Inflationary Expectations and the Market Value of the Firm.

James Franklin Potts
Louisiana State University and Agricultural & Mechanical College

Follow this and additional works at: https://digitalcommons.lsu.edu/gradschool_disstheses

Recommended Citation
https://digitalcommons.lsu.edu/gradschool_disstheses/3257

This Dissertation is brought to you for free and open access by the Graduate School at LSU Digital Commons. It has been accepted for inclusion in LSU Historical Dissertations and Theses by an authorized administrator of LSU Digital Commons. For more information, please contact gradetd@lsu.edu.
INFORMATION TO USERS

This material was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or “target” for pages apparently lacking from the document photographed is “Missing Page(s)”. If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.

2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.

3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in “sectioning” the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.

4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from “photographs” if essential to the understanding of the dissertation. Silver prints of “photographs” may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.

5. PLEASE NOTE: Some pages may have indistinct print. Filmed as received.

University Microfilms International
300 North Zeeb Road
Ann Arbor, Michigan 48106 USA
St. John's Road, Tyler's Green
High Wycombe, Bucks, England HP10 8HR
POTTS, JAMES FRANKLIN
INFLATIONARY EXPECTATIONS AND THE MARKET VALUE OF THE FIRM.

THE LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COL., PH.D., 1978

University Microfilms International 300 N. ZEEB ROAD, ANN ARBOR, MI 48106
INFLATIONARY EXPECTATIONS AND THE MARKET VALUE OF THE FIRM

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The Department of Finance

by

James Franklin Potts
B.B.A., Baylor University, 1966
M.S., Baylor University, 1968
August, 1978
The author expresses his gratitude to the members of his committee, Dr. Thomas R. Beard, Dr. David T. Crary, Dr. William R. Lane, Dr. Loren C. Scott, Dr. William F. Staats, and Dr. Don L. Woodland, for their contributions to this dissertation and to the graduate program at L.S.U. Special thanks are due Dr. William R. Lane whose careful examination of the preliminary drafts led to many helpful suggests and to Dr. David T. Crary whose encouragement and offer of an instructorship made this last year of research possible.

A debt of gratitude is owed Dr. James Willis and Mr. Bruce L. McManis who provided programming and statistical advice. Thanks should also be given Ms. Peggy A. Naquin who cheerfully and conscientiously typed this dissertation in its various stages.

Finally, the author recognizes the contributions of his family, Ms. Elizabeth A. Potts, Marshall, Darrell, and Heather, who have patiently and encouragingly endured, and his parents, Mr. and Mrs. Uel Potts, who have been a continuing source of encouragement and inspiration.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ACKNOWLEDGMENTS</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>vi</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vii</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose Of The Study</td>
<td>3</td>
</tr>
<tr>
<td>The Hypothesis</td>
<td>5</td>
</tr>
<tr>
<td>Scope of the Study</td>
<td>7</td>
</tr>
<tr>
<td>Organization and Objectives</td>
<td>8</td>
</tr>
<tr>
<td>II. SURVEY OF THE LITERATURE</td>
<td>12</td>
</tr>
<tr>
<td>Early Views on Inflation</td>
<td>13</td>
</tr>
<tr>
<td>Why Firms Gain From Inflation</td>
<td>14</td>
</tr>
<tr>
<td>Early Tests of the Keynes-Fisher Hypothesis</td>
<td>16</td>
</tr>
<tr>
<td>Kessel (1956)</td>
<td>16</td>
</tr>
<tr>
<td>Bach and Ando (1957)</td>
<td>20</td>
</tr>
<tr>
<td>The Role of Expectations</td>
<td>22</td>
</tr>
<tr>
<td>Kessel and Alchian (1962)</td>
<td>22</td>
</tr>
<tr>
<td>Post-1965 Tests of the Keynes-Fisher Hypothesis</td>
<td>26</td>
</tr>
<tr>
<td>Bach and Stephenson (1974)</td>
<td>26</td>
</tr>
<tr>
<td>Bradford (1974)</td>
<td>27</td>
</tr>
<tr>
<td>Hong (1977)</td>
<td>32</td>
</tr>
<tr>
<td>The Evolution of the Post-War Inflation</td>
<td>35</td>
</tr>
<tr>
<td>Increased Awareness of Inflation</td>
<td>35</td>
</tr>
<tr>
<td>Price Expectations and Interest Rates</td>
<td>36</td>
</tr>
<tr>
<td>Empirical Studies of the Fisher Effect</td>
<td>38</td>
</tr>
<tr>
<td>Thomas Sargent (1969)</td>
<td>39</td>
</tr>
<tr>
<td>Gibson (1970)</td>
<td>39</td>
</tr>
<tr>
<td>Yohe and Karnosky (1969)</td>
<td>42</td>
</tr>
<tr>
<td>Expectations and the Fisher Effect</td>
<td>44</td>
</tr>
<tr>
<td>Turnovsky (1940)</td>
<td>45</td>
</tr>
<tr>
<td>Gibson (1977)</td>
<td>49</td>
</tr>
</tbody>
</table>
CHAPTER III. RANK CORRELATION TESTS ................................... 55
  Selection of Time Periods ........................................ 56
  The Data Sample ................................................... 57
  The Sub-Samples .................................................. 58
  Selection Criteria ................................................ 58
  Definition of Variables ......................................... 59
  Nonparametric Tests ............................................. 60
  Spearman Rank Correlation Test ............................... 61
  Kendall Rank Correlation Coefficient ....................... 63
  Sample Characteristics ........................................ 66
  Rank-Correlation Results ..................................... 68
  Comparisons With Previous Studies ........................... 71

IV. THE EFFECT OF DEBTOR-CREDITOR STATUS ON SECURITY
  RETURNS ............................................................ 83
  Selection of Time Period ... .................................... 85
  Selection Criteria ................................................. 86
  Portfolio Formation Procedure ............................... 87
  Tests of Portfolio Performance ............................... 92
  Analysis of Portfolio Tests ................................... 99

V. IMPLICATIONS OF RECENT TRENDS ................................ 102
  Changes in the Uncertainty of Expectations ................. 103
  Measurements of Expectations Uncertainty .................. 108
  The Impact of Uncertainty on Interest Rates ............... 110
  The Post-1965 Debt Movement ................................. 115
  Interpretation of Trends ..................................... 122

VI. SUMMARY AND CONCLUSIONS ..................................... 125

BIBLIOGRAPHY ........................................................... 133

APPENDIX A .............................................................. 138

APPENDIX B .............................................................. 152

VITA ................................................................. 153
<table>
<thead>
<tr>
<th>TABLE</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-1</td>
<td>Regression Results</td>
<td>29</td>
</tr>
<tr>
<td>II-2</td>
<td>T-Test, Mann-Whitney Test</td>
<td>31</td>
</tr>
<tr>
<td>II-3</td>
<td>Cross-Sectional Regression of Mean Monthly Returns on Risk and Wealth Transfer Variables</td>
<td>34</td>
</tr>
<tr>
<td>III-1</td>
<td>Characteristics of Sample Used in Rank Correlation Tests</td>
<td>67</td>
</tr>
<tr>
<td>III-2</td>
<td>Rank Correlation Results</td>
<td>69</td>
</tr>
<tr>
<td>III-3</td>
<td>Cross-Sectional Regression of Mean Monthly Returns on Risk and Wealth Transfer Variables</td>
<td>79</td>
</tr>
<tr>
<td>III-4</td>
<td>Correlation Matrices and Mean Sample Values of Explanatory Variables</td>
<td>80</td>
</tr>
<tr>
<td>IV-1</td>
<td>Holding Period Yields on Debtor and Creditor Portfolios</td>
<td>96</td>
</tr>
<tr>
<td>IV-2</td>
<td>Summary of Portfolio Tests</td>
<td>98</td>
</tr>
<tr>
<td>V-1</td>
<td>Aaa Corporate Risk Premium and Unanticipated Inflation.</td>
<td>112</td>
</tr>
<tr>
<td>V-2</td>
<td>Frequency of Debtor Firms</td>
<td>120</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-1</td>
<td>2</td>
</tr>
<tr>
<td>II-2</td>
<td>25</td>
</tr>
<tr>
<td>II-2</td>
<td>40</td>
</tr>
<tr>
<td>II-3</td>
<td>43</td>
</tr>
<tr>
<td>II-4</td>
<td>46</td>
</tr>
<tr>
<td>II-5</td>
<td>47</td>
</tr>
<tr>
<td>II-6</td>
<td>47</td>
</tr>
<tr>
<td>V-1</td>
<td>109</td>
</tr>
<tr>
<td>V-2</td>
<td>113</td>
</tr>
<tr>
<td>V-3</td>
<td>116</td>
</tr>
<tr>
<td>V-4</td>
<td>119</td>
</tr>
</tbody>
</table>
ABSTRACT

This dissertation examines one effect of inflation on the value of the firm—the Keynes-Fisher Hypothesis that debtor firms benefit from unanticipated inflation. The primary objective of this study is to determine what, if any, differences in performance exist as a result of net monetary debtor or creditor status during different inflationary conditions.

The literature on debtor versus creditor performance during inflation reflects a lack of agreement on the validity of the Keynes-Fisher Hypothesis. The findings of previous tests of debtor versus creditor performance are not homogeneous, and conflicts exist between such studies and the theoretical effects of unanticipated inflation. This dissertation suggests the lack of consensus is the result of improper tests and consideration of only the short run effects of anticipated inflation on holding period returns.

Initially, rank correlation tests were applied to a sample of Compustat firms to test for a relationship between net monetary debtor-creditor status and holding period returns. These tests indicated the inability of rank correlation methods to detect debtor benefits even in periods of unanticipated inflation. The differences between several of the prior studies are likely due to the use of this technique. It is necessary first to control for several other factors in order to detect those effects which result from debtor-creditor status.
A series of tests to isolate the effect of debtor-creditor status on holding period yields were conducted by constructing separate portfolios of debtor and of creditor firms, identical in all important respects except net monetary debtor-creditor status. In this way, any statistically significant differences in holding period yields could be attributed to differences in debtor-creditor status. The findings generally were consistent with the hypothesis of this dissertation and with research identifying periods of unanticipated inflation. Specifically in periods with relatively high unanticipated inflation (1955-59 and after 1967), debtor firms demonstrated superior holding period returns. In the interim period of more correctly anticipated inflation, no difference in the performance of debtor versus creditor portfolios was detected. However, two findings were not as expected. Creditor benefits appear in two periods. The five-year lagged holding period yields for creditor portfolios was superior to debtors in the 1969-73 and 1970-74 periods, even though inflation was not found to be overanticipated in either of the preceding five-year periods. Second, debtor benefits do not reappear strongly after 1967 when the degree of unanticipated inflation was as great as before 1960.

