTM 0.23201264 0.2338106 18.04418460 3.57 0.0067 NTM 0.23201264 0.1315120 25.39858665 5.03 0.0311 NSA -0.02716200 0.01747324 12.19772611 2.42 0.128 NST 0.02716200 0.01747324 13.3373662 2.25 0.1427 Arda on condition number: 11.73045, 636.1854 10.2567720 4.86 0.0002 rror 37 164.16542715 <td< td=""><td>Total</td><td></td><td></td><td>3.04119010</td><td></td><td></td></td<>	Total			3.04119010		
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Arriable Estimate Fror Sum of Squares F Prob/F rtgECSP 47.84521470 19.451358 7.47312545 11.50 0.0014 -2.43983601 1.3713585 7.47312545 14.55 0.0004 -2.43983601 1.3713585 7.47312545 14.55 0.0004 1.46168139 2.2137042 2.44468326 0.45 0.0146 1.46168139 2.2137042 7.46324832 0.45 0.0291 1.46168139 2.2137042 7.464246326 0.45 0.2301 NTH 0.33207284 0.23877864 4.76024683 0.2301 NTH 0.32207284 0.21471224 12.45 0.2380 NES 0.72716200 0.01471224 12.1877822 2.42 0.1285 NG Sum of Squares Hean Square 7 Prob>F rep & Variable B5 Semoved B-equare + 0.56873206 C(p) + 5.18834225 DP Sum of Squares Hean Square 7 Prob>F repression 10 242.					aday, July	12, 1990
RTSECEP 47.84211970 19.80139849 60.05558878 11.90 0.0014 1 -5.24798869 1.37011858 71.012596 14.95 0.0064 2 -4.498312 1.37118457 71.012596 5.34 0.0064 3 3920301 1.3718457 7.0312746 0.2015726 6.34 0.0014 5 1.47539824 1.21379425 7.48147734 1.46 0.0149 5 1.47539824 1.21379425 7.48147734 1.46 0.2321 5 0.4753155 0.02325186 15.04415650 3.57 0.021 5 0.4775165 0.02325186 15.04415650 3.57 0.0147 5 0.27216371 0.1471322 1.21377421 2.42 0.1227 5 0.02716200 0.0147324 11.33373062 2.23 0.1227 5 0.02716200 0.0147324 12.1877421 2.45 0.1227 5 0.02716204 R-2033001 1.33774235 1.028673206 C(p) - S.18834225 5 DF Sum of Squares Hean Square 7						36
L -5.2078865 1.3701585 75.47612596 14.65 0.0004 2.4498361 1.3718457 7.03132465 3.38 0.0744 5.3.8920501 1.3278447 33.02035725 6.54 0.0149 5.1.45580139 2.22135404 2.4488326 0.48 0.490 5.1.47839624 1.21379425 7.48847734 1.48 0.2311 DMTH 0.23207284 0.23897946 4.76024695 0.84 0.3380 5.0.30078155 0.02328586 4.76024695 0.94 0.3380 5.0.30078155 0.02328586 4.76024695 0.94 0.3380 5.0.30078155 0.02328586 4.76024695 0.94 0.3380 5.0.30079185 0.02328586 4.76024695 0.94 0.3380 5.0.30079185 0.02338611 1.333795862 2.422 0.1285 5.0.4271620 0.011471352 7.28447244 3.422 0.0238 5.0.0002 1.225 0.01277 0.4471352 7.2847244 3.42 0.0728 5.0.0001 0.001747324 12.18772821 2.422 0.1285 5.0.1427 ands on condition number: 11.73045, 636.1854 	Variable	Estimate	Brfor	sum of Squares	¥	Prob>P
2 -2.41998341 1.31719457 17.03832486 5.36 0.0149 3 3.3620301 1.3276447 33.0203728 6.56 0.0149 3 1.47538024 1.2335404 2.4448328 6.48 0.400 DHTM 0.23207286 0.23389786 4.76024895 0.54 0.3380 DHTM 0.23207286 0.23289786 4.76024895 0.54 0.3380 DHTM 0.23207284 0.1155120 27.3989888 5.03 0.0311 BR -0.26022844 0.1155120 27.3989786 2.42 0.1288 BR7 -0.02718200 0.0147324 12.18772821 2.42 0.1288 BR13 0.30475024 0.20338011 11.33373682 2.25 0.1427 pg & Variable B5 Removed R-square • 0.56873206 C(p) • 5.18834225 D.16834225 pg & Variable B5 Removed R-square • 0.56873206 C(p) • 5.18834225 D.16834225 pg & Variable B5 Removed R-square • 0.56873206 C(p) • 5.18834225 D.168034225 pg ression 10 242.86707285 24.28670729 4.386 0.0002	INTERCEP	67.88621670		60.05556878	11.90	
3.38220301 1.32784447 33.02035728 6.54 0.0409 1.44539624 1.2135404 2.44649324 0.469324 0.4399 DNTH 0.2202724 0.23897946 1.4049324 0.469324 0.4399 DNTH 0.23027244 0.23897946 1.804416860 0.57 0.0687 DR3 -0.04775185 0.02526186 18.04416860 0.57 0.0687 DR4 -2.3022444 0.1155120 25.38939808 5.03 0.0318 D.21012131 0.14711522 17.2844724 3.42 0.0728 D.30479024 0.20338011 11.33373882 2.22 0.1425 mds on condition number: 11.73045, 636.1854 5.16834225 DF Sum of Squares Hean Square 7 Prob>F rgression 10 242.88707285 24.28870728 4.88 0.0002 rtail 47 0.202.88707285 24.28870728 4.88 0.0002 rtail 427.03280000 Type 11 1.161911111 1.1	B1					
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Ariable Estimate Error Sum of Squares 7 Proby MTERCEP 78.17764939 10.29374477 290.34099029 57.68 0.0001 1 -5.35010632 1.35710327 78.23277514 15.54 0.0003 The SAS System 14:47 Thursday, July 12, 1990 37	Total					
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1 -5.35010432 1.35710327 78.23277514 15.54 0.0003 The SAB System 14:47 Thursday, July 12, 1990 37	Variable				7	teop>t
1 -5.35010432 1.35710327 78.23277514 15.54 0.0003 The 8A8 System 14:47 Thursday, July 12, 1950 31	INTERCEP	78.17764939	10.29374477	290.34099029	\$7.65	0.0001
37	b 1					
			The SAS Sy	stes 14:47 Thur	eday, July	
3 -1.79318818 1.07172441 14.09208329 2.80 0.1028						
	82	-1.79318818	1.07172441	14.09208329	2.80	0.1025

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	3.89650	308	1.23168564	50.37789238	10.01	
33						0.0031
16	1.99605	319	0.84824359			0.0239
-						
MSR3	-0.0587		0.02300294			0.0148
MSR4	-0.3235(1576	0.09457127	58.91727761	11.70	0.0015
MSR5	0.35443	3295	0.12833432	38.39478464	7.63	0.0088
MSR7	-0.01550		0.01517229			
MSR13	0.20371		0.10782438	17.98303544	3.57	0.0664
	condition nu			273.8667		
tep10	Variable MSR7	Renove	d R-squa	re = 0.53975567	C(p) = 3.2	8385063
	DF	1	un of Squares	Hean Square	1	Prob) P
Regressi			230.49321225	28.51165153	5.72	0.0001
Irror	39		196.53928775	5.03946892		
Total	47		427.03250000			
	Parano	ter	Standard	Type II		
Variable	Estis	la te	Irror	Sum of Squares	1	Prob ?
				•	_	
INTERCEP	80.79599	454	9.97551469	330.59311778	65.60	0.0001
	-4.7709		1.23382816			
						0.0004
12	-1.47350		1.02564309			0.1588
3	3.45199	232	1.15297665	45.17241684		0.0048
36	1.92057	900	0.84550108	26.00284019		0.0287
	-0.06834	141				
ISR3	+U, U0D34	1171	0.02100031			0.0024
15R4	-0,32558		0.09460415	59.68836711	11.84	0.0014
1525	0.37764	769	0.12638007	44.99883198	8.93	0.0048
18R13	0.16906		0.10238747			
	••••••					••••••
	condition num					
	•••••••					
	•••••••				C(p) • 3.0	4532702
	•••••••	moved	R-sque			
tepl1 . Y	Variable B2 Re D7	moved S	R-sque	re = 0.81539822 Hean Square	7	
top11 . 1	Variable B2 Re DF on 7	moved S	R-squa of Squares 220.09179226	re = 0.\$1539822 Hean Square 31.44168461	F 6+08	frob)f
tepli . 1 Regressia Error	Variable B2 Re DF on 7 40	moved S	R-squa of Squares 220.09179226 206.94070774	re = 0.81539822 Hean Square 31.44168461	F 6+08	frob)f
legressia Ingressia	Variable B2 Re DF on 7	moved S	R-squa of Squares 220.09179226	re = 0.\$1539822 Hean Square 31.44168461	F 6+08	frob)f
legressia Ingressia	Variable B2 Re D7 on 7 40 47	moved S	R-squa of Squares 220.09179226 206.94070774 427.03250000	re = 0.81539822 Hean Square 31.44168461 5.17351769	7 6+08	frob)f
legressia	Variable B2 Re DF on 7 40	moved S	E-squa of Squares 220.09179226 206.94070774	re = 0.81539822 Hean Square 31.44168461 5.17351769	P 6+08	Prob) P 0.0001
tepli . Regressio Error Fotal	Variable B2 Rd DF on 7 40 47 Faranc	moved S	R-squa of Squares 220.09179226 206.94070774 427.03250000 Standard	re = 0.81539822 Hean Square 31.44168461 5.17351769	P 6+08	Prob) P 0.0001
tepli . tegressic tror fotal /ariable	Variable B2 Re DF on 7 40 47 Parama Batim	moved S oter late	E-squa Um of Squares 220.09179226 206.94070774 427.03250000 Standard Error	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares	P 6.08 P	Prob> F 0.0001 Prob> F
tepli . Regression Error Fotal Variable KWTBRCEP	Variable B2 Re D7 on 7 40 47 Paramo Bstis 76.67631	moved S otor usto 1336	E-squa E-squa E of Squares 220.09179226 208.94070774 427.03250000 Standard Stror 9.68073504	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435	F 6.08 F 62.73	Frob>F 0.0001 Frob>F 0.0001
tepli . Regression Error Fotal Variable KWTBRCEP	Variable B2 Re DF on 7 40 47 Parama Batim	moved S otor usto 1336	E-squa Um of Squares 220.09179226 206.94070774 427.03250000 Standard Error	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435	F 6.08 F 62.73	Frob>F 0.0001 Frob>F 0.0001
tepli . tegressic tror total variable twiskcep bl	Variable B2 Re D7 on 7 40 47 Paramo Bstis 76.67631	moved 8 1000 1000 1000 1000 1000 1000 1000 1	E-squa 0 of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.65614435 99.01944868	F 6,08 F 62,73 19,14	Frob>F 0.0001 Frob>F 0.0001 0.0001
tepli . V Regressio Error Fotal Variable (NTERCEP B1 B3	Variable B2 Re D7 on 7 40 47 Paramo 8stis 76.67638 -5.25830 2.81780	moved 8 0ter 1010 1035 1035 1035	E-squa of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.65614435 99.01944888 35.26953408	F 6.08 F 62.73 19.14 6.82	Frob>F 0.0001 Frob>F 0.0001 0.0001 0.0001 0.0120
Copli V Regressio Pror Total Variable (MTBRCEP)1 33	Variable B2 Ro D7 on 7 40 47 Paramo Bstis -5,25836 2,81760 1,64820	moved S ster hate 1336 1327 1999	E-squa of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.66073504 1.20194142 1.07922805 0.83485868	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614436 99.01944868 35.26953408 20.16438974	F 62.73 19.14 6.82 3.90	Prob / F 0.0001 Prob / F 0.0001 0.0001 0.0120 0.0120 0.0553
Copli V Correction Cotal Variable CNTERCEP Di Si Si Si Si Si Si Si Si Si Si Si Si Si	Variable B2 Rd DF on 7 40 47 Paramo 8stis 76.87631 -5.25830 2.81780 1.84820 -0.0548	moved 8 1000 1000 1000 1000 1000 1000	R-squa 01 Squares 220.09179226 206.94070774 427.03250000 Standard Brror 9.68073504 1.20194142 1.07922805 0.63485868 0.01892229	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55514435 99.01944668 35.26953408 20.16438974 42.98570208	F 6.08 F 62.73 19.14 6.82 3.90 8.31	Proby F 0.0001 Proby F 0.0001 0.0001 0.0120 0.0120 0.0553 0.0063
tepli . tegressic tror total variable (MTBRCEP) 1 3 3 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Variable B2 Rd DF on 7 40 47 Paramo 8stis 76.87638 -5.25836 2.81786 1.84826 -0.05456 -0.36903	moved 8 1000 1000 1000 1000 1000 1000 1000 1	E-squa 220.09179226 206.94070774 427.03250000 Standard Error 9.66073504 1.20194142 1.0792205 0.33405868 0.01892829 0.09082417	re = 0.\$1539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55514435 99.01944868 35.24953408 20.16438974 42.98570208 85.41092123	F 6.08 F 62.73 19.14 6.82 3.90 8.31 16.51	Prob» F 0.0001 Prob» F 0.0001 0.0001 0.0120 0.0120 0.0553 0.0063 0.0063
tepli . tegressic tror total variable (MTBRCEP) 1 3 3 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Variable B2 Rd DF on 7 40 47 Paramo 8stis 76.87631 -5.25830 2.81780 1.84820 -0.0548	moved 8 1000 1000 1000 1000 1000 1000 1000 1	R-squa 01 Squares 220.09179226 206.94070774 427.03250000 Standard Brror 9.68073504 1.20194142 1.07922805 0.63485868 0.01892229	re = 0.\$1539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123	F 6.08 F 62.73 19.14 6.82 3.90 8.31 16.51	Prob» F 0.0001 Prob» F 0.0001 0.0001 0.0120 0.0120 0.0553 0.0063 0.0063
tepli 1 tegressic tror fotal variable (NTBRCEP)1)3)6 (SR3 (SR4 (SR5	Variable B2 Rd DF on 7 40 47 Paramo 8stis 76.87638 -5.25836 2.81786 1.84826 -0.05456 -0.36903	moved 8 92497 1457 1457 1999 1457 1999 1994	E-squa 220.09179226 206.94070774 427.03250000 Standard Error 9.66073504 1.20194142 1.0792205 0.33405868 0.01892829 0.09082417	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.5590804	F 62.73 19.14 6.82 3.90 8.81 16.51 7.45	Prob) F 0.0001 Prob) F 0.0001 0.0001 0.0124 0.0553 0.0002 0.0094
tepl1 . Regression Error Fotal Variable UNTERCEP B1 B3 B6 HSR3 HSR4 HSR5	Variable B2 Re D7 on 7 40 47 Paramo Batis 76.67631 -5.25836 2.81786 1.64220 -0.05436 -0.36805 0.34322	moved 8 92497 1457 1457 1999 1457 1999 1994	E-squa E-squa 220.09179226 206.94070774 427.03250000 Standard Brror 9.68073504 1.20194142 1.07922805 0.6348660 0.01092820 0.09082417 0.12572819	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.5590804	F 6.08 F 62.73 19.14 6.82 3.90 8.31 10.51 7.45	Prob>F 0.0001 Prob>F 0.0001 0.0001 0.0126 0.0553 0.0063 0.0002 0.0094
tepl1 . Regression Error Fotal Variable INTERCEP D1 D3 D6 HSR3 HSR4 HSR5 HSR13	Variable B2 Ro DF on 7 40 47 Paramo Bstis 76.67638 -5.25830 2.81780 1.64820 -0.36603 0.34322 0.21737	moved 8 200 336 327 457 999 1075 296 994 295	E-squa 0 of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.33695868 0.01892829 0.09087417 0.12572818 0.08798707	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141	F 6.08 F 62.73 19.14 6.82 3.90 8.31 10.51 7.45	Prob>F 0.0001 Prob>F 0.0001 0.0001 0.0126 0.0553 0.0063 0.0002 0.0094
tepl1 . Regression Error Fotal Variable INTERCEP D1 D3 D6 HSR3 HSR4 HSR5 HSR13	Variable B2 Re D7 on 7 40 47 Paramo Batis 76.67631 -5.25836 2.81786 1.64220 -0.05436 -0.36805 0.34322	moved 8 200 336 327 457 999 1075 296 994 295	E-squa 0 of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.48073504 1.20194142 1.07922805 0.83485868 0.01892929 0.09082417 0.12572818 0.08798707 5.272878,	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55514635 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141 143.1572	F 6.08 F 62.73 19.14 6.82 3.90 8.31 16.51 7.45 4.92	Prob F 0.0001 Prob F 0.0001 0.0001 0.0126 0.001 0.0126 0.005 0.0063 0.0002 0.0094 0.0323
tepli . Regression Error Fotal Variable (NTERCEP D1 D3 D6 4583 4584 1585 15813	Variable B2 Ro DF on 7 40 47 Paramo Bstis 76.67638 -5.25830 2.81780 1.64820 -0.36603 0.34322 0.21737	moved 8 200 336 327 457 999 1075 296 994 295	E-squa 0 of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.48073504 1.20194142 1.07922805 0.83485868 0.01892929 0.09082417 0.12572818 0.08798707 5.272878,	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141	F 6.08 F 62.73 19.14 6.82 3.90 8.31 16.51 7.45 4.92	Proby F 0.0001 Proby F 0.0001 0.0001 0.0120 0.0120 0.0053 0.0003 0.0003 0.0003 0.0004 0.0323
tepl1 . Regressic Error Fotal Variable INTERCEP D1 D3 D6 MSR3 MSR4 MSR3 MSR4 MSR13	Variable B2 Ro DF on 7 40 47 Paramo Bstis 76.67638 -5.25830 2.81780 1.64820 -0.36603 0.34322 0.21737	moved 8 200 336 327 457 999 1075 296 994 295	E-squa 0 of Squares 220.09179226 206.94070774 427.03250000 Standard Error 9.48073504 1.20194142 1.07922805 0.83485868 0.01892929 0.09082417 0.12572818 0.08798707 5.272878,	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55514635 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141 143.1572	F 6.08 F 62.73 19.14 6.82 3.90 8.31 16.51 7.45 4.92	Prob>F 0.0001 Prob>F 0.0001 0.0001 0.0126 0.0053 0.0003 0.0003 0.0002 0.0094 0.0323
tepl1 . Regression Error Fotal Variable (NTERCEP 51 53 54 1583 1584 1585 15813 punds on	Variable B2 Re D7 on 7 40 47 Parame 8stis 76.87631 -5.25834 2.81784 1.64220 -0.05434 -0.36905 0.34322 0.21737	moved 8 1010 1015 1336 1327 1457 1999 1075 1296 1994 1995 1994 1995	E-squa control Squares 220.09179228 208.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.3345868 0.01892828 0.09082417 0.12572818 0.09795707 5.272878, The SAS Standard	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55514635 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141 143.1572	F 62.73 19.14 6.82 3.90 8.31 16.51 7.45 4.92 ursday, July	Prob>P 0.0001 Prob>P 0.6001 0.002 0.002 0.0053 0.0002 0.0094 0.0323 12, 199 3
tepl1 . V Regression Error Fotal Variable (NTERCEP D1 D3 D6 1583 1584 15813 punds on	Variable B2 Ro DF on 7 40 47 Paramo Bstis 76.67638 -5.25830 2.81780 1.64820 -0.6480 0.34322 0.21737 condition num	moved 8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	E-squa 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.33485868 0.01892829 0.09082417 0.12572818 0.09798707 5.272878, The SAS Standard	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.55590804 25.46029141 143.1572 ystem 36:47 Th	F 62.73 19.14 6.82 3.90 6.31 10.51 7.45 4.92 ursday, July	Prob>F 0.0001 Frob>F 0.0001 0.0001 0.0126 0.0553 0.0002 0.0094 0.0323 12, 199 3
tepl1 . Regression Error Fotal Variable (NTERCEP B1 B3 B6 1583 1584 1585 15813 bounds on 11 varial	Variable B2 Re D7 on 7 40 47 Paramo Bstis 76.67638 -5.25836 2.81786 1.64826 -0.05456 -0.36903 0.34321 0.21737 condition num	moved S Stor hate 3336 327 3457 1999 1075 1999 1075 1999 1075 1999 1075 1999 1099 1099 1099 1099 1099 1099 109	E-squa 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.83485868 0.01892829 0.09082417 0.12572818 0.09798707 5.272878, The SAS S	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.5590804 25.46029141 143.1572 ystem 16:47 Th	F 6.08 F 62.73 19.14 6.62 3.90 8.31 16.51 7.45 6.92 ursday, July	Prob F 0.0001 Prob F 0.0001 0.0126 0.001 0.0126 0.0053 0.0002 0.0004 0.0323 12, 199 3
tepl1 . Regressic Error Fotal Variable INTERCEP B1 B3 B6 HSR3 HSR4 HSR3	Variable B2 Re D7 on 7 40 47 Parame Batis 76.67631 -5.25836 2.81786 1.64220 -0.05434 -0.36903 0.34322 0.21737 Condition num bles left in 1 y of Backward	moved S S S S S S S S S S S S S	E-squa 220.09179228 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.3892828 0.01892828 0.09082417 0.12572818 0.09798707 5.272878, The SAS S 0.1 are signif.	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.98570208 65.41092123 38.55590804 25.46029141 143.1572 ystem 16:47 Th	F 6.08 F 62.73 19.14 6.62 3.90 8.31 16.51 7.45 6.92 ursday, July	Prob P 0.0001 Prob P 0.0001 0.0126 0.0053 0.0002 0.0024 0.0023 12, 199 3
tepl1 . Regression Error Fotal Variable INTERCEP B1 B3 MSR3 MSR4 MSR5 MSR13 ounds on 11 varial Summary	Variable B2 Re D7 on 7 40 47 Parame Batis 76.67631 -5.25836 2.81786 1.64220 -0.05434 -0.36903 0.34322 0.21737 Condition num bles left in 1 y of Backward	moved S S S S S S S S S S S S S	E-squa E-squa 220.09179228 208.94070774 427.03250000 Standard Brror 9.68073504 1.20194142 1.07922805 0.348368 0.01092820 0.09082417 0.12572818 0.09798707 5.272878, The SAS S 0.1 Are signifing ation Procedus Partial Models	re = 0.51539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55614435 99.01944868 35.26953408 20.16438974 42.95570208 85.41092123 38.55590804 25.46029141 143.1572 ystem 16:47 Th	F 6.08 F 62.73 19.14 6.62 3.90 8.31 16.51 7.45 6.92 ursday, July	Prob>F 0.0001 Frob>F 0.0001 0.001 0.0126 0.0126 0.0126 0.0022 0.0094 0.0323 12, 199 3
tepli . V Regressio Error Fotal Variable INTERCEP B1 B3 D6 MSR3 MSR4 HSR5 MSR13 ounds on 11 varial Summar; Step 1	Variable B2 Re DF on 7 40 47 Paramo Bstis 76.67633 -5.25836 2.81786 1.64820 -0.64820 -0.64820 0.34322 0.21737 condition num bles left in t y of Baokward Variable Num Removed	moved ster hate 336 327 457 999 1075 296 994 395 aber: he mod Elimin ber In	E-squa of Squares 220.09179226 206.94070774 427.03250000 Standard Brror 9.68073504 1.20194142 1.07922805 0.03485888 0.01892920 0.0082417 0.02572818 0.09798707 S.272878, The SAS S 0.09798707 S.272878, The SAS S 0.09798707 S.272878, The SAS S 0.09798707 S.272878, The SAS S 0.09798707 S.272878, The SAS S 0.09798707 S.272878, She SAS S 0.09798707 SAS S 0.097978707 SAS S 0.097978707 SAS S 0.0979775 SAS S 0.0979775	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435 99.01944868 35.26953408 20.16438974 42.98570208 98.41092123 38.55590804 25.46029141 143.1572 ystem 10:47 Th icant at the 0.10 re for Dependent Tode1 hes2 C(p)	F 62.73 19.14 6.82 3.90 6.31 10.51 7.45 4.92 ursday, July 00 level. Variable MSB	Prob> P 0.0001 Prob> P 0.0001 0.0001 0.0001 0.0023 0.0063 0.0023 0.0023 12, 199 3 12, 199 3 12 Prob> P
tepli varial Summar; Step i	Variable B2 Re DF on 7 40 47 Paramo Bstis 76.67633 -5.25836 2.81786 1.64826 -0.6486 -0.36493 0.21737 0.21737 condition num blog left in t y of Baokward Variable Num Removed B4	moved S stor hate 1336 1327 1457 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1999 1075 1995 1996 1997 1996 1997 100 100 100 100 100 100 100 10	E-squa 220.09179226 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.3365868 0.01892829 0.09082417 0.12572818 0.09798707 S.272878, The SAS S 0.1 Are signif. ation Procedu: Partial Mi R=2 1 0.0001 0,1	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435 99.01944868 35.26953408 20.16438974 42.98570208 85.41092123 38.5590804 25.46029141 143.1572 ystem 16:47 Th icant at the 0.10 re for Dependent pde1 he-2 C(p) 1988 17.0106	F 62.73 19.14 6.82 3.90 8.31 16.51 7.45 4.92 ursday, July 00 level. Variable HSE P 0.0108	Prob P 0.0001 Prob P 0.0001 0.0001 0.0126 0.0553 0.0063 0.0063 0.0063 12, 199 3 12, 199 3 12 Prob P 0.9188
tepl1 . Regressic Error Total Variable INTERCEP B1 B3 B6 HSR3 HSR4 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR4 HSR5 HSR3 HSR4 HSR5 HSR3 HSR4 HSR5 HSR3 HSR4 HSR5 HSR3 HSR4 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR4 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR3 HSR5 HSR5 HSR3 HSR5 HSR3 HSR5 HSR5 HSR5 HSR3 HSR5	Variable B2 Re DF on 7 40 47 Paramo Bstis 76.67633 -5.25836 2.81786 1.64820 -0.64820 -0.64820 0.34322 0.21737 condition num bles left in t y of Baokward Variable Num Removed	moved ster hate 336 327 457 999 1075 296 994 395 aber: he mod Elimin ber In	E-squa 220.09179228 206.94070774 427.03250000 Standard Error 9.68073504 1.20194142 1.07922805 0.0392829 0.09082417 0.12572818 0.09798707 S.272878, The SAS S 0.272878, The SAS S 0.272878, The SAS S 0.272878, The SAS S 0.0001 0.1 0.0001 0.1 0.0004 0.1	re = 0.81539822 Hean Square 31.44168461 5.17351769 Type II Sum of Squares 324.55814435 99.01944868 35.26953408 20.16438974 42.98570208 98.41092123 38.55590804 25.46029141 143.1572 ystem 10:47 Th icant at the 0.10 re for Dependent Tode1 hes2 C(p)	F 62.73 19.14 6.82 3.90 6.31 10.51 7.45 4.92 ursday, July 00 level. Variable MSB	Prob / F 0.0001 Prob / F 0.0001 0.0001 0.0001 0.0001 0.002 0.0043 0.002 0.0043 0.002 0.0043 12, 198 12 Prob / F

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4	87	14	0.001/	0.5946	11.3205	0.1385	0.7122
	MSR2	13	0.0031	0.5915	9.5431	0.2505	0.6201
5	IIQ44	4.7	A+4431				
6	MSR1	12	0.0102	0.5813	8.2804	0.8486	0.3634
Ĩ	MERS	11	0.0068	0.5745	6.7743	0.5709	0.4550
8	35	10	0.0057	0.5687	5.1883	0.4843	0.4909
ē	NONTH	9	0.0167	0.5521	4.3935	1.4297	0.2394
10	MSR7	8	0.0123	0.5398	3.2839	1.0445	0.3132
11	82	1	0.0244	0.5154	3.0453	2.0640	0.1588