Two trends were noted and examined as possible explanations of these unexpected findings. First, it was noted that the variance in expected inflation for a given period had been increasing in the late 1960's. Increased uncertainty surrounding inflation forecasts would have the same effect as higher inflationary expectations, thereby decreasing debtor benefits and perhaps even causing creditor benefits in some periods. Second, the superior stock performance of net monetary
debtors was observed only several years subsequent to periods of unanticipated inflation. As would be expected in a rational market, the superior performance of debtor firms was followed by an increase in the percentage of debtor firms. The increase was concurrent with the observed lag structure in performance.

This dissertation has provided comprehensive explanations of the inconsistencies of prior studies as well as empirical evidence supporting these explanations. It develops an hypothesis supported by empirical tests which reconciles the findings of previous studies with research measuring the degree of unanticipated inflation. Finally, the likely implication of recent trends is examined along with promising areas for further research.
CHAPTER I

INTRODUCTION

In a free enterprise economy business firms are subject to two general types of constraints, one internal to the firm and the other external. The first type of constraint is self-imposed and arises from decisions of management. The second includes a wide range of external economic influences. Because general economic conditions are beyond the control of the firm, management must be able to adjust to these outside influences rapidly and with foresight. Such adjustments are complicated by the fact that the relative impact of various exogenous economic forces on business firms is subject to change over time. One of the most important changes which has occurred since World War II has been the continual and growing impact of inflation.

As Figure I-1 illustrates, the inflationary period which began in 1940 has been different from all others in the history of our nation.¹ Before World War II every major war began a period of inflation, and each wartime inflation was followed by a period of price deflation. In these post-war deflations, money decreased in value and lenders recouped what they had lost during the periods of rising prices.²

¹This period of generally uninterrupted inflation which began in 1940 is referred to as the post-war inflation, even though this period actually began before the end of World War II.

FIGURE I-1

PRICE INFLATION IN THE UNITED STATES 1820-1971

(1913 = 100)

However, no such adjustment of prices has occurred since World War II. Rising prices gradually became a recognized part of our economy. As a result of the recognition and anticipation of inflation, research conducted prior to 1940 concerning the impact of inflation on business firms has become less applicable to the analysis of modern business conditions. Moreover, the literature of finance in general lacks operational guidelines for business managers with respect to the most appropriate use of debt. Specifically, what mixture of assets and liabilities will enable the firm to maximize shareholder wealth under conditions of continuing inflationary pressure? The findings of this dissertation may aid in the development of such policy guidelines.

PURPOSE OF THE STUDY

The impact of inflation upon the value of business firms has long been of interest to scholars in the fields of economics and finance. However, the existing literature has tended to concentrate on the effects of inflation on welfare and income distribution, investor required rates of return, and income determination from the accounting


point of view. Since the early 1950's increasing emphasis has been placed on various empirical studies which have attempted to identify, and to some degree, measure the impact of inflation on business firms. A number of these studies have concentrated primarily on various tests of the so called Keynes-Fisher Hypothesis that business firms are debtors and therefore, benefit from inflation. Other more recent studies have tested the impact of debtor-creditor status as part of a more comprehensive framework considering the overall impact of inflation on business firms.

Research into the impact of inflation on business firms has varied widely in a number of important areas. Most studies use the same criteria for identifying debtor and creditor firms, but some apply the criteria to average measures while others use only the first year. The time periods are rarely identical, and many methods have been used for testing the data. Even the underlying assumptions are different in some studies. Due to these and other inconsistencies, it is not surprising that the results of research undertaken thus far have often been conflicting. One objective of this dissertation is a careful

---


examination of prior research. Points of agreement and disagreement will be mentioned, accompanied by explanations for some of the apparent contradictions which exist.

One important omission in the research conducted thus far has been a clear explanation of the relationship between stock price performance tests of the Keynes-Fisher Hypothesis, and research on the response of interest rates to changes in price expectations. Therefore, a second goal of this paper will be to provide such an explanation. Specifically, there is much evidence to indicate that the continuing post-war inflation has caused inflationary expectations to become an increasingly important determinant of interest rates, especially after 1960. A number of researchers have found evidence indicating a pronounced increase in the importance of price expectations as a determinant of interest rates occurred about 1960, and refer to this change in the determinants of interest rates as the "structural break of 1960". This dissertation seeks to explain clearly how this structural break should effect the validity of the Keynes-Fisher Hypothesis.

THE HYPOTHESIS

In the following chapter a thorough review of the pertinent literature from the fields of finance and economics is presented. By reviewing these findings we can develop the hypothesis of this dissertation.

---

Previous studies have developed a method of differentiating debtor and creditor firms according to inflationary impact. This method concentrates on a comparison of the relative importance of the firm's monetary assets minus monetary liabilities. Some of these same studies tested the market performance of debtor and creditor firms and found evidence that debtor firms had outperformed creditor firms during periods of inflation. However, later studies found results which were in conflict with the earlier research in that they found little or no relationship between debtor status and holding period returns on common stock. In fact, the most recent studies have found evidence of a negative relationship between debtor status and holding period returns.

It is recognized that the impact of inflation on business firms depends upon inflationary expectations. Both the correctness of expectations and how quickly expectations are incorporated into interest rates have an influence on the impact of inflation on debtor versus creditor firms. Research conducted in the post-war period offers evidence of the evolutionary nature of inflation during this period. Specifically, as inflation continued after the war, interest rates adjusted more rapidly and more completely to inflationary expectations. Inflation was generally unanticipated after World War II. However, expectations adapted to continuing inflation, and from about 1959 until 1967 forecasted rates of inflation were very close to actual rates. After 1967, unanticipated inflation began to reappear, and peaked during the 1972-1974 period. Considering this evidence on unanticipated inflation, it is possible to develop an hypothesis concerning the relationship between unanticipated inflation and holding
period yields of debtor and creditor corporations during the post-war period.

It is the hypothesis of this dissertation that corporations which established and/or maintained debtor positions during periods of unanticipated inflation will demonstrate superior holding period yields when compared to corporations which established and/or maintained creditor positions during such periods. Furthermore, when unanticipated inflation declines, this difference in performance should decline, and when unanticipated inflation reappears the superior performance of debtor firms should reappear. Therefore, we expect to find superior holding period yields for debtor firms before 1960 and following 1967. No significant difference in the performance of debtor and creditor firms should be expected during the interim period of correctly anticipated inflation.

SCOPE OF THE STUDY

This dissertation is concerned with the theoretical and empirical relationships between unanticipated inflation and holding period yields on the common stocks of debtor and creditor corporations. For the purposes of this study, no unlisted corporations, partnerships, or proprietorships will be considered. Also, all listed corporations subject to government regulation of profits will be excluded. The size of the corporations tested will not be considered because all tests of debtor-creditor status and holding period yield will be based on relative measures. Because of the data used, any conclusions drawn from the tests conducted in this dissertation will apply primarily
to large, listed, unregulated, industrial corporations. Any attempt to
generalize the findings to include other types of firms would be
highly speculative.

The tests conducted in this study include only post-1952 data. Due to the unique nature of the post-war inflation, conclusions drawn from tests conducted during this time period may not be applicable to other periods.

A further limitation was the exclusion in Chapter IV of all other inflationary effects, such as depreciation (via taxes) and inventory costing methods. This was done in order to concentrate our efforts on the impact of debtor-creditor status on holding period yield. The reason for choosing this one factor is that although researchers generally agree on the impact of other effects, there has been disagreement as to the significance of debtor-creditor status.

ORGANIZATION AND OBJECTIVES

The remainder of this dissertation is organized in the following manner. In Chapter II the relevant literature in finance and economics is reviewed. This review analyzes and compares the findings of studies which were foremost in the development of the hypothesis of this dissertation. This analysis indicates the relationship between finance studies of debtor versus creditor performance in periods of inflation, and economic research into the changing nature and impact of inflationary expectations. Evidence is presented indicating that the effects of inflation on debtor and creditor firms depends upon the degree to which inflation is anticipated and incorporated into interest rates as an
inflationary premium. As already mentioned, the accuracy of inflationary expectations has varied in the post-war period. Various subperiods are discussed as they relate to finance studies testing the relationship between debtor-creditor status and holding period returns.

Three groups of finance studies with seemingly contradictory results will be reviewed. The first group includes papers written between 1956 and 1963. These studies found evidence supporting the Keynes-Fisher Hypothesis that debtors benefit from inflation. Later tests conducted from 1970-1974 using similar data obtained mixed results; some found a weak relationship between holding period returns and debtor status while others found no relationship. The most recent studies, conducted since 1975, actually found a negative relationship between debtor status and holding period returns. By reviewing these studies in conjunction with interest rate research, we will see that these findings are actually consistent with the evolutionary nature of the

---

11 Among the early studies are R. Kessel and A. Alchian, "Effects of Inflation," (1962); DeAllessi, "Do Business Firms Gain from Inflation?" (1964); and V. A. Broussalian, "Unanticipated Inflation: A Test of the Debtor-Creditor Hypothesis," Ph.D. dissertation (UCLA, 1961). This group of researchers used primarily pre-1960's data.


post-war inflation. Also, by analyzing the results of these studies, the logic leading to the hypothesis of this dissertation will be clarified.

Chapter III examines rank correlation methods used to test the relationship between holding period yields and debtor-creditor status. The data sample, selection of time periods, and selection criteria are explained. The Spearman and Kendall rank correlation techniques are discussed, and the results of these tests reported. We expect these tests to reflect a high degree of correlation between debtor status and holding period yields when unanticipated inflation existed. This relationship should decline when unanticipated inflation declines. Through an examination of the methods used in Chapter III, we are directed to the tests conducted in Chapter IV, which seeks to overcome many of the shortcomings of rank correlation tests.

Chapter IV contains the portfolio tests used to compare the performance of debtor versus creditor corporations. The logic surrounding the formation of portfolios of debtor and creditor firms, in order to isolate the effect of debtor-creditor status on holding period yields is explained. Also, the methods used to make the portfolios as identical as possible, except for debtor-creditor status, are detailed. The statistical techniques used for testing the performance of these portfolios are described, and the results of these tests reported. The findings were generally consistent with the hypothesis of this dissertation. Firms which established and/or maintained debtor positions during the pre-1960 and post-1967 periods of relatively high unanticipated inflation outperformed firms establishing
and/or maintaining creditor positions during those same periods. During the interim period of relatively low unanticipated inflation, no differences in performance was detected. These results are analyzed and linked to the findings of previous studies.

Chapter V examines as yet unanswered questions about recent and future trends. In Chapter V the findings of recent research are also related to questions suggested by the results of the tests conducted in Chapter IV. This discussion explains the likely impact of recent changes in the uncertainty surrounding the formation of expectations, as it affects interest rates and thus, debtor-creditor performance. Included is an analysis of the post-1965 debt movement, and its probable impact on debtor-creditor performance via interest rates.

The final chapter, Chapter VI, contains a summary of the conclusions arising from tests of the hypothesis. It also contains an interpretation of these results and implications of the research findings for policy decisions, and recommendations of areas for further research.
CHAPTER II

SURVEY OF THE LITERATURE

The purpose of this chapter is to examine aspects of the literature of finance and economics related to the development of the hypothesis of this dissertation. The first part of this chapter examines early views of inflation and theories explaining how business firms should gain from inflation. In the second section of this chapter, early tests of the Keynes-Fisher Hypothesis are discussed. The objectives of this section are: to document the method used for differentiating debtor and creditor firms; to examine the contention that business firms are debtors; and to review the methodology and the results of early indirect market tests of the Keynes-Fisher Hypothesis, which, with one exception, supported the contention that the common stocks of debtor firms outperformed those of creditor firms during pre-1960 inflations.

The third part of this review will center around the findings of post-1965 tests of the Keynes-Fisher Hypothesis, concentrating on the apparent conflicts with earlier studies. The fourth and final section of this chapter will examine the changes in the link between inflationary expectations and interest rates which have occurred in the post-war period. Economic studies will be cited to provide evidence that interest rates were biased estimators of inflation prior to 1960 and after 1967.
when inflation was largely unanticipated. However, during the interim period of more correctly anticipated inflation interest rates were much less biased. A careful review of these studies will indicate why this dissertation is a logical extension of the literature, as well as a needed link between the literature of finance and economics.

EARLY VIEWS ON INFLATION

Until the late 1960's, businessmen, economists, and the general public assumed that a period of rising prices acts as a stimulus to the economy and that, in general, business firms are debtors and, therefore, gain from inflation. This widespread belief that business firms "gain" from inflation was popularized by John Maynard Keynes and Irving Fisher.\(^1\) Today this conclusion is stated in some form in most economic texts as in the following quotation from a popular economic text:

> Inflation also redistributes income by altering the relationship between debtors and creditors. Specifically, inflation tends to benefit debtors at the expense of creditors. . . As prices go up, the value of the dollar comes down. Thus, because of inflation, the borrower is given 'dear' dollars but pays back 'cheap' dollars.\(^2\)

In most cases the statement that business firms gain from inflation is not accompanied by a clear, consistent explanation of what the term gain actually means. To avoid any confusion the following definition of the term shall be assumed throughout the remainder of this dissertation.


An economic unit gains from inflation if, as a result of inflation, the rate of growth in its nominal wealth is greater than the increase in the general level of prices plus the real rate of interest.  

WHY FIRMS GAIN FROM INFLATION

Explanations of why business firms gain from inflation usually fall into one of the three following categories. The most prevalent explanation is that of the Keynes-Fisher Hypothesis discussed above. The key argument to this hypothesis is that business firms borrow and, therefore, contract to repay fixed dollar amounts. When unanticipated inflation occurs, the decline in the real value of money which results causes losses to creditors and gains to business firms because the real value of the debt is diminished. The essence of this particular explanation rests on the assumption that interest rates fail to completely reflect price level changes during inflation. The Keynes-Fisher Hypothesis then is based on the assumption that interest rates have traditionally been biased estimators of future prices. Without this assumption, the conclusion that creditors lose and debtors gain does not necessarily follow.

A second explanation for the conclusion that businesses gain from inflation is the Wage Lag hypothesis developed by Hamilton and

DeAlessi, "Do Business Firms Gain From Inflation?" p. 162.

According to this hypothesis, wages do not increase as rapidly as prices during period of demand pull inflation. Therefore, profit margins expand, benefiting any firm which has employees. Of course, the proponents of this view realize wages rise, but they merely contend that they do not go up as fast as prices in inflationary periods, nor do they go down as fast as prices in periods of deflation. This theory is most applicable in labor intensive economies and industries.

A third explanation of how business firms gain from inflation is based on the existence of business inventories. These inventories are generally sold at prices which reflect mark-ups based on current costs. If current replacement costs are greater than the original cost due to inflation, then the business will reap an inflation premium due to its mark-up policy. However, while it is true that business profits may appear larger as a result of these inflationary inventory profits, this is purely a result of the original cost accounting method.

While the last two explanations of how businesses gain from inflation are worthy of further examination, this dissertation will concentrate only on the Keynes-Fisher Hypothesis.

---


Two key elements are necessary to the logic of the Keynes-Fisher hypothesis. First, there is the assumption that business firms are debtors. Second, there must be, if not explicitly at least implicitly, the assumption that interest rates fail to fully reflect price level changes during inflationary periods. Both of these elements have been extensively tested in the literature of finance and economics.

EARLY TESTS OF THE KEYNES-FISHER HYPOTHESIS

The first wave of studies which attempted to test the Keynes-Fisher Hypothesis was primarily concerned with the relationship between aggregate stock market levels and inflation rates. These studies were based on data from periods of mild inflation prior to the structural break of 1960, and, with one exception, provided evidence which supports the Keynes-Fisher Hypothesis.

Kessel (1956)

One of the earliest test of the Keynes-Fisher Hypothesis was conducted by Reuben A. Kessel. Kessel considered two historically

---


10 DeAlessi and Broussalian obtained results supporting the Keynes-Fisher Hypothesis. These two works will not be covered in this section; however, see: DeAlessi, "Do Business Firms Gain from Inflation?" and Broussalian, "Unanticipated Inflation."

11 Reuben A. Kessel, "Test of A Hypothesis."
observed regularities: (1) banks as a class lose during inflation, in that their stocks do not increase in price as much as the general level of prices; and (2) stock price indexes generally rise slightly less than the general level of prices. These two historical observations appear to refute the Keynes-Fisher Hypothesis.

In order to test the assumption that business firms are debtors, Kessel selected a series of five samples, four of which were randomly drawn from the New York Stock Exchange industrial listing. The other sample consisted of sixteen stocks randomly drawn from the population of bank shares listed in the New York Times. These samples were divided into debtors and creditors by calculating monetary assets minus monetary liabilities. Banks are usually thought of as debtors because of their large ratio of debt to equity. However, when Kessel sorted out the monetary accounts from the real accounts, he found all 16 banks had monetary assets which exceeded monetary liabilities. Therefore, all 16 banks were creditors. In the other four samples of industrial corporations, debtors and creditors were approximately equal

12Kessel divided firms into creditors and debtors using the following classification system. This system is widely accepted in the literature and will be followed in this dissertation.

<table>
<thead>
<tr>
<th>Monetary Assets</th>
<th>Monetary Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Accounts Payable</td>
</tr>
<tr>
<td>Marketable Securities</td>
<td>Notes Payable</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>Tax Liability Reserve</td>
</tr>
<tr>
<td>Tax Refunds Receivable</td>
<td>Bonds</td>
</tr>
<tr>
<td>Notes Receivable</td>
<td>Preferred Stock</td>
</tr>
<tr>
<td>Prepaid Insurance</td>
<td></td>
</tr>
<tr>
<td>Gold</td>
<td></td>
</tr>
</tbody>
</table>
in number. Due to this finding, Kessel concluded that it is incorrect to assume that business firms are debtors.  

Kessel also examined the belief that debtors gain from inflation. This was accomplished by an examination of the stock price performance of the debtor firms versus the creditor firms. His sample of bank stocks rose in price by 47 percent from the end of 1942 to the end of 1948, while the wholesale price index rose by 60 percent. In the first sample of 30 industrial corporations, the debtor corporations stock increased in value by 81 percent while the creditor corporations stock declined in value by 13 percent during the same time period. These results were significant at a .0025 level. Similar results were obtained for this sample using stock prices from the end of 1939 to the end of 1948 and from the end of June 1942 to the end of June 1948.

Kessel also used rank correlation to determine if the degree of debtor or creditor status was related to the change in stock prices. The 30 stocks were ranked from most extreme debtor to most extreme creditor and these rankings were correlated to stock price performance. This correlation proved to be significant at the .002 level.

Kessel obtained similar results from the other three industrial samples for both periods of inflation and deflation. In each case

---

13 Louis DeAlessi, in "Do Business Firms Gain From Inflation?", reports similar findings on the frequency of business debtors and creditors in the U.S. However, in a sample of corporations from the United Kingdom the percentage of debtor corporations was significantly higher. In that sample, about 80 percent of the firms selected from 1948 to 1956 data were debtors. Evidence will be presented in Chapter V, indicating that the percentage of debtor firms in the U.S. increased after 1965.
debtor stocks out-performed creditor stocks in inflationary periods and vice versa in periods of deflation. Also, the degree of debtor or creditor status was correlated to the stock price performance.

The results of Kessel's research suggest a rationale for the uniformities reported by empirical investigators of past inflations in other countries: That bank stocks did not keep pace with increases in the general level of prices, and that prior to the 1950's, stock prices in general just kept pace with increases in the price level. Kessel concluded that bank stocks perform poorly because banks are creditors. He explained the movement of stock price indexes by the fact that such indexes were composed of both debtor and creditor securities in approximately equal numbers. Because of this fact, a consolidation of the monetary position of all the firms which compose such an index would essentially represent neutral shares. Therefore, Kessel's study did not support the hypothesis that business firms are debtors, but did support the hypothesis that debtor firms did benefit from inflation during the time periods mentioned. The latter finding is critical to the logic of the hypothesis to be tested in this dissertation.

14 Kessel cited a number of studies reporting such findings; for example, Bresciani-Turroni, Economics of Inflation, (London: 1937) pp. 253, 298; J. H. Rogers, The Process of Inflation in France, (New York, 1929) pp. 212-213, 265; D. L. Grove, "The Role of the Banking System in the Chilean Inflation," International Monetary Fund Staff Papers, (September, 1951) pp. 55. However, more recent studies in this country have found average rates of return on common stocks greater than the average rates of inflation. The most comprehensive study was that of Lawrence Fisher and James H. Lorie, "Rates of Return on Investments in Common Stocks," Journal of Business, (January, 1964), pp. 1-24.
Bach and Ando (1957)

One study containing findings somewhat different from those of Kessel was conducted by G. L. Bach and Albert Ando. Their study examined the redistributitional effects of inflation on the governmental and household sectors of the economy. However, it is their research concerning the effects of inflation upon corporations which is related to the subject of this dissertation. The period examined in their research, 1939-1952, was one of moderate inflation.

Bach and Ando tested two basic propositions: (1) inflation redistributes real purchasing power from creditors to debtors when debts are stated in fixed dollar amounts; (2) to the extent that inflation is correctly anticipated, the redistribution effects indicated above will tend to be negated, except where readjustments of terms on economic contracts are prevented or retarded by governmental rules, the existence of long-term contracts, and unequal knowledge or unequal bargaining power.