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OBS	B 1	82	83	14	3 5	84	B7	HONTH	MSR1	MSR2	MSR3	NSR4
1	0	0	1	0	0	0	0	1	21.90	84.85	48.10	16.32
2	Ō	0	1	0	Ó	0	0	2	26.58	85.07	59.31	12.26
3	0	0	1	0	0	0	0	3	26.08 26.18	83.60 85.09	70.71 52.52	16.64 18.40
4	0	0	1	0	ŏ	0	ŏ	5	26,64	84.23	\$5.28	18.71
6	ō	ō	ī	ō	ŏ	õ	0.	6	24.02	83.89	35.65	16.25
7	0	0	0	1	0	0	0	1	21.10 19.30	80.93 83.35	15.40 17.60	9.30 9.50
8 9	0	0	0	1	0	0	0	2 3	20.80	81.61	23.70	11.14
10	ŏ	ŏ	ŏ	1	0	ō	0	4	22.30	80.20	14.80	13.30
11	0	0	0	1	0	0	0	5	25.10 19.30	75.63 80.76	23.90 20.10	13.10 10.10
12 13	0	0	0	1 0	0	0	ŏ	1	10.20	77.51	\$1.70	14.60
14	ō	ō	ŏ	ō	ī	ō	0	2	21.70	71.94	91.60	14.80
15	0	0	0	0	1	0	0	3	10.40	72.15 71.76	72.80 96.90	7.80 6.50
16 17	0	0	0	0	1	0	0	4	17.10 20.50	72.91	76.00	6.90
18	ŏ	ŏ	ŏ	ŏ	ī	ŏ	ō	6	19.30	75.32	53.00	6.90
19	0	0	0	0	0	1	0	1	14.30	78.39	85.00	18.30
20	0	0	0	0	0	1	0 0	2 3	14.80 13.50	80.57 79,99	72.00 57.90	14.20 15.20
21 22	ŏ	ŏ	ŏ	ŏ	ŏ	i	ŏ	4	13.20	80.59	25.20	17.80
23	Ö	Ō	0	0	0	1	0	5	13.00	80.72	25.50	23.80
24	0	0	0	0	0	1	0 1	6 1	17.90 51.80	80.59 87.48	27.90 86.00	21.90 24.00
25 26	0	0	0	0	0	0	i	2	45.60	72.31	115.00	31.00
035	MSR		MSR6	MSR7		ISR8	MSRS) MSK		11 HSR1:	2 MSR	13
1	9.9	5	48.3	52	1	7.40	2.00	89 (.5 95			89
2	9.5		49.6	100		0.00	0.70					
3	9.9		48,8 49,2	87 131		9.10	3.30		.6 94 .0 94			
45	10.7		48.4	90		6.50	2.8			.2 96.	7 99.	
6	11.3	15	41.1	103	1	99.90	3.7					
7	6.0		30.5	75		18.50 79.40	3.7(.0 95 .9 94			
8	5.1		29.3 28.9	82 86		3.10	1.1		.9 95			
10	6.3	0	30.5	89	1	12.60	1.7	5 86	.9 95			
11	7.5		29.6	78		1.50	1.3		.0 96 .7 9 5			
12 13	7.0 18.0		31.2 47.1	84 19		78.40 94.97	0.9		.9 94			1.2
14	19.7		45.9	26		17.42	1.6	5 89	.0 95			
15	17.2		46.1	\$1		12.81	1.0			.4 95. .1 94.		
16 17	17.0		47.0 44.9	24 100		08.04 07.22	2.4		.4 94			
10	14.0		45.6	73	1	98.00	2.2	0 94	.5 94	.9 98.	9 91.	60
19	17.0		42.0	69		99.24	0.8			.0 85. .6 94.		
20 21	16.0		43.8 43.8	57 74		DU.45 D7.80	0.0		·.7 94 •.6 93	. 9 97.		
22	16.9		42.4	43		00.00	0.0			.3 19.	9 99 .	
23	17.		41.9	46		98.59	0.0			.4 95.		
24	16.		41.7	80 91		99.30 75.60	1.9			.8 98. .1 87.		
25 26	22.(34.5	67		71.60	1.7		.2 92	.9 87.	ē 97.	10
••			=					System	14:4	9 Thur ada	y, July	12, 1990 2
085	81	D 2	83	84	35	36	87	Nonth	M521	MSR2	MBRJ	MSR4
27	0	0	0	0	0	0	1	3	\$0.60	66.45	100.00	26.00
28	0	0	0	0	0	0	1	4	47.00	64.51 64.88	123.00	26,00 29,00
29 30	0	0	Ö	Ö	ŏ	ŏ	i		48.40	77.20	91.00	23.00
31	-1	-1	-1	-1	-1	-1	-1	1	23,90	75.18	48.00	19.00

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32	-1	-1	-1	-1	-1	-1	-1	2	31.60	77.16	50.00	21.00
33	-1	-1	-1	-1	-1	-1	-1	3	23.20	79.22	36.00	15.00
34	-1	-1	-1	-1	-1	-1	-1	4	24.90	79.17	38.00	18.00
55	-1	-1	-1	-1	-1	-1	-1	5	25.90	81.80	40.00	19.00
36	-1	-1	-1	-1	-1	-1	-1	6	21.00	86.78	44.00	12.00
085	HS1	15	MSR6	HSR7		MSR8	MSR9	H\$R10) MSR1	1 NSB12	MSR13	I
27	24.0	0	34.2	76		87.50	0.00	95.(93.	4 92.1	94.60)
28	26.0		34.3	98		55.70	0.00	96.1	• • • • •			
29	29.0	0	32.3	135		81.00	1.20	94.0			95.50)
30	30.0		31.0	102		85.20	5.60	94.1			95.70	
31	17.0		29.6	59		64.40	2.90	95.0		· -		
32	17.0	-	29.9	43		93.90	1.20	96.4		-		
33	13.0		30.4	63		91.00	0.00	95.1		-		
34	15.0		29.8	87		92.30	1.10	95.				
35	15.0		30.0	67		84.60	0.00	93.0				
36	14.0		27.2	80		80.00	1.10	97.0				-
						The		lyster		Thursday		

Backward Elimination Procedure for Dependent Variable HSR10

Step 0 All Variables Entered R-square = 0.64258878 C(p) = 19.00000000
NOTE: The model is not of full rank. A subset of the model which is of full
rank is chosen.

	DF	Sum of Squares	Mean Square	r	Prob> F
Regressio	n 18	182.58714007	10.14373000	1.70	0.1405
Brror	17	101.55591548	5.97387738		
Total	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	Prob>T
INTERCEP	90.48796723	56.32324156	15.41922994	2.58	0.1266
81	7.31404712	39.11726127	0.20885022	0.03	0.8539
B 3	2.64589939	9.34822509	0.47856908	0.08	0.7806
B4	0.55266712	9.45476434	0.02041184	0.00	0.\$541
85	-6.42666197	10.70790879	2.15187922	0.36	0.5563
B6	-6.53828528	8.14159974	3.85269421	0.64	0.4330
MONTH	0.50502532	0.38608536	10.22153078	1.71	0.2063
MSR1	-0.18539978	0.20159438	5.05263430	0.85	0.3706
MSR2	-0.22149415	0.21594808	6,28466529	1.05	0.3194
HSR3	-0.03361370	0.04289291	3.64874793	0.61	0.4440
MSR4	-0.34889430	0.21776757	15.33407680	2.57	0.1275
MSR5	0.68423498	0.47024333	12.64799181	2.12	0.1639
M526	0.30535963	0.35601755	3.73822508	0.63	0.4398
MSR7	-0.04807522	0.02848790	17.01288054	2.85	0,1098
MSR8	0.01721005	0.06965573	0.36467562	0.06	0.8078
MSR9	-0.51599832	0.57572127	4.79875215	0.80	0.3826
MSR11	-0.28019969	0.40128248	2.91266950	0.49	0.4945
MSB12	-0.20171282	0.29718400	4.63292686	0.78	0.3908
MER13	0.68384410	0.31091668	28.89897734	4.84	0.0420
Bounds on	condition number:	1280.709,	39667.02		********
Step 1 V	ariable 34 Rem ove	d I-squar	0.64251695	C(p) = 17.0	0341685

	DT	Sum of Squares	Hean Square	7	Prob>P
Regression	17	162.56672823	10.73921931	1.90	0.0925
Srror Total	18 35	101.57632732 284.14305556	5.64312930		
	Parametor	Standard	Туре 11		
Variable	Estimate.	Irror	Sum of Squares	1	Prob>P
INTERCEP	81.28277804	\$3.12270422	16.66239205	2.95	0.1029

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81	9,28622316	19.23909449	1.31470701	0.23 0.8351
83	2.25784652	6.39684846	0.70303462	0.12 0.7282
35	-6.79028592	8.47091779	3.62606170	0.64 0.4332
16	-6.85623644	5.88758564	7.65278711	1.36 0.2594
		• • • • • • • • • •		
MONTE	0.50986882	0.36650139	10.92158515	1.94 0.1811
HSR1	-0.19189360	0.16349870	7.77342453	1.38 0.2558
HSR2	-0.22476357	0.20272278	6.93692088	1.23 0.2821
		The SAS System	16:49 Thure	day, July 12, 1990
				4
MSR3	-0.03336620	0.04148500	3.65049198	0.65 0.4317
HSR4	-0.34895132	0.21165119	15.33939716	2.72 0.1166
MSR5	0.66360380	0.30201038	27.24544933	4.83 0.0413
HSR6	0.30260390	0.37237085	3.72664218	0.66 0.4270
MSR7	-0.04792608	0.02757678	17.04420501	3.02 0.0993
HSR8	0.01695314	0.06756511	0.35528372	0.06 0.8047
	-0.50091414		5.65927013	1.90 0.3299
HSR9		0.50019930	• · · · • • • • • • • •	
MSR11	-0.27029861	0.35356771	3.29808947	0.58 0.4545
MSR12	-0.26526707	0.28272962	4.96757093	0.88 0.3605
MSR13	0.68108646	0.29868820	29.34190909	5.20 0.0350
Bounds on	condition number:	327.9588, 1	.3641.43	

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 Step 2
 Variable B7 Entered
 R-square = 0.64258878
 C(p) = 19.00000000

 NOTE: The variable which previously had small tolerance is now allowed to enter after removal of some variables from the model.

	DF	Sum of Squares	Mean Square	7	Prob>F
Regressi	on 18	182.58714007	10.14373000	1.70	0.1405
Error	17	101.55591548	5.97387738		
Total	35	284.14305356			
	ParaBeter	Standard	Type II		
Variable	Estimate	#rror	Sum of Squares	1	Prob>P
INTERCEP	91.04063435	54.81407356	16.47944942	2.76	0.1151
B1	10.63004982	30.33737288	0.73345076	0.12	0.7393
B3	2.09323227	7.15881679	0.51075032	0.09	0.7735
35	-6.97932908	9.29630529	3.36715339	0.56	0.4631
36	-7.09095240	7.26746746	5.68720983	0.95	0.3429
357	-0.55266712	9.45476434	0.02041184	0.00	0.9541
MONTH	0.50502532	0.38608536	10.22153078	1.71	0.2083
MSR1	-0.14539978	0.20159438	5.05263430	0.85	0.3706
HSR2	-0.22149415	0.21594808	6.28466529	1.05	0.3194
MSR3	-0.03361370	0.04289291	3.60874793	0.61	0.4440
MSR4	-0.34889430	0.21776757	15.33407680	2.57	0.1275
HSR5	0.68423498	0.47024333	12.6479 P 181	2.12	0.1639
MSEC	0.30535963	0.38601755	3,73822508	0.63	0.4398
MSE7	-0.04807522	0.02848790	17.01288054	2.85	0.1098
MSR8	0.01721005	0.06965573	0.36467562	0.06	0.1078
MSRØ	-0.51599832	0.\$7\$72127	4.79875215	0.80	0.3826
MSR11	-0.28019969	0.40128248	2.91266950	0.49	0.4945
MSR12	-0.26171282	0.29718400	4.63292686	0.78	0.3908
MSR13	0.68384410	0.31091668	28.89897734	4.84	0.0420
Bounds on	condition number:	770.3173,	27665.17		
Step 3	Variable 37 Bomove	d R-squar	• • 0.64251695 C	(p) = 17.0	0341685
		A	Mara 6	-	

Step 3	Variable 37	Laborad	I-Square	0.64251695	C(p) = 17.00	7341485
	Df	sun of	Iquares	Hean Square	7	Prob>7
Regressi	on 17	182.	54672823	10.73921931	1.90	0.0928
Brrar	18	101.	57632732	5.64313930		
Total	35	284.	14305556			
		T	he SAS Syst	6149 Thu	rsday, July	12, 1990 S

Standard

17-27

Parameter

Type II

Variable	Estimate	Strot.	Sum of Squares	T	Prob>f
INTERCEP	91.28277804	53.12270422	16.66239205	2.95	0.1029
81	9.28622316	19.23909449	1.31470701	0.23	0.6351
83	2.25784652	6.39684848	0.70303462	0.12	0.7282
35	-6.79028592	8.47091779	3.62606170	0.64	0.4332
86	-6.85625644	5.88758564	7.65278711	1.36	0.2594
HONTH	0.50986882	0.36650139	10.92158515	1.94	0.1811
MSR1	-0.19189360	0.16349870	7.77342453	1.38	0.2558
HSR2	-0.22476357	0.20272278	6.93692088	1.23	0.2821
HSR3	-0.03336620	0.04148500	3.65049198	0.65	0.4317
MSR4	-0.34595132	0.21165119	15.33939716	2.72	0.1166
MSR5	0.66360380	0.30201038	27.24544933	4.83	0.0413
MSR6	0.30260390	0.37237085	3.72664218	0.66	D.4270
MSR7	-0.04792608	0.02757678	17.04420501	3.02	0.0993
MSRS	0.01695314	0.06756511	0.35528372	0.06	0.8047
MSR9	-0.50091414	0.50019930	5.65927013	1.00	0.3299
MSE11	-0.27029861	0.35356771	3.29808947	0.58	0.4545
MSR12 MSR13	-0.26526707 0.68108646	0.28272962 0.29868820	4.96757093 29.34190909	0.88	0.3605 0.0350
HDEL J	A. 001/0040	V. 290002V	TA: 34180808	5.20	0.0330
Bounds on cos	ndition number:	327.9588,	13641.43		
			-		*******
Stand Varia		und 8		C(n) - 18 A	2388879
arah 4 482)	CHPH VAUN VAUNA	ved B-square	t - N'DJ120030	-(P) - 79.0	******
	Df	Sum of Squares	Hean Square	7	Prob>P
Regression	16	182.21144451	11.38821528	2.12	0.0595
Strot	19	101.93161104	5.36482163		
Total	35	284.14305556			
1		\$4 11 11111111			
	Parameter	Standard	Type II		
Variable	Estimate	Brror	Sum of Squares	7	Prob>P
				-	
INTERCEP	88.41537116	50.58351441	16.39052395	3.05	0.0966
D1	7.95501230	18.03132926	1.04419476	0.19	0.6641
B3	2.52833243	6.14791281	0.90733620	0.17	0.6855
85	-6.34118434	8.07291721	3.31005376	0.62	0.4419
36	-6.38768133	5.44414404	7,38554515	1.38	0.2552
MONTH	0.50508088	0.35686490	10.74656047	2.00	0.1732
MSR1	-0.17662511	0.14796360	7.64452328	1.42	0.2473
HSR2	~0.21472883	0.19377618	6.58772140	1.23	0.2816
MSR3	-0.03557837	0.03952509	4.34691886	0.81	0.3793
MSR4	-0.36207640	0.19996426	17.58939824	3.28	6.0860
MBR5	C.86923709	0.29365419	27,86396382	5.19	0.0344
MSRG	0.30734502	0.36260473	3.85425731	0.72	0.4072
MSR7	-0.04783039	0.02688559	16.97946044	3.16	0.0912
MBR9	-0.50501745	0.48744823	5.75852254	1.07	0.3132
MSR11	-0.24278365	0.32773922	2.94399671	0.55	0.4679
MSR12	-0.27020245	0.27500172	\$.17920433	0.97	0.3382
MSR13	0.69081260	0.28876890	30,70301070	5.72	0.0272
			19090 40		
	ndition number:	303.0192,	16V69+99 		
		The SAS Sy	stes 16:49 Th	urnday, July	
					4
Step 5 Var:	iable 33 Remove	d R-square	• • 0.63807334	C(p) = 13.2	1477370
	D7	Sum of Squares	Hean Square	7	top)
		•	•		
Regression	15	181,30410831	12.08694055		0.0378
Brfor	20	102,83894724	8,14194736		
Total	36	284.14305558			
		.	_		
	Parameter		Type I1		
Variable	S stimate	Error	Sum of Squares	1	Prob>7
INTERCEP	83.10846590		15.49014088		
81	14.43409773	8.58638358	14.53069335	2.83	0.1083

B6 -8.13937220 3.31939993 30.91849707 6.01 0.023 MONTH 0.55598807 0.32769944 14.80048428 2.86 0.10 MSR1 -0.19371444 0.13902755 9.90274320 1.94 0.17 MSR2 -0.21174669 0.18957552 6.41499538 1.25 0.27 MSR3 -0.03619141 0.03866785 4.5044844 0.85 0.36 MSR4 -0.35714589 0.19541439 17.17535917 3.34 0.03 MSR5 0.66713336 0.28744613 27.69746514 5.39 0.03 MSR5 0.66713336 0.2854247 18.07572108 3.13 0.003 MSR7 -0.04543156 0.22589427 18.07572108 3.13 0.004 MSR1 -0.27165015 0.28020676 5.23570943 1.02 0.322 MSR12 -0.27165015 0.28020676 5.23570943 1.02 0.322 Bounds on condition number: 73.79636, 4153.805 4153.805 Error 21 105.32903855 5.015668336 705 2.91 0.0						
MONTH 0.55596807 0.32769944 14.80048428 2.88 0.105 MSR1 -0.18371444 0.13902755 9.8827320 1.94 0.177 MSR2 -0.21174669 0.18957552 6.14499538 1.25 0.25 0.2117469 0.18957552 6.14499538 1.25 0.25 0.2117469 0.18957552 6.14499538 1.25 0.25	85	-8.67410126	5.62329230	12.23475520	2.38	0.138
HSR1 -0.19371444 0.13902755 9.88274320 1.94 0.174 HSR2 -0.21174669 0.1897752 6.41498338 1.25 0.27 MSR3 -0.03519141 0.03868785 4.80441844 0.88 0.38 0.384 0.038 MSR4 -0.33714589 0.19541439 17.17535917 3.34 0.085 MSR5 0.66713336 0.28744613 27.48746514 5.39 0.031 MSR5 0.64446852 0.13950844 52.19242104 10.15 0.004 MSR7 -0.04543156 0.2558427 18.07572106 3.13 0.067 MSR7 -0.04543156 0.2568227 2.49008840 0.48 0.494 MSR11 -0.22009918 0.31628227 2.49008840 0.48 0.494 MSR12 -0.27168015 0.26920678 5.23570943 1.02 0.22 MSR13 0.67877305 0.28124847 29.44997528 5.82 0.023 MSR13 0.67877305 0.28124847 29.44997528 5.82 0.023 Bounds on condition number: 73.79836 <	B6	-8.13937220	3.31939993	30.91649707	6.01	0.023
HSR2 -0.21174666 0.18957552 6.41499338 1.25 0.27 HSR3 -0.03619141 0.03686785 4.50441844 0.86 0.36 HSR4 -0.35714588 0.19541439 17.17535917 3.34 0.037 HSR5 0.66713336 0.28744413 27.69746514 5.39 0.031 HSR6 0.44446852 0.13950844 52.19242104 10.15 0.004 HSR7 -0.04543156 0.02589427 18.07572106 3.13 0.094 HSR1 -0.2728301 0.43988570 4.85176241 0.94 0.34 HSR1 -0.27089918 0.31628227 2.49008840 0.48 0.494 HSR12 -0.27165015 0.26920678 5.23570943 1.02 0.32 HSR13 0.67877305 0.28124847 29.94997526 5.92 0.023 Bounds on condition number: 73.79636, 4153.805 1.02 0.325 0.023 Fror Sum of Squares Hean Square F Probi 1 0.10356635 1.02 0.255 0.023 Bit 15.263449	MONTR	0.55596807	0.32769944	14.80048428	2.88	0.105
MSE3 -0.03619141 0.03866785 4.50441844 0.85 0.364 MSE4 -0.35714588 0.19541439 17.17535917 3.34 0.035 MSE5 0.66713336 0.28744613 27.69746514 5.39 0.035 MSE5 0.44446852 0.1395084 52.18242104 10.15 0.004 MSE7 -0.04533156 0.02589427 16.07572106 3.13 0.002 MSE9 -0.42728301 0.43988570 4.85176241 0.94 0.34 MSE12 -0.22009916 0.3628227 2.49008840 0.44 0.82 MSE13 0.67877305 0.28124847 29.94997526 5.82 0.025 Bounds on condition number: 73.79636, 4153.805 4153.805	MSR1	-0.19371444	0.13902755	9.98274320	1.94	0.178
MSE3 -0.03619141 0.03866785 4.50441844 0.85 0.364 MSE4 -0.35714588 0.19541439 17.17535917 3.34 0.035 MSE5 0.66713336 0.28744613 27.69746514 5.39 0.035 MSE5 0.44446852 0.1395084 52.18242104 10.15 0.004 MSE7 -0.04533156 0.02589427 16.07572106 3.13 0.002 MSE9 -0.42728301 0.43988570 4.85176241 0.94 0.34 MSE12 -0.22009916 0.3628227 2.49008840 0.44 0.82 MSE13 0.67877305 0.28124847 29.94997526 5.82 0.025 Bounds on condition number: 73.79636, 4153.805 4153.805	MSRZ	-0.21174669	0.18957552	6.41499538	1.25	0.277
HSR5 0.66713336 0.28744413 27.69746514 5.39 0.031 HSR6 0.44444652 0.13950844 52.19242104 10.15 0.004 HSR7 -0.04543156 0.02569427 16.05722106 3.13 0.090 HSR9 -0.42723901 0.43988570 4.65176241 0.94 0.450 HSR11 -0.22009918 0.31628227 2.49008840 0.45 0.494 HSR12 -0.27165015 0.26920678 5.23570943 1.02 0.325 HSR13 0.67877305 0.28124847 29.44997528 8.82 0.023 Bounds on condition number: 73.79636 4153.805 4153.805 Estep 6 Variable HSR11 Removed R-square = 0.62930984 C(p) = 11.43160323 Bounds on condition number: 73.79636 5.01566836 7023 Fror 21 105.32903565 5.01566836 7023 Fror 21 105.32903565 5.01566836 7023 Fror 21 105.32903565 5.01566836 7043 JNTERCEP 61.60354306 36.12504389 14.585570	MSEJ		0.03886785	4.50441844	0.85	0.380
MSR6 0.44446852 0.13950864 52.19242104 10.15 0.004 MSR7 -0.04543156 0.02569427 16.07572106 3.13 0.002 MSR9 -0.42729301 0.43988570 4.65176241 0.94 0.36 MSR1 -0.22009918 0.31628227 2.4900840 0.48 0.48 MSR12 -0.27165015 0.26920678 5.23570943 1.02 0.32 MSR13 0.67877305 0.28124847 29.94997526 5.82 0.023 Bounds on condition number: 73.79636 4153.805 4153.805 Exegression 14 178.81401991 12.77242999 2.55 0.023 Bror 21 105.32903565 5.01566836 7 7063 Total 35 286.14305556 2.91 0.102 INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.102 B5 -9.09670657 5.52133161 13.61476335 2.71 0.112 B5 -9.09670657 5.52133161 13.61476335 2.71 0.12 B6	MSR4	-0.35714589	0.19541439	17.17535917	3.34	0.082
MSR7 -0.04543156 0.02569427 16.07372106 3.13 0.067 MSR9 -0.42729301 0.43988570 4.85176241 0.94 0.343 MSR11 -0.22009918 0.31628227 2.49008840 0.48 0.494 MSR12 -0.27165015 0.26920678 5.23570943 1.02 0.323 MSR13 0.67877305 0.28124847 29.94997528 5.82 0.023 Bounds on condition number: 73.79636 4153.805 4153.805 Step 6 Variable HSE11 Removed B-square = 0.62930984 C(p) = 11.63160323 Bounds on condition number: 73.79636 4153.805 Step 6 Variable HSE11 Removed B-square Mean Square P Prob Bounds on condition number: 73.79636 5.01566836 Fror Step 6 Variable HSE11 Removed B-squares Hean Square P Prob Broor 21 105.32903865 5.01566836 Fotal 35 284.14305556 2.91 0.102 INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.102 INTERCEP 61.60354306 36.12504389 1	MSR5	0.66713336	0.28744613	27.69746514	5.39	0.031
MSR9 -0.42729301 0.43988570 4.85176241 0.94 0.343 MSR11 -0.22009918 0.31628227 2.49008840 0.48 0.49 MSR12 -0.27165015 0.26920678 5.23570943 1.02 0.32 MSR13 0.67877305 0.28124847 29.94997528 5.82 0.02 Bounds on condition number: 73.79636 4153.805 Bounds on condition 90.8101991 12.77242999 2.55 0.021 Bounds on condition 90.8201991 90.8201991 90.8201991 90.8201991	MSR6	0.44448852	0.13950864	52.19242104	10,15	0.004
HSR11 -0.22009918 0.31628227 2.49008840 0.48 0.48 MSR12 -0.27165015 0.26920678 5.23570943 1.02 0.32 HSR13 0.67877305 0.28124847 29.94997526 5.82 0.02 Bounds on condition number: 73.79636 4153.805 Bounds on condition number: 73.79636 4153.805 Bounds on condition number: 73.79636 4153.805 Bounds on condition number: 73.79636 5.01566836 Bounds on condition number: 73.79637 10.62930984 C(p) = 11.63160323 Bounds on condition number: 73.79636 5.01566836 7 Bounds on condition number: 73.79637 12.77242999 2.55 0.023 Bounds on condition number: 73.79637 10.102 12.77242999 2.55 0.023 Bounds on condition number: <td< td=""><td>MSR7</td><td>-0.04543156</td><td>0.02569427</td><td>16.07572106</td><td>3.13</td><td>0.092</td></td<>	MSR7	-0.04543156	0.02569427	16.07572106	3.13	0.092
HSR12 -0.27165015 0.20920678 5.23570943 1.02 0.325 HSR13 0.67877305 0.28124847 29.94997526 5.82 0.025 Bounds on condition number: 73.79636 4153.805 4153.805 Bounds on condition number: 73.79636 5.01566836 Bounds on condition number: 73.79636 5.01566836 Bounds on condition number: 73.79637 2.55 0.021 Bission 14 176.81401991 12.77242999 2.55 0.021 Bission 14 175.81401991 12.77242999 2.55 0.021 Bission 0 Bission 0 <t< td=""><td>MSR9</td><td>-0.42729301</td><td>0.43988570</td><td>4.85176241</td><td>0.94</td><td>0.343</td></t<>	MSR9	-0.42729301	0.43988570	4.85176241	0.94	0.343
HSR13 0.67877305 0.28124847 29.94997526 5.82 0.023 Bounds on condition number: 73.79636, 4153.805 Step 6 Variable HSR11 Removed B-square = 0.62930984 C(p) = 11.63160323 DF Sum of Squares Hean Square P Prob: Eegression 14 178.81401991 12.77242999 2.55 0.023 Bror 21 105.32903565 5.01566836 70.255 0.023 Variable Betimate Error Sum of Squares P Prob: INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.1023 D1 15.28344498 8.39377517 16.63298979 3.32 0.023 D5 -9.09670657 5.52133161 13.61474535 2.71 0.1123 D6 -8.26962295 3.27317076 32.01569295 6.38 0.0131 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.111 MSR1 -0.13300665 0.13646221 9.02011964 1.80 0.194 MSR1 <	MSR11	-0.22009918	0.31628227	2.49008840	0.48	0.494
Bounds on condition number: 73.79636, 4153.805 Bounds on condition number: Sum of Squares P Prob: Bounds on condition number: 12.77242999 2.55 0.02: Bror 21 105.32903865 5.01566836 70.02: Bror 21 105.32903865 5.01566836 70.02: Total 35 284.14305556 Prob: Prob: INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.10: B1 15.28544498 8.39377517 16.63298979 3.32 0.08: B5 -9.09670657 5.52133161 13.61474535 2.71 0.11: B6 -8.26962295 3.27317076 32.01569295 6.38 0.01: MONTH 0.51767335 0.31905451 13.20415620 2	MSR12	-0.27165015	0.26920678	5.23570943	1.02	0.325
Step 6 Variable HSE11 Removed B-square = 0.62930984 C(p) = 11.63160323 DF Sum of Squares Hean Square F Prob Regression 14 178.81401991 12.77242999 2.55 0.023 Bror 21 105.32903865 5.01566836 2.55 0.023 Bror 21 105.32903865 5.01566836 2.55 0.023 Forameter Standard Type II Type II F Prob Variable Betimate Bror Sum of Squares F Prob INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.107 B1 15.28544498 8.39377517 16.63298979 3.32 0.087 B5 -9.09670657 5.52133161 13.61474535 2.71 0.117 B6 -8.26962295 3.27317076 32.01569295 6.38 0.019 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.118 MSR1 -0.18300665 <td>HSR13</td> <td>0.67877305</td> <td>0.28124847</td> <td>29.94997526</td> <td>5.82</td> <td>0.025</td>	HSR13	0.67877305	0.28124847	29.94997526	5.82	0.025
DF Sum of Squares Mean Square F Prob Regression 14 176.81401991 12.77242999 2.55 0.025 Brror 21 105.32903865 5.01566836 2.55 0.025 Fotal 35 284.14305556 284.14305556 11<			73.79636,	4153.805		
Regression 14 178.81401991 12.77242999 2.55 0.025 Brror 21 105.32903865 5.01566836 2.55 0.025 Total 35 284.14305556 284.14305556 7	Step 6 Vari	able MSE11 Rem	oved F-squar	. = 0.62930984	C(p) = 11.6	3160322
Brror 21 105.32903885 5.01566836 Total 35 284.14305556 5.01566836 Variable Batimate Standard Type II Variable Batimate Standard Type II INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.100 B1 15.28344498 8.39377517 16.63298979 3.32 0.08 B5 -9.09670657 5.52133161 13.61474535 2.71 0.112 B6 -8.26962295 3.27317076 32.01569295 6.38 0.012 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.112 MSE1 -0.18300665 0.13646621 9.02011964 1.80 0.194 MSR2 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.1945977 19.16873282 3.82 0.064		D?	Sum of Squares	Mean Square	t	Prob>
Brror 21 105.32903885 5.01566836 Total 35 284.14305556 From Standard Type II Variable Batimate Standard Type II Prob INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.100 B1 15.28344498 8.39377517 16.63298979 3.32 0.08 B5 -9.09670657 5.52133161 13.61474535 2.71 0.112 B6 -8.26962295 3.27317076 32.01569295 6.38 0.012 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.112 MSE1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.1945977 19.16873282 3.82 0.06	Regression	14	178.81401991	12.77242999	2.55	0.025
Total 35 284.14305556 Parameter Standard Type II Variable Betimate Broor Sum of Squares P Prob INTERCEP 61.60354306 36.12504389 14.58557075 2.91 0.107 B1 15.28344498 8.39377517 16.63298979 3.32 0.067 B5 -9.09670657 5.52133161 13.61474535 2.71 0.114 B6 -8.26962295 3.27317076 32.01569295 6.38 0.011 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.112 MSE1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.06						
VariableEstimateErrorSum of SquaresPProblemINTERCEP61.6035430636.1250438914.585570752.910.101B115.283444988.3937751716.632989793.320.081B5-9.096706575.5213316113.614745352.710.114B6-8.269622953.2731707632.015692956.380.011MONTH0.517673350.3190545113.204156202.630.114MSR1-0.183006650.136466219.020119641.800.194MSR2-0.223992850.186424777.240857411.440.244MSR3-0.034795460.038138664.174873000.830.37MSR40.374291390.1914597719.168732823.820.064	Total	35				
VariableEstimateErrorSum of SquaresPProblemINTERCEP61.6035430636.1250438914.585570752.910.101B115.283444988.3937751716.632989793.320.081B5-9.096706575.5213316113.614745352.710.114B6-8.269622953.2731707632.015692956.380.011MONTH0.517673350.3190545113.204156202.630.114MSR1-0.183006650.186466219.020119641.800.194MSR2-0.223992850.1864624777.240857411.440.244MSR3-0.034795460.038138664.174873000.830.37HSR4-0.374291390.1914597719.168732823.820.064		Parameter	Standard	Type II		
B1 15.28344498 8.39377517 16.63298979 3.32 0.08 B5 -9.09670657 5.52133161 13.61474535 2.71 0.114 B6 -8.26962295 3.27317076 32.01569295 6.38 0.011 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.114 MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.194 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.244 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.064	Variable				2	Prob>
B5 -9.09670657 5.52133161 13.61474535 2.71 0.11 B6 -8.26962295 3.27317076 32.01569295 6.38 0.011 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.111 MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.190 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.241 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.370 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.061	INTERCEP	61.60354306	36.12504389	14.58557075	2.91	0.102
B6 -8.26962295 3.27317076 32.01569295 6.38 0.01 MONTH 0.51767335 0.31905451 13.20415620 2.63 0.11 MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.06	B1	15.28344498	8.39377517	16.63298979	3.32	8.082
MONTH 0.51767335 0.31905451 13.20415620 2.63 0.11 MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.06	B 5	-9.09670657	5.52133161	13.61474535	2.71	0.114
MONTH 0.51767335 0.31905451 13.20415620 2.63 0.11 MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.06	36	-8.26962295	3.27317076	32.01569295	6.38	0.019
MSR1 -0.18300665 0.13646621 9.02011964 1.80 0.19 MSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 MSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 MSR4 -0.37429139 0.19145977 19.16873282 3.82 0.06	Month	0.51767335	0.31905451	13.20415620		0.119
HSR2 -0.22399288 0.18642477 7.24085741 1.44 0.24 HSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 HSR40.37429139 0.19145977 19.16873282 3.82 0.06	MSR1		0.13646621	9.02011964		0.194
HSR3 -0.03479546 0.03813866 4.17487300 0.83 0.37 HBR40.37429139 0.19145977 19.16873282 3.82 0.06						0.242
HSR40.37429139 0.19145977 19.16873282 3.82 0.06						0.371
						0.064
			0.28254750	29.61754342	5.91	0.024

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0.13777176 0.44581014 52.51801160 10.47 0.0040 MSRO 14.24763240 MSR7 -0.04195349 0.02489208 2.84 0.1067 MSR9 -0.49174249 0.42471247 6.72379192 1.34 0.2599 -0.22798672 3.89970265 0.3879 0.25855813 0.78 MSR12 MSE13 0.64999216 0.27475374 28.07099707 5.60 0.0277 The SAS System 16:49 Thursday, July 12, 1990

Bounds on condition number: 72.93569, 3792.734

Step 7 Variable MSE12 Removed E-square = 0.61558540 C(p) = 10.28439577 DF Sum of Squares Hean Square 7 Prob>F Regression 13 174.91431726 13.45494748 2.71 0.0190 109.22873830 22 4.98494265 STLOL fotal 35 284.14305556 Parameter Standard Type II Variable Estimate STTOT. sum of Squares 1 Prob P INTERCEP 44.53041165 30.34312179 10.69318636 2.15 0.1564 13.70247639 8.15798042 14.00706177 2.82 0.1072 11 85 -7.75635842 5.28105295 10.70098870 2.16 0.1561 -7.56833866 3.15898015 28.49847092 0.0255 \$.74 MONTH 0.38072076 0.27728484 9.35998385 1.89 0.1836 MSR1 -0.14892477 0.13021449 6.49425706 1.31 0.2650 4.91811740 0.3204 -0.17678650 0.17766010 MSR2 0.99 MSR3 -0.02238198 0.03526556 1.0000700 0.40 0.5322 0.0934 1824 -0.30010878 0.17111354 18.27224365 3.08 25.71892327 MARS 0.59479303 0.26133441 5.18 0.0329

MERT -0.3324005 0.02358114 11.05188502 2.23 0.1 MERL3 0.37485706 0.28988230 24.20206774 4.89 0.0 Bounds on condition number: 67.40747. 3164.121	Ment					
HSBB -0.59208206 0.00716063 10.00211535 2.12 0.1 HSB13 0.35988230 24.22280774 4.68 0.0 HSB13 0.35988230 24.22280774 4.68 0.0 HSB13 0.35988230 24.22280774 4.68 0.0 HSB13 DT Sum of Squares 10.005346122 C(p) • 6.019171 HSB13 DT Sum of Squares Hean Square 7 Proi HSB13 DT Sum of Squares 14.00853182 2.98 0.0 BETOD ST Handed Type II 7 9 10.005360 1.005360 0.0 TATERCEP 11.25976035 20.5115556 6.45274460 1.65 0.1 St -6.69110071 4.016018 0.64673512 1.63 0.1 B5 -6.6910071 0.14160254 0.45274480 1.52 0.2 0.1 HSR1 -0.14075340 0.1462244 0.7568375 2.0 0.1 HSR2 -0.14075340 0.1642246 0.7568375 1.0 0.0 0.1						
HSB13 0.37485706 0.225988230 24.22286774 4.68 0.0 ounds on condition number: 67.40747, 3164.121 top 8 Variable HSB3 Banoved R-aquare + 0.60854702 C(p) + 6.619171 DP Sum of Squares Hean Square P Proi Aggression 12 17.01441028 16.40854102 2.08 0.0 Stror 23 11.22844350 4.63802806 2.08 0.0 Total 25 224.1400585 9.62774640 1.65 0.1 Variable Estimate Stror Sum of Squares P Proi THTERCEP 41.25076635 29.5115654 8.46274860 1.65 0.1 Statistic Stror Sum of Squares P Proi 0.1 0.0 0.0 HSR -0.1673940 0.2568336 12.814680 1.60 0.0 HSR -0.1673940 0.25683246 12.814680 1.60 0.0 HSR -0.1673940 0.2568236 25.7064771 5.70 0.0 HSR -0.2555034 0.25752256 25.7064771						
Dunds on condition number: 67.40747, 3164.121 top 8 Yariable HSR3 Removed R-square + 0.40654702 C(p) + 8.419171 DP Sum of Squares Nean Square Pro Regression 12 172.01441028 14.40853419 2.05 0.0 Regression 12 172.01441028 14.40853419 2.05 0.0 Regression 12 172.01441028 14.40853419 2.05 0.0 Namiable Estimate Standard Type II Pro 1.0576402 7.5347863 0.45274840 1.05 0.1 Namiable Estimate Stroor Sum of Squares Pro 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.1 0.1 0.2 0.2 0.3 0.1 0.2 0.2 0.3 0.1 0.2 0.3 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.2		•••••••				0.1600
top 8 Variable HSR3 Removed R-square = 0.400854702 C(p) = 8.40191713 DP Sum of Squares Nean Square P Proi Begression 12 172.51441026 14.40085419 2.98 0.0 Brror 35 224.1030556 4.33002806 2.98 0.0 Variable Bestimate Standard Type II Proi Variable 1.2576655 29.5115654 9.46274860 1.65 0.1 1.2 1.2576655 29.5115654 9.46274860 1.257678655 0.1 0.1 0581 -6.8210971 4.810018 0.46677312 1.85 0.1 0581 -0.407380 0.1284834 3.4760747 0.72 0.4 1882 -0.4005334 0.1284834 3.4760747 0.72 0.4 1883 0.40073922 0.2003068 24.8882837 5.87 0.0 1883 0.40073923 0.02218426 3.4760747 0.72 0.4 1885 0.40073922 0.2031062 2.8882837 5.87 0.0 1887 0.00721735 <	18E13	0.57485706	0.25988230	24.29290774	4.53	0.0377
DF Sum of Squares Hean Square F Prof. hegreesion 12 172.51441028 14.40853419 2.98 0.0 hegreesion 23 111.2284530 4.43802806 2.98 0.0 herror 33 204.1030556 From Sum of Squares F Prof. heating Batimate Strong T Sum of Squares F Prof. heating Batimate Strong T Sum of Squares F Prof. heating Strong T Sum of Squares F Prof. Sum of Squares F Prof. heating 11.67860822 7.5347860 12.01733627 2.48 0.1 0.5 0.1 heating -6.681071 6.1862831 3.30100249 2.75 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.1 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	ounds on con	dition number:	67.40747,	3164.121		
Regression 12 172.0141028 14.40983419 2.98 0.0 Brror 23 111.22844330 4.83602606 2.98 0.0 Variable Parameter Standard Type II Proint Proint Variable Estimate Standard Type II Proint Proint 11 1.47680822 7.53417860 12.01733827 2.46 0.1 12 11.47680822 7.5347787 24.58148589 5.60 0.0 135 -6.6910971 4.94160018 0.86873512 1.83 0.1 146 -0.14734380 0.12846934 1.37460747 0.72 0.2 1481 -0.14734380 0.12846934 3.37460747 0.72 0.2 1482 -0.14734380 0.0218428 0.4682837 1.8 0.1 1482 -0.14734380 0.12846931 13.30100249 2.75 0.1 1482 -0.4873780 0.22952266 23.7080471 1.81 0.0 0.8 14833 0.58914120 0.22552266 23.70804711 5.32 0.0 <td>tep 8 Vari</td> <td>able MSE3 Reso</td> <td>ved R-square</td> <td>- 0.60854702</td> <td>C(p) = \$.\$!</td> <td>917113</td>	tep 8 Vari	able MSE3 Reso	ved R-square	- 0.60854702	C(p) = \$.\$!	917113
BFFOR 23 111.22846350 4.63602806 Total 35 284.1600556 Fype II Variable Estimate Standard Type II INTERCEP 41.25076635 20.51155654 0.45274860 1.95 0.1 BS -6.6910071 4.94160018 0.68573512 1.63 0.1 BS -6.6910071 4.94160018 0.68573512 1.63 0.1 BS -6.6910071 4.94160018 0.68573512 1.63 0.1 BS -6.6910971 0.91586433 13.3010249 1.75 0.1 MBR -0.14734360 0.12846934 3.3760249 7.75 0.1 MBR -0.37637368 0.0219428 4.4782517 13.41 0.0 MBR -0.3721735 0.2207021 12.8586893 2.60 0.1 MBR -0.3721735 0.2307021 12.858682837 1.870 0.1 MBR -0.3721735 0.2307021 12.8586893 2.60 0.1 MBR -0.3721735 0.2307021 12.858687351 1.870 0.1		DT	Sum of Squares	Nean Square	7	Prob>T
Total 35 286.14305556 Variable Farmeter Estimate Standard Error Type II Sum of Squares P Pro 1NTERCEP 41.250766952 20.51155654 0.45274360 1.95 0.1 B1 11.47669622 7.53417660 12.01733527 2.48 0.1 B5 -6.6361750 2.6573577 26.851459 2.3514580 1.30 0.1 MONTH 0.42251106 0.2653346 12.21646911 2.55 0.1 MSR1 -0.14095334 0.12846930 3.47606747 0.72 0.4 MSR5 0.4907352 0.2005508 26.8586493 2.65 0.75 0.1 MSR5 0.4907352 0.2005508 26.8586493 2.60 0.75 0.1 MSR1 -0.3597368 0.38855206 25.75864973 2.60 0.75 0.1 MSR1 -0.56977388 0.3895206 25.70504711 3.22 0.0 MSR1 0.56914120 0.2555256 25.70504711 3.22 0.0	Regression	17	172.91441026	14.40953419	2.98	0.0118
Parameter Standard Standard Bror Type II Sum of Squares P Variable Estimate Standard Bror Standard Standard Type II Standard Standard Squares P INTERCEP 11 1.0760822 7.53417860 12.01733827 2.48 0.1 B5 -6.693401971 24360018 6.8673512 1.63 0.1 B6 -6.03661750 2.85785757 26.85140889 5.50 0.0 MSR1 -0.14734360 0.12640834 6.3564130 1.32 0.2 MSR2 -0.14095334 0.1662424 3.47600747 0.72 0.4 MSR2 -0.25050034 0.1262426 4.46782517 1.61 0.0 MSR5 0.45073952 0.2307021 12.552669 25226724 1.57 0.1 MSR17 -0.03721735 0.03955206 9.5226724 1.5.7 0.1 1.5.32 0.0 MSR13 0.56914120 0.25552256 25.70504711 5.322 0.0 Tror Sum of Squares Mean Square <t< td=""><td>Brror</td><td>23</td><td>111.22864530</td><td>4.23602806</td><td></td><td></td></t<>	Brror	23	111.22864530	4.23602806		
Variable Estimate Error Sum of Squares P P INTERCEP 41.25976635 20.61155654 9.45274860 1.85 0.1 11 11.6766622 7.3417860 12.01733827 2.46 0.1 12 11.6766622 7.3417860 12.01733827 2.46 0.1 135 -6.69110971 4.94160018 6.8673512 1.63 0.1 146 -0.4734360 0.22548934 6.3564130 1.32 0.2 1582 -0.1409534 0.1626243 3.4760747 0.73 0.4 1582 0.49073952 0.2005068 28.6892837 5.97 0.0 1585 0.49073952 0.2005068 28.692837 1.41 0.0 1587 -0.03721735 0.2327021 12.65284724 1.67 0.1 1587 -0.0379320 0.2327026 9.5228724 1.87 0.1 1588 -1.65973050 0.3985206 9.5228724 1.87 0.1 1587 <	fotal	35	284.14305556			
INTERCEP 41.25976635 20.5115656 0.45274860 1.65 0.1 B1 11.67666622 7.33477860 12.01733827 2.46 0.1 B5 -6.69110971 4.98160018 0.86573512 1.83 0.1 B6 -1.635461730 2.9578577 26.85146891 2.53 0.1 100H7H 0.42251106 0.12846936 3.58414389 5.50 0.5 15R1 -0.1409534 0.13646433 13.30100249 2.75 0.1 15R2 -0.14095346 0.02005009 26.86828375 5.97 0.0 15R5 0.43760348 0.0200509 26.86828375 5.97 0.0 15R5 0.43760348 0.02219426 4.44782817 1.41 0.0 15R7 -0.55937368 0.292552256 25.70604711 5.32 0.0 15R8 -0.55937368 0.292552256 25.70604711 5.32 0.0 16R9 -0.55937368 0.292552256 25.70604711 5.32 0.0 16R9 Variable MSR2 Removed R-equare + 0.596331351 C(p) + 7.201048		Parapeter	Standard	Type 11		
B1 11.07565622 7.33417860 12.01733827 2.48 0.1 B5 -6.0910071 4.94160015 0.08673512 1.63 0.1 B6 -8.03641730 2.95785757 2.881463095 5.00 0.00 MONTM 0.42231106 0.28583346 12.21646911 2.53 0.1 MSR2 -0.140753934 0.16624244 3.47608747 0.72 0.4 MSR3 -0.25650034 0.16646433 13.0100249 2.75 0.1 MSR5 0.33760368 0.0219426 4.4672217 1.9.41 0.0 MSR7 -0.65937308 0.38955206 9.52626724 1.97 0.1 MSR9 -0.55937308 0.39855206 9.52626724 1.97 0.1 MSR13 0.56914120 0.25552256 25.70604711 5.32 0.0 MSR9 -0.55937308 0.39855206 9.52626724 1.97 0.1 MSR13 0.56914120 0.25552256 25.70604711 5.32 0.0 MSR13 0.56914120 0.25552256 25.70604711 5.32 0.0	Variable	Estimato	Stror	Sum of Squares	1	Prob>P
BSC.GS110071 - C.S150015 C.S55121 1.63 0.1 BC -C.S3661750 2.95785757 26.85146969 5.50 0.0 HSR1 -0.14774580 0.25853364 12.21646951 2.63 0.1 HSR1 -0.14774580 0.12846954 0.35961430 1.52 0.2 HSR2 -0.25650034 0.16626244 3.47606747 0.72 0.4 HSR3 -0.49073952 0.2005050 26.86962875 5.97 0.0 HSR5 0.49073952 0.2005050 26.86962875 5.97 0.0 HSR5 0.03760582 0.2005050 26.86962875 5.97 0.0 HSR5 0.03760582 0.2005050 26.86962875 5.97 0.0 HSR7 -0.03721735 0.02307021 12.8586993 2.00 0.1 HSR3 0.55914120 0.25552256 25.70804711 5.32 0.0 HSR3 0.56914120 0.25552256 25.70804711 5.32 0.0 HSR3 0.56914120 0.25552256 25.70804711 5.32 0.0 HSR3 0.065804 24.76464634 0.04213254 1.24 0.0 HSR5 0.401556 HSR5 0.401556 HSR5 0.401556 HSR5 0.40213254 1.24 0.0 HSR5 0.411 0.2461577 0.77380303 0.0 HSR5 0.411 0.2461777 0.77380 0.5837079 1.0 HSR5 0.411 0.246177 0.717380 0.8537079 1.0 HSR 0.43245244 2.8001852 23.4265558 4.00 0.0 HSR1 0.04263777 0.717380 0.52837077 1.60 0.2 HSR 0.43245264 2.8001852 23.4265558 0.075 0.3 HSR 0.0281290 0.11460135 3.583398000 0.75 0.3 HSR 0.0281290 0.11460135 3.583398000 0.75 0.3 HSR 0.0281290 0.11460135 3.583398000 0.75 0.3 HSR 0.02812910 0.11460135 3.583398000 0.75 0.3 HSR 0.0281290 0.11460135 3.583398000 0.75 0.3 HSR 0.0281294056 0.07512620 72.44470561 1.517 0.0 HSR 0.0281795 0.136148737 0.23824068 1.0751263 2.60 0.1 HSR 0.0281795 0.136148904 1.0228003 2.60 0.1 HSR 0.0281795 0.136148904 1.0228005 0.075 0.3 HSR 0.0281795 0.136148904 1.043239 HSR 0.01458737 0.23224068 2.058370230 C(p) - \$.600892 D7 Sum of Squares Nean Square P Pre	INTERCEP	41.25976635	29.51155654	9.45274860	1.95	0.1754
bit -6.9365(750 2.95785757 26.83148989 5.60 0.0 MONTH 0.42251106 0.28583346 12.21448911 2.33 0.1 MSR1 -0.14095394 0.12848934 3.47408747 0.72 0.4 MSR4 -0.25650034 0.15464633 1.30100249 2.76 0.1 MSR5 0.40073952 0.20085089 28.8892837 5.97 0.0 MSR5 0.430730352 0.20085089 28.8892837 5.97 0.0 MSR5 0.33760368 0.0219426 44.84782517 13.41 0.0 MSR7 -0.65937308 0.39855206 8.52626724 1.97 0.1 MSR9 -0.55937368 0.39855206 25.70804711 5.32 0.0 MSR1 0.56914120 0.25552256 25.70804711 5.32 0.0 Tror T 14.70471277 4.77936303 7.7201049 Tror 24 14.70471277 4.77936303 3.22 0.0 Tror 24 14.70471277 4.779363033 3.22 0.0 Trotal		11.87869522				0,1286
MONTH 0.4225106 0.22583346 12.21646011 2.53 0.1 MSR1 -0.14734380 0.12846934 6.35914300 1.92 0.2 MSR2 -0.25650034 0.1662244 3.4760677 0.72 0.4 MSR5 0.40973952 0.20050506 26.86982807 5.97 0.0 MSR5 0.43760368 0.09219426 64.44782517 13.41 0.0 MSR5 0.43975368 0.0305069 22.8566993 2.60 0.1 MSR7 -0.03721735 0.202307021 12.8566993 2.60 0.1 MSR9 -0.65937368 0.3085206 5.2626724 1.97 0.1 MSR9 -0.65937368 0.3085206 5.2626724 1.97 0.1 MSR9 -0.65937368 0.3085206 25.70804711 5.322 0.0 The SAS System 16:49 Thursday, July 12, 0.0 15.22 0.0 Total DF Sum of Squares Mean Square P Pro Regression 11 169.43834278 15.40348571 3.22 0.0	D 5		4.94180018		1.83	0.1889
HSR1 -0.1473680 0.12848934 6.35841430 1.52 0.2 HSR2 -0.14095934 0.16628244 3.47609747 0.72 0.4 HSR3 0.48073952 0.20085069 28.88982837 5.97 0.0 HSR5 0.49073952 0.20085069 28.88982837 5.97 0.0 HSR5 0.49073952 0.20085069 28.88982837 1.8.10 0.0 HSR5 0.49073952 0.20085020 9.52826724 1.97 0.1 HSR5 0.03721735 0.02307021 12.88566983 2.60 0.1 HSR5 -0.59937305 0.238552266 9.52826724 1.97 0.1 HSR5 0.59914120 0.25552265 23.70804711 8.32 0.0 Dr Sum of Squares 16:49 Thursday, July 12, 0.0 1.0						0,0281
HSR2 -0.14095934 0.16626244 3.47406747 0.72 0.40 HSR4 -0.25650034 0.15666433 13.3010249 2.75 0.1 HSR5 0.4073952 0.00219426 64.64782517 13.41 0.0 HSR5 0.337603965 0.09219426 64.64782517 13.41 0.0 HSR7 -0.05721735 0.02307021 12.65866893 2.60 0.1 HSR7 -0.55937305 0.39855206 9.52626724 1.97 0.1 HSR3 0.55914120 0.25552256 23.70804711 8.32 0.0 Dunds 'on condition number: 60.59963, 2460.224 1.97 0.1 tog 9 Variable HSR2 Removed R-square = 0.59631381 C(p) = 7.201049 DF Sum of Squares Hean Square P Pro Regression 11 169.43834278 15.40348571 3.22 0.0 Stript 24 114.70471277 4.77936303 3.22 0.0 Stript 24 114.70471277 4.77936303 1.28 0.2 Variable Bs		0.42251106	0.26583346	12.21646911		0.1256
TSRE -0.25650036 0.15486433 13.30100249 2.75 0.1 TSR5 0.49073952 0.2005069 28.8982837 5.97 0.0 MBR5 0.3721735 0.02307021 12.85566983 2.60 0.1 MBR7 -0.03721735 0.02307021 12.85566983 2.60 0.1 MBR9 -0.55937905 0.39855206 9.52626724 1.97 0.1 MSR13 0.559314120 0.2552256 25.70207711 5.32 0.0 Dr Sum of Squares 16:49 Thursday, July 12, 0.1 0.559314120 0.2552256 22.4 counds on condition number: 40.59963, 2460.224 1.97 0.1 0.1 counds on condition number: 40.59963, 2460.224 1.07 0.0 0.0 top 9 Variable MSR2 Removed R-square * 0.59631351 C(p) * 7.201049 0.0 bror Sum of Squares Mean Square 7 Pro hegression 11 16*.43834275 15.40348571 3.22 0.0 Ifror 21 24414205856 1.0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td>0.2633</td></td<>						0.2633
HSR5 0.49073952 0.20085069 28.88982837 5.97 0.0 HSR6 0.33760366 0.09219426 64.64782517 13.41 0.0 HSR7 -0.05721735 0.02307021 12.85866983 2.60 0.1 HSR9 -0.55837368 0.38855206 9.52624724 1.97 0.1 HSR3 0.55914120 0.25552256 23.70804711 5.32 0.0 Dunds on condition number: 40.59963, 2440.224 2440.224 top 9 Variable HSR2 Removed R-square + 0.59631351 C(p) + 7.201045 DF Sum of Squares Mean Square P Pro Regression 11 169.43834276 18.40348571 3.22 0.0 Stror 24 14.70471277 4.77936303 22 0.0 Wariable Batimate Error Sum of Squares P Pro Norrow 24.3426517 8.9799811 3.22 0.0 Norrow 24.114.70471277 4.77936303 1.26 0.2 Nation Batimate Error Sum of Squares P Pro						0,4053
1586 0.33760366 0.09219426 64.84782517 13.41 0.0 1587 -0.03721735 0.02307021 12.85866993 2.60 0.1 15813 0.58937366 0.3985206 8.5226724 1.97 6.1 15813 0.58914120 0.25552256 25.70804711 5.32 0.0 The SAS System 16:49 Thursday, July 12, Dunds 'on condition number: 60.59963, 2460.224 Dr Sum of Squares Hean Square P Pro Regression 11 169.43834278 15.40348571 3.22 0.0 Regression 11 15.412064 6.04213236 1.26 0.2						