To test these propositions Bach and Ando initially selected a random sample of 100 companies from the 1939 Moody's Industrials. Their final sample was reduced to 52 firms due to mergers, incomplete data, failures, and other occurrences between 1939 and 1952. These sample data were divided into three subperiods 1939-1946, 1946-1949, and 1949-1952 because many firms reversed their position from debtors to creditors or vice versa during the 1939-1952 period.

Two measures of performance were used in the Bach-Ando study: (1) the change in the market value of the stock, and (2) net return on investments. Contrary to Kessel's finding, Bach and Ando's results did not confirm the prediction that debtor companies will gain from inflation. They found that from 1939-1945 the common stocks of creditor firms in their sample rose slightly more (231%) than those of debtor firms (224%). From 1946-1949 debtor stocks lost more (-35%) than creditor stocks (-30%). However, in the 1945-1952 period debtors gained (54%) while creditors gained (13%). Rank correlation coefficients of creditor-debtor status ranked against increase in stock prices were .23 for the first period, .09 for the second period, and .18 for the third period. These mixed results led Bach and Ando to believe that while the debtor-creditor effect does occur, income statement factors were generally more dominant.

Bach and Ando offered a number of possible explanations why their correlation coefficients were lower than those of Kessel. These included: different samples, shorter time periods, classification of companies as debtors or creditors based on the beginning data only, their use of median rather than mean measures of stock price changes for debtor and creditor groups, their addition of net return on investment or some combination of these factors.

It is important to note that Bach and Ando obtained results more similar to those of Kessel when they used the common stock test for the entire 1939-1952 time period. For the entire period the rank correlation of debtor-creditor rank against stock price performance was .26; this was higher than the correlation coefficient for any of the
three subperiods. They stated that they were unable to explain why the value of the correlation coefficient was so much higher for the longer time period, and therefore, doubted its significance.

Bach and Ando never mentioned that the interest rate mechanism was largely inoperative during their 1946-1949 subperiod. This is unusual since the results of the common stock test for this period were opposite to those of the other two subperiods. Only during this period did creditor stocks out-perform debtor stocks, and only in this period did both debtor and creditor stocks show negative price increases. The relatively short subperiods may have influenced their results if there existed a lag between a change in debtor-creditor status of the firm and any resulting change in stock price performance.

THE ROLE OF EXPECTATIONS

Kessel and Alchian (1962)

In another study of the effects of inflation on business firms, Kessel and Armen A. Alchian examined unanticipated inflation, the transition to anticipated inflation (the intermediate stage as they called it) and fully anticipated inflation. A thorough understanding of these stages of "inflationary evolution" is useful in fully appreciating the key role played by expectations of inflation in determining the impact of inflation on business firms. If inflation is unanticipated, that is, if the holders of monetary assets expect

prices to remain unchanged, then one set of implications is generated. However, if the holders of monetary assets, taken as a group, expect the general level of prices to rise, then an entirely different set of implications follow.

Kessel and Alchian explain quite clearly the various implications as inflationary expectations evolved from unanticipated to fully anticipated. If inflation is unanticipated, net monetary debtors gain at the expense of net monetary creditors. Also, governments, that is taxpayers, gain at the expense of the holders of government obligations, both interest bearing and non-interest bearing. As inflation continues and awareness of the rise in prices grows, the transition to a correctly anticipated inflation begins. During this stage, the quantity of real balances demanded decreases and the real value of the nominal stock of monetary assets falls. However, this rise in prices, unlike the rise in prices during unanticipated inflation, represents an adjustment by money holders to the increased costs of holding monetary assets. This may decrease the efficiency with which the economy utilizes its resources and may result in a loss to holders of monetary assets. Most important to this dissertation is that, in transition, all existing securities are re-valued so that their yields will reflect an unbiased estimate of the future course of prices. As a result of this adjustment process, the holders of all fixed return securities, both government and private, incur capital losses.

If inflation continues long enough it may reach a state that Kessel and Alchian call "correctly anticipated" inflation. If inflation is correctly anticipated, prices will rise at a constant rate. Also,
the continued decline in the purchasing power of money will induce a series of substitutions for money and monetary assets. In particular, real assets, gold, real estate, diamonds, etc., are substituted for monetary assets as a means of storing value. In this latter stage, inflation, essentially a tax on money, has its most devastating influence upon labor-intensive firms, while firms with low cash-to-equity ratios are least affected. Consequently, the demand for capital rises and rents rise relative to wages. Therefore, the fraction of national income devoted to capital formation increases.

Considering the characteristics Kessel and Alchian enumerated, it is possible to classify past inflationary periods as they conform to these descriptions. By doing this, it is possible to generate hypotheses about the effects of these past inflationary periods as they pertain to the Keynes-Fisher Hypothesis. The criteria used by Kessel and Alchian to characterize unanticipated inflation tend to be most closely related to the period from 1954-1959. The description of the transitional stage most closely resembles the 1960's and the 1969-1972 period would more closely conform to their description of a correctly anticipated inflation. 17

Figure II-1 plots measures of anticipated and unanticipated inflation. 18 As one can observe from this graph, anticipated inflation

17 These conclusions were based on an examination of the relationships between rates of change in the general level of prices and the level of wages, levels of employment, and rates of capital formation, all of which may be found in the Survey of Current Business and The Historical Statistics of the United States.

18 For an explanation of the method used to approximate anticipated versus unanticipated inflation, the reader should refer to Joseph Bisignano, "The Effect of Inflation on Savings Behavior," Federal Reserve Bank of San Francisco Economic Review, (December, 1975) p. 24.
went from about one to two percent during the first half of the 1960's. From mid-1967 to 1970 anticipated inflation grew rapidly and reached four percent. After 1970 anticipated inflation appeared to stabilize between four and five percent until 1972. By observing the unanticipated inflation component, one may observe how the public gradually learned to adjust to continual price increases. In fact, during the early 1970's unanticipated inflation fell, actually becoming negative in 1971 and 1972.

FIGURE II-1

RECENT HISTORY OF INFLATION


The effects of anticipated inflation were explained by Brian Motley. He concluded that if inflation becomes anticipated to the

degree that the negotiation of loan contracts is treated by both borrowers and lenders as a process involving real rather than monetary magnitudes, the proposition that equity holders gain at the expense of lenders will no longer hold true because bargains would be struck in terms of the real rate of interest rather than in the money rate of interest.

None of the early studies included time periods during which the expectations of stock purchasers and lenders varied from almost totally unanticipated inflation in the beginning to almost total anticipation in the latter stages. Therefore, it is not surprising that the results of studies conducted prior to 1960 would be very different from tests of the Keynes-Fisher Hypothesis which were conducted later and included post-1960 data.

POST-1965 TESTS OF THE KEYNES-FISHER HYPOTHESIS

As the rate of inflation increased after 1965, research into various aspects of the effects of inflation on the business firm also intensified. The traditional approach of attributing differentials in stock price performance to debtor effects alone was abandoned.

Bach and Stephenson (1974)

G. L. Bach and J. B. Stephenson attempted to test the effects of inflation on business firms by combining depreciation and debtor-creditor effects. Firms were classified on the basis of their

---

20 Bach and Stephenson, "Inflation and the Redistribution of Wealth."
exposure to inflation. Bach and Stephenson observed that during inflationary periods depreciation charges are fixed while replacement costs of assets are increasing; therefore, all companies with depreciable assets lose because they pay excessive amounts in taxes. The basic hypothesis Bach and Stephenson attempted to test was that the stock price performance of debtor firms should be better than that of creditor firms, and the performance of low depreciation firms should surpass that of high depreciation firms.

A basic theoretical problem with the approach used by Bach and Stephenson was their failure to recognize the different impact of anticipated versus unanticipated inflation. Depreciation effects will lead to disproportionally higher taxes regardless of whether inflation is anticipated or unanticipated, while only unanticipated inflation will cause a redistribution of wealth from creditor to debtor firms. Because of their failure to recognize this fact, Bach and Stephenson combined these two effects into a measure they called "inflationary exposure". Due to this logical inconsistency, it is not surprising that the results yielded were mixed and inconclusive.

Bradford (1974)

A model constructed by William D. Bradford included both monetary and depreciation effects as separate effects. Bradford's study tested the same premises, the Keynes-Fisher Hypothesis, previously tested by Kessel (4), DeAlessi (1), and Bach and Ando (21).

---

21 William Bradford, "Inflation and the Value of the Firm."
However, none of these previous studies included depreciation effects. Using data based upon the samples used by Bach and Ando, Bradford performed six different independent tests.

The first test employed a regression equation of the form:

\[ Y = a + b_1 x_1 + b_2 x_2 + u, \]

where

- \( Y \) refers to the change in real wealth,
- \( b_1 \) regression estimate of impact of monetary position,
- \( b_2 \) regression estimate of impact of depreciation,
- \( x_1 \) is the weighted sum of the average net monetary asset position of the firm,
- \( x_2 \) is the weighted depreciation position of the firm, and
- \( u \) is the random error term.

The results of this regression test are shown in Table II-1. In this table \( D_1 \) represents the regression results when depreciation was calculated as the average annual depreciation charges, and where \( D_2 \) is the depreciation calculated as the average annual net fixed assets. In both cases \( \bar{W} \) is the average annual total market value of the equity. These regression results found the depreciation variable to be significant based upon regression t test for both the 1949-52 and 1948-56 time periods. The fact that this variable was not significant for the 1952-1955 time period is not surprising, considering the price stability during that time period. However, it is surprising that the monetary position of the firms was not found to be significant in any time period.

Bradford also used the t test for the difference between two means. For this test the population was divided into four classifications: high depreciation debtors, high depreciations creditors, low depreciation
TABLE II-1

REGRESSION RESULTS

<table>
<thead>
<tr>
<th></th>
<th>1949-52</th>
<th>1952-55</th>
<th>1948-56</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All Firms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression Coefficient:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>-0.13</td>
<td>-1.13</td>
<td>4.39</td>
</tr>
<tr>
<td></td>
<td>(0.90)</td>
<td>(1.01)</td>
<td>(3.73)</td>
</tr>
<tr>
<td>$X_2$</td>
<td>-3.40***</td>
<td>-2.16***</td>
<td>-1.95</td>
</tr>
<tr>
<td></td>
<td>(1.59)</td>
<td>(0.83)</td>
<td>(2.39)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.22</td>
<td>0.23</td>
<td>0.08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1949-52</th>
<th>1952-55</th>
<th>1948-56</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Firms Which Were Consistent Debtors or Creditors At Least Seven of Nine Years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression Coefficient:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_1$</td>
<td>-0.42</td>
<td>-1.41</td>
<td>3.97</td>
</tr>
<tr>
<td></td>
<td>(0.84)</td>
<td>(0.91)</td>
<td>(3.81)</td>
</tr>
<tr>
<td>$X_2$</td>
<td>-4.11***</td>
<td>-3.01***</td>
<td>5.30</td>
</tr>
<tr>
<td></td>
<td>(1.73)</td>
<td>(1.03)</td>
<td>(4.57)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.21</td>
<td>0.23</td>
<td>0.07</td>
</tr>
</tbody>
</table>

* Firms which were debtors or creditors all nine years of the period studied.
* ( ) Represents the standard error of the regression coefficient
** = significant at the 0.10 level
*** = significant at the 0.05 level
**** = significant at the 0.01 level

debtors, and low depreciation creditors. The results of the t test based upon comparisons of the mean gains of these groups are shown in Table II-2. In the 1949-52 and 1948-56 periods, the signs for all tests are as predicted by the hypothesis. The greater the debtor position and the smaller the depreciation charges, the better the company's performance; and the greater the creditor position and the greater the depreciation charges the poorer the company's performance. Again, the stable period 1952-55 yielded mixed results.