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Irror	25	118.28810185	4.73152407		
Total	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Batimate	Brfor	Sum of Squares	7	Prob>P
INTERCEP	27.62926798	24.63915065	5.94960791	1.26	0.2728
81	5.36866356	5.01174059	5.4.945534	1.15	0.2943
35	-3.09144791	3.84408625	3.06012154		0.4289
R6	-4.44939514	1.73899441	30.97466610	6.55	0.0169
MONTH	0.35816887 -0.25519506	0.24704349 0.15028703	9.94557491 13.54277060	2.10 2.88	0.1595 0.1019
MSR4 MSR5	0.38449609	0.14063083	35.36908653		0.0113
MSR6	0.30103873	0.07425803	77.76048045		0.0004
HSR7	-0.03974355	0.02241570	14.87406642		0.0884
MSP9	-0.64511594	0.34024977	17.00908369		0.0696
MSR13	0.60382370	0.25069207	27.44986181	5.80	0.0237
	condition number:				
			stem 16:49 Th		
					9
3tep11	Variable B5 Remove	d R-squar	. = 0.57293264	C(p) + 4.3	1314265
	DF	sum of squares	Mean Square	7	Prob>F
Regressi	lon 9	162.79483216	18.08831468	3.88	0.0032
Brror	28	121.34822339	4.66723936		
fotal	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Batiante	Stror	Sum of Squares	7	Prob>F
INTERCES	13.43994724	17.08111410	2.88950077	0.62	0.4385
B1	1.74833160	2.18770123	2.98079196		0.4314
B6	-4.31364865	1.71898317	29.39039015		0.0187
MONTH .	0.29532969 -0.17731344	0.23276323 0.11414144	7.51355650 11.26306751	1.61 2.41	0.2158 0.1324
HSR4 MSR5	0.35076958	0.13331718	32.30960731	-	
MSR6	0.27147445	0.06408008	83.76679823		0.0003
MSR7	-0.03567530	0.02168857	12.62796492	2.71	0.1120
MSR9	-0.64739549	0.33791874	17.13069031		
MSR13	0.74825548	0.17371399	86.59449319	18.55	0,0002
	n condition number:	-	311.4218		
			~~~~~~~~~~~~~~~~~~	***********	
Step12	Variable 31 Remove	ed R-squar	• • 0.56244218	C(p) = 2.8	1211371
	DF	Sum of Squares	Mean Square	1	Prob>7
Legress		159.81404020	19.97675502		0.0015
Brror	27	124.32901536	4.60477835		
Total	35	284.14305556			
	Parameter	Standard	Туре II		• • •
Variable	e Satimate	<b>Sror</b>	Sum of Squares	1	Prob>P
INTERCE		14.88416944	8.30766520		0.1904
<b>B</b> 6	-3,16284267	0.93245888	52.97909420		0.0022
MONTH	0.26514642 -0.15668088	0.22813654 0.11043677	6.22000277 9.26858278		0.2553
HSR4 MSR5	-0.15008088	0.12215372	29.58637590		0.0174
MSR6	0.26805654	0.06350792	82.03623569		0.0002
HSR7	-0.02579761	0.01770235	9.77925908		0.1566
MSR9	-0.53549318	0.30547750	14.15005637		0.0910
HSR13	0.67313998	0.14510797	99.09163407	21.52	0.0001
	n condition number		163.1957		
			*************		

Step13 Variable B2 Entered E-square = 0.57293264 C(p) = 4.31314265 NOTE: The variable which previously had small tolerance is now allowed to enter after removal of some variables from the model.

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B2 B5 MONTH MSR4 MSR5 MSR5 MSR7 MSR9 MSR13 Bounds on condition Step14 Variable	B2 Removed	284.14305556 Standard Error 17.08111410 2.18770123 1.71898517 0.23276323 0.1141444 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408,	Type II Sum of Squares 2.88950077 2.98079195 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	3.88 0.0032 eday, July 12, 1990 10 P Prob>F 0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
Total Variable INTERCEP 13 B2 1 B5 -4 MONTH ( MSR4 -0 MSR5 ( MSR5 ( MSR7 -0 MSR9 -0 MSR13 ( Bounds on condition Step14 Variable Regrersion	35 Parameter Estimate 3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.27147445 0.03567530 0.64739549 0.74825548 ion number: BZ Removed	The SAS Sys 284.14305556 Standard Error 17.08111410 2.18770123 1.71898517 0.23276323 0.1141444 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-square	Type II Sum of Squares 2.88950077 2.98079196 29.39039015 7.51355650 11.265751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	10 P Prob>F 0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
Variable INTERCEP 13 B2 1 B5 -4 MONTH 0 MSR4 -0 MSR4 -0 MSR5 0 MSR5 0 MSR7 -0 MSR9 -0 MSR9 -0 MSR9 -0 Step14 Variable Regression	Parameter Botimate 3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.2714745 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	284.14305556 Standard Error 17.08111410 2.18770123 1.71898517 0.23276323 0.1141444 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408,	Type II Sum of Squares 2.88950077 2.98079196 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	10 P Prob>F 0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
Variable INTERCEP 13 B2 1 B5 -4 MONTH 0 MSR4 -0 MSR5 0 MSR5 0 MSR7 -0 MSR9 -0 MSR9 -0 MSR9 -0 Step14 Variable Regregsion	Parameter Botimate 3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.2714745 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	Standard Error 17.08111410 2.18770123 1.71898517 0.23276323 0.11414144 0.13331718 0.06408008 0.02165857 0.33791874 0.17371399 7.597408, d R-square	Sum of Squares 2.68950077 2.98079198 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218 311.4218	P Prob>F 0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002 (p) = 2.81211371
Variable INTERCEP 13 B2 1 B5 -4 MONTH 0 MSR4 -0 MSR5 0 MSR5 0 MSR7 -0 MSR9 -0 MSR9 -0 MSR9 -0 Step14 Variable Regregsion	Parameter Botimate 3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.2714745 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	Standard Error 17.08111410 2.18770123 1.71898517 0.23276323 0.11414144 0.13331718 0.06408008 0.02165857 0.33791874 0.17371399 7.597408, d R-square	Sum of Squares 2.68950077 2.98079198 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218 311.4218	0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
INTERCEP 13 B2 1 B5 -4 MONTH 6 MSR4 -6 MSR5 6 MSR5 6 MSR7 -6 MSR9 -6 MSR9 -6 MSR13 6 Bounds on condition Step14 Variable Regrepsion	Estimate 3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.27147445 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	Error 17.08111410 2.18770123 1.71898517 0.23276323 0.11414144 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-equare	Sum of Squares 2.68950077 2.98079198 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218 311.4218	0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
INTERCEP 13 B2 1 B5 -4 MONTH 6 MSR4 -6 MSR5 6 MSR7 -6 MSR9 -6 MSR9 -6 MSR13 6 Bounds on condita Step14 Variable Regrepsion	3.43994724 1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.27147445 0.03567530 0.64739549 0.74825548 ion number:	17.08111410 2.18770123 1.71898517 0.23276323 0.1141444 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-square	2.68950077 2.98079196 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	0.62 0.4385 0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
B2 1 B5 -4 MONTH 0 MSR4 -6 MSR5 0 MSR5 0 MSR7 -6 MSR9 -6 MSR13 0 Bounds on condition Step14 Variable Regrepsion	1.74833160 4.31364865 0.29532969 0.17731344 0.35076958 0.2714745 0.03567530 0.64739549 0.74825548 ion number:	2.18770123 1.71898517 0.23276323 0.11414144 0.13331718 0.06408008 0.02165857 0.33791874 0.17371399 7.597408, d R-square	2.98079198 29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	0.64 0.4314 6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
B5 -4 MONTH ( MSR4 -6 MSR5 ( MSR5 ( MSR7 -6 MSR9 -6 MSR13 ( Bounds on condit: Step14 Variable Regrepsion	4.31364865 0.29532969 0.17731344 0.35076958 0.2714745 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	1.71898517 0.23276323 0.11414144 0.13331718 0.06408008 0.02166857 0.33791874 0.17371399 7.597408, d R-square	29.39039015 7.51355650 11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	6.30 0.0187 1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
HONTH ( MSR4 -( MSR5 ( MSR5 ( MSR7 -( MSR9 -( MSR13 ( Bounds on condition Step14 Variable Regrepsion	0.29532969 0.17731344 0.35076958 0.27147445 0.03567530 0.64739549 0.74825548 ion number:	0.23276323 0.11414144 0.13331718 0.06408008 0.02166857 0.33791874 0.17371399 7.597408, d R-square	7.51355650 11.26306751 32.30960731 83.76679823 12.62796692 17.13069031 86.59449319 311.4218	1.61 0.2158 2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
MSR4 -( HSR5 ( HSR6 ( HSR7 -( MSR9 -( MSR13 ( Bounds on condition Step14 Variable Regrepsion	D.17731344 D.35076958 D.27147445 D.03567530 D.64739549 D.74825548 ion number:	0.11414144 0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-equare	11.26306751 32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	2.41 0.1324 6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
HSR5 ( HSR6 ( HSR7 -( HSR9 -( MSR13 ( Bounds on condit: Step14 Variable Regrepsion	0.35076958 0.27147445 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	0.13331718 0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-equare	32.30960731 83.76679823 12.62796492 17.13069031 86.59449319 311.4218	6.92 0.0141 17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
HSR6 ( MSR7 -( MSR9 -( MSR13 ( Bounds on condit: Step14 Variable Regrepsion	0.27147445 0.03567530 0.64739549 0.74825548 ion number: B2 Removed	0.06408008 0.02168857 0.33791874 0.17371399 7.597408, d R-square	83.76679823 12.62796492 17.13069031 86.59449319 311.4218 9 = 0.56244218 C	17.95 0.0003 2.71 0.1120 3.67 0.0664 18.55 0.0002
HSR7 -( MSR9 -( MSR13 () Bounds on condita Step14 Variable Regrepsion	0.03567530 0.64739549 0.74825548 ion number: 	0.02168857 0.33791874 0.17371399 7.597408, d R-square	12.62796492 17.13069031 86.59449319 311.4218 9 = 0.56244218 C	2.71 0.1120 3.67 0.0664 18.55 0.0002
MSR9 -( MSR13 ( Bounds on condit: Step14 Variable Regrepsion	0.64739549 0.74825548 ion number: 	0.33791874 0.17371399 7.597408, d R-square	17.13069031 86.59449319 311.4218 9 = 0.56244218 C	3.67 0.0664 18.55 0.0002
MSR13 ( Bounds on condit: Step14 Variable Regression	0.74825548 ion number: B2 Removed	0.17371399 7.597408, d R-equare	86.59449319 311.4218 9 = 0.56244218 C	3.67 0.0664 18.55 0.0002
Bounds on condit: Step14 Variable Regression	ion number: B2 Removed	7.597408, d R-equare	311.4218 • • 0.56244218 C	(p) + 2.81211371
Step14 Variable Regression	B2 Removed	d R-square	• • 0.56244218 C	
Step14 Variable Regression	B2 Removed	d R-square	• • 0.56244218 C	
Regression				
Regression				
	DF	Sum of Squares	Mean Square	
				f Prob>f
Fries '	8	159.81404020	19.97675502	4.34 0.0018
	27	124.32901536	4.60477835	
Total	35	284.14305556		
	Parameter	Standard	Type II	
Variable	Estimate	Error	Sum of Squares	f Prob>f
INTERCEP 11	9.99216066	14.88416944	8.30766520	1.80 0.1904
	3.16284267	0.93245888	52.97909420	11.51 0.0022
MONTH	0.26514642	0.22813654	6.22000277	1.35 0.2553
MS24 -(	0.15668088	0.11043677	9.26858278	2.01 0.1674
MSR5 (	0.30963369	0.12215372	29.58637590	6.43 0.0174
MSR6 (	0.26805654	0.06350792	82.03623569	17.82 0.0002
MSR7 -(	0.02579761	0.01770235	9.77925908	2.12 0.1566
MSR9(	0.53549318	0.30547750	14.15005637	3.07 0.0910
MSR13	0.87313998	0.14510797	99.09163407	21.52 0.0001
Bounds on condit.	.on number:	4.641112,	163.1957	
••••				************
Step15 Variable	. HONTH Ren	oved E-square	. = 0.54055179 C	(p) = 1.85331399
	D7	Sum of Squares	Hean Square	Prob>P
Regression	7	153.59403743	21.94200535	6.71 0.0014
Brror	28	130.54901813	4.66246493	
Total	35	284.14305556		
	Parapeter	Standard	Type II	
Variable	Estimate	Error	Sum of Squares	f Frob>f
INTERCEP 2	0.05864711	14.97699973	8.36313698	1.79 0.1912
	3.1064/366	0.93701177	51.24643215	10.99 0.0025
	0.18083166	0.10914148	12.79925873	2.75 0.1087
		The SAS Sy		sday, July 12, 1990
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MSR5	0.32932169	0.12172882	34.12474482	7.32	0.0115
MSR6	0.26055680	0.06357375	78.31857335	16.80	0.0003
HSR7	-0.01992729	0.01707242	6.35216722		0.2530
MSRO	-0.52230903	0.30717297	13.48045824	2.89	0.1001
MSR13	0.68139111	0.14583920	101.77541612	-	0.0001
Bounds on a	condition number:	4.551857.	131.7893		
	**************			**********	
Step16 Va	ariable MSR7 Remo	ved I-square	= 0.51819627	C(p) = 0.91	663799
		,			
	Df	Sum of Squares	Hean Square	7	Prob>P
Regression		147.24187020	24.54031170	5.20	0.0010
Error Total	29 35	136.90118535 284.14305556	4.72073053		
10081		804·14303334			
	Parameter	Standard	Type II		
Variable	Estimate	Brror	Sum of Squares	F	Prob>P
				•	
INTERCEP	27.10227711	13.79286255	18.22686415	3.86	0.0591
B6	-2.78535210	0.90128989	45.08586582	9.55	0.0044
MSR4	-0.16654067	0.10912811	10.99452813	2.33	0.1378
HSR5	0.29114221	0.11798214	28.74663643	6.09	0.0197
MSR6	0.25196455	0.06353946	74.23369133	15.73	0.0004
MSR9	-0.59496438	0.30267363	18.24071957		0.0590
MSR13	0.60104293	0.12937193			0.0001
Bounds on o	condition number:	4.223191,	94.62532		
•••••					
Step17 Va	ariable MSR4 Remo	ved R-square	= 0.47950263	C(p) = 0.75	3707217
				-	
	DF	Sum of Squares	Mean Square	1	Prob>P
• • • • • • • • • • • •					
Regression		136.24734207	27.24946841		0.0010
Brror	30	147.89571349	4.92985712		
Total	35	284.14305556			
	Bennester-	Chandand	<b>.</b>		
Variable	Parameter	Standard	Type II		Backs #
ARLIEDIA	Estimate	Error	Sum of Squares	T	Prob>f
INTERCEP	39.66342622	11 11077744	AA #3730643	12.20	0.0016
B6	-2.38509588	11.31027743 0.88117788	60.62730541	12.30 7.33	0.0015
MSR5	0.14211422	0.06766046	36.11759663 21.74901191	4.41	0.0111 0.0442
HSRG	0.24234650	0.06461140	69.35688215	14.07	0.0005
MSR9	-0.51490772	0.30462419	14.08524344	2.86	0.1013
MSR13	0.46801154	0.09768928	113.14976015	22.95	0.0001
	0.40001134	0.00.00010	110.144/0413		0.0001
Bounds on o	condition number:	1.890053,	38.74717		
		The SAS Sys	itom 16:49 Th	uraday, July	12, 1990
				•	12
	-4.1.				
Step18 Va	ariable MSR9 Remo	ved E-square	= 0.42993167	C(p) = 1.11	487809
	DF	Sum of Squares	Near 8	-	
	VE		Hean Square	T	Prob>f
Regression	n 4	122.16209863	30.54052466	5.84	0.0013
Brror	31	161.98095693	5.22519216	****	
Total	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	r	Prob>f
				-	· - <b> · •</b>
INTERCEP	40.66366603	11.62818686	63.89859697	12.23	0.0014
<b>B</b> 6	-2,11881393	0.89257328	29.44422577	5.64	0.0240
HSR5	0.14250730	0.08965725	21.86974994	4.19	0.0493
MSR6					
LISE C	0.22412669	0.06558641	61.01853184	11-68	0.0018
MSR13	0.22412669 0.45650602	0.06558641 0.10032844	61.01853184 108.18004799	11.68 20.70	0.0018 0.0001

Bounds on condition number: 1.829645, 26.34921 -------***********************

All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination Procedure for Dependent Variable MSR10

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	Variable	•	Number	Partial	Nodel			
Step	Entered	Lenoved	In	E==2	E==5	C(p)	r	Prob>P
1		B4	17	0.0001	0.6425	17.0034	0.0034	0.9541
2	<b>B</b> 7		18	0.0001	0.6426	19.0000	0.0034	0.9541
3		37	17	0.0001	0.6425	17.0034	0.0034	0.9541
4		MSE8	16	0.0013	0.6413	15.0629	0.0630	0.8047
5		B3	15	0.0032	0.6381	13.2148	0.1691	0.6855
6		MSR11	14	C.0088	0.6293	11.6316	0.4843	0.4945
7		MSR12	13	0.0137	0.6156	10.2844	0.7775	0.3879
8		MSR3	12	0.0070	0.6085	8.6192	0.4028	0.5322
		MSR2	11	0.0122	0.5963	7.2010	0.7188	0.4053
10		MSR1	10	0.0126	0.5837	5.8009	0.7498	0.3951
11		BS	Ĩ	0.0108	0.5729	4.3131	0.6468	0.4289
12		B1	8	0.0105	0.5624	2.8121	0.6387	
13	B2	DI	ŷ		+ • + • - +		••••	0.4314
	84	~~		0.0105	0.5729	4.3131	0.6387	0.4314
14		B2	8	0.0105	0.5624	2.8121	0.6387	0.4314
15		MONTH	7	0.0219	0.5406	1.8533	1.3508	0.2553
16		MSR7	6	0.0224	0.5182	0.9166	1.3624	0.2530
17		MSR4	5	0.0387	0.4795	0.7571	2.3290	0.1378
18		HSR9	4	0.0496	0.4299	1.1149	2.8571	0.1013
				The SAS	System	16:49 Thur	eday, July	12, 1990 23

Backward Elimination Procedure for Dependent Variable MSE11

Step 0 All Variables Entered R-square = 0.66502524 C(p) = 19.00000000 NOTE: The model is not of full rank. A subset of the model which is of full rank is chosen.

	DF	Sum of Squares	Mean Square	r	Prob>P
Regressio	n 18	71.59809488	3.97767194	1.88	0.1008
Error	17	36.06412734	2.12141926		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Botimate	Error	Sum of Squares	r	Prob>P
INTERCEP	76.44083349	30.88464715	12.99547165	6.13	0.0241
<b>B1</b>	-38.61004497	21.37314768	6.92293331	3.26	0.0886
<b>B</b> 3	8.57585964	5.18202497	5.81008965	2.74	0.1163
B4	9.72305259	5.11762297	7.65764452	3.61	0.0745
<b>B</b> 5	7.91783995	6.15567549	3.50984963	1.65	0.2156
B6	5.59771638	4.75277654	2.94275087	1.39	0.2551
Month	0.05508502	0.24100532	0.11082563	0.05	0.8219
MSR1	0.03378199	0.12281251	0.16051356	0.08	0.7866
MSR2	0.04347560	0.13218910	0.22947024	0.11	0.7463
MSR3	-0.00539286	0.02598527	0.09137140	0.04	0.8381
MSR4	0.05314886	0.13862605	0.31183492	0.15	0.7062
MSR5	0.35311480	0.28455491	3.26682736	1.54	0.2315
MSR6	-0.06256385	0.23373751	0.15199054	0.07	0.7922
M\$R7	-0.02090987	0.01762535	2.98473494	1.41	0.2519
MSR8	0.05355659	0.03950263	3.89942289	1.84	0.1929
MSR9	0.16839103	0.34871022	0.49469223	0.23	0.6353
MSR10	-0.09950338	0.14250182	1.03433545	0.49	0.4945
H5R12	-0.08796180	0.17983017	0.50756265	0.24	0.6310
MSR13	0.19172100	0.20478102	1.85\$45836	0.85	0.3623
Bounds on	condition number:	1076.665,	34810.65		*******
Step 1	Ariable MSR3 Remu	ved R-squar	<b>a</b> = 0.66417655	C(p) = 17.0	4307088

	DF	Sum of Squares	Mean Square	dold I
Regression	17	71.50672348	4.20627785	2.09 0.06
Brror	18	36.15549874	2.00863882	
Total	35	107.66222222		
	Parameter	Standard	Туре II	B Bash
Variable	Estimate	Error	Sum of Squares	i blop
INTERCEP Bl	74.90838933	29.18092625 20.79289445	13.23623971 6.95849103	6.59 0.01 3.46 0.07
B3	8.50343653	5.03095212	5.73839491	2.86 0.10
	9.63104828	4.96101260	7.57021669	3.77 0.00
84	8.14883157	5.89108804	3.84327542	1.91 0.18
B5 B6	5.71061149	4.59432422	3.10330028	1.54 0.22
Month	0.05348428	0.23439146	0.10458527	0.05 0.82
MSR1	0.03439774	0.11946853	0.16651546	0.08 0.77
		The SAS Sy		rsday, July 12, 1
MSR2	0.05228387	0.12131713	0.37001607	0.18 0.67
HSR4	0.06866354	0.11359604	0.73388487	0.37 0.55
MSR5	0.32086687	0.23196085	3.84345883	1.91 0.18
MSRG	-0.07888339	U.21418224	0.27246209	0.14 0.71
MSR7	-0.02067917	0.01711923	2.93089054	1.46 0.24
MSR8	0.05533147	0.03752663	4.36683827	2.17 0.15
MSR9	-0.16310229	0.33840716	0.46659802	0.23 0.63
MSR10	-0.09414756	0.13636942	0.95738364	0.48 0.49
H5312	-0.07419925	0.16265260	0.41800248	0.21 0.65
MSB13	0.18529994	0.19697590	1.77756800	0.88 0.35
ounds on oor	dition number:	1076.213,	32019.69	
Step 2 · Vari	able MONTH Res	oved R-squir	• • 0.66320513	C(p) + 15.0923705
	DF	Sum of Squares	Mean Square	f Prol
Regression	16	71.40213821	4.46263364	2.34 0.03
Brror	19	36.26008401	1.90842547	
Total	35	107.66222222		
	Parameter	Standard	Type II	
Variable	Estimate	Error	Sum of Squares	r Prol
INTERCEP	71.75287294	25.04689050	15.66196179	8.21 0.00
B1	-40.80645882	18.16258143	9.63336183	5.05 0.03
83	8.97026898	4.48005405	7.65099101	4.01 0.09
B4	9.91430655	4.68184205	8.55788361	4.48 0.04
B5	8.90740899	4.74057821	6.73775727	3.53 0.01
B6	6.19894480	3.96273109	4.67005009	2.45 0.13
MSB1	0.04558588	0.10619093	0.35169089	0.18 0.61
MSR2	0.06318118	0.10923431	0.63845827	0.33 0.50
MSR4	0.07602589	0.10616197	0.97860134	0.51 0.48
MSR5	0.32575048	0.22513200	3.99574275	2.09 0.10
MSR6	-0.10152004	0,18502688	0.57452526	0.30 0.54
HSE7	-0.01904986	0.01518595	3.01106380	1.58 0.22
MSR8	0.05493573	0.03653945	4.31381043	2.26 0.14
HSR9	-0.18849556	0.31151170	0.69876110	0.37 0.5
MSR10	-0.08490406	0.12692399	0.85397412	0.45 0.5
MSR12	-0.05374111	0.13228267	0.31497970	0.17 0.6
MSR13	0.18185229	0.19143369	1.72216993	0.90 0.3
		864 . 271 ,	24318.99	
		B		
эсер з У <b>АГ</b>				C(p) = 13.2408464
	DF	som of sdortes	Hean Square	f Pro

Regression	15	71.08715851	4.73914390	2.59	0.0242
Brror	20	36.57506371	1.82875319		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	<b>Setimate</b>	Irror	Sum of Squares	7	Prob>P
					13 1000
		The SAS Syst		ureday, July	12, 1990
					••
INTERCEP	67.86135908	22.65462451	16.40916437	8.97	0.0071
<b>B1</b>	-41.39452851	17.72286178	9.97638672	5.46	0.0300
B3	8.97927097	4.38549738	7.66654235	4.19	0.0540
B4	10.36545614	4.45228410	9.91211183	5.42	0.0305
85	8.81623776	4.63536656	6.61536050	3.62	0.0717
B6	6.24783844	3.87734248	4.74838965	2.60	0.1228
MSR1	0.05382117	0.10203915	0.50877740	0.28	0.6037
MSR2	0.06429391	0.10689625	0.66156086	0.36	0.5543
MSR4	0.08465514	0.10182249	1.28407936	0.69	0.4156
MSR5	0.33449189	0.21937601	4.25155728	2.32	0.1430
MSR6	-0.08733674	0.17787006	0.44090326	0.24	0.6288
MSR7	-0.01822096	0.01471103	2.80550493	1.53	0.2298
MSR8	0.05597072	0.03568155	4.49976160	2.46	0.1324
MSR9 MSR10	-0.21546068 -0.08654812	0.29793752 0.12418319	0.95640256 0.88826954	0.52	0.4779
MSR13	0.15731732	0.17782566	1.43126250	0.78	0.3868
LISET?	0.13/31/36	0.11/02300	1.43160630	0.70	0.3000
Bounds on cor	dition number:	858.7814,	22475.81		
•••••					
itep 4 Vari	iable MSR6 Remo	ved R-square	- 0.65618426	C(p) = 11.44	868058
	DF	Sum of Squares	Mean Square	r	Prob>P
Passasia-	14	70.64625525	5.04616109	2.86	0.0145
Regression Error	21	37.01596697	1.76266509	2.00	0.0243
Total -	35	107.66222222	1.10100304		
	••				
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	Prob>P
INTERCEP	63.83809840	20.73578928	16.70661814	9.48	0.0057
Bl	-39.73372217	17.07985962	9.53937039	5.41	0.0301
<b>B</b> 3	7.89102181	3.71523281	7.95177758	4.51	0.0457
B4	10.95966480	4.20652980	11.96510205	6.79	0.0165
B5	7.83759108	4.10867304	6.41404258	3.64	0.0702
B6	5.54000775	3.53376129	4.33227614	2.46	0.1319
MSR1	0.04966500	0.09983315	0.43623571	0.25	0.6240
MSR2	0.05900519	0.10452332	0.76825780	0.44	0.5163
HSR4	0.08578959	0.09993997	1.29885456	0.74	0.4004
MSR5	0.35590933	0.21107535	5.01156667	2.84	0.1066
MSR7	-0.01646173	0.01400788	2.43430903	1.38	0.2531
MSR8	0.05666665	0.03500324	4.61964435	2.62	0.1204
MSR9	-0.18128913		0.71616844		0.5307
MSR10	-0.08729595	0.12190949	0.90382204	0.51	0.4818
MSR13	0.15911889	0.17454577	1.46485504	0.83	0.3723
		827.5015,			
		ved E-square		C(p) = 9.6	5431448
		Sum of Squares			Prob>P
		•			
Regression	13 22	70.21001954 37.45220268	• • • • • • • •	3.17	0.0083
Brror Total	35	107.66222222	1.10431483		
1941	30		.es 16:49 Th	ursday. July	12. 1990
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	Paraseter	Standard	Type II		
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Variable	Betimate	Brror	Sum of Squares	7	Prob>P
INTERCEP	68.55569046	18.12221783	24.36234055	14.31	0,0010
B1	-33.70398453	11.82625216	13.82683907		0.0093
83	6.92579295	3.11369108	8.42253158	4.95	0.0367
<b>B4</b>	9.81927144	3.46620211	13.66172225	8.03	0.0097
85	6.30923366	2.68108390	9.42729498	5.54	0.0280
<b>B6</b>	4.06467062	1.88845427	7.83664797	4.63	0.0426
MSR2	0.04345878	0.08946864	0.40166882	0.24	0.6320
M584	0.09250343	0.09731625	1.53815341	0.90	0.3522
MSR5 MSR7	0.34727534 -0.01492940	0.20673161	4.80384275 2.10393805	2.82 1.24	0.1071 0.2783
MSR8	0.06297807	0.01342930 0.03206039	6.56894626	3.86	
MSR9	-0.15517269	0.27470352	0.54319633	0.32	
MSR10	-0.09546297	0.11871511	1.10081052	0.65	
MSR13	0.15516977	0.17135712	1,10081052 1,39593310	0.82	0.3750
		410.7803,	9286.737		
		****************			
Step 6 Var	iable MSR2 Remo	ved R-square	= 0.64840154	C(p) = 7.8	4365415
		Sum of Squares	-		Prob) T
Regression	12	69.80835072		3.53	0.0045
Brror	23	37.85387150	1.64582050		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares		Prob>F
			-		
		16.08942497	33.26911611		0.0002
B1	-34.75107744	11.43335718	15.20447658	•••••	0.0058
B3 B4	7.30669566 10.00204419	2.96285629 3.38800202	10.00929134 14.34407952	6.08 8.72	0.0215 0.0071
195 .	6.18690577	2.62452010	9.14596772	5.56	0.0273
B6	4.37899967	1.74440518	10.37140418	6.30	0.0195
MSR4	0.08384985	0.09406918	1.30765231	0.79	0.3820
MSR5	0.33888927	0.20255878	4.60676400	2.80	0.1079
MSR7	-0.01551888	0.01315033	2.29207946	1.39	0.2500
MSR8	0.06585372	0.03098128	7.43608491	4.52	0.0445
MSR9	-0.11643770	0.25847123	0.33399910		0.6566
MSR10 MSR13	-0.09876304 0.15250891	0.11653531	1.18210565 1.34984791	0.72 0.82	0.4055 0.3745
NJR13	0.13230081	0.16840075	1.94804181	0.06	0.3/43
Bounds on co	ndition number:	397 ، 1322 ,	8224.202		
Step 7 Var	iable MSR9 Remo	ved R-square	- 0.64529925	C(p) = 8.0	0109549
	DF	Sum of Squares	Hean Square	r	Frob>F
Regression	11	69.47435162	6.31585015	3.97	0.0023
Irror	24	38.18757060	1.59116127		
Total	35	107.66222222			
		The SAS Eye	tem 16:49 Th	ursday, July	12, 1990 17
	Parameter	Standard	Type II		
Variable	Satimate	Brror	Sum of Squares	7	Prob>P
INTERCEP	73.\$4835334	15.42488055	36.57022203	22.98	0.0001
81	-32.41572581	10.01989079	16.65327753	10.47	0.0035
<b>B</b> 3	8.57187953	2.43200475	11.61888754	7.30	0.0124
B4	9.28920218	2.94560066	15.82425574	9.95	0.0043
85 86	5.78531968	2.42714926 1.69882073	9.04015663 10.05571053	5.68 6.32	0.0254 0.0191
MSR4	4.27067804 0.09632110	0.08839783	1.88918236	1.19	0.2867
MSR5	0.28481100	0.16042251	5.01530222	3.15	0.0685
MSR7	-0.01413049	0.01257000	2.01074946	1.26	0.2721

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MSR8	0.06398707	0.03018879	7.14837268	4.49	0.0446
HSR10	-0.07789476	0.10514190			
	-0.07700410			0.65	
MSR13	0.12441332	0.15380668	1.04111230	U.03	V. 4203
Bounds on con	ndition number:	315.4872,	5959.37		
Step 8 Vari	Lable MSR10 Res	eraups-I bevo	= 0.63718748	C(p) = 4.41	276857
-					
	DP	Sum of Squares	Nean Square	7	Prob>P
		•	•		
Regression	10 25 35	68.60102044	6.86010204	4.39	0.0013
Brror	26		1.56244807		
BILOL	£3		1.3444041		
Total	35	<b>39.06120178</b> 107.66222222			
	_				
	Parameter				
Variable	Estimate	Brror	Sum of Squares	1	Prob>P
INTERCEP	70.36389224	14.51367849	36.72402761	23.50	0.0001
B1	-32.74098976	9.91953649	17.02183757		0.0029
B3	6.45712294	2.40506847	11.26234460		0.0127
B4	9.62325635	2.88450082	17.39035190		0.0027
B5	5.76155365	2.40493999	8.96760195	5.74	0.0244
B6	4.39212904	1.67556663	10.73574955	6.87	0.0147
MSR4	0.11139070	0.08524601	2.66781268	1.71	0.2032
MSR5	0.27275459	0.15814842	4.64750672		
MSR7	-0.01185924	0.01207993	1.50588223	• • • •	
MSR8	0.06594059	0.02980083	7.64987626		0.0363
MSR13	0.07968994	0.14018254	0.50492251	0.32	0.5748
Bounds on cot	dition number:	314.8815,	5344.808		
64 6 V			- 0 63340761	C(-) - 7 6	****
Step 9 vari	LADIE MSKIJ KOB	oved R-square		$\mathcal{C}(\mathbf{p}) = \mathbf{z} \cdot \mathbf{e}$	50/8022
				-	<b>-</b>
	DF	Sum of Squares	Hean Square	r	Prob>P
•					
Regression	9	68.09609793	7.56623310	4.97	0.0006
Error	26	68.09609793 39.56612429	1.52177401		
Total	35	107.66222222			
	•••				
	Beerenter	Frandand	P.m. 11		
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	r	Prob> <b>F</b>
INTERCEP	78.15403007	4.71830521			0.0001
		The SAS Syd	it <b>en</b> 16:49 Th	uraday, July	12, 1990
					18
	-11 79998009	9.63198327	16.51765242	10.85	0.0028
B1	-31.73326997				
83	6.41181950	2.37225396	11.11707099		0.0120
<b>B4</b>	9.55790373	2.8444641	17.18224686		0.0024
35	4.87633683	1.80872125	11.06099694	7.27	0.0121
BG	4.57206655	1.62383975	12.06393298	7.93	0.0092
MSR4	0.10526379		2.42110628		
MSR5	0.25643914				
MSR7	-0.00959148	0.01125284	1.70559964		
MSRB	0.06840886	0.02909655	8.41185845	5.53	0.0266
Bounds on col	ndition number:	304.8255,	4433.946		
		*************			
Step10 Ver	iable MSE7 Bann	ved R-squera	. 0.82222846	$C(p) = 1.1^{\circ}$	7194059
				-\F/	
	DF	Sum of Squares	MAAR Eaures	7	Prob>P
	UT .	and of adortes	ueru sõnfie	*	1100/1
<b>.</b> .					
Regression	8	66.99049829		-	0.0003
Error	27	40.67172393	1.50636015		
Total	35	107.66222222			
	Basantes	Standard	Time 11		
	Parameter		Type II		
Variable	Estimate	Error	Sum of Squares	P	Prob>P

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INTERCEP	77.40027080	4.61113943	424.42029725	281.75	0.0001
B1	-32.85197356	9.49369589	18.03769813	11.97	0.0018
83	6.29740270	2.35642762	10.75829723	7.14	0.0126
B4	9.58798084	2.82978645	17.29321764	11.48	0.0022
85	5.51903223	1.63571171	17.14909292	11.38	0.0023
B6	4.90818900	1.56723201	14.77422762	9.81	0.0041
MSR4	0.12841653	0.07850904	4.03024326	2.68	0.1135
MSR5	0.23163626	0.14993588	3.59526383	2.39	0.1340
MSRð	0.06682842	0.02888997	8.05040408	5.35	0.0286

## Bounds on condition number: 299.1657, 3821.113

Stepll V	ariable MSR5 Rem	oved R-square	. = 0.58883453	C(p) = 0.8	6668520
	DF	Sum of Squares	Hean Square	7	Prob>P
Regressio	n 7	63.39523446	9.05646207	5.73	0.0003
Brror	28	44.26698777	1.58096385		
Total	35	107.66222222			
	Parameter	Standard	Туре II		
Variable	Estimate	Error	Sum of Squares	7	Prob> <b>F</b>
INTERCEP	82.46570911	3.32147443	974.55624591	616.43	0.0001
B1	-20.62941545	5.37602041	23.27951706	14.72	0.0006
B3	3.10469805	1.15990332	11.32705712	7.16	0.0123
B4	5.72266340	1.35437704	28.22533956	17.85	0.0002
B5	4.28099802	1.46084463	13.57700373	8.59	0.0067
B6	3.12148167	1.08355232	13,12029942	8.30	0.0075
MSR4	0.17128429	0.07523865	8,19360575	5.18	0.0307
MSR8	0.06498367	0.02957144	7.63458628	4.83	0.0364
		The SAS Syr	stem 16:49 Th	ursday, July	12, 1990
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Bounds on condition number: 91.40499, 1036.919

All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination Procedure for Dependent Variable MSR11

	Variable	Number	Partial	Model			
Step	Removed	In	#==2	R==2	C(p)	r	Prob>7
1	MER3	17	0.0008	0.6642	17.0431	0.0431	0.8381
2	MONTH	16	0.0010	0.6632	15.0924	0.0521	0.8221
3	MSR12	15	0.0029	0.6603	13.2408	0.1650	0.6891
4	MSEG	14	0.0041	0.6562	11.4487	0.2411	0.6288
5	MSR1	13	0.0041	0.6521	9.6543	0.2475	0.6240
6	MSB2	12	0.0037	0.6464	7.8437	0.2359	0.6320
7	MSR9	11	0.0031	0.6453	6.0011	0.2029	0.6566
8	MSR10	10	0.0081	0.6372	4,4128	0.5489	0.4660
9	MSR13	9	0.0047	0.6325	2.6508	0.3232	0.5748
10	MSE7	8	0.0103	0.5222	1.1719	0.7265	0.4018
11	MSR5	1	0.0334	0.5888	0.8667	2.3867	0.1340

The SAS System 18:49 Thursday, July 12, 1990

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OBS	<b>B</b> 1	B2	B3	84	B5	B6	B7	Honth	MSR1	MSR2	MSR3	MSR4
1	0	0	1	0	0	0	0	1	21.90	84.88	48.10	16.32
2	Ó	0	1	0	0	0	0	2	24.58	85.07	59.31	12.26
3	0	0	1	0	0	0	0	3	26.08	83.60	70.71	18.64
4	0	0	1	0	0	0	0	4	26.18 26.64	85.09 84.23	\$2.52 55.28	18.40 18.71
6	ŏ	ŏ	1	ŏ	ŏ	ŏ	ŏ.	6	24.02	83.69	35.65	16.25
ĩ	ŏ	ŏ	ō	ĩ	ŏ	ŏ	õ	ī	21.10	80.93	15.40	9.30
8	0	0	0	1	0	0	0	2	19.30	83.36	17.60	9.50
.9	0	0	0	1	0	0	0	3	20.80	81.61 80.20	23.70 14.80	11.14 13.30
10 11	ŏ	0	ŏ	1	0	0	ŏ	5	22.30 25.10	75.63	23.90	13.10
12	0	ō	ō	ī	õ	ō	õ	6	19.30	80.76	20.10	10.10
13	0	0	0	0	1	0	0	1	10.20	77.51	\$1.70	14.60
14	0	0	0	0	1	0	0	2	21.70	71.94	91.60	14.80
15 16	0	0	0	0	1	0	0	3	10.40 17.10	72.15 71.76	72.80 96.90	7.80 6.50
17	ŏ	ŏ	ŏ	ŏ	ĩ	ŏ	ŏ	5	20.50	72.91	76.00	6.90
18	ŏ	Ō	Õ	Õ	ī	Õ	Ō	6	19.30	75.32	53.00	6.90
19	0	0	0	0	0	1	0	1	14.30	78.39	85.00	18.30
20	0	0	0	0	0	1	0	2	14.80	80.57	72.00	14.20 15.20
21 22	0	0	0	0	0	1	0	3	13.50 13.20	79.99 80.59	57.90 25.20	17.80
23	ŏ	ŏ	ŏ	ŏ	ŏ	i	ŏ	5	13.00	80.72	25.50	23.80
24	Ō	ō	ō	Ō	Ō	ī	Ó	6	17.90	80.59	27.90	21.90
25	0	0	0	0	0	0	1	1	51.80	67.48	86.00	24.00
26	0	0	0	0	0	0	1	2	45.60	72.31	115.00	31.00
OBS	MSB	15	MSR6	MSR7		MSR8	MSRS	MSR	10 MSR	11 MSRI	2 MSR	13
1	9.9		48.3	52		97.40	2.00					
2	9.5		49.6	100	-	00.00	0.70					
3	9.9 10.7		48.8 49.2	87 131		99.10 98.90	3.30					
5	10.5	-	48.4	90		96.50	2.80					
6	11.3		41.1	103		98.90	3.70	96	.8 94		1 99.	92
7	6.0		30.5	75		88.50	3.76					
8	5.9		29.3	82		79.40	1.76					
9 10	6.7		28.9	86 89		83.10 72.60	1.19					
11	7.5		29.6	78		81.50	1.30					
12	7.0		31.2	64		76.40	0.91	97	.7 95			-
13	18.0		47.1	18		96.97	1.70					
14 15	19.7		45.9	28 51		77.42 82.81	1.60					
15	17.6		47.0	24		98.04	2.40					
17	18.3		44.9	100		97.22	1.97					
18	14.6		45.6	73		98.00	2.20					
19	17.6		42.9	69		99.24	0.80					
20 21	16.6		43.8 43.8	57 74		98.45 97.80	0.80					
22	16.9		42.4	43		00.00	0.00					
23	17.2		41.9	48	-	96.59	0.00				5 99.	70
24	16.2		41.7	60		99.30	1.90					
25	22.0		35.5	91		75.60	0.90					
26	26.0	00	34.5	67		71.60 Th	1.7( • SAS	) 96 Syst <b>ee</b>		.9 87. 9 Thursda		
								J, J. J			,,/	2
OBS	<b>B1</b>	B2	<b>B</b> 3	B4	B5	<b>B</b> 6	B7	MONTH	MSR1	MSR2	MSR3	MSR4
27	0	0	0	0	0	0	1	3	50.60 47.00	66.45 64.51	100.00	26.00 26.00
28 29	0	0	0	0	0	0	1	5	49.60	64.88	127.00	29.00
30	ő	ŏ	ŏ	ŏ	ŏ	ŏ	ī	6	48.40	77.20	91.00	23.00
31	-1	-1	-1	-1	-1	-1	-1	1	23.90	75.18	48.00	19.00

32	-1	-1	-1	-1	-1	-1	-1	2	31.60	77.16	50.00	21.00
33	-1	-1	-1	-1	-1	-	-1	3	23.20	79.22		15.00
34	-1	-1	-1	-1	-1	-	-1	4	24.90	79.17		18.00
35	-1	-1	-1	-1	-1	-	-1	5	25.90	81.80		19.00
36	-1	-1	-	-1	-1	-	-	ě	21.00	86.78		12.00
30	-1	•1	-1	-1	-1	-1	-1	0	£1.VV	99.19	34.00	16.00
OBS	MSR	5	MSR6	MSR7		MSR8	MSR9	MSE1(	) MSR1	1 MSR12	MSR13	
27	24.0	0	34.2	76		87.50	0.00	95.0	93.	4 92.1	94.60	
28	26.0	0	34.3	98		55.70	0.00	96.1	87.	2 92.9	94.00	
29	29.0	0	32.3	135		81.00	1.20	94.0	95.	1 88.4	95.50	
30	30.0	-	31.0	102		85.20	5.60	94.1			95.70	
31	17.0	-	29.6	59		64.40	2.90	95.0			95.60	
32	17.0		29.9	43		93.90	1.20	96.		• • • •	97.10	
33	13.0	-	30.4	63		91.00	0.00	95.8			94.60	
34	15.0	-	29.8	87		92.30	1.10	95.2			94.00	
		-										
35	15.0	0	30.0	67		84.60	0.00	93.8			95.30	
36	14.0	0	27.2	80		80.00	1.10	97.0	<b>5 9</b> 5.	2 95.6	95.70	
						The	SAS S	iystem	16:49	Thursday	, July 12	, 1990 3

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Backward Elimination Procedure for Dependent Variable MSR10

Step 0 All Variables Entered R-square = 0.64258878 C(p) = 19.00000000
NOTE: The model is not of full rank. A subset of the model which is of full
rank is chosen.

	DP	Sum of Squares	Hean Square	7	Prob>P
Regression	18	182.58714007	10.14373000	1.70	0.1405
Error	17	101.55591548	5.97387738		
Total	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	Prob>F
INTERCEP	90.48796723	56.32324156	15.41922994	2.58	0.1266
B1 ·	7.31404712	39.11726127	0.20885022	0.03	0.8539
B3	2.64589939	9.34822509	0.47856908	0.08	0.7806
B4	0.55266712	9.45476434	0.02041184	0.00	0.9541
B5	-6.42666197	10.70790879	2.15187922	0.36	0.5563
B6	-6.53828528	8.14159974	3.85269421	0.64	0.4330
MONTH	0.50502532	0.38608536	10.22153078	1.71	0.2083
MSR1	-0.18539978	0.20159438	5.05263430	0.85	9.3706
MSR2	-0.22149415	0.21594808	6.28466529	1.05	0.3194
MSR3	-0.03361370	0.04289291	3.66874793	0.61	0.4440
MSR4	-0.34889430	0.21776757	15.33407680	2.57	0.1275
MSR5	0.68423498	0.47024333	12.64799181	2.12	0.1639
MSR6	0.30535963	0.38601755	3.73822508	0.63	0.4398
MSR7	-0.04807522	0.02848790	17.01288054	2.85	0.1098
MSR8	0.01721005	0.06965573	0.36467562	0.06	0.8078
MSR9	-0.51599832	0.57572127	4.79875215	0.80	0.3826
MSE11	-0.28019969	0.40128248	2.91266950	0.49	0.4945
MSR12	-0.26171282	0.29718400	4.63292686	0.78	0.3908
MSB13	0.68384410	0.31091668	28.89897734	4,84	0.0420
Bounds on co	ndition number:	1280.709,	39667.02		
Step 1 Var	iable <b>34 Rem</b> oved	l R-square	<b>₽ 0.64251695</b>	C(p) = 17.0	0341685
	DP	Sum of Squares	Mean Square	7	Prob>f
Regression	17	182.56672823	10.73921931	1.90	0.0928
Brror	18	101.57632732	5.64312930		
Total	35	284.14305556			
	Remember	Et andro - 4	func 11		
No-(-b)-	Parameter	Standard	Type II	,	Prob>P
Variable	Estimate	Error	Sum of Squares	r	rrod/f
INTERCEP	91.28277804	53.12270422	16.66239205	2.95	0.1029

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Bounds	on condition number:	327.9588,	13641.43		
MSR13	0.68108646	0.29868820	29.34190909	5.20	0.0350
MSR12		0.28272962	4.96757093	0.88	0.3605
MSR11	-0.27029861	0.35356771	3.29808947	0.58	0.4545
MSR9	-0.50091414	0.50019930	5.65927013	1.00	0.3299
MSR8	0.01695314	0.06756511	0.35528372	0.06	0.8047
MSR7	-0.04/#2608	0.02757678	17.04420501	3.02	0.0993
MSR6	0.30 /390	0.37237085	3.72664218	0.66	0.4270
MSR5	0.65. 180	0.30201038	27.24544933	4.83	0.0413
MSR4	-0.3485 32	n. <b>21165119</b>	15.33939716	2.72	0.1166
MSR3	-0.033361.0	0.04148500	3.65049198	0.65	0.4317
				-	4
		The SAS Syste	m 16:49 Thurs	day, July	12, 1990
MSE2	-0.22476357	0.20272278	6.93692088	1.23	0.2821
MSR1	-0.19189360	0.16349870	7.77342453	1.38	0.2558
MONTH	0.50986882	0.36650139	10.92158515	1.94	0.1811
B6	-6.85625644	5.88758564	7.65278711	1.36	0.2594
B5	-6.79028592	8.47001779	3.62606170	0.64	0.4332
B3	2.25784652	6.39684846	0.70303462	0.12	0.7282
<b>D</b> 1	9.28622316	19.23909449	1.31470701	0.23	0.6351

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Step 2 Variable B7 Entered R-square = 0.64258878 C(p) = 19.00000000 NOTE: The variable which previously had small tolerance is now allowed to enter after removal of some variables from the model.

	DF	Sum of Squares	Mean Square	P	Prob P
Regressi	on 18	182.58714007	10.14373000	1.70	0.1405
Brror	17	101.55591548	5.97387738		
Total	35	284.14305556			
	Parameter		Туре II		
Variable	Estimate	Error	Sum of Squares	7	Prob) P
INTERCEP	91.04063435	54.81407356	16.47944942	2.76	0.1151
B1	10.63004982	30.33737288	0.73345076	0.12	0.7303
B3	2.09323227	7.15881679	0.51075032	0.09	0.7735
B5	-6.97932908	9.29630529	3.36715339	0.56	0.4631
B6	-7.09095240	7.26746746	5.68720983	0.95	0.3429
87	-0.55266712	9.45476434	0.02041184	0.00	0.9541
MONTH	0.50502532	0.38608536	10.22153078	1.71	0.2083
MSR1	-0-18539978	0.20159438	5.052€3430	0.85	0.3706
MSR2	-0.22149415	0.21594808	6.28466529	1.05	0.3194
MSR3	-0.03361370	0.04289291	3.66874793	0.61	0.4440
MSR4	-0.34889430	0.21776757	15.33407680	2.57	0.1275
MSR5	0.68423498	0.47024333	12.64799181	2.12	0.1639
MSR6	0.30535963	0.38601755	3.73822508	0.63	0.4398
MSE7	-0.04807522	0.02848790	17.01288054	2.85	0.1098
MSR8	0.01721005	0.06965573	0.36467562	0.06	0.8078
MSR9	-0.51599832	0.57572127	4.79875215	0.80	0.3826
MSE11	-0.28019969	0.40128248	2.91266950	0.49	0.4945
MSR12	-0.26171282	0.29718400	4.63292686	0.75	0.3908
MSR13	0.68384410	0.31091668	28.89897734	4.84	0.0420
Bounds on	condition number	: 770.3173,	27665.17		
			***************	*********	********
Step 3	Variable <b>37 Ees</b> ov	ed R-square	= 0.64251695 C	(p) = 17.00	341685
	DF	Sum of Squares	Mean Square	7	Prod Y
Regressi		182.56672823	10.73521931	1.90	0.0928
Error	18	101.57632732	5.64312930		
Total	35	284.14305556			
		The SAS Sys	tem 16:49 Thur	sday, July	12, 1990

Standard Parameter

Type 11

Variable	Estimate	Brror	Sum of Squares	7	Prob>P
INTERCEP	91.28277804	53.12270422	16.66239205	2.95	0.1029
81	9.28622316	19.23909449	1.31470701	0.23	0.6351
83	2.25784652	6.39684846	0.70303462	0.12	0.7282
85	-8.79028592	8.47091779	3.62606170	0.64	0.4332
34	-8.85625844	5.83758564	7.65278711	1.36	0.2594
SONT!	0.50986882	0.36650139	10.92158515	1.94	0.1811
MSR1	-0.19189360	0.16349870	7.77342453	1.38	0.2558
MSR2 MSR3	-0.22476357 -0.03336620	0.20272278 0.04148500	6.93692088 3.65049198	1.23 0.65	0,2821 0,4317
MSR4	-0.34895132	0.21165119	15.33939716	2.72	0.1166
MSR5	0.66360380	0.30201038	27.24544933	4.83	0.0413
HSRE	0.30260390	0.37237085	3.72664218	0.66	0.4270
MSR7	-0.04792608	0.02757678	17.04420501	3.02	0.0993
MSR8	0.01695314	0.06756511	0.35528372	0.06	0.8047
MSR9 MSR11	-0.50091414 -0.27029861	0.50019930 0.35356771	5.65927013 3.29808947	1.00 0.58	0.3299
MSE12	-0.26526707	0.28272962	4.96757093	0.88	
MSR13	0.68108646	0.29868820	29.34190909	5.20	0.0350
	ndition number:	327.9588,	13641.43		
Step 4 Var	iable MSRS Remo	ved R-square	= 0.64126658	C(p) + 15.062	188973
	DP	Sum of Squares	Mean Square	T	Prob>F
Regression	16	182.21144451	11.38821528	2.12	0.0595
Brror	19	101.93161104	5.36482163		0.0303
Total	35	284.14305556			
	Parameter	Standard	Type 11	-	
Variable	Estimate	Error	Sum of Squares	1	Prob>F
INTERCEP	88.41537116	50.58351441	16.39052395	3.06	0.0966
B1 ·	7.95501230	18.03132926	1.04419476	0.19	0.6641
B3	2.52833243	6.14791281	0.90733620	0.17	0.6855
B5	-6.34118434	8.07291721	3.31005376	0.62	0.4419
36	-6.38768133	5.44414404	7.38554515	1.38	0.2552
MONTH	0.50508088	0.35686490	10.74656047	2.00	0.1732
MSR1 MSR2	-0.17662511 -0.21472883	0.14796360 0.19377618	7.64452328 6.58772140	1.42	0.2473
MSR3	-0.03557337	0.03952509	4.34691886	0.81	0.3793
MSR4	-0.36207640	0.19996426	17.58939824	3.28	0.0860
MSR5	0.66923709	0.29365419	27.86396382	5.19	0.0344
MSR6	0.30734502	0.36260473	3.85425731	0.72	0.4072
HSR7	-0.04783039	0.02688559	16,97946044	3.16	0.0912
MSR9 MSR11	-0.50501745 -0.24278385	0.48744823 0.32773922	5.75852254 2.94399671	1.07	0.3132 0.4679
MSR12	-0.27020245	0.27500172	5.17920433	0.55	0.3382
MSR13	0.69081260		30.70301070		
Bounds on co	ndition number:	303.0192,			
			****		
		The SAS Sys	t <b>en</b> 16:49 Th	ursday, July )	12, 1990 8
Step 5 Var	iable 33 Secove	d R-square	- 0.63807334	C(p) = 13.216	177370
	DT	Sum of Squares	Mean Square	7	Prob>F
Bagaaalaa	15	181.30410831	12.08694055	3 84	0 0374
Regression Error	15	102.83694724	12.08694055 5.14194736		0.0378
Total	35	284.14305556			
	Parameter		Type II		
Variable	Estimate	Error	Sum of Squares	T	Prob>F
			18		
INTERCEP B1	83.10666590 14.43409773	47.88196812 8.58638358			0.0980
	************		*************		VVJ

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85	-8.67410126	5.62329230	12.23475520	2.38	0.1386
B6	-8.13937220	3.31939993	30.91649707		0.0235
MONTR					
	0.55596807	0.32769844	14.80048428		0.1053
HSR1	-0.19371444	0.13902755	9.98274320	1.94	0.1788
HSR2	-0.21174669	0.18957552	6.41499538	1.25	0.2773
MSRJ	-0.03619141	0.03866785	4.50441844	0.85	0.3605
MSR4	-0.35714589	0.19541439	17.17535917	3.34	0.0826
MSR5	0.66713336	0.28744613	27.69746514	5.39	0.0310
MSR6	0.44446352	0.13950864	52.19242104	10.15	0.0046
MSR7	-0.04543156	0.02569427	16.07572106	3.13	0.0923
MSR9	-0.42729301	0.43988570	4.85176241	0.94	0.3430
MSR11	-0.22009918	0.31626227	2.49008840	0.48	0.4945
MSR12	-0.27165015	0.26920678	5.23570943		
	0.67877305				
MSR13	V. V/8//3US	Q.28124847	29.94997528	5.82	0.0255
Neverda en ese					
		73.79636,		***********	*******
Štep 6 – Vari	able MSR11 Beg	oved R-square	0.62930984	C(p) = 11.6	3160322
	DF	Sum of Squares	Hean Square	7	Prob>7
	•				
Regression	14	178.81401991	12.77242999		0.0258
Brfor	21	105.32903565	5.01566836		
Total	35	284.14305556			
	Parameter	Standard			
Variable	Estimate	Error		1	Prob>7
				•	
INTERCEP	61.60354306	36.12504389	14.58557075	2.91	0.1029
<b>B1</b>	15.28544498	8.39377517	16.63298979		0.0829
B5	-9.09670657	5.52133161	13.61474535	2.71	0.1143
36	-3.26962295	3.27317076	32.01569295	6.38	0,0196
MONTH	0.51767335	0.31905451	13.20415620	2.63	0.1196
MSR1	-0.18300665	0.13646621	9.02011964	1.80	0.1942
MSR2	-0.22399288	0.18642477	7.24085741		0.2429
MSR3 .	-0.03479546	0.03813866	4.17487300		0.3719
MSR4	-0.37429139	0.19145977	19.16873282	3.82	0.0640
MSR5	0.68659549	0.28254750	29.61754342	5.91	0.0242
MSR6	0.44581014	0.13777176	52.51801160		0,0040
MSR7	-0.04195349	0.02489208	14.24763240		0.1067
MSR9	-0.49174249	0.42471247	6.72379192		0.2599
MSR12	-0.22798672	0.25855813	3.89970265	0.78	0.3879
MSR13	0.64999216	0.27475374	28.07099707	5.60	0.0277
		The SAS Sys	stes 16:49 Th	ureday, July	12, 1990
					7
		72.93569,	3792.734		
***********					********
Step 7 Vari	able MSE12 Res	oved E-square	. = 0.61558540	C(p) = 10.2	8439577
	Df	Sum of Squares	Mean Square	7	Prob>F
Regression	13	174.91431726	13.45494748	2.71	0.0190
Brror	22	109.22873830	4.96494265		
Total	35	284.14305556	**********		
	~~	807147JU733 <b>0</b>			
	Bannadan	<b>6</b> • • • • • • • •			
***	Parabeter	Standard	Type II		
Variable	<b>Sctimate</b>	Error	Sum of Squares		Prob>P
_					
INTERCEP	44,53041165	30.34312179	10.69318636	2.15	0.1564
81	13.70247639	8,15798042	14.00706177	2.82	0.1072
85	-7.75635842	5.28105295	10.70998670		0.1561
36	-7.56833866	3.15898015	28.49847092		0.0255
-		• • • • • • • • • •			
MONTH	0.38072076	0.27728484	9.35998385		0,1836
MSR1	-0.14892477	0,13021449	6.49425706	1.31	0.2650
MSR2	-0.17676650	0.17766019	4,91511760	0.99	0.3306
MSR3	-0.02238198	0.03526556	1.89990700	0.40	0.5322
MSR4	-0.30010876	0.17111354	15.27224365		0.0934
MSR5	0.59479303	0.26133441	25.71892327		0.0329
nəri	A'28418202	A. 20133441	43 · / 108432/	5.18	U.U34¥

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MSR6	0.38174573	0.11646343	53.34373537	10.74	0.0034
HSR7	0.38174573 -0.03524605	0.02358114	11.09189506		
MSES	-0.59209206	0.40710643	10.50211535		
MSR13	0.57485706	0.25988230			
UANTA	0.3/403/00	V. 4396643V		4.03	0.03//
Bounda en					
	condition number:				
+++	*************	*************			
	ariable MSR3 Remo				
		And Resident		-(p) • • •	
	Dr	Sum of Squares	Hean Square	1	Prob>7
				•	
Regressio	n 12	172.91441026	14.40953419	2.98	0.0118
Brror	23	111.22864530	4.83602806		
Total		284.14305556			
	Parameter	Standard	Type II		
Variable					Prob>7
				•	
INTERCEP	41.25976635	29.51155654	9.45274860	1.95	0.1754
81	11 87668422	7.53417860	12.01733827		0.1286
35	11.87669622 -6.69110971	4.94180018	8.86573512		
36	-6.93461750	2.95785757			0.1889
MONTH	0.42251106	0.26583346	26,58148989	5.50	0.0281
			12.21646911 6.35941430		0.1256
MSR2	-0.14734360 -0.14095934	0.12848934			0.2633
		0.16626244	3.47606747		0.4053
MSR4	-0.25650034	0.15466433	13.30100249	2.75	0.1108
MSR5	0.49073952 0.33760368	0.20085069	28.86982837		0.0226
MSR6	0.33760368 -0.03721735	6.09219426	64.84782517		0.0013
MSR7	-0.03721735	0.02307021	12.56566993	• • • • •	0.1203
пара	-0.3393/348	0.39855206	9.52626724	1.97	
MSR13	0.58914120	0,25552256	25.70804711	5.32	0.0305
		The SAS Syl	stom 18:49 Thu	preday, July	12, 1990
Bounds on (	condition number:	60.5 <b>9863,</b>	2460.224		
*********				*********	********
Stop 5 V	ariable MSR2 Remov	ved R-square	• • 0. <b>5963135</b> 1	C(p) = 7.20	0104908
				_	
	DY	sum of squares	Nean Square	<b>7</b>	Prob>T
Regression	n 11		15.40348571	3.22	0.0050
BITOT	24	114.70471277	4.77936303		
Total	35	284.14305556			
	<b>-</b> .				
	Paraseter		Type II		
Variable	<b>I</b> stimate	<b>B</b> FFOF	Sum of Squares	1	frob>f
INTERCEP	27.84468084	24.76464634	6.04213254	1.26	0.2720
<b>D1</b>	9.54265177	6.97197356	8.95357979	1.87	0.1838
35	-4.51727390	4.19975018	5.52937387	1.16	0.2928
36	-6.43245264	2.68091652	23.82655558	4.99	0.0352
NONTH					
	0.34622471	0.24867212	9.26471261	1.94	0.1766
MSR1	0.34622471 -0.09923199			1.94 0.75	0.1766 0.3951
MSR1 MSR4		0.24867212	9.26471261		
-	-0.09923199	0.24867212 0.11460135	9.26471261 3.58338908	0.75 2.45	0.3951 0.1306
M\$24	-0.09923199 -0.23840491	0.24867212 0.11460135 0.15228444	9.26471261 3.\$6338908 11.71387243 30.89121870	0.75 2.45 6.46	0.3951 0.1308 0.0179
MSR4 MSR5	-0.09923199 -0.23840491 0.80567315	0.24867212 0.11460135 0.15228444 0.19890120	9.26471261 3.56338908 11.71357243 30.89121670 72.49470581	0.75 2.45 6.46 15.17	0.3951 0.1306 0.0179 0.0007
MSR4 MSR5 MSR6 MSR7	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694	0.24867212 0.11460135 0.15228444 0.19890120 0.07521620 0.02290219	9.26471261 3.56338908 11.71357243 30.69121670 72.49470581 11.92558932	0.75 2.45 6.46 15.17 2.50	0.3951 0.1306 0.0179 0.0007 0.1273
MSR4 MSR5 MSR6	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694 -0.71537060	0.24867212 0.11460135 0.15228444 0.19890120 0.07521620 0.02290219 0.35145904	9.26471261 3.56338908 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104	0.75 2.45 6.46 15.17 2.50 4.14	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530
MSR4 MSR5 MSR6 MSR7 MSR9	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694	0.24867212 0.11460135 0.15228444 0.19890120 0.07521620 0.02290219	9.26471261 3.56338908 11.71357243 30.69121670 72.49470581 11.92558932	0.75 2.45 6.46 15.17 2.50	0.3951 0.1306 0.0179 0.0007 0.1273
MSR4 MSR5 MSR6 MSR7 MSR9 MSR13	-0.09923199 -0.23840491 0.80867318 0.29294086 -0.03617694 -0.71837060 0.61458737	0.24867212 0.11460135 0.15228444 0.19800120 0.07521620 0.02200219 0.35145904 0.25226268	9.26471261 3.56336008 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104 28.36816614	0.75 2.45 6.46 15.17 2.50 4.14	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530
HSR4 HSR5 HSR6 HSR7 HSR9 HSR13	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694 -0.71537060	0.24867212 0.11460135 0.15228444 0.19800120 0.07521620 0.02200219 0.35145904 0.25226268	9.26471261 3.56336008 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104 28.36816614	0.75 2.45 6.46 15.17 2.50 4.14	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530
HSR4 HSR5 HSR6 HSR7 HSR9 HSR13	-0.09923199 -0.23840491 0.80867318 0.29294086 -0.03617694 -0.71837060 0.61458737	0.24867212 0.11460135 0.15228444 0.19800120 0.07521620 0.02200219 0.35145904 0.25226268	9.26471261 3.56336008 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104 28.36816614	0.75 2.45 6.46 15.17 2.50 4.14	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530
HSE4 HSE5 HSE6 HSE7 HSE9 HSE13 Bounds on (	-0.09923199 -0.23840491 0.80867318 0.29294086 -0.03617894 -0.71837080 0.61488737 bondition number:	C.24867212 C.11460135 C.15228444 C.19890120 C.07521820 C.02290219 C.35145904 C.25228288 S0.8524,	9.26471261 3.56338908 11.71357243 30.69121670 72.49470551 11.92558932 19.80080104 28.36016014 1843.233	0.75 2.45 6.46 15.17 2.50 4.14 5.94	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530 0.0226
HSR4 HSR5 HSR6 HSR7 HSR9 HSR13 Bounds on (	-0.09923199 -0.23840491 0.80867318 0.29294086 -0.03617894 -0.71837060 0.61488737 Dondition number:	C.24867212 C.11460135 C.15228444 C.19890120 C.07521820 C.02290219 C.35145904 C.25228288 S0.8524,	9.26471261 3.56336008 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104 28.36816614	0.75 2.45 6.46 15.17 2.50 4.14 5.94	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530 0.0226
HSR4 HSR5 HSR6 HSR7 HSR9 HSR13 Bounds on (	-0.09923199 -0.23840491 0.80867318 0.29294086 -0.03617894 -0.71837080 0.61488737 bondition number:	C.24867212 C.11460135 C.15228444 C.19890120 C.07521820 C.02290219 C.35145904 C.25228288 S0.8524,	9.26471261 3.56338008 11.71367243 30.69121670 72.49470581 11.92558932 19.80080104 28.36818614 1843.233	0.75 2.45 6.46 15.17 2.50 4.14 5.94	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530 0.0226
HSE4 HSE5 HSE6 HSE7 HSE9 HSE13 Bounds on ( Step10 Va	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694 -0.71537060 0.61458737 Dondition number: ariable MSE1 Remov	0.24867212 0.11460135 0.15228444 0.15900120 0.07521620 0.02200219 0.35145904 0.35145904 0.25228289 50.8524, yed R-squares	9.26471281 3.56336908 11.71357243 30.69121870 72.49470581 11.92556932 19.80060104 28.36616614 1643.233 9 = 0.55370230 Mean Square	0.75 2.45 6.46 15.17 2.50 4.14 5.94 C(p) = 5.80	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530 0.0226 0.0226
HSR4 HSR5 HSR6 HSR7 HSR9 HSR13 Bounds on (	-0.09923199 -0.23840491 0.50567315 0.29294056 -0.03617694 -0.71537060 0.61458737 Dondition number: ariable MSE1 Remov	C.24867212 C.11460135 C.15228444 C.19690120 C.07521620 C.02290219 C.35145904 C.25228289 SO.8524,	9.26471261 3.58338908 11.71357243 30.69121670 72.49470581 11.92558932 19.80080104 28.34814814 1843.233	0.75 2.45 6.46 15.17 2.50 4.14 5.94 C(p) = 5.80	0.3951 0.1306 0.0179 0.0007 0.1273 0.0530 0.0226

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Brror					
	25	118.28810185	4.73152407		
Total	35	284.14305556			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	1	Prob>P
				•	
INTERCEP	27.62926798	24.63915065	5.94960791	1.26	0.2728
B1	5.36866356	5.01174059		1.15	
35			5.42945534		0.2943
	-3.09144791	3.84408625	3.06012154	0.65	0.4289
36	-4.44939514	1.73899441	30.97466610	6.55	0.0169
HONTH	0.35816887	0.24704349	9.94557491	2.10	0.1595
HSR4	-0.25519506	0.15028703	13.64277060	2.88	0.1019
MSR5	0.38449609	0.14063053	33.36908653	7.48	0.0113
MSE6	0.30103873	0.07425803	77.76048045	16.43	0.0004
MSR7	-0.03974355	0.02241570	14.87406642	3.14	0.0884
MSR9	-0.64511594	0.34024977	17.00908369	3.59	0.0696
MSR13	0.60382370	0.25069207	17.00908369 27.44986181	5.80	0.0237
ounds on con	dition number:	37.47714,	1037.035		
**********					
		The SAS Sy	stem 15:49 Th	Ireday, July	12, 1990
·····		• • • • • • •			
tepii vari	TOIS B3 YERGASC	E E-EQUET	0.57293264	C(p) * 4.3	1314403
	DF	Sum of Squares	Hean Square	r	Prob>F
Regression	9	162.79483216	18.08831468		0.0032
-	9 26			3.00	0.0032
Brror		121.34822339	4.66723936		
Total	35	284.14305556			
	•••••				
	Parameter	Standard	Type II	_	
Variable	<b>Betimate</b>	Irror	Sum of Squares	r	Prop>P
INTERCEP	13.43994724	17.08111410	2.88950077	0.62	0.4385
B1	1.74833160	2.18770123	2.98079196	0.64	0.4314
36	-4.31364865	1.71898517	29.39039015	6.30	0.0187
HONTH	0.29532969	0.23276323	7.51355650	1.61	0.2158
HSRC	-0.17731344	0.11414144	11.26306751	2.41	0.1324
MSR5	0.35076958	0.13331718	32.30960731	6.92	0.0141
MSRG	0.27147445	0.06408008	83.76679823	17.95	0.0003
MSR7	-0.03567530	0,02168857	12.62796492	2.71	
					0.1120
MSR9	-0.64739549	0.33791874	17.13069031	3.67	0,0664
MS#13	0.74825548	0.17371399	86,59449319	18.55	0.0002
ounds on con	dition number:	7.597408,	311.4218		
**********					
tep12 Varí	able 31 Removed	i R-aquar	• • 0.56244218	C(p) = 2.8	1211371
•		-		-	
	DF	Sum of Squares	Hean Square	r	Prop I
Regression		159.81404020	19.97675502	4.34	0.0018
		124.32901536	4.60477835		
<b>B</b> FFOF	27				
	27 35	284.14305556			
	35				
	-	284.14305556 Standard	Type II		
Total	35		Type II Sum of Squares	r	Prob>f
Total	35 Paranotor	Standard		F	Prob>F
Total Variable	35 Parameter Botimate	Standard	Sum of Squares		-
Total Variable INTERCEP	35 Paranotor Estimato 19.99216066	Standard Brror 14.38416944	Sum of Squares 8.30766520	1.80	0.1904
Total Variable INTERCEP B6	35 Paraneter Estimate 19.99216066 -3.16284267	Standard Srror 14.88416944 0.93245888	Sum of Squares 8.30766520 52.97909420	1.80	0.1904 0.0022
Total Variable INTERCEP B6 Month	35 <b>Parameter</b> <b>Estimate</b> 19.99216066 -3.16284267 0.26514642	Standard Error 14.88416944 0.93245888 0.22813654	Sum of Squares 8.30766520 52.97909420 6.22000277	1.80 11.51 1.35	0.1904 0.0022 0.2553
Total Variable INTERCEP B6 HONTH MSR4	35 <b>Parameter</b> <b>Estimate</b> 19.99216066 -3.16284267 0.26514642 -0.15668088	Standard Srror 14.88416944 0.93245888 0.22813654 0.11043677	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278	1.80 11.51 1.35 2.01	0.1904 0.0022 0.2553 0.1674
Total Variable INTERCEP B6 HONTH MSR4 MSR5	35 <b>Parameter</b> <b>Estimate</b> 19.99216066 -3.16284267 0.26514542 -0.15668088 0.30963369	Standard Srror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58637590	1.80 11.51 1.35 2.01 6.43	0.1904 0.0022 0.2553 0.1674 0.0174