Results of the Mann-Whitney Test, also shown in Table II-2, corroborated the results of the regression and t tests. The results of this rank correlation test were generally consistent for the 1945-52 and 1948-56 periods, and once again had little predictive ability in the 1952-55 period. For the first two periods mentioned the values were significant at least at the 10 percent level for 33 of the 40 tests conducted. Only one of the 16 tests for the 1952-55 period was significant.

Bradford also conducted a portfolio test based upon an investment strategy consistent with his hypothesis. Bradford's hypothesis states that during inflation a portfolio of net debtor firms would out-perform net creditor firms, and a portfolio of low depreciation firms would out-perform a portfolio of high depreciation firms. Bradford compared the performance of portfolios selected according to this strategy with the performance of portfolios selected using an opposite strategy and using a random selection process. He found some support for his hypothesis. Using the Kendall Rank Correlation (tau) test, he found significant differences in performance at the
TABLE II-2

T TEST, MANN-WHITNEY TEST

\[
\begin{array}{ccccccc}
\text{1949-52} & \text{1952-55} & \text{1960-56} & \text{D}_1 / \text{W} & \text{D}_2 / \text{W} & \text{D}_1 / \text{W} & \text{D}_2 / \text{W} & \text{D}_1 / \text{W} & \text{D}_2 / \text{W} \\
\hline
\text{LDD > HDD} & 0.96 & 0.67 & -0.13 & 0.15 & 1.48^* & 2.02** \\
\text{LDC > HDC} & 1.02 & 0.23 & 0.11 & 0.66 & 1.85** & 2.13*** \\
\text{LD > HDC} & 0.91 & 0.37 & 0.42 & 0.99 & 2.36*** & 2.97*** \\
\text{LD > HD} & 1.47 & 0.90 & -0.26 & 0.62 & 1.85** & 2.83*** \\
\end{array}
\]

\[
\begin{array}{ccccccc}
\text{U-Value, Mann-Whitney Test} & \\
\hline
\text{LDD > HDD} & 0.09 & 1.40^* & 0.91 & 1.18 & 2.84*** & 2.28 \\
\text{LDC > HDC} & 1.41 & 1.75** & 1.12 & 1.01 & 1.73 & 1.05 \\
\text{LD > HDC} & 1.17 & 2.85*** & 0.43 & 0.92 & 1.94 & 3.00 \\
\text{LD > HD} & 1.51 & 1.48 & 1.14 & 0.93 & 2.96 & 2.05 \\
\end{array}
\]

Firms Which Were Consistent Debtors or Creditors at Least Seven of Nine Years

\[
\begin{array}{ccccccc}
\text{1949-52} & \text{1952-55} & \text{1968-56} & \# & \theta & \text{D}_1 / \text{W} & \text{D}_2 / \text{W} \\
\hline
\text{LDD > HDD} & 2.03 & 1.80** & -0.14 & -0.10 & 0.44 & 0.75 & 1.40^* & 2.23** \\
\text{LDC > HDC} & 1.15 & 0.38 & 0.25 & 0.39 & 0.13 & 0.75 & 1.21 & 1.31 \\
\text{LD > HDC} & 1.59 & 1.47 & 0.26 & 0.58 & 0.51 & 1.52 & 1.82*** & 2.38 *** \\
\text{LD > HD} & 2.55*** & 1.44 & -0.06 & 0.10 & 0.14 & 0.50 & 1.70 & 2.15** \\
\end{array}
\]

\[
\begin{array}{ccccccc}
\text{U-Value, Mann-Whitney Test} & \\
\hline
\text{LDD > HDD} & 2.57*** & 1.65 & 0.62 & 1.03 & 1.13 & 2.52*** & 1.21 & 2.09** \\
\text{LDC > HDC} & 1.76** & 2.30 & 0.31 & 0.31 & 0.91 & 1.12 & 1.57 & 1.06 \\
\text{LD > HDC} & 2.05** & 1.90 & 0.39 & 0.36 & 1.31 & 1.43 & 1.76** & 2.04** \\
\text{LD > HD} & 2.75*** & 2.55*** & 0.70 & 1.32 & 1.34 & 1.70 & 1.63 & 2.88*** \\
\end{array}
\]

The alternate hypotheses are expressed, the null hypothesis in each case being equality of the two respective populations.

* LDD = low depreciation debtors
** HDD = high depreciation debtors
*** LDC = low depreciation creditors
**** LD = all low depreciation firms
HDD = all high depreciation firms
LDC = all low depreciation creditors

† Firms which were debtors or creditors all nine years of the period studied.

* = significant at the 0.10 level
** = significant at the 0.05 level
*** = significant at the 0.01 level

12 percent level with the data covering the 1948-56 period, and at the 10 percent level for the 1949-52 period.

The samples were also tested to determine whether the values of the population from which one of the samples was drawn were stochastically larger than the values of the population from which the other sample was drawn. Although the signs of the test statistic were all consistent with the model, the null hypothesis was rejected at a higher level when monetary position was considered. Therefore, Bradford concluded that monetary position was not as influential a factor as depreciation position or a combination of depreciation and monetary positions.

Hong (1977)

More recently Hai Hong examined the differential effects of inflation on individual business firms. Hong tested the hypotheses that, ceteris paribus, the stock price of a firm is higher (a) the higher its net debtor position; (b) the lower its proportion of fixed assets; and (c) the lower the degree of understatement of cost of goods sold.

These hypotheses were tested by means of a cross-sectional linear regression equation. Mean returns on common stocks (for given holding periods) were regressed on the three asset variables. Because returns are assumed linear in their systematic risk (\( B \)), \( B \) was also included as an explanatory variable. The cross-sectional equation tested by

\[ \text{22} \] Hai Hong, "Inflation and the Market Value of the Firm."
Hong was:

\[ Y_i = x + a_{0i} + a_1 x_{1i} + a_2 x_{2i} + a_3 x_{3i} + U_i \ (i = 1, 2, \ldots, n) \]

where

- \( x \) = constant
- \( B_i \) = systematic risk of \( i \)th firm
- \( x_{1i} \) = net debtor position
- \( \frac{x_{2i}}{\text{book value of the firm}} \) = fixed assets
- \( \frac{x_{3i}}{\text{book value of the firm}} \) = inventory cost understatement per unit inflation
- \( Y_i \) = monthly return on firm \( i \), averaged over the holding period

The results of this regression using COMPUSTAT data for three time periods, 1954-59, 1959-63, and 1964-68, are shown in Table II-3. The first line coefficients are those obtained with no omission of variables, the second line shows regression estimates where \( B \) was omitted, and the third when \( x_2 \) and \( x_3 \) were omitted.

The results indicate that heavily-capitalized firms perform worse than firms with relatively less depreciation. Also, the effect of undercosting inventory could not be rejected at the 10 percent level for the first two periods. Most surprising is the total lack of evidence to support the debtor-creditor hypothesis. This is especially puzzling when one considers the 1954-58 period, a period of under-anticipation of the rate of inflation.

This article by Hong and other similar recent articles have offered evidence which appear to contradict the Keynes-Fisher (debtor-creditor) hypothesis. When one examines the changing nature of the post-war
### TABLE II-3

**Cross-Sectional Regression of Mean Monthly Returns on Risk and Wealth Transfer Variables**

\[
Y_t = \alpha + \alpha_1 \beta_1 + \alpha_2 X_{1t} + \alpha_3 X_{2t} + \alpha_4 X_{3t}
\]

<table>
<thead>
<tr>
<th>Period</th>
<th>Const.</th>
<th>Sys. Risk</th>
<th>Debt</th>
<th>Plant</th>
<th>Inv.</th>
<th>( r^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \alpha )</td>
<td>( \alpha_1 )</td>
<td>( \alpha_2 )</td>
<td>( \alpha_3 )</td>
<td>( \alpha_4 )</td>
<td></td>
</tr>
<tr>
<td>1 (1964-68)</td>
<td>.0083</td>
<td>.0068</td>
<td>.0006</td>
<td>-.0143</td>
<td>-.0099</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>(2.75)</td>
<td>(3.18)*</td>
<td>(0.18)</td>
<td>(-3.86)*</td>
<td>(-1.57)**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.0165</td>
<td>.0055</td>
<td>-.0194</td>
<td>-.0079</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(8.71)</td>
<td>(1.61)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \rho = 0.033 )</td>
<td>-0.0011</td>
<td>.0106</td>
<td>-.0067</td>
<td></td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.50)</td>
<td>(4.51)*</td>
<td>(-2.03)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (1959-63)</td>
<td>.0087</td>
<td>-.0043</td>
<td>-.0027</td>
<td>-.0077</td>
<td>-.0074</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>(2.00)</td>
<td>(-1.18)</td>
<td>(-0.66)</td>
<td>(-2.32)*</td>
<td>(-1.71)**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.0039</td>
<td>-.0047</td>
<td>-.0061</td>
<td>-.0077</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.64)</td>
<td>(-1.69)**</td>
<td>(-2.00)*</td>
<td>(-1.76)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \rho = 0.012 )</td>
<td>.0023</td>
<td>-.0015</td>
<td>-.0063</td>
<td></td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(-0.44)</td>
<td>(-2.10)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (1954-58)</td>
<td>.0140</td>
<td>.0047</td>
<td>-.0007</td>
<td>-.0122</td>
<td>-.0035</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>(5.83)</td>
<td>(2.54)*</td>
<td>(-0.19)</td>
<td>(-3.14)*</td>
<td>(-0.63)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.0180</td>
<td>.0014</td>
<td>-.0106</td>
<td>-.0042</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(9.02)</td>
<td>(0.34)</td>
<td>(-2.44)*</td>
<td>(-0.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \rho = 0.016 )</td>
<td>.0103</td>
<td>.0035</td>
<td>-.0042</td>
<td></td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4.68)</td>
<td>(1.59)**</td>
<td>(-1.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. Figures in parentheses are \( t \)-values.
2. (*) indicates significant at the 5% level on a one-tail \( t \)-test. (**) at 10%.