Total Variable INTERCEP B6 MONTH MSR4 MSR5 MSR6	35 <b>Parameter</b> <b>Estimate</b> 19.99216066 -3.16284267 0.26514642 -0.15665088 0.30963369 0.26808654	Standard Srror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372 0.08350792	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58437590 82.03623569	1.80 11.51 1.35 2.01 6.43 17.82	0.1904 0.0022 0.2553 0.1874 0.0174 0.0002
Total Variable Intercep B6 Month MSR4 MSR5 MSR6 MSR7	35 <b>Parameter</b> <b>Setimate</b> 19.99216066 -3.16284267 0.26514642 -0.15668088 0.30963369 0.26808654 -0.02579761	Standard Srror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372 0.06350792 0.01770235	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58637590 82.03623569 9.77925908	1.80 11.51 1.35 2.01 6.43 17.82 2.12	0.1904 0.0022 0.2553 0.1674 0.0174 0.0002 0.1566
Total Variable INTERCEP B6 MONTH MSR4 MSR5 MSR6 MSR7 HSR9	35 <b>Parameter</b> <b>Sstimate</b> 19.99216066 -3.16284267 0.26514642 -0.15668088 0.30963369 0.26805654 -0.02579761 -0.53549318	Standard Sror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372 0.08350792 0.01770235 0.30547750	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58637590 42.03623569 9.77925908 14.15005637	1.80 11.81 1.35 2.01 6.43 17.82 2.12 3.07	0.1904 0.0022 0.2553 0.1674 0.0174 0.0002 0.1566 0.0910
	35 <b>Parameter</b> <b>Setimate</b> 19.99216066 -3.16284267 0.26514642 -0.15668088 0.30963369 0.26808654 -0.02579761	Standard Srror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372 0.06350792 0.01770235	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58637590 82.03623569 9.77925908	1.80 11.51 1.35 2.01 6.43 17.82 2.12	0.1904 0.0022 0.2553 0.1674 0.0174 0.0002 0.1566
Total Variable INTERCEP B6 MONTH MSR4 MSR5 MSR6 MSR7 MSR9	35 <b>Parameter</b> <b>Sstimate</b> 19.99216066 -3.16284267 0.26514642 -0.15668088 0.30963369 0.26805654 -0.02579761 -0.53549318	Standard Sror 14.88416944 0.93245888 0.22813654 0.11043677 0.12215372 0.08350792 0.01770235 0.30547750	Sum of Squares 8.30766520 52.97909420 6.22000277 9.26858278 29.58637590 42.03623569 9.77925908 14.15005637	1.80 11.81 1.35 2.01 6.43 17.82 2.12 3.07	0.1904 0.0022 0.2553 0.1674 0.0174 0.0002 0.1566 0.0910

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Step13 Variable 82 Entered E-square = 0.57293264 C(p) = 4.31314265 NOTE: The variable which previously had small tolerance is now allowed to enter after removal of some variables from the model.

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	DP	Sum of Squares	Hean Square	f Prob>f
Regression	9	162.79483216	18.08831468	3.88 0.0032
Brror	26	121.34822339	4.66723936	
		The SAS Sys	t <b>en 16:49 Th</b> u	reday, July 12, 1990 10
Total	35	284.14305556		
Variable	Faraneter Estimate	Standard Error	Type II Sum of Squares	r prodyl
INTERCEP	13.43994724	17.08111410	2.88950077	0.62 0.4385
32	1.74833160	2.18770123	2.98079196	0.64 0.4314
B6	-4.31364865	1.71898517	29.39039015	6.30 0.0187
MONTH	0.29532969	0.23276323	7.51355650	1.61 0.2158
HSR4	-0.17731344	0.11414144	11.26306751	2.41 0.1324
MSR5	0.35076958	0.13331718	32.30960731	6.92 0.0141
MSR6	0.27147445	0.06408008	83.76679823	17.95 0.0003
MSR7	-0.03567530	0.02168857	12.62796492	2.71 0.1120
HSR9	-0.64739549	0.33791874	17.13069031	3.67 0.0664
MSR13	0.74825548	0.17371399	86.59449319	18.55 0.0002
Bounds on caus	dition number:	7.597403,	311.4218	
_				
Step14 Vari	able B2 Removed	E-square	= 0.56244218	C(p) = 2.81211371
	Df	Sum of Squares	Hean Square	r Prob>r
Regression	8	159.81404020	19.97675502	4.34 0.0018
Error	27	124.32901536	4.60477835	
Total	35	284.14305556		
	Parameter	Standard	<b>F</b> ime 11	
Variable			Type II	
ARLIEDIO	Estimate	<b>R</b> rror	Sum of Squares	f Prob>f
INTERCEP	19.99216066	14.88416944	8.30766520	1.80 0.1904
B6	-3,16284267	0.93245888	52.97909420	11.51 0.0022
HONTH	0.26514642	0.22813654	6.22000277	1.35 0.2553
HSR4	-0.15868088	0.11043677	9.28858278	2.01 0.1674
HSR5	0.30963369	0.12215372	29.58637590	6.43 0.0174
MSRC	0.26805654	0.06350792	82.03623569	17.82 0.0002
MSR7	-0.02579761	0.01770235	9.77925908	2.12 0.1564
MSR9	-0.53549318	0.30547750	14.15005637	3.07 0.0910
MSR13	0.67313998	0.14510797	99.09163407	21.52 0.0001
Bounds on con	dition number:	4.641112,	163.1957	
Step15 Vari	able MONTH Read	wed R-square	• 0.54055179	C(p) = 1.85331399
	DF	Sum of Squares	Nean Square	F Frob>F
Regression	7	153.59403743	21.94200535	4.71 0.0014
Irror	28	130.54901813	4.66246493	
Total	35	284.14305556		
	•	•• • •	<b>.</b>	
Variable	Parameter Estimate	Standard Error	Type II Sum of Squares	F Prob>F
INTERCEP	20.05864711	14.97699973	8.36313698	1.79 0.1912
B6	-3.10648365	0.93701177	51.24643215	10.99 0.0025
HSR4	-0.18083166	0.10914148	12.79925873	2.75 0.1087
		The SAS Sys		irsday, July 12, 1990

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HSR       0.26055650       0.06357375       76.31837335       18.107       1.36       0.377242         HSR       -0.052230903       0.30717267       13.4604582       2.89       0.         HSR       0.68139111       0.14583920       101.77641612       21.85       0.         Bounds on condition number:       4.551857,       131.7593       131.7593         Image: Standard on condition number:       4.551857,       131.7593       0.51819627       C(p) - 0.51663         DP       Sum of Squares       Hean Square       P       Promession       16.17.24187020       24.54031170       5.20       0.         Total       35       264.14305556       Type II       Programsion       P       Promesume for Sum of Squares       P       P       P       P       P       P       P       P       P       P       P       P       P       P       P       P       P       P       P <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>							
HSR       0.20055850       0.0535737       73.11873733       18.80       0.3077287         HSR       -0.032209003       0.0107287       13.4804584       2.89       0.         HSR13       0.68139111       0.1453920       101.77641812       21.83       0.         Bounds on condition number:       4.551857,       131.7583       131.7583         Step16       Variable HSR7 Removed       R-square - 0.51819627       C(p) - 0.01663         DP       Sum of Squares       Nean Square       P         Regression       6       147.24187020       24.54031170       5.20       0.         Broot       23       136.0018335       4.72073033       5.20       0.         Total       35       284.14305355       4.72073033       5.20       0.         INTERCEP       27.10227711       15.79286235       18.22686415       3.86       0.86         Stat       -0.18654067       0.1012831       10.8045383       1.33       0.73173       0.         HSB5       0.23186435       0.6012839       13.22686415       3.86       0.86       0.92         IMTERCEP       27.10227711       13.79286235       18.22671857       3.86       0.         HSB5	MSR5	0.32932169	0.12172882	34.12474482	7.32	0.0115	
MSEP       -0.01982729       0.01707242       6.35218722       1.36       0.         MSED       -0.5220803       0.30717287       13.46048384       2.88       0.         MSED       0.68139111       0.14583820       101.77941612       21.83       0.         Nounds on condition number:       4.551857,       131.7583       0.51818927       C(p) -       0.816637         Brepi6       Variable HSR7 Besoved       R-square -       0.51818927       C(p) -       0.816637         Broom       6       147.24187020       24.54031170       5.20       0.         Broom       29       136.90118335       4.72073033       5.20       0.         Broom       29       136.40118335       4.72073033       5.20       0.         Broom       29       136.90118335       4.72073033       5.20       0.         INTERCIP       27.10227711       13.78286235       18.22686415       3.86       0.         Broom       0.25196435       0.90128998       45.0558652       2.55       0.         MSB5       0.25196435       0.90128193       10.99452813       2.33       0.         MSB4       0.3661362       0.126393       18.22686413       3.66						0.0003	
MSR9       -0.52230903       0.30717297       13.48049824       2.88       0.         MSR13       0.68139111       0.14583920       101.77941612       21.83       0.         Nounds on condition number:       4.551857,       131.7583       131.7583         Step16       Variable HSR7 Removed       B-square =       0.51819627       C(p) =       0.8106133         DF       Sum of Squares       Mean Square       F       Fr         Step16       Variable HSR7 Removed       B-square =       0.51819627       C(p) =       0.810633         DF       Sum of Squares       Mean Square       F       Fr         Step16       Variable       Estimate       Error       Sum of Squares       F       Fr         NTSECP       27.1027711       13.79286235       18.22686415       3.66       0.856         D6       -2.78535210       0.90128989       45.08568532       3.56       0.7854         MSEG       0.23196435       0.0633946       74.23369133       15.73       0.7856         MSEG       0.23196435       0.0633946       74.23369133       15.73       0.79707         MSEG       0.23196435       0.2637637       12.24646841       5.53       0.						0.2530	
HSB13       0.680130111       0.143805020       101.77041612       21.63       0.         Nounda on condition number:       4.551857,       131.7583       131.7583         Itep16       Variable MSR7 Removed       R-square - 0.51819627       C(p) - 0.010633         DP       Sum of Squares       Hean Square       P         Regression       6       147.24187020       24.54031170       5.20       0.         Bror       29       136.00116533       4.72073033       4.72073033       5.20       0.         Total       35       204.14305586       F       Pression       6       147.24187020       24.54031170       5.20       0.         Total       35       204.14305586       F       Pros       70011633       4.72073033       5.30       0.         Nariable       Estimate       Error Sum of Squares       F       Pr         INFERCEP       27.10227711       13.79266235       18.22686415       3.86       0.         NSS6       0.23164635       0.030287363       18.2407182613       5.73       0.         INFS6       0.23164635       0.30267363       18.24071857       3.86       0.         NSS13       0.6304283       0.12837183							
Nounda on condition number:         4.551857,         131.7583           Step16 Variable MSR7 Removed         R-square - 0.51819627         C(p) - 0.91663           DF         Sum of Squares         Hean Square         7           Regression         6         147.24187020         24.54031170         5.20         0.4           Broor         29         136.00118333         4.72073033         5.20         0.4           Total         35         284.14303536         18.22686415         3.86         0.8           Standard         Type II         Front         Sum of Squares         7         Pr           NTRECEP         27.10227711         13.79286235         18.22686415         3.86         0.8           Standard         Type II         2.76535210         0.00128989         45.05586523         2.55         0.           NB5         0.28196435         0.3267363         18.24071957         3.35         0.4           NB51         0.60104233         0.12937193         101.69199560         21.55         0.           Hounds on condition number:         4.223191,         94.62532         94.62532         0.75707           DF         Sum of Squares         Hean Square         7         9.7 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Step16         Variable HSR? Bemoved         R-square = 0.51818627         C(p) = 0.816637           DF         Sum of Squares         Hean Square         P           Beression         6         147.26187020         24.64031170         5.20         0.1           Strop         23         136.90118533         4.72073053         4.72073053         5.20         0.1           Store         23         136.90118535         4.72073053         5.20         0.1           Variable         Batimate         Error         Sum of Squares         F         Pr           INTERCEP         27.10227711         13.79266235         18.22686415         3.86         0.           B6         -2.7653210         0.9012889         45.0586582         9.55         0.7814221         0.199452813         2.33         0.           HS55         0.25196455         0.903253184         74.23359133         15.73         0.           HS59         -0.5964535         0.30267363         18.24071857         3.86         0.           HS60         0.25196455         0.90228713         101.89199580         21.56         0.           HS79         -0.596453         0.302673541         12.30         0.         74.62532     <	USEIS	4.00134111	V. 1438396V	101.11047015	41.03	A. AAAT	
Step16         Variable HSR? Bemoved         R-square = 0.51818627         C(p) = 0.816637           DF         Sum of Squares         Hean Square         P           Beression         6         147.26187020         24.64031170         5.20         0.1           Strop         23         136.90118533         4.72073053         4.72073053         5.20         0.1           Store         23         136.90118535         4.72073053         5.20         0.1           Variable         Batimate         Error         Sum of Squares         F         Pr           INTERCEP         27.10227711         13.79266235         18.22686415         3.86         0.           B6         -2.7653210         0.9012889         45.0586582         9.55         0.7814221         0.199452813         2.33         0.           HS55         0.25196455         0.903253184         74.23359133         15.73         0.           HS59         -0.5964535         0.30267363         18.24071857         3.86         0.           HS60         0.25196455         0.90228713         101.8919950         21.56         0.           HS79         -0.596453         0.30267363         16.24719577         3.66         0.77707	lounda on c	ondition number:	4.551857	191 7693			
Step16         Variable MSR? Bemoved         R-square = 0.51819827         C(p) = 0.91683           DP         Sum of Squares         Nean Square         P           Begression         6         147.24187020         24.54031170         5.20         0.4           Total         35         284.14305356         Type 11         Fror         Sum of Squares         F         Pr           Total         35         284.14305356         Type 11         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F         F<							
DP         Sum of Squares         Hean Square         P           Berossion         6         147.24187020         24.54031170         5.20         0.1           Broat         25         136.90118535         4.72073053         5.20         0.1           Total         35         224.1400556         4.72073053         5.20         0.1           Variable         Estimate         Error         Sum of Squares         F         Pr           INTERCEP         27.10227711         13.79286235         18.22686415         3.86         0.           B6         -2.78535210         0.90128989         45.08586582         9.55         0.           MSR4         -0.16564057         0.10912811         10.99452813         2.3359133         15.73         0.60         0.           MSR5         0.29114221         0.11798214         28.74653643         6.09         0.           MSR13         0.60104293         0.12937193         101.89199500         21.58         0.           Bounds on condition number:         4.223191,         94.62532         5.53         0.           Total         35         284.1430556         7.724946841         5.53         0.           Stror         30 </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Berression       6       147.24187020       24.54031170       5.20       0.1         Brror       29       136.90118335       4.72073033       5.20       0.1         Total       35       224.14305536       4.72073033       5.20       0.1         Variable       Batimate       Bror       Sum of Squares       F       F         INTERCEP       27.10227711       13.79286235       18.22686415       3.86       0.1         B6       -2.76353210       0.90128989       45.0638652       9.55       0.         MSR4       -0.1685067       0.10912811       10.99452813       2.33       0.         MSR5       0.29114221       0.11796214       28.74663643       6.08       0.         MSR5       0.2616455       0.60233946       74.2336133       15.73       0.         MSR13       0.60104293       0.12937193       101.89199560       21.58       0.         Bounde on condition number:       4.223191,       94.62532       4.92965712       5.53       0.         Total       35       284.14305556       Type II       F       F         Regression       5       136.24734207       27.24946841       5.53       0.	Step16 Va	riable MSR7 Repo	ved R-square	= 0.51819627	C(p) = 0.92	663799	
Troor       29       136:80118535       4.72073033         Total       35       284.14305556       Type II         Variable       Estimate       Error       Sum of Squares       F         INTERCEP       27.10227711       13.79286235       16.22686415       3.86       0.         B6       -2.78535210       0.00128989       45.0858632       9.55       0.         MS84       -0.1654067       0.10912811       10.99452813       1.33       1.5.73       0.         MS86       0.23186453       0.00253964       74.2356133       1.5.73       0.         MS81       0.25186453       0.00267363       16.24071957       3.86       0.         MS813       0.60104283       0.12937193       101.8919950       21.58       0.         Bounds on condition number:       4.223191,       94.62532       94.62532         Step17       Variable HS84 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       F       Pr         Step17       Variable HS84 Removed       R-square = 0.47950263       C(p) = .53       0.         Biror       30       147.38571369       4.92985712       5.53       0.     <		DP	Sum of Squares	Nean Square	7	Prob>P	
Tron       29       138:00118535       4.72073033         Total       35       264.14305556         Variable       Estimate       Type II         Variable       Estimate       Error Sum of Squares       F         INTERCEP       27.10227711       13.79286235       18.22686415       3.86       0.         B6       -2.78535210       0.00128089       45.0858632       9.55       0.         MSR4       -0.1654067       0.10912811       10.99452813       2.33       0.         MSR5       0.28184221       0.11798214       28.7483643       6.09       0.         MSR1       0.60104293       0.12937193       101.8919950       21.58       0.         NSR13       0.60104293       0.12937193       101.8919950       21.58       0.         Nounds on condition number:       4.223191,       94.62532       0.75707         D7       Sum of Squares       Hean Square       F       Pr         Espression       5       136.24734207       27.24946841       5.53       0.         Total       35       284.14305556       Yz24965712       7.33       0.         Nariable       Estimate       Error       Sum of Squares <td< td=""><td>Regression</td><td>. 6</td><td>147.24187020</td><td>24.54031170</td><td>5.20</td><td>0.0010</td></td<>	Regression	. 6	147.24187020	24.54031170	5.20	0.0010	
Total         35         284.14305556           Parameter Estimate         Standard Error         Type II Sum of Squares         F           INTERCEP         27.10227711         13.79286235         18.22686415         3.866         0.           S6         -2.76535210         0.9012809         45.0558652         9.55         0.           MSR4         -0.16654067         0.10912811         10.99452813         2.33         0.           MSR5         0.25196455         0.06353946         74.23369133         15.73         0.           MSR5         0.25196455         0.12937193         10.89199560         21.58         0.           MSR13         0.60104293         0.12937193         10.80199560         21.58         0.           Nounde on condition number:         4.223191,         94.62532         94.62532           Regression         5         136.24734207         27.24946841         5.53         0.           Bror         30         147.89571349         4.92985712         701         701           Variable         Estimate         Error Sum of Squares         F         Pr           NS6         -2.38509589         0.6917788         36.11796663         7.33         0.				4.72073053			
Variable         Estimate         Error         Sum of Squares         P         Pr.           INTERCEP         27.10227711         13.79286235         18.22686415         3.86         0. 86         -2.78535210         0.90128989         45.08586582         9.55         0.           MSA4         -0.16654067         0.10912811         10.99452813         2.33         0.           MSB5         0.29114221         0.11798214         28.74663843         6.09         0.           MSB6         0.25196455         0.0633946         74.23359133         15.73         0.           MSB7         -0.59496438         0.30267383         18.24071957         3.86         0.           MSB13         0.60104293         0.12937193         101.89199560         21.58         0.           Nounds on condition number:         4.223191,         94.62532         94.62532           Itep17         Variable MSR4 Removed         R-square = 0.47950263         C(p) = 0.75707           DF         Sum of Squares         Hean Square         P         Pr           Regression         5         136.24734207         27.24946841         5.53         0.           Stror         30         147.89571369         4.92965712         10ta		35					
Variable         Estimate         Error         Sum of Squares         P         Pr.           INTERCEP         27.10227711         13.79286235         18.22686415         3.86         0. 86         -2.78535210         0.90128989         45.08586582         9.55         0.           MSA4         -0.16654067         0.10912811         10.99452813         2.33         0.           MSB5         0.29114221         0.11798214         28.74663843         6.09         0.           MSB6         0.25196455         0.0633946         74.23359133         15.73         0.           MSB7         -0.59496438         0.30267383         18.24071957         3.86         0.           MSB13         0.60104293         0.12937193         101.89199560         21.58         0.           Nounds on condition number:         4.223191,         94.62532         94.62532           Itep17         Variable MSR4 Removed         R-square = 0.47950263         C(p) = 0.75707           DF         Sum of Squares         Hean Square         P         Pr           Regression         5         136.24734207         27.24946841         5.53         0.           Stror         30         147.89571369         4.92965712         10ta							
INTERCEP 27.10227711 13.79286235 18.22686415 3.86 0. B6 -2.78535210 0.90128989 45.08586582 9.55 0. HSR4 -0.16654067 0.10912811 10.99452813 2.33 0. HSR5 0.25196455 0.06535946 74.23369133 15.73 0. HSR5 0.25196455 0.30267363 18.24071957 3.86 0. HSR9 -0.59496438 0.30267363 18.24071957 3.86 0. HSR13 0.60104293 0.12037193 10.8919950 21.58 0. Nounds on condition number: 4.223191, 94.62532 Htep17 Variable HSR4 Removed R-square + 0.47950263 C(p) = 0.75707 DF Sum of Squares Hean Square F Pr Regression 5 136.24734207 27.24946841 5.53 0. Error 30 147.89571349 4.92985712 Total 35 284.14305556 Parameter Standard Type II NTERCEP 39.66342622 11.31027748 60.62730541 12.30 0. HSR5 0.14211422 0.06766046 21.74901191 4.41 0. HSR5 0.1421140077 0.30462419 14.0854344 2.66 0. HSR13 0.46801154 0.09768928 113.14076015 22.95 0. HSR13 0.46801154 0.09768928 113.14076015 22.95 0. Hounds on condition number: 1.890053, 38.74717 The \$A\$ System 18:49 Thuraday, July 12, Step18 Variable HSR9 Removed B-squares Hean Square F Pr Regression 4 122.16209863 30.54052466 5.84 0. Broor 31 161.800556 Fror 31 161.800556 Fror 31 161.800556 7.23 0. HSR13 0.46801154 0.09768928 113.14076015 22.95 0. Hounds on condition number: 1.890053, 38.74717 The \$A\$ System 18:49 Thuraday, July 12, Step18 Variable HSR9 Removed B-square F Pr Regression 4 122.16209863 30.54052466 5.84 0. Broor 31 161.8005569 Fror 31 161.800556 Fror 31 161.800556 7.22319216 7. The Standard Type II NTERCEP 40.6636603 11.6281868 63.89859697 12.23 0. B6 -2.1181393 0.82817328 29.4442277 5.64 0.	_						
B6       -2.78335210       0.90128989       45.08586582       9.55       0.         M5R4       -0.18654067       0.10912811       10.99452813       2.33       0.         M5R5       0.23194621       0.1798214       28.74653643       6.09       0.         M5R6       0.23194623       0.06353946       74.23369133       15.73       0.         M5R9       -0.59496438       0.30267363       18.24071957       3.86       0.         M5R13       0.60104293       0.12937193       101.89199560       21.58       0.         Nounds on condition number:       4.223191,       94.62532       94.62532         Nounds on condition number:       4.223191,       94.62532       0.75707         DF       Sum of Squares       Hean Square       P         Regression       5       136.24734207       27.24946541       5.53       0.         Broor       30       147.89571349       4.92965712       5.03       0.         Total       35       284.14305556       F       Pr         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         M585       0.14211422       0.66766046       21.74901191       4.41 <td>Variable</td> <td>Estimate</td> <td>Brror</td> <td>Sum of Squares</td> <td>T</td> <td>Prob&gt;P</td>	Variable	Estimate	Brror	Sum of Squares	T	Prob>P	
B6       -2.78535210       0.00128989       45.08586582       9.55       0.         MSR4       -0.18654067       0.10912811       10.99452813       2.33       0.         MSR5       0.23194621       0.1798214       28.74653643       6.09       0.         MSR6       0.23194623       0.06353946       74.23369133       15.73       0.         MSR9       -0.59496438       0.30267363       18.24071957       3.86       0.         MSR13       0.60104293       0.12937193       101.89199560       21.58       0.         Hounds on condition number:       4.223191,       94.62532       94.62532         Heap17       Variable MSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       P         Regression       5       136.24734207       27.24946541       5.53       0.         Bror       30       147.89571349       4.92965712       5.03       0.         Total       35       284.14305556       F       Pr         INTERCEP       39.66342622       11.31027748       80.62730541       12.30       0.         MS85       0.14211422       0.6766046       21.74901191 <t< td=""><td></td><td>37 18339414</td><td>11 70344347</td><td>14 99846414</td><td></td><td></td></t<>		37 18339414	11 70344347	14 99846414			