**Source:** Hai Hong, "Inflation and the Market Value of the Firm: Theory and Tests," p. 1042.
inflation; however, it is not surprising that the impact of debtor-creditor status on stock price performance has diminished.

THE EVOLUTION OF THE POST-WAR INFLATION

If, in fact, inflationary evolution has occurred during the time period in question in this dissertation, expectations about the future path of prices should have changed. Such a change is evidenced by the findings of research since World War II into the determinants of interest rates. These interest rate studies offer evidence which supports the division of periods developed by Kessel and Alchian.

Increased Awareness of Inflation

In the past, some economists held the opinion that interest rates failed to fully reflect price changes, and that the public failed to understand that inflation diminished the value of money. Irving Fisher stated:

That the value of money does not change is, therefore, one of the world's great illusions. We all begin under the sway of this illusion. If prices go up or down we think, at first, whatever it may be that puts them up or down, it is not changing the value of money. The fault, we believe, must be in the changing goods, the profiteer, or the "bloated bondholder," or Wall Street, or the government. 23

From the beginning of World War II into the 1970's, the United States enjoyed a period of practically uninterrupted prosperity, and also, a long period of rising prices. Inflation has become a global economic phenomenon, and through the news media this fact has been impressed upon the population. As a result of this attention,

23 Irving Fisher, Inflation (New York, 1933) p. 46.
reinforced by continual exposure to rising prices, the public has grown more aware of the real value of money. The populace of the United States may be less subject to money illusion now than at any other time in the post-war period.

In examining the literature containing explanations and empirical tests of the link between price changes as they effect expectations and expectations as they affect interest rates, one can observe the likely impact of this increased awareness of inflation upon interest rates. This evidence is essential to the hypothesis of the declining importance of the Keynes-Fisher hypothesis in the 1952-1975 period.

**Price Expectations and Interest Rates**

In 1923 J. M. Keynes stated his belief that:

> In countries where the currency has not collapsed completely, there has seldom or never existed sufficient general confidence in a further rise or fall of prices to cause the short-term rate of interest to rise above ten percent per annum, or, fall below one percent.\(^{25}\)

Keynes' observation is in conflict with recent experience and indicates how radically the post-war inflation differs from previous economic experience. It is not that expectations were slower to adjust to actual price experience before 1960 than after. It is that, once formed, expectations have substantially less than their theoretically expected effects on interest rates in the earlier period.

---

\(^{24}\) For tests and explanations of the increasing impact of inflationary expectations, the reader is directed to J. A. Frenkle, "Inflation and the Formation of Expectations," *Journal of Monetary Economics* (October 1975) pp. 403-442.

While contemporary economists tend to agree on the identity of the forces affecting interest rates, they tend to disagree over the relative importance of these forces. For many years after the Keynesian revolution economists emphasized the inverse relationship between money and interest rates. However, more recently, in part as a result of extended periods of rising interest rates accompanied by increases in the money stock and prices, economists have turned their attention to the effects of income and price expectations on interest rates.

The theoretical operation of price expectations effects on interest rates was set forth by Irving Fisher, but apart from his evidence, little empirical work had been done in this area until after the structural break of 1960. Recent studies have documented the increasing importance of the Fisher effect in the United States and have attributed an important role to the influence of price changes in explaining observed interest rate movements, especially during the 1960's and 1970's.


27 Philip Cagan provided strong evidence of price-expectations effects in postwar European inflations "The Monetary Dynamics of Hyper-Inflation," in Milton Friedman, ed., Studies in the Quantity Theory of Money (Chicago, 1956), pp. 23-117. More recently Kajal Lahiri in his article, "Inflationary Expectations: Their Formation and Interest Rate Effects," American Economic Review, (March, 1976), pp. 124-131, found that short-term expectations alone could explain more than 70 percent of the variations in the nominal rate of interest in some periods since 1960. These articles and others offer evidence of the increasing importance of expectations during continuing inflation in the determination of interest rates. In economic theory this phenomena is referred to as the adaptive expectations hypothesis.
By the latter part of the 1960's the structural break that occurred in 1960 was becoming widely recognized by the Federal Reserve System, as well as the rest of the financial community. A former president of the Federal Reserve System expressed his awareness of this growing relationship between inflation and interest rates by saying, "Those of us who have worked in this field know that the thing that really makes high interest rates is inflation getting out of control."  

The literature dealing with interest rate determination similarly reveals a marked change in emphasis, with research based on time periods prior to 1960 finding less evidence of the Fisher effect than those studies conducted using post-1960 data.

**EMPIRICAL STUDIES OF THE FISHER EFFECT**

Since the mid-1960's, there have been several empirical examinations of the effect of price changes on the market rate of interest which show the increasing importance of inflationary expectations upon interest rates during the 1954-1975 time period. This suggests a declining importance of the Keynes-Fisher hypothesis over this period.

---


29. Several researchers have incorporated expectations of inflation into models of interest rate determination. However, the earlier studies found much longer lags between price changes and interest rate changes, and much less correlation between expectations of price level increases and increasing interest rates. See for example, Thomas J. Sargent, "Commodity Price Expectations and the Interest Rate," *Quarterly Journal of Economics*, (February, 1969), pp. 127-140; and Kajal Lahiri, "Inflationary Expectations," (1976).
Thomas Sargent (1969)

Thomas Sargent found interest rates and commodity prices highly and positively correlated in the U.S. over the period 1902-1940. He also found evidence of this phenomenon in several other countries. Sargent tested Fisher's explanation of the Gibson Paradox using a multivariate model that measured the impact of several monetary and real variables on the nominal rate of interest. His results were surprisingly different from previous studies in two respects. First, inflation unexpectedly explained variations in interest rates to a larger degree than previously believed. The second unexpected result was the extremely long lag between an increase in prices and the ensuing effect upon interest rates. Sargent's results indicated that the market's expectations of inflation adjusted very slowly. In fact, his research indicated that many years were required for a substantial portion of the adjustment to occur.

Gibson (1970)

Another study which generally supported Sargent's findings was conducted by William E. Gibson. Gibson's study was an attempt to measure the magnitude and the timing of the Fisher effect. Like Sargent, Gibson found evidence of long lags between changes in the price level and changes in interest rates. Gibson concluded that this delay in the expectations effect resulted not from a failure of

30 Thomas Sargent, "Commodity Price Expectations and the Interest Rate."

31 William Gibson, "Price Expectations' Effects on Interest Rates."
expectations to adjust rapidly, but from the slowness of savings and investment to adjust to changes in price expectations.

As Figure II-2 shows, Gibson's data in general supported the notion that people give greater weight to more recent price behavior when forming expectations. However, he found a cyclical pattern to this tendency. Rather than a smooth decline, the correlation coefficients for short term rates related to price changes decline, then rise, and then decline again. As Figure II-2 shows, peaks occurred in the third, sixth, and ninth years. Gibson believed this pattern occurred because people used their knowledge of past cycles in forming their expectations of future price and interest rate movements. He called this phenomenon the "reference cycle".

FIGURE II-2

TIME RESPONSE OF INTEREST RATE CHANGES TO PRICE ACCELERATIONS

The significance of Sargent's research and Gibson's research as related to the Keynes-Fisher hypothesis and the hypothesis of this dissertation is that the longer the lag between price changes and interest rate adjustments, the more interest rates become a biased underestimate of inflation. Therefore, borrowers should benefit due to the insufficient inflationary premiums in the interest rates contracted during such period. Sargent's and Gibson's studies also show that in addition to being spread over lengthy periods of time, adjustments in interest rates did not increase by the full amount of the percentage increase in the level of prices. Even though the lag varies in different studies, no one has questioned the existence of a lag between price changes and the resultant higher interest rates. Therefore, at any point in time during periods of inflation, interest rates must be regarded as a biased underestimate of price changes due to the adjustment lag. Furthermore, if as Gibson's data indicate, interest rates never fully reflect inflation, a partial bias will remain even after a lag.

Sargent's study was based on 1856 to 1938 data and Gibson's study used 1869 to 1963 observations of changes in prices and interest rates. The findings of studies which have used more recent data provide useful insight into the unique nature of the post World War II inflation. It is the findings of these more recent studies with respect to the validity of the Keynes-Fisher hypothesis which lead to the hypothesis of this dissertation, since these results, particularly those which are based on post-1960 data, are very different from Sargent's and Gibson's early findings.
Yohe and Karnosky (1969)

In one study, Yohe and Karnosky, using 1952 to 1969 data, found the effect of price level changes upon interest rates occur after a very short lag. This finding is quite a different result from the research of Sargent and Gibson, which found lags so long that recent price behavior could be ignored in evaluating changes in observed interest rates. Yohe and Karnosky also found that price level changes exerted a much greater effect on interest rates in the 1960's than in the 1950's. In fact, their data indicated that a minority of the interest rate changes in the 1950's could be attributed to the Fisher effect, but in the 1960's price changes accounted for a majority of all fluctuations in interest rates.

Figure II-3 is a graph of Yohe and Karnosky's regression results. These values are found using yields on four to six month commercial paper as a proxy for short-term interest rates, \( (r^n_t) \). The yield to maturity on Aaa-rated corporated bonds is used as a measure of long term interest rates, \( (r^n_L) \). Price expectations are approximated by the rate of change in the consumer price index for all items, \( (P^C) \).

The function

\[
r^n_t = a_0 + a_1 P^C_t + a_2 P^C_{t-1} + \ldots + a_{n+1} P^C_{t-n}
\]

where \( (r^n_t) \) the current nominal rate of interest is a function of \( a_0 \) the real rate of interest, plus an inflation premium based upon expectations formed by weights \( (a_1, a_2, \ldots, a_{n+1}) \) given to past changes

---

FIGURE II-3

SUMMARY OF REGRESSION RESULTS
Ordinary Least Squares
(1952-1969)

in the consumer price index \( P^c \). This equation was estimated by least squares regression of \( r_n \) on current and lagged values of price changes for \( n = 24, 36, \) and \( 48 \) months.

Figure II-4 shows that the regression results were very similar for seasonally adjusted and unadjusted data. Therefore, Yohe and Karnosky used the unadjusted results. These regressions indicate that price movements accounted for about 50 percent of the variance in interest rates between 1952 and late 1969. Figure II-3 shows that increasing the length of the lag from 24 to 48 months has little effect on the distribution of these coefficients. These results are consistent with the adaptive expectations hypothesis that great weight in the formation of price expectations comes from quite recent experience with relatively small weight given to price movements in the distant past.

**EXPECTATIONS AND THE FISHER EFFECT**

More recent research has added further support to the findings of Yohe and Karnosky and suggested a rationale for their differences from earlier studies of Gibson and Sargent. Three separate studies by Turnovsky, Gibson, and Lahiri, using data from time periods similar to those used by Yohe and Karnosky, found evidence of a change in the relationship between price expectations and interest rates. These researchers found evidence which indicates that the relationship between expected rates of inflation and actual rates of inflation was much closer to the 1960's than in the 1950's. They also found short-term expectations explaining an increasingly larger portion of variations in interest rates. Furthermore, all of these studies
found that expectations have had a much stronger effect on interest rates since 1959.