HSR4       -0.16654067       0.10912811       10.99452813       2.33       0.         HSR5       0.29114221       0.11796214       28.74663643       6.09       0.         HSR6       0.25196455       0.60533946       74.23369133       15.73       0.         HSR6       0.25196453       0.30267363       18.24071957       3.86       0.         HSR13       0.60104293       0.12937193       101.89199560       21.58       0.         Hounds on condition number:       4.223191,       94.62532       94.62532         Hounds on condition number:       4.223191,       94.62532       0.75707         DF       Sum of Squares       Hean Square       P       Pr         Regression       5       136.24734207       27.24946841       5.53       0.         Bror       30       147.89571349       4.82985712       5.53       0.         Total       35       284.14305556       7.33       0.       9       5.53       0.         Nariable       Estimate       Error       Sun of Squaree       P       Pr         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         MS85       0.14211422 <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.0591</td>						0.0591	
MSR5       0.29114221       0.11795214       28.74663643       6.09       0.         MSR6       0.25196453       0.06353946       74.23399133       15.73       0.         MSR13       0.60104293       0.12937193       101.89199560       21.58       0.         ounds on condition number:       4.223191,       94.62532       94.62532         tep17       Variable MSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       F         Total       35       136.24734207       27.24946841       5.53       0.         Total       35       284.14305556       920857122       0.       7.33       0.         Variable       Estimate       Error       Sum of Squares       F       Pr         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         MSB5       0.14211422       0.05766046       21.74901191       4.41       0.         MSB5       0.14211422       0.05768048       113.14076015       22.95       0.         MSB5       0.1421422       0.05768048       113.14076015       22.95       0.         MSB6       0.24234650       0.0						0.0044	
MSRG       0.23196635       0.06333946       74.23369133       15.73       0.         MSR9       -0.59496438       0.30267363       18.24071957       3.86       0.         MSR13       0.60104293       0.12937193       101.8919950       21.58       0.         ounds on condition number:       4.223191,       94.62532       94.62532		••••••••				0.1378	
MSR9       -0.59496438       0.30267363       18.24071957       3.86       0.         MSR13       0.60104293       0.12937193       101.89199560       21.58       0.         Nounde on condition number:       4.223191,       94.62532       94.62532         Itep17       Variable H584 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Nean Square       F         Regression       5       136.24734207       27.24946841       5.53       0.         Bror       30       147.89571349       4.92985712       5.53       0.         Total       35       284.14305556       F       F       F         Nariable       Estimate       Error Sum of Squares       F       F         NYERCEP       39.66342622       11.31027748       80.62730541       12.30       0.         B6       -2.38509588       0.88117788       36.11759663       7.33       0.         M585       0.14211422       0.06766046       21.74901191       4.41       0.         M5813       0.46801154       0.09768928       113.14976015       22.95       0.         M5813       0.46801154       0.09768928       13.14976015 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
HSR13       0.60104293       0.12937193       101.89199560       21.38       0.         Nounde on condition number:       4.223191,       94.62532       94.62532         Step17       Variable HSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DP       Sum of Squares       Hean Square       F         Regression       5       136.24734207       27.24946841       5.53       0.         Bror       30       147.89571349       4.92985712       5.53       0.         Variable       Batimate       Error       Sum of Squares       F       Pr         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509588       0.88117788       36.11759663       7.33       0.         HSR5       0.14211422       0.06766046       21.74901191       4.41       0.         HSR6       0.24234650       0.6646140       69.3568215       14.07       0.         HSR9       -0.51490772       0.30462419       14.05524316       2.86       0.         HSR9       -0.61490772       0.30462419       14.05524315       14.07       0.         HSR9       -0.61490753       38.74717							
Hounds on condition number:       4.223191,       94.62532         Step17       Variable HSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       F         Regression       5       136.24734207       27.24946841       5.53       0.         Bror       30       147.89571349       4.92985712       5.53       0.         Total       35       284.14305556       F       F       F         NTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         MSES       0.14211422       0.06766046       21.74901191       4.41       0.         MSES       0.14211422       0.06766046       21.74901191       4.41       0.         MSES       0.14211422       0.06766046       21.74901191       4.41       0.         MSES       0.14211422       0.06766928       113.14976015       22.95       0.         MSES       0.14630154       0.09768928       113.14976015       22.95       0.         Mounds on condition number:       1.890053,       38.74717       The \$A\$ System       16:49 Thursday, July 12,         Step18       Variable       MSE\$ parameter       S.42		• • • • • • • • • •					
tep17       Variable MSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       F         Regression       5       136.24734207       27.24946841       5.53       0.         Stror       30       147.89571349       4.92985712       5.53       0.         Total       35       284.14305556       7       7       7         Variable       Estimate       Error       Sum of Squares       F       F         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509586       0.88117786       36.11759663       7.33       0.         MSE5       0.14211422       0.06766046       21.74901191       4.41       0.         MSE5       0.14211422       0.06766028       113.14976015       22.95       0.         MSE6       0.24234650       0.06461140       69.35688215       14.07       0.         MSE13       0.46801154       0.09768928       13.14976015       22.95       0.         Mounds on condition number:       1.890053,       38.74717       38.74717       114.89095693       5.22519216       5.64       0.	MSR13	0.60104293	0.12937193	101.89199560	21.58	0.0001	
tep17       Variable MSR4 Removed       R-square = 0.47950263       C(p) = 0.75707         DF       Sum of Squares       Hean Square       F         Regression       5       136.24734207       27.24946841       5.53       0.         Stror       30       147.89571349       4.92985712       5.53       0.         Total       35       284.14305556       7       7       7         Variable       Estimate       Error       Sum of Squares       F       F         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509586       0.88117786       36.11759663       7.33       0.         MSE5       0.14211422       0.06766046       21.74901191       4.41       0.         MSE5       0.14211422       0.06766028       113.14976015       22.95       0.         MSE6       0.24234650       0.06461140       69.35688215       14.07       0.         MSE13       0.46801154       0.09768928       13.14976015       22.95       0.         Mounds on condition number:       1.890053,       38.74717       38.74717       114.89095693       5.22519216       5.64       0.	•	A					
DF         Sum of Squares         Hean Square         F         Pr           Regression         5         138.24734207         27.24946841         5.53         0.           Broor         30         147.89571369         4.92985712         5.53         0.           Total         35         284.14305556         1         7.724946841         5.53         0.           Variable         Batimate         Error         Sum of Squares         F         Pr           INTERCEP         39.66342622         11.31027748         60.62730541         12.30         0.           B6         -2.38509588         0.88117788         36.11759663         7.33         0.           MSR5         0.14211422         0.06786046         21.74901191         4.41         0.           MSR5         0.14211422         0.06461140         69.3568215         14.07         0.           MSR6         0.24234650         0.0646140         69.3568215         14.07         0.           MSR5         0.14211422         0.06786042         13.14976015         22.95         0.           Mounds on condition number:         1.890053,         38.74717         38.74717           The \$A\$ \$ystem         16:49 Thuraday, Jul	- •		-	¥4.62332			
DF         Sum of Squares         Hean Square         F         Pr           Regression         5         138.24734207         27.24946841         5.53         0.           Broor         30         147.89571369         4.92985712         5.53         0.           Total         35         284.14305556         1         7.724946841         5.53         0.           Variable         Batimate         Error         Sum of Squares         F         Pr           INTERCEP         39.66342622         11.31027748         60.62730541         12.30         0.           B6         -2.38509588         0.88117788         36.11759663         7.33         0.           MSR5         0.14211422         0.06786046         21.74901191         4.41         0.           MSR5         0.14211422         0.06461140         69.3568215         14.07         0.           MSR6         0.24234650         0.0646140         69.3568215         14.07         0.           MSR5         0.14211422         0.06786042         13.14976015         22.95         0.           Mounds on condition number:         1.890053,         38.74717         38.74717           The \$A\$ \$ystem         16:49 Thuraday, Jul	tep17 Va	riable MSE4 Remov	ved R-square	- 0.47950263	C(p) = 0.75	5707217	
Regression       5       136.24734207       27.24946841       5.53       0.         Brror       30       147.89571349       4.92985712       5.53       0.         Total       35       284.14305556       4.92985712       5.53       0.         Wariable       Estimate       Error       Sum of Squares       F       Fr         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509588       0.88117788       36       1759663       7.33       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR6       0.24234650       0.09768928       113.14976015       22.95       0.         Nounds on condition number:       1.890053,       38.74717       38.74717         The SAE System       16:49 Thureday, July 12,         Step18       Variable       MSR9 Removed       E-square + 6.422993167       C(p) + 1.11487          P       F			-				
Bror       30       147.89571349       4.92985712         Total       35       284.14305556       Type II         Variable       Estimate       Error       Sum of Squares       P         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509588       0.88117788       36.11759663       7.33       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR5       0.1421422       0.06766046       21.74901191       4.41       0.         MSR5       0.1421422       0.06768028       113.14976015       22.95       0.         MSR6       0.24234650       0.09768928       113.14976015       22.95       0.         Mounds on condition number:       1.890053,       38.74717       38.74717         The SAS System       16:49 Thursday, July 12,         Step18       Variable HSR9 Removed       E-square = 0.42993167       C(p) = 1.11487         DF       Sum of Squares       Hean Square       F       Pr         Regression       4       122.162		DF	STE OL SCHELGE	uesu square	r	Prob>P	
Total       35       284.14305556         Variable       Parameter       Standard       Type II         INTERCEP       39.66342622       11.31027748       60.62730541       12.30       0.         B6       -2.38509588       0.88117788       36.11759663       7.33       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR6       0.24234650       0.06461140       69.3568215       14.07       0.         MSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         Bounds on condition number:       1.890053,       38.74717       38.74717         The SAS System       16:49       Thureday, July 12,         Btep18       Variable MSR9       Removed       E-square = 0.42993167       C(p) = 1.11487         DF       Sum of Squares       Mean Square       F       Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Stror       31       161.98095693       5.22519216       5.84       0.         Total       35	Regression	i <b>5</b>	136.24734207	27.24946841	5.53	0.0010	
Parameter         Standard         Type II           Variable         Estimate         Error         Sum of Squares         F           INTERCEP         39.66342622         11.31027748         60.62730541         12.30         0.           B6         -2.38509588         0.88117788         36.11759663         7.33         0.           MSR5         0.14211422         0.06766046         21.74901191         4.41         0.           MSR6         0.24234650         0.06461140         69.35688215         14.07         0.           MSR6         0.24234650         0.06768928         113.14976015         22.95         0.           MSR13         0.46801154         0.09768928         113.14976015         22.95         0.           Mounds on condition number:         1.890053,         38.74717         38.74717           The SAS System 16:49 Thureday, July 12,           Btep18         Variable MSR9 Removed         E-square = 6.42993167         C(p) = 1.11487           DF         Sum of Squares         Hean Square         F         Pr           Ecgression         4         122.16209863         30.54052466         5.84         0.           Stror         31         161.96095693 <t< td=""><td>Brror</td><td>30</td><td>147.89571349</td><td>4.92985712</td><td></td><td></td></t<>	Brror	30	147.89571349	4.92985712			
Variable         Extinate         Brror         Sum of Squares         P           INTERCEP         39.66342622         11.31027748         60.62730541         12.30         0.           B6         -2.38509588         0.88117788         36.11759663         7.33         0.           MSR5         0.14211422         0.06766046         21.74901191         4.41         0.           MSR6         0.24234650         0.06461140         69.35688215         14.07         0.           MSR9         -0.51490772         0.30462419         14.08524344         2.86         0.           MSR13         0.46801154         0.09768928         113.14976015         22.95         0.           Nounds on condition number:         1.890053,         38.74717         38.74717           The SAS System 16:49 Thursday, July 12,           Step18         Variable HSR9 Removed         E-square = 0.42993167         C(p) = 1.11487           DF         Sum of Squares         Hean Square         P         Pr           Regression         4         122.16209863         30.54052466         5.84         0.           Bror         31         161.98095693         5.22519216         1         7           Variable <td>Total</td> <td>35</td> <td>284.14305556</td> <td></td> <td></td> <td></td>	Total	35	284.14305556				
Variable         Estimate         Brror         Sum of Squares         P           INTERCEP         39.66342622         11.31027748         60.62730541         12.30         0.           B6         -2.38509588         0.88117788         36.11759663         7.33         0.           MSR5         0.14211422         0.06766046         21.74901191         4.41         0.           MSR6         0.24234650         0.06461140         69.35686215         14.07         0.           MSR9         -0.51490772         0.30462419         14.08524344         2.86         0.           MSR13         0.46801154         0.09768928         113.14976015         22.95         0.           Nounds on condition number:         1.890053,         38.74717         38.74717           The SAS System         16:49 Thursday, July 12,           Step18         Variable MSR9 Removed         E-square = 6.42993167         C(p) = 1.11487           DF         Sum of Squares         Hean Square         P         Pr           Regression         4         122.16209863         30.54052466         5.84         0.           Stror         31         161.98095693         5.22519216         7         7		<b>9</b>	<b>6</b> • • • • • • •	• · · ·			
INTERCEP 39.66342622 11.31027748 60.62730541 12.30 0. B6 -2.38509588 0.88117788 36.11759663 7.33 0. MSR5 0.14211422 0.06766046 21.74901191 4.41 0. MSR6 0.24234650 0.06461140 69.35688215 14.07 0. MSR9 -0.51490772 0.30462419 14.08524344 2.86 0. MSR13 0.46801154 0.09768928 113.14976015 22.95 0. Mounds on condition number: 1.890053, 38.74717 The \$A\$ System 16:49 Thursday, July 12, Btep18 Variable MSR9 Removed E-square = 0.42993167 C(p) = 1.11487 DF Sum of Squares Mean Square F Pr Regression 4 122.16209863 30.54052466 5.84 0. Stror 31 161.98095693 5.22519216 Total 35 284.14305556 Parameter Standard Type II Variable Estimate Error Sum of Squares F Pr INTERCEP 40.66386603 11.62818686 63.89859697 12.23 0. B6 -2.11881393 0.89257328 29.44422577 5.64 0.					-		
B6       -2.38509588       0.88117788       36.11759663       7.33       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         Nounds on condition number:       1.890053,       38.74717       38.74717         The \$A\$ \$ystem       16:49       Thuraday, July 12,         Nounds on condition number:       1.890053,       38.74717         The \$A\$ \$ystem       16:49       Thuraday, July 12,         Bitaple       Mean \$quare       F       Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Standard       Type II         Total       35       284.14305556         Variable       Batimate       Bror       Sum of \$quares       F <t< td=""><td>VATIADIO</td><td>ESTIMATO</td><td>EFFOR</td><td>Sum of Squares</td><td>r</td><td>Prod Pr</td></t<>	VATIADIO	ESTIMATO	EFFOR	Sum of Squares	r	Prod Pr	
B6       -2.38509588       0.88117788       36.11759663       7.33       0.         MSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         Wounds on condition number:       1.890053,       38.74717       38.74717         The SAS System 16:49 Thursday, July 12,         Nounds on condition number:         1.890053, 38.74717         The SAS System 16:49 Thursday, July 12,         Nounds on condition number:         DF Sum of Squares Mean Square         P Pr         Regression 4       122.16209863       30.54052466       5.84       0.         Standard       Type II         Total       35       284.14305556         Variable       Batimate       Error       Sum of Squares <td></td> <td>20 66242622</td> <td>11 91022244</td> <td>40 47730EA1</td> <td>12 10</td> <td>0.0015</td>		20 66242622	11 91022244	40 47730EA1	12 10	0.0015	
HSR5       0.14211422       0.06766046       21.74901191       4.41       0.         MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         Wounds on condition number:       1.890053,       38.74717       7         The SAS System 16:49 Thursday, July 12,         Nounds on condition number:         I.890053, 38.74717         The SAS System 16:49 Thursday, July 12,         Bitspl8 Variable HSR9 Removed         Resquare = 0.42993167       C(p) = 1.11487         DF         Sum of Squares       Mean Square       P         Pr         Regression 4       122.16209863       30.54052466       5.84       0.         Standard       Type II         Farameter       Standard       Type II         Variable       Batimate       Error       Sum of Squares       F       Pr         INTERCEP       40.66366603       11.628186							
MSR6       0.24234650       0.06461140       69.35688215       14.07       0.         MSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         Mounds on condition number:       1.890053,       38.74717         The \$A\$ System       16:49 Thursday, July 12,         DF Sum of Square = 0.42993167 C(p) = 1.11487         DF Sum of Squares Mean Square F Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Stror       31       161.98095693       5.22519216       7       7         Total       35       234.14305556         Fror Sum of Squares F Pr         INTERCEP       40.66366603       11.62818686       63.89859697       12.23       0.         B6       -2.11881393       0.89257328       29.44422577       5.64       0.		••••••••				0.0111	
HSR9       -0.51490772       0.30462419       14.08524344       2.86       0.         MSR13       0.46801154       0.09768928       113.14976015       22.95       0.         wounds on condition number:       1.890053,       38.74717         The SAS System       16:49       Thursday, July 12,         Or sum of Square = 0.42993167       C(p) = 1.11487         DF       Sum of Squares       Mean Square       F       Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Standard       Type II         Parameter       Standard       Type II         Variable       Batimate       Error       Sum of Squares       F       Pr         INTERCEP       40.66386603       11.62818886       63.89859697       12.23       0.         B6       -2.11881393       0.89257328       29.44422577       5.64       0.						0.0442	
HSR13       0.46801154       0.09768928       113.14976015       22.95       0.         wounds on condition number: 1.890053, 38.74717         The SAS System 16:49 Thursday, July 12,         tep18 Variable HSR9 Removed R-square = 0.42993167 C(p) = 1.11487         DF Sum of Squares Mean Square F Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Stror       31       161.98095693       5.22519216       .       .         Total       35       284.14305556       Fror Sum of Squares F Pr         INTERCEP 40.66386603       11.62818886       63.89859697       12.23       0.         B6       -2.11881393       0.89257328       29.44422577       5.64       0.						0.0008	
wounds on condition number:       1.890053, 38.74717         The SAS System 16:49 Thursday, July 12,         The SAS System 16:49 Thursday, July 12,         Step18 Variable MSR9 Removed R-square = 0.42993167 C(p) = 1.11487         DF Sum of Squares Hean Square F Pr         Regression 4 122.16209863 30.54052466 5.84 0.         Stror 31 161.98095693 5.22519216         Total 35 264.14305556         Parameter Standard Type II         Variable 8stimate 8ror Sum of Squares F Pr         INTERCEP 40.66386603 11.62818686 63.89859697 12.23 0.         B6 -2.11881393 0.89257328 29.44422577 5.64 0.		•••••••				0.1013	
The SAS System 16:49 Thursday, July 12,         itep18 Variable MSR9 Removed R-square = 0.42993167 C(p) = 1.11487         DF Sum of Squares Nean Square P Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Bror       31       161.98095693       5.22519216       7         Total       35       284.14305556       F Pr         Variable       Batimate       Error Sum of Squares       F Pr         INTERCEP       40.66386603       11.62818886       63.89859697       12.23       0.         96       -2.11881393       0.89257328       29.44422577       5.64       0.	MSR13	0.46801154	0.09768928	113.14976015	22.95	0.0001	
The \$A\$ System       16:49 Thursday, July 12,         Itap18 Variable HSR9 Removed       R-square = 0.42993167       C(p) = 1.11487         DF       Sum of Squares       Nean Square       F       Pr         Regression       4       122.16209863       30.54052466       5.84       0.         Regression       4       122.16209863       30.54052466       5.84       0.         Regression       4       122.16209863       30.54052466       5.84       0.         Boting to squares       F       Pr         Parameter       Standard       Type II         Variable       F       Pr         INTERCEP       40.66366603       11.62818686       63.89859697       12.23       0.         Pr       INTERCEP       40.66366603       11.62818686       63.89859697       12.23       0. <th co<="" td=""><td>ounds on c</td><td>condition number:</td><td>1.890053,</td><td>38.74717</td><td></td><td></td></th>	<td>ounds on c</td> <td>condition number:</td> <td>1.890053,</td> <td>38.74717</td> <td></td> <td></td>	ounds on c	condition number:	1.890053,	38.74717		
DF         Sum of Squares         Hean Square         F         Pr           Regression         4         122.16209863         30.54052466         5.84         0.           Bror         31         161.98095693         5.22519216         .         .         0.           Total         35         284.14305556         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         . <td></td> <td></td> <td>The SAS Sy</td> <td></td> <td></td> <td></td>			The SAS Sy				
DF         Sum of Squares         Hean Square         F         Pr           Regression         4         122.16209863         30.54052466         5.84         0.           Bror         31         161.98095693         5.22519216         .         .         0.           Total         35         284.14305556         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         . <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td>						1	
Regression         4         122.16209863         30.54052466         5.84         0.           Brror         31         161.98095693         5.22519216         .         .         0.           Total         35         284.14305556         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .         .	Step18 Va	riable MSR9 Remo	ved E-square	• • 0.42993167	C(p) = 1.1	1487809	
Brror         31         161.98095693         5.22519216         .           Total         35         284.14305556         5.22519216         .           Parameter         Standard         Type II         Pr           Variable         Estimate         Error         Sum of Squares         P           INTERCEP         40.66366603         11.62818686         63.89859697         12.23         0.           B6         -2.11881393         0.89257328         29.44422577         5.64         0.		DF	Sum of Squares	Nean Square	7	Prob>F	
Brror         31         161.98095693         5.22519216           Total         35         284.14305556         -           Parameter         Standard         Type II           Variable         Estimate         Error         Sum of Squares         F           INTERCEP         40.66366603         11.62818686         63.89859697         12.23         0.           B6         -2.11881393         0.89257328         29.44422577         5.64         0.	Regression	• 4	122.16209863	30.54052466	5.84	0.0013	
Total         35         284.14305556           Parameter         Standard         Type II           Variable         Estimate         Error         Sum of Squares         P           INTERCEP         40.66366603         11.62818686         63.89859697         12.23         0.           B6         -2.11881393         0.89257328         29.44422577         5.64         0.							
Variable         Estimate         Error         Sum of Squares         P           INTERCEP         40.66366603         11.62818686         63.89859697         12.23         0.           B6         -2.11881393         0.89257328         29.44422577         5.64         0.							
Variable         Estimate         Error         Sum of Squares         P           INTERCEP         40.66366603         11.62818686         63.89859697         12.23         0.           B6         -2.11881393         0.89257328         29.44422577         5.64         0.							
INTERCEP 40.66366603 11.62818686 63.89859697 12.23 0. B6 -2.11881393 0.89257328 29.44422577 5.64 0.		Parameter	Standard	Type II			
B6 -2.11881393 0.89257328 29.44422577 5.64 0.	Variable	<b>Sstimate</b>	Error	• •	T	Prob>P	
B6 -2.11881393 0.89257328 29.44422577 5.64 0.	INTRACOD	AN	11 87414844	61.80160807	12 23	0.0014	
						0.0240	
M363 U.1463U/JU U.U0003/23 21.800/40984 4.19 D.							
						0.0493	
			• • • • • • • • •			9.0018	
MSB13 0.45650602 0.10032844 108.18004799 20.70 0.	M2813	0.45650602	U,10032844	105.18004799	20,70	0.0001	

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Bounds on condition number: 1.829845, 28.34921

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All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination Procedure for Dependent Variable MSR10

	Variable	•	Number	Partial	Model			
Step	Entered	Resoved	In	Ise5	2022	C(p)	T	Prob>P
1		<b>B4</b>	17	0.0001	0.6425	17.0034	0.0034	0.9541
2	B7		18	0.0001	0.6426	19.0000	0.0034	0.9541
3		87	17	0.0001	0.6425	17.0034	0.0034	0,9541
4		MSRS	16	0.0013	0.6413	15.0629	0.0630	0.8047
5		83	15	0.0032	0.6381	13.2148	0.1691	0.6855
6		MSR11	14	0.0088	0.6293	11.6316	0.4843	0.4945
1		MSR12	13	0.0137	0.6156	10.2844	0.7775	0.3879
8		MSRJ	12	0.0070	0.6085	8.6192	0.4028	0.5322
9		HSE2	11	0.0122	0.5963	7.2010	0,7188	0.4053
10		MSR1	10	0.0126	0.5837	5.8009	0.7498	0.3951
11		B5	9	0.0108	0.5729	4.3131	0.6468	0.4289
12		<b>3</b> 1	8	0.0105	0.5624	2.8121	0.6387	0.4314
13	B2	••	ě	0.0105	0.5729	4.3131	0.6387	0.4314
14		B2	8	0.0105	0.5624	2.8121	0.6387	0.4314
15		HONTH	ž	0.0219	0.5406	1.8533	1.3508	0.2553
16		HSR7	Ġ	0.0224	0.5182	0.9166	1.3624	0.2530
17		MSR4	5	0.0387	0.4795	0.7571	2.3290	0.1378
18		MSR9		0.0496	0.4299	1.1149	2.8571	0.1013
44			-		System		sday, July	
				1114 484				13

Backward Elimination Procedure for Dependent Variable MSR11

Step 0 All Variables Entered E-square = 0.66502524 C(p) = 19.00000000
NOTE: The model is not of full rank. A subset of the model which is of full
rank is chosen.

	DF	Sum of Squares	Hean Square	7	Prob> <b>F</b>
Regression	18	71.59809488	3.97767194	1.88	0,1008
Brror	17	36.06412734	2.12141926		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Setimate	Brror	Sum of Squares	T	Prob>f
INTERCEP	76.44083349	30.88464715	12.99547165	6,13	0.0241
B1	-38.61004497	21.37314768	6.92293331	3.26	0.0886
B3	8.57585964	5.18202497	5.81008965	2.74	0,1163
<b>B</b> 4	9.72305259	5.11762297	7.65764452	3.61	0.0745
B5	7.91783995	8.15567549	3.50984963	1.65	0.2156
36	5.59771638	4.75277654	2.94275087	1.39	0.2551
Honte	0.05508502	0.24100532	0.11082563	0.05	0.8219
MSR1	0.03378199	0.12281251	0.16051356	0.08	0.7866
MSR2	0.04347560	0.13218910	0.22947024	0.11	0.7463
MSR3	-0.00539286	0.02598527	0.09137140	0.04	0.8381
MSR4	0.05314886	0.13862605	0.31183492	0.15	0.7052
MSR5	0.35311480	0.28455491	3.26682736	1.54	0.2315
MSR6	-0.06256385	0.23373751	0.15199054	0.07	0.7922
MSR7	-0.02090987	0.01742835	2.98473494	1.41	0.2519
MSR8	0.05355659	0.03950263	3.89942289	1.84	0.1929
MSR9	-0.16839103	0.34871022	0.49469223	0.23	0.6353
MSR10	-0.09950338	0.14250182	1.03433545	0.49	0.4945
MSR12	-0.08796180	0.17983017	0.50756265	0.24	0.6310
HSR13	0.19172100	0.20478102	1.85945836	0.88	0,3623
Bounds on cos	ndition number:	1076.665,	34810.65		

Step 1 Variable MSE3 Removed

E-square = 0.66417655 C(p) = 17.04307088

	DP	Sum of Squares	Nean Square	r	Prob) P
	17	71.50672348	4.20627785	2 44	0.0843
Regression Error	18	36.15549874	2.00863882	2.09	0.0647
Total	35	107.66222222	£. VV00300£		
	••				
	Parapeter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	1	Prob> I
INTERCEP	74.90838933	29.18092625	13.23623971	6.59	0.0194
81	-38.700\$4404	20.79289445	6.95849103	3.46	0.0791
B3	8.50343653	5.03095212	5.73839491	2.86	0.1082
14 15	9.63104828 8.14883157	4.96101260 5.89108804	7.57021869 3.84327542	3.77 1.91	0.0680 0.1835
36	5.71061149	4.59432422	3.10330028	1.54	0.2298
MONTH	0.05348428	0.23439146	0.10458527	0.05	0.8221
MSR1	0.03439774	0.11946853	0.16651546	0.08	0.7767
•		The SAS Sys	ten 15:49 Thur	eday, July	12, 1990
		-			14
MSR2	0.05228387	0.12181713	0.37001607	0.18	0.6729
MSR4	0.06866354	0.11359604	0.73388487	0.37	0.5531
MSR5	0.32086687	0.23196085	3.84345883	1.91	0.1835
MSR6	-0.07888339	0.21418224	0.27246209 2.93089054	0.14	0.7169
MSR7 MSR8	-0.02067917 0.05533147	0.01711923 0.03752663	4.36683827	1.46 2.17	0.2427 0.1576
MSR9	-0.16310229	0.33840716	0.46659802	0.23	0.8356
MSR10	-0.09414756	0.13636942	0.95738364	0.48	0.4988
MSR12	-0.07419925	0.16265260	0.41800248	0.21	0.6537
MSR13	0.18529994	0.19697590	1.77756800	0.88	0.3593
				• • • • •	
Bounds on cor	ndition number:	1076.213,	32019.69		
		••••••		********	
Step 2 Vari	Lable MONTH Rea	oved R-square	• • 0.66320513 C	(p) = 15.09	237056
	DF	Sum of Squares	Mean Square	7	Prob>T
Regression	16	71.40213821	4.46263364	2.34	0.0397
Brror	19	36.26008401	1.90842547		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	r	Prob>F
				•	
INTERCEP	71.75287294	25.04689050	15.66196179	8.21	0.0099
B1	-40.80645882	18.18258143	9.43336183	5.05	0.0367
<b>B</b> 3	8.97026898	4.48006405	7.65099101	4.01	0.3597
34	9.91430655	4.68184205	8.55788361	4.48	0.0476
35	8.90740899	4.74057821	6.73775727	3.53	0.0757
<b>3</b> 6	6.19894480	3.96273109	4.67005009	2.45	0.1342
XSR1	0.04558588	0.10619093	0.35169089	0.18	0.6725
MSE2	0.06318118	0.10923431	0.63845827	0.33	0.5698
MSR4	0.07602889	0.10616197	0.97880134	0.51	0.4826
MSR5	0.32576048	0.22513200 0.18502688	3.99574275	2.09	0.1642
MSR6	-0,10152004 -0,01904986	0.01518595	0.57452526	0.30	0.5895
MSR7 MSR8	0.05493573	0.03653945	3.01106380 4.31381043	1.58 2.26	0.2243 0.1492
MSR9	-0.18849556	0.31151170	0.69876110	0.37	
MSR10	-0.08490408	0.12692399	0.85397412		0.5116
MSR12	-0.05374111	0.13228267	0.31497970	0.17	
MSR13	0,18185229	0,19143369	1.72216993	0.90	0.3541
Bounds on cos	ndition number:	864.271,	24318.99		
• • • • • • • • • • • • • • •		••••••			
Step 3 Var.	iable MSE12 Rea	oved R-square	• • 0.66027950 C	(p) = 13.24	084649
	DT	-	Mean Square	1	Prob>P
		· •	-	-	

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Regression	15 .	71.0871585 <u>1</u>	4.73914390	2.59	0.024
1rror	20	36.57506371	1.82875319		
Total	35	107.66222222			
	<b>.</b> .				
Variable	ParaBeter Estimate	Standard Srror	Type II Sum of Squares	•	Prob
		BILUE	ndin of address	•	FLUU
		The SAS Sy	ston 16:49 Th	ureday, July	12, 11
INTERCEP	67.86135908	22.65462451	16.40916437	8.97	0.007
<b>B1</b>	-41.39452851	17.72286178	9.97638672	5.46	0.030
83	8.97927097	4.38549738	7.66654235	4.19	0.054
84	10.36545614	4.45228410	9.91211183	5.42	0.03
B5	8.81623776	4.63536656	6.61536050	3.62	0.07
86	6.24783844	3.87734248	4.74838965	2.60	0.12
MSR1	0.05382117	0.10203915	0.50877740	0.28	0.60
MSR2	0.06429391	0.10689625	0.66156086	0.36	0.554
HSR4	0.08465514	0.10132249	1.26407936	0.69	0.41
MSR5	0.33449189	0.21937601	4.25155728	2.32	0.14
MSR6	-0.08733674	0.17787006	0.44090326	0.24	0.62
MSR7	-0.01822096	0.01471103	2.80550493	1.53	0.22
Msr8	0.05597072	0.03568155	4.49976160	2.46	0.13
MSR9	-0.21546068	0.29793752	0.95640256	0.52	0.47
MSR10	-0.08654812	0.12418319	0.88826954	0.49	0.49
MSR13	0.15731732	0.17782566	1.43126250	0.78	0.38
	dition number:	858.7814,	22475.81		
	able MSRS Resc		0.65618426	C(p) = 11.4	4868051
	DF	Sum of Squares	Mean Square	T	Prob
Regression	14	70.64625525	5.04616109	2.86	0.01
STTOT	21	37.01596697	1.76266509	•••••	••••
Total	35	107.66222222	••••••		
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	Prob
		********			
INTERCEP	63.83809840	20.73578928	16.70661814	9.48	0.00
81	-39.73372217	17.07985962	9.53937039	5.41	0.03
<b>B</b> 3	7,89102181	3.71523281	7.95177758	4.51	0.04
B4	10.95966480	4.20652980	11.96510205	6.79	0.01
B5	7.83759106	4.10867304	6.41404258	3.64	0.07
<b>B</b> 6	5.54000775	3.53378129	4.33227614	2.46	0.13
MSR1	0.04966500	0.09983315	0.43623571	0.25	0.62
MSR2	0.06900519	0.10452332	0.76825780	0.44	0.51
MSR4	0.08578959	0.09993997	1.29885456	0.74	0.40
MSRS	0.35590933	0.21107535	5.01156667	2.84	0.10
MSR7	-0.01646173	0.01400785	2.43430903	1.38	0.25
MSRO	0.05666665	0.03500324	4.61964435	2.62	0.12
MSR9	-0.18128913	0.28441276	0.71616844		
MSR10	-0.08729595		0.90382204	• • •	
MSR13	0.15911889	0.17454577	1.46485504	0.83	0.372
ounds on cor	dition number:	· · · · •	18858.77	,	
tep 5 Vari	able MSR1 Remo	end B-square	0.65213236	C(p) = 9.6	543144(
	DF	Sum of Squares	Hean Square	7	Frob
Regression	13	70.21001954	B.40077073	3.17	0.00
Brror	22	37.45220268	1.70237285		
Total	35	107.66222222 The SAS Sy	8tes 16:49 Th	ureday, July	12, 19
	••••	<b>a</b> . <b> .</b>	<b>. .</b>		
	Parameter	Standard	Тур# 11		

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Variable	Estimate	Error	Sum of Squares	r	trob>t
		1			
INTERCEP	68.55569046	18.12221783	24.36234055	14.31	0.0010
B1	-33.70398453	11.82625216	13.82683907	8.12	0.0093
13	6.92579295	3.11369108	8.42253158	4.95	0.0367
<b>B4</b>	9.81927144	3.46620211	13.66172225	8.03	0.0097
35	6.30923366	2.68108390	9.42729498	5.54	0.0280
B6	4.06467062	1.88845427	7.88664797	4.63	0.0426
MSR2	0.04345878	0.08946864	0.40166882	0.24	0.6320
MSR4	0.09250343	0.09731625	1.53815341	0.90	0.3522
MSR5	0.34727534	0.20673161	4.80384275	2.82	0.1071
MSR7	-0.01492940	0.01342930	2.10393805	1.24	0.2783
MSR8	0.06297807	0.03206039	6.56894626	3.86	0.0622
MSR9	-0.15517269	0.27470352	0.54319633	0.32	0.5779
MSR10	-0.09546237	0.11871511	1.10081052	0.65	0.4299
MSR13	0.15516977	0.17135712	1.39593310	0.82	0.3750
Bounds on coi	ndition number:	410.7803,	9286.737		
***********				*********	
Step 6 Var:	iable MSE2 Remo	ved B-square	= 0.64840154	C(p) = 7.8	4365415
	DF	Sum of Squares	Mean Square	7	Prob>P
				• • •	
Regression	12	69.80835072	5.81736256	3.53	0.0045
Error	23	37.85387150	1.64582050		
Total	35	107.66222222			
	Parapeter	Stendard	Type II		
Variable	Estimate	Brror	Sum of Squares	T	Frob>F
		BILOL	adm or advertag	E.	1100/1
INTERCEP	72.33857021	16.08942497	33.26911611	20.21	0.0002
B1	-34.75107744	11.43335718	15.20447658	9.24	0.0058
B3	7.30669566	2.96285629	10.00929134	6.08	0.0215
B4	10.00204419	3.38800202	14.34407952	8.72	0.0071
B5	6.18690577	2.62452010	9.14596772	5.56	0.0273
B5 .	4.37899967	1.74440518	10.37140418	6.30	0.0195
MSR4	0.08384985	0.09406918	1.30765231	0.79	0.3820
MSR5	0.33888927	0.20255878	4.60676400	2.80	0.1079
MSR7	-0.01551888	0.01315033	2.29207946	1.39	0.2500
MSR8	0.06585372	0.03098128	7.43608491	4.52	0.0445
MSR9	-0.11643770	0.25847123	0.33399910	0.20	0.6566
MSR10	-0.09876304	0.11653531	1.18210565	0.72	0.4055
MSR13	0.15250891	0.16840075	1.34984791	0.82	0.3745
Bounds on co	ndition number:	397.1322,	8224.202		
Step 7 VAR	isble MSR9 Remo	ved E-square	= 0.64529925	C(p) = 6.0	0109549
	DF	Sum of Squares	Mean Square	7	Frob>F
Regression	11	69.47435162	6.31585015	3.97	0.0023
Strot	24	38.18787060	1.59116127		
Total	35	107.66222222			
		The SAS Sys	it <b>on</b> 16:49 Th	uraday, July	12, 1990 17
	<b>.</b>		<b>a</b>		
Varisble	Paraseter Sstimate	Standard Error	Type II Sum of Squares	r	frob>f
INTERCEP	73.94835334	15.42488055	36.57022203	22.98	0.0001
B1	-32.41572561	10.01989079	16.65327753	10.47	0.9035
33	6.57187953	2.43200475	11.61888754	7.30	0.0124
34	9.28920218	2.94560066	15.82425574	9.95	0.0043
85	5.78531968	2.42714926	9.04015663	5.69	0.0254
85 86	4.27067504	1.69882073	10.05571053	6.32	0.0191
MSR4	0.09632110	0.08839783	1.88918236	1.19	0.2887
MSRS	0.28481100	0.16042251	5.01530222	3.15	0.0885
MSR7	-0.01413049	0.01257000	2.01074946	1.25	0.2721
nər i		A+A123\AAA	T	1.40	******

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.88	0.06398707	0.03018879	7.14837268	4.49	0.0446
MSR10	0.06398707 -0.07789476 0.12441332	0.10514190	0.87333118		0.466
MSR13	0.12441332	0.15380868	1.04111230	0.65	0.426
ounds on con	dition number:	315.4872,	5959.37		
Step 8 Vari	able MSR10 Rem	oved R-squar	e = 0.63718748	C(p) = 4.4	1276857
	DF	Sum of Squares	Hean Square	T	Prob>1
Regression	10	68.60102044	6.86010204	4.39	0.001
Repor	25	39.06120178	1.56244807		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Estimate	<b>Error</b>	Sum of Squares	7	Prob>
	70.36389224		36.72402761		
<b>B1</b>	-32.74098978	9.91953649	17.02183757		
B3	6.45712294	2.40506847	11.26234460		0.0125
34	9.62325635	2.88450082	17.39035190		
85	5.76155365	2.40493999	8.96760195		
B6	4.39212904	1.87556663	10.73574955	6.87	0.014
MSR4	0.11139070	0.08524601	2.66781268	1.71	0.2032
MSR5	0.27275459	0.15814842			0.0961
MSR7	-0.01185924	0.01207993	1.50588223	0.96	0.3350
MSES	0.06594059	0.02980083	7.64987626	4.90	0.036
MSR13	0.07963994			0.32	
		314.8815,			
itep 9 Vari		oved R-square			
-	DF	Sum of Squares	Hean Square	7	\$Lop>
Regression	D7 9	Sum of Squares 68.09609793	Mean Square 7.56623310	F 4.97	\$Lop>
	DF	Sum of Squares	Hean Square	F 4.97	\$Lop>
Regretaion Brror	DF 9 26 35	Sum of Squares 68.09609793 39.56612429 107.66222222	Mean Square 7.56623310 1.52177401	F 4.97	\$Lop>
Regretaion Brror	DF 9 26	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard	Hean Square 7.56623310 1.52177401	F 4.97	Prob>  0.000
Regretation Error Total Variable	DF 9 26 35 Parameter Estimate	Sum of Squares 68,09609793 39.56612429 107.66222222 Standard Error 4.71830521	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525	F 4.97 F 274.37	Prob>  0.000( Prob>  0.000;
Regretation Error Total Variable	DF 9 26 35 Parameter Estimate	Sum of Squares 68,09609793 39.56612429 107.66222222 Standard Error 4.71830521	Hean Square 7.56623310 1.52177401 Type II Sum of Squares	F 4.97 F 274.37	Prob>  0.000( Prob>  0.000; 12, 19;
Regression Brror Total Variable INTERCEP	DF 9 26 35 Parameter Estimate	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Sys	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 The	F 4.97 F 274.37 ursday, July	Prob>  0.0000 Prob>  0.0000 12, 190
Regression Brror Total Variable INTERCEP	DF 9 26 35 Parameter Estimate 78.15403007	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Sys	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099	F 4.97 F 274.37 ursday, July 10.85 7.31	Prob) 0.0000 Prob) 10.0000 12, 199 12, 199 10.0024 0.0024
Regression Brror Total Variable INTERCEP	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS System 9.63196387 2.37225396	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099	F 4.97 F 274.37 ursday, July 10.85 7.31	Prob) 0.0000 Prob) 10.0000 12, 199 12, 199 10.0024 0.0024
Regression Brror Total Variable INTERCEP B1 B3	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Brror 4.71830521 The SAS Sys 9.63196387	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242	F 4.97 F 274.37 ursday, July 10.85 7.31	Prob) 0.0000 Prob) 12, 19 0.0020 0.0120 0.024
Regression Brror Total Variable INTERCEP B1 B3 B4	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS System 9.63196387 2.37225386 2.8444641 1.80872125	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099 17.18224686	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27	Prob>1 0.0000 Prob>1 0.0000 12, 199 12, 199 12, 199 10.0024 0.0120 0.0024 0.0121
Regretision Brror Total Variable INTERCEP B1 B3 B4 B5 B6	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Syst 9.63196387 2.37225386 2.8444661	Hean Square           7.56623310           1.52177401           Type II           Sum of Squares           417.52343525           stem         16:49 Thi           16.51765242           11.11707099           17.16224686           11.06099694	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93	Prob) 0.000 Prob) 12, 19 0.002 0.012 0.012 0.012 0.012
Regression Error Total Variable INTERCEP B1 B3 B4 B5	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Syn 9.63196387 2.37225396 2.8444641 1.80872125 1.62383975	Hean Square           7.56623310           1.52177401           Type II           Sum of Squares           417.52343525           stem         16:49 Thi           16.51765242         11.11707099           17.18224686         11.06099694           12.06393298         2.42110628	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.59	Prob>1 0.0000 Prob>1 0.0002 12, 190 12, 190 12
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 HSR4 HSR5	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379 0.25643914	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 Yhe SAS Sys 9.63196387 2.37225386 2.8444641 1.80872125 1.62383975 0.06365400 0.15348471	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099 17.18224686 11.06099694 12.06393298 2.42110628 4.24803970	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.59 2.79	Prob>1 0.0000 Prob>1 0.0002 12, 19 0.0024 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR6 MSR6 MSR7	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Syn 9.63196387 2.37225386 2.8444641 1.80872125 1.6236975 0.08345400	Hean Square           7.56623310           1.52177401           Type II           Sum of Squares           417.52343525           stem         16:49 Thi           16.51765242         11.11707099           17.18224686         11.06099694           12.06393298         2.42110628	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.59 2.79	Prob) 0.0000 Prob) 12, 19 0.0022 0.0022 0.0022 0.0022 0.0023 0.0025 0.0025 0.1055 0.4015
Regretision Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR6 MSR6 MSR7 MSR8 Kounds on con	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379 0.25643914 -0.0959148 0.06840846 dition number;	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Syn 9.63196387 2.37225386 2.8444641 1.80872125 1.62383975 0.08345400 0.15348471 0.01125284 0.02909655 304.8255,	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099 17.18224686 11.06099694 12.06393298 2.42110628 4.24803970 1.10559964 8.41185845	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.59 2.79 0.73 5.53	Prob>1 0.0000 Prob>1 0.0002 12, 199 12, 199 12
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR4 MSR5 MSR7 MSR3 B0unds on con	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379 0.25643914 -0.00959148 0.06840896 dition number:	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Sys 9.63196387 2.37225386 2.8444641 1.80872125 1.62383975 0.06345400 0.15348471 0.01125284 0.02809655 304.8255,	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 The 16.51765242 11.11707099 17.16224686 11.06099694 12.06393298 2.42110628 4.24803970 1.10559964 8.41185845 4633.946	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.59 2.79 0.73 5.53	Prob) 0.0000 Prob) 12, 190 0.0028 0.0120 0.0024 0.0120 0.0024 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0120 0.0028 0.0100 0.0000
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR4 MSR5 MSR7 MSR3 B0unds on con	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379 0.25643914 -0.0959148 0.06840886 dition number: able MSR7 Remov	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Sys 9.63196387 2.37225396 2.8444641 1.80872125 1.62383975 0.08345400 0.15348471 0.01125284 0.02909655 304.8255, // C R-squares	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 Thu 16.51765242 11.11707099 17.18224686 11.0609694 12.06393298 2.42110628 4.24803970 1.10559964 8.41185845 4633.946	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 2.79 0.73 5.53 C(p) = 1.15	Prob) 0.0000 Prob) 10.0001 12, 191 0.0022 0.0120 0.0024 0.0120 0.0024 0.0120 0.0024 0.0120 0.0024 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR4 MSR5 MSR7 MSR3 B0unds on con	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633683 4.57206655 0.10526379 0.25643914 -0.0959148 0.06840886 dition number: able MSR7 Remov	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Error 4.71830521 The SAS Sys 9.63196387 2.37225386 2.8444641 1.80872125 1.62383975 0.06345400 0.15348471 0.01125284 0.02809655 304.8255,	Hean Square 7.56623310 1.52177401 Type II Sum of Squares 417.52343525 stem 16:49 The 16.51765242 11.11707099 17.16224686 11.06099694 12.06393298 2.42110628 4.24803970 1.10559964 8.41185845 4633.946	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 2.79 0.73 5.53 C(p) = 1.15	Prob) 0.0000 Prob) 12, 190 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.2032 0.0022 0.0022 0.2032 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022 0.0022
Regression Brror Total Variable INTERCEP B1 B3 B4 B5 B6 MSR4 MSR5 MSR7 MSR5 B0unds on con Btep10 Vari Regression	DF 9 26 35 Parameter Estimate 78.15403007 -31.73326997 6.41181950 9.55790373 4.87633663 4.57206655 0.10526379 0.25643914 -0.00959148 0.06840886 dition number: able MSR7 Remov DF 8	Sum of Squares 68.09609793 39.56612429 107.66222222 Standard Brror 4.71830521 The SAS Sys 9.63196387 2.37225396 2.8444641 1.80872125 1.62383975 0.08345400 0.15348471 0.01125284 0.02909655 304.8255, /od R-squares 66.99049829	Hean Square           7.56623310           1.52177401           Type II           Sum of Squares           417.52343525           stem         16:49 Thi           16.51765242           11.1707099           17.18224686           1.06099694           12.06393298           2.42110628           4.24803970           1.10559964           6.31185845           4633.946           Mean Square           8.37381229	F 4.97 F 274.37 ursday, July 10.85 7.31 11.29 7.27 7.93 1.89 2.79 0.73 5.53 C(p) = 1.17 F	Prob) 0.0000 Prob) 10.0001 12, 191 0.0022 0.0120 0.0024 0.0120 0.0024 0.0120 0.0024 0.0120 0.0024 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026 0.0026
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INTERCEP	77.40017080	4.61113943	424.42029725	281.75	0.0001
B1	-32.85197356	9.49369589	18.03769813	11.97	0.0018
83	6.29740270	2.35642762	10.75829723	7.14	0.0126
34	8.58798084	2.82978645	17.29321764	11.48	0.0022
85	5.51903223	1.63571171	17.14909292	11.38	0.0023
B6	4.90818900	1.56723201	14.77422762	9.81	0.0041
MSR4	0.12841653	0.07850904	4.03024326	2.68	0.1135
MSR5	0.23163626	0.14993588	3.59526383	2.39	0.1340
MSR8	0.06682842	0.02888997	8.06040408	5.35	0.0286
пекф	V. V0004644	U. U4888991	6.00040408	3.33	U. V404
iounds on co	ondition number:	299.1657.,	3821.113		
Stepli Var	riable MSE5 Remo	ved R-square	= 0.58883453	C(p) = 0.8	6668520
	DF	Sum of Squares	Hean Square	7	\$cop>\$
Regression	7	63.39523446	9.05646207	5.73	0.0003
Brror	28	44.26698777	1.58096385		
Total	35	107.66222222			
	Parameter	Standard	Type II		
Variable	Estimate	Error	Sum of Squares	7	Prob>F
INTERCEP	82.46570911	3.32147443	974.55624591	616.43	0.0001
B1	-20.62941545	5.37602041	23.27951706	14.72	0.0006
83	3.10469805	1.15990332	11.32705712	7.16	0.0123
B4	5.72266340	1.35437704	28.22533956	17.85	0.0002
85	4.28099802	1.46084463	13.57700373	8.59	0.0067
B6	3.12148167	1.08355232	13.12029942	8.30	0.0075
MSR4	0.17128429	0.07523865	8.19360575	5.18	0.0307
MSR8	0.06498367	0.02957144	7.63458628	4.83	0.0364

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Bounds on condition number: 91.40499, 1036.919

All variables left in the model are significant at the 0.1000 level.

Summary of Backward Elimination Procedure for Dependent Variable MSR11

Step	Variable Regoved	Number In	Partial R#=2	Model R==2	C(p)	r	Prob) F
1	MSRJ	17	0.0008	0.6642	17.0431	0.0431	0.8381
2	MONTH	16	0.0010	0.6632	15.0924	0.0521	0.8221
3	MSR12	15	0.0029	0.6603	13.2408	0.1650	0.6891
4	MSEG	14	0.0041	0.6562	11.4487	0.2411	0.6288
5	MSR1	13	0.0011	0.6521	9.6543	0.2475	0.6240
6	MSR2	12	0.0037	0.6484	7.8437	0.2359	0.6320
1	MSR9	11	0.0031	0.6453	6.0011	0.2029	0.6566
8	MSR10	10	0.0081	C.6372	4.4128	0.5489	0.4660
9	MSR13	9	0.0047	0.6325	2.6508	0.3232	0.5748
10	HSR7	8	0.0103	0.6222	1.1719	0.7265	0.4018
11	MSR5	1	0.0334	0.5888	0.8667	2.3867	0.1340

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Captain Billy J. Gililland was born on 30 July 1959 in Tucson, Arizona. He graduated from Saints Peter and Paul High school in St. Thomas U. S. Virgin Islands in 1977. In 1981 Captain Gililland enlisted in the Air Force and was trained as a avionics communications specialists at Keesler AFB, Mississippi. In 1985, then Staff Sergeant Gililland, attended Officer's Training School and was subsequently commissioned a Second Lieutenant. After attending the aircraft maintenance officer's course, he was assigned to Norton AFB, California. He served there from 1986 to 1989 as Officer in Charge of the Aerospace Ground Equipment branch, Field Maintenance Squadron, Officer in Charge of The Isochronal Inspection branch and the Officer in Charge of the Flightline branch in the Organizational Maintenance Squadron. In June 1989 Captain Gililland entered the School of Systems and Logistics, Air Force Institute of Technology. He is married to the lovely Jenny Lee Gililland and is the proud father of Justin Lee and Brain James.

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