**Turnovsky (1970)**

In 1970, S. J. Turnovsky published a study which demonstrated that a significant break in the formation, rationality, and accuracy of businessmen's price expectations occurred in the early 1960's. The data on price expectations used by Turnovsky were provided by Joseph A. Livingston who had conducted a survey every six months since 1946 asking informed business economists their predictions of price changes for the next six months or twelve months. Turnovsky then compared these predictions to actual price changes obtained from the U. S. Department of Labor publications.

Figures II-5 and II-6 indicate to what extent predictions for the next 6 or 12 months follow actual price changes for the past 6 or 12 months respectively. It is important to note that until the early 1960's both the short term and longer term predictions move relatively independently of immediate past price changes. However, after that period predictions move very closely with actual price changes. This evidence suggests that the inflation of the late 1950's was largely unanticipated, while more recent inflation, at least until 1969, was largely expected.

In order to further test whether a break in the formation of expectations did occur, Turnovsky estimated the expectations equations using ordinary least squares regression for two time periods. Period

---

FIGURE II-4

REGRESSION RESULTS USING SEASONALLY ADJUSTED AND UNADJUSTED DATA

FIGURE II-5

PREDICTED AND IMMEDIATE PAST-ACTUAL PRICE CHANGES, SIX MONTHS

Percentage Price Change

At Annual Rate

12 Month Actual Price Change

12 Month Predicted Price Change


FIGURE II-6

PREDICTED AND IMMEDIATE PAST-ACTUAL PRICE CHANGES, TWELVE MONTHS

At Annual Rate

6 Month Predicted Price Change

Source: Turnovsky, p. 1446.
one was from the first half of 1962 to the first half of 1969. Equations representing three different theories of how expectations are incorporated into interest rate changes were used; these were:

1. Extrapolative hypothesis. This approach asserts that the expected price change for the next six months equals that for the past six months with a correction added to allow for the trend in price changes over the past six months.

2. Adaptive expectations hypothesis. This approach asserts that the change in expectations equals some portion of the last period's forecast error. Both hypotheses are special cases of distributed lags, used in so many previous studies of the Fisher effect.

3. Weighted expectations hypothesis. This approach is specialized for adaptive expectations where expected price is a geometrically declining weighted average of all past six monthly price changes.

Equations representing all three hypotheses were more successful in explaining expectations in the later period as evidenced by much higher values for $R^2$ and higher t values for the regressions in the latter period (1962-1969) than for the earlier period (1954-1964). Turnovsky concluded that while expectations and thus, interest rates were biased underestimates of inflation before 1960, while from 1960-1969, expectations and interest rates have shown no systematic biases to either under or overpredict. Moreover, whatever the reason, and the theories are numerous, the apparent result has been a substantial improvement in the accuracy of forecasts.
Very closely related to Turnovsky's study, both in methodology and results, was an article by William E. Gibson entitled, "Interest Rates and Inflationary Expectations: New Evidence." Gibson used the same survey data gathered by Joseph Livingston, and tested very similar time periods. Period one was from 1952-1959 and period two was 1959-1970.

Gibson used the survey data to determine expected rates of change in prices, and then related the expected rates of change to actual market rates of interest. This approach indicated interest rates were closely related to expected rates of inflation for various maturities from three months to ten years. The correlation was greater when data from the second period were used, and as shown in Table II-4, expected rates of inflation were more highly correlated to rates of interest for both short and longer term maturities in period two. Because of this evidence, Gibson, like Turnovsky, concluded that either the expectations-generating function or the effects of expectations on interest rates changed from period one to period two.

Because the difference in coefficients by periods was discovered by chance, it could have been possible that the change in the relationship of expected rates of inflation to actual rates might have actually taken place sometime other than 1959. It might have appeared to occur in 1959 due to this particular segmentation of the data. To check this possibility, the estimations in Figures II-6 and II-7 were repeated for various time periods. The results of these tests yielded two major conclusions. First, these tests further substantiated the hypothesis

34 William Gibson, "New Evidence."
## TABLE II-4

### INTEREST RATES AND EXPECTED RATES OF INFLATION

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Observations at 6-month intervals; end of June and December, 1959:12-1970:12)</td>
<td>(Observations at 6-month intervals; end of June and December, 1952:6-1959:6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rate</th>
<th>Constant</th>
<th>( \hat{b}^* )</th>
<th>( R^2 )</th>
<th>S.E.</th>
<th>Rate</th>
<th>Constant</th>
<th>( \hat{b}^* )</th>
<th>( R^2 )</th>
<th>S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n = 6 )</td>
<td>( n = 6 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-month bills</td>
<td>2.204*</td>
<td>0.9269*</td>
<td>0.737</td>
<td>0.7790</td>
<td>2.254*</td>
<td>0.2587*</td>
<td>0.244</td>
<td>0.7336</td>
<td></td>
</tr>
<tr>
<td>(0.302) (0.1172)</td>
<td>(0.206) (0.1101)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-month bills</td>
<td>2.359*</td>
<td>0.9358*</td>
<td>0.751</td>
<td>0.7578</td>
<td>2.882*</td>
<td>0.1796</td>
<td>0.133</td>
<td>0.7115</td>
<td></td>
</tr>
<tr>
<td>(0.293) (0.1140)</td>
<td>(0.189) (0.1012)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-12-month bills</td>
<td>2.496*</td>
<td>0.9411*</td>
<td>0.767</td>
<td>0.7061</td>
<td>10-year and longer bonds</td>
<td>3.157*</td>
<td>0.0910</td>
<td>0.070</td>
<td>0.4461</td>
</tr>
<tr>
<td>(0.273) (0.1062)</td>
<td>(0.117) (0.0635)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-5-year securities</td>
<td>3.087*</td>
<td>0.8312*</td>
<td>0.784</td>
<td>0.6140</td>
<td>3-month bills</td>
<td>2.158*</td>
<td>0.4537*</td>
<td>0.180</td>
<td>0.8000</td>
</tr>
<tr>
<td>(0.238) (0.0924)</td>
<td>(0.208) (0.2249)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-year and longer bonds</td>
<td>3.437*</td>
<td>0.6012*</td>
<td>0.774</td>
<td>0.4579</td>
<td>3-5-year securities</td>
<td>2.821*</td>
<td>0.4479*</td>
<td>0.263</td>
<td>0.6562</td>
</tr>
<tr>
<td>(0.177) (0.0689)</td>
<td>(0.170) (0.1831)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n = 12 )</td>
<td>( n = 12 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-month bills</td>
<td>1.889*</td>
<td>1.0869*</td>
<td>0.767</td>
<td>0.7330</td>
<td>3-month bills</td>
<td>2.108*</td>
<td>0.2578*</td>
<td>0.229</td>
<td>0.4067</td>
</tr>
<tr>
<td>(0.312) (0.1269)</td>
<td>(0.115) (0.1135)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-month bills</td>
<td>2.045*</td>
<td>1.0957*</td>
<td>0.779</td>
<td>0.7141</td>
<td>3-5-year securities</td>
<td>2.757*</td>
<td>0.9603*</td>
<td>0.844</td>
<td>0.5226</td>
</tr>
<tr>
<td>(0.304) (0.1237)</td>
<td>(0.222) (0.1149)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-12-month bills</td>
<td>2.192*</td>
<td>1.0658*</td>
<td>0.794</td>
<td>0.6637</td>
<td>10-year and longer bonds</td>
<td>3.170*</td>
<td>0.7342*</td>
<td>0.877</td>
<td>0.3377</td>
</tr>
<tr>
<td>(0.282) (0.1149)</td>
<td>(0.144) (0.5547)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Expected prices from Livingston; observed consumer price index and interest rates from *Federal Reserve Bulletin*.  
* Denotes significant at 0.05 level.

that an important shift in the relationship between expectations and interest rates took place at the very end of the 1950's. This is consistent with the findings of Yohe and Karnosky and Turnovsky. All three studies indicate that expectations have had a stronger effect on interest rates since 1959. Gibson also concluded that for a time after 1956, interest rates may have actually overadjusted to changes in expectations. Like Turnovsky, Gibson presents a number of plausible arguments for the structural break that occurred in late 1959 or early 1960. For this dissertation, it is only important to establish the underanticipation of inflation before 1960 and the more fully or perhaps overanticipated inflation which followed. The reasons why this occurred are not critical to the hypothesis of this dissertation. However, as previously explained, the role of expectations is crucial to the theory that debtor firms benefit from inflation.

Even though the identical data mentioned by Turnovsky and Gibson to approximate expectations do not cover post-1970 periods, it is entirely possible that the sharp rise in prices which occurred in the 1968-74 period may have been unanticipated to some degree. If this did occur, the benefits to debtors from acquiring debt prior to the change in interest rates which followed could be similar to that hypothesized for the 1955-1959 period.

In a recent article entitled "A Study of Price Forecasts", John A. Carlson offers evidence that the trend towards correctly anticipated inflation was reversed after 1967. 35 Carlson's study, like the research of Gibson and Turnovsky previously discussed, was based on

the original responses to the Livingston surveys. His findings, illustrated in Figure II-7, update and generally support the findings of Gibson and Turnovsky.

Carlson found that over the 29-year horizon of the Livingston surveys, unanticipated inflation has usually been positive. In other words, forecasts of inflation have typically underestimated the rate of increase in the Consumer Price Index. In fact, unanticipated inflation was negative (the rate of inflation was overpredicted) on only 13 occasions out of the 58 surveys. Furthermore, as Figure II-7 indicates, inflation surprises are larger when forecasters underpredict than when they overpredict. This finding makes the results obtained by Hong and others even more puzzling. Here we have once again the apparent contradiction between studies showing that debtors did not benefit from inflation in periods where inflation was by all published results shown to be unanticipated.

For the purpose of analyzing the results conducted in this dissertation, it is important to note that Carlson, Gibson, and Turnovsky identified essentially the same periods of anticipated and unanticipated inflation. These periods include unanticipated inflation prior to 1959, especially the 1955-59 period; correctly anticipated inflation from 1960-67; and a rise in unanticipated inflation after 1967. Especially noteworthy was the rapid and unexpected surge in prices after 1972, due to the Arab oil embargo, agricultural shortages, and possibly the removal of wage-price controls.
FIGURE II-7

ACTUAL INFLATION TYPICALLY OUTSTRIPS EXPECTATIONS

Inflation Rate (percent)


Actual

Expected

In light of the previous research concerning the anticipation of inflation, one can expect to find the following results in testing the hypothesis that benefits to debtor firms from inflation are inversely related to the degree to which inflation is correctly anticipated. Initially there should be superior performance in firms which maintained a debtor position during the period prior to 1959 when inflation was more unanticipated. For the 1960-67 period when inflation forecasts were very accurate, no significant difference in the performance of debtor versus creditor firms are expected. Finally, as unanticipated inflation reappears after 1967, the benefits to debtor firms should also reappear. The next two chapters test for the validity of these expected results.
CHAPTER III

RANK CORRELATION TESTS

The purpose of this chapter is to develop tests satisfying two requirements. The initial objective will be to test the relationship between debtor-creditor position and holding period returns, hereafter abbreviated as HPR. These tests will employ rank correlation techniques similar to those employed in prior studies to allow the comparison of these results using recent data (1960-1973) to the findings of studies using earlier data.

Studies conducted using data from the early post-war period generally found significant negative rank correlation, evidence apparently supporting the Keynes-Fisher Hypothesis during the early post-war period. A second group of studies using data up to 1970 found only weak support for the Keynes-Fisher Hypothesis. That is, they generally found negative correlation coefficients, but the coefficients were usually not statistically significant. The most recent research, utilizing data

---

1 The early studies which found significant correlation between the degree of debt and holding period returns on common stock were: Kessel, "Inflation-Caused Wealth Redistribution," Broussalian, "A Test of the Debtor-Creditor Hypothesis," and DeAlessi, "Do Business Firms Gain From Inflation?".

2 Among those finding only weak support for the Keynes-Fisher Hypothesis were: Bach and Stephenson, "Inflation and the Redistribution of Wealth," and Bradford, "Inflation and the Value of the Firm."
from the post-1960 period, found evidence of a positive and significant relationship between creditor status and holding period returns.\textsuperscript{3}

The second objective of these rank correlation tests will be to conduct a comparison of the validity of the Keynes-Fisher Hypothesis prior to and following the 1960 structural break in interest rate determination. This will be accomplished by testing the data from two sub-periods, 1955-59 and 1960-73, then comparing the relationship between debtor-creditor status and HPR in the early versus the latter period. If inflation was more correctly anticipated in the latter period, then the correlation between debtor rank and stock price performance should be weaker than in the prior period. If this did not occur, one would expect the results to be similar to those of Kessel and other investigators of earlier inflations, and the results from the first and second sub-period should be very similar. However, it will be shown that a decline in rank correlation significance or even an opposite correlation indicating creditors outperformed debtors is not enough to fully substantiate the hypothesized decline in the importance of the Keynes-Fisher Hypothesis.

**SELECTION OF TIME PERIOD TESTED**

The 1955 to 1973 time period was selected for a number of reasons. Prior to 1955 Compustat data are not available. Also, prior to 1952

\textsuperscript{3} Studies which found evidence contradictory to the Keynes-Fisher Hypothesis included: J. Litner, "Inflation and Security Returns," *Journal of Finance*, (May, 1975), pp. 259-280; Bodie, "Common Stocks as a Hedge Against Inflation;" and Hong, "Inflation and the Market Value of the Firm."
interest rates were not free to adjust to changes in inflationary expectations due to the operations of the United States Treasury and the Federal Reserve system. It is also important to note that rising expectations of inflation were generally prevalent after 1955. The 1955-1973 period also included data prior to and following the structural break in interest rate determination. Finally, this period ends before the recent disruptive influences on expectations which followed the removal of wage-price controls and the Arab oil embargo. The effects of such disruptions are discussed more fully later in this dissertation.

THE DATA SAMPLE

The data sample used for this study come from the familiar Investor's Management Sciences Compustat data tape, annual industrial edition, primary file, dated 1955-1973. Data are available for the largest and most important New York, American, and Regional Exchange companies. For most of these companies, data are available for at least ten years, and in some cases, data are available for twenty years. The Primary file contains approximately 900 companies, primarily industrial corporations listed on the New York Stock Exchange.

Regulated companies such as public utilities and transportation companies were excluded. Such regulation could bias stock price performance, obscuring relationships which might otherwise exist between stock price performance and debtor-creditor status. Furthermore, firms in industries such as utilities and transportation tend to be very debt oriented due to their asset structure and/or extremely stable cash flows. The inclusion of such firms would likely result in a heavy industrial bias toward debtor status in the sub-sample.
THE SUB-SAMPLES

From the data sample of approximately 900 companies described in the preceding section, two sub-samples were selected. Based upon results of previous studies, it was anticipated that these sub-samples would contain both debtor and creditor firms in sufficient number to conduct a rank correlation test. These sub-samples were not randomly selected, but included all firms from the data samples which conformed to the selection criteria. The final sub-samples consisted of 283 firms for the 1955-60 period; 50 of these were debtors and 233 were creditors. In the 1960-73 period, 204 firms conformed to the selection criteria; 73 were debtors and 131 were creditors.

SELECTION CRITERIA

The five selection criteria were based on the availability of complete data necessary to conduct rank correlation tests of the relationship between debtor-creditor status and stock price performance. Companies with incomplete data in any necessary category were excluded.

All companies were required to have complete yearly data for monetary assets and monetary liabilities. This was necessary to establish year by year the debtor or creditor position of the firm. To avoid yearly cyclical inconsistency, all firms selected had all fiscal years ending December 31. Each firm selected for the sub-samples had total assets listed for each year. This information was necessary in order to rank debtors and creditors according to their relative rather than absolute debtor or creditor status. Closing stock prices
and cash dividends were necessary to calculate HPRs, therefore, any firm which did not have this data for each year was excluded. The data were adjusted to account for the impact of stock dividends and stock splits. Companies selected for the sub-samples were also required to be consistently debtors or creditors. Any creditor company which was a debtor for more than one year or any debtor firm which was a creditor for more than one year was excluded from the sub-sample. This consistency criterion was applied to each sub-period independently.

DEFINITION OF VARIABLES

The variables examined in the following rank correlation tests are the average relative debtor-creditor position and the stock price performance (measured by HPR).

The debtor or creditor status of each firm was calculated by subtracting monetary liabilities from monetary assets. A detailed listing of the accounts involved calculation is included in footnote number 12 page ... Negative numbers indicate debtor firms and positive numbers indicate creditor firms. Ranking of this variable was based on the average relative importance of the debtor or creditor position as calculated below.

\[
DC = \frac{\sum_{t=m}^{m} MA_t - ML_t}{\sum_{t=m}^{m} TA_t / m}
\]

where

DC = average relative debtor or creditor status

MA = monetary assets

ML = monetary liabilities
TA = total assets

m = number of years in the period tested.

Firms were also ranked according to performance, measured by deflated holding period returns (HPR\(^{-}\)). This measure was calculated by taking the closing price of the common stock for the time period tested plus all cash dividends over the period and dividing this total by the price at the beginning of the period as in Equation III-2 below.

\[
HPR^{-} = \frac{\sum_{t=1}^{m} (P_{e}^{-} + D_{t}^{-})}{P_{o}^{-}}
\]  (III-2)

where

HPR\(^{-}\) = deflated holding period returns

P\(_{e}^{-}\) = deflated ending price

P\(_{o}^{-}\) = deflated beginning price

D\(_{t}^{-}\) = deflated cash dividends

m = number of years per period tested.

Due to the different rates of inflation existing within each time period tested, all cash dividends and price data were adjusted for changes in the level of prices, using the wholesale price index. Stock prices and cash dividends were also adjusted for stock splits and stock dividends. In assigning performance ranks, the highest HPR\(^{-}\) was assigned the number one rank, then lower ranks were assigned down to the lowest HPR\(^{-}\) which was assigned the (nth) rank.

NONPARAMETRIC TESTS

Two rank correlation methods are employed in testing the Compustat data previously described. One method is based on r\(_{S}\), the Spearman
coefficient of rank correlation. The other is based upon the coefficient $\tau$, or Kendall's "tau". Both of these are nonparametric techniques involving the ranking of the value of each variable. Parametric techniques are usually preferable because of their greater sensitivity. However, this generalization is not true when the underlying assumptions are seriously violated. In fact, under certain circumstances (e.g., badly skewed distributions, particularly with small n's) a nonparametric test may well be as powerful as its parametric counterpart. Applying more than one nonparametric test to the data adds credibility to the findings if the results are consistent. The term nonparametric is generally used to describe distribution-free methods where we make no assumptions about the distributions from which we are sampling. However, the values of the test statistics, $r_s$ and $\tau$, derived from these procedures do conform to known distributions. To reject the null hypothesis, the test statistic must be sufficiently different from zero that the random chance of obtaining such a value is very small, .05 or less.

SPEARMAN RANK CORRELATION TEST

The first technique employed is the coefficient rank correlation ($r_s$). In this method, the initial step is to form a pair of ranks.

---


5 Kendall's method is also described in Chao, *Statistical Methods and Analyses*, pp. 453-456.
for each company. Each company in the sample is assigned one rank for the average relative debtor-creditor status and one rank based on HPR. The assignment of debtor-creditor ranks was independent of the assignment of HPR ranks.

The assignment of debtor-creditor rankings was accomplished by calculating the average relative debtor or creditor position using Equation III-1. This calculation yields a single figure which may be positive, zero, or negative. The firms are then ranked from the largest positive number, the number one rank (indicating the greatest relative creditor position) down to the largest negative number or the nth rank (indicating the greatest relative debtor position). To insure that ties were eliminated, the calculations were carried out to four decimal places.

Companies were assigned performance ranks based on HPR as calculated in Equation III-2. The ranking was accomplished in a manner similar to the debtor-creditor ranking with the firm having the highest HPR assigned the number one rank down to the nth rank for the firm with the lowest HPR.

After each firm is assigned a pair of ranks in the manner just described, the sum of the squared differences between each pair of ranks is calculated. For example, assume six companies listed in alphabetical order (A, B, C, D, E, F) had the following ranks assigned for debtor-creditor status (I) and HPR (II).

<table>
<thead>
<tr>
<th>Companies</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I) D-C Status</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>(II) HPR</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
Then we can apply the formula for Spearman's coefficient of rank correlation to find $r_s$ as follows:

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2-1)}$$

where $d_i$ is the difference between ranks of the $i$th pair and $n$ is the number of pairs included.

The significance of the rank correlation coefficient may be determined by comparing:

$$t = r_s \frac{n-2}{\sqrt{1-r_s^2}}$$

with the Student's $t$ distribution with $n-2$ degrees of freedom.

The hypothesis tested is that the two variables with rank values are independent; that is, there is no particular association between the ranks of one variable and the ranks of the other. If the rank order of one variable agrees with that of the other, there will be a positive correlation between the rank orders, while a negative coefficient reflects a negative correlation.

**Kendall Rank Correlation Coefficient**

Using the same type of data for which the Spearman rank correlation coefficient is useful, another statistic called the Kendall rank correlation coefficient (designated $\tau$) can be computed. Kendall's $\tau$ is also a measure of the degree of correlation between two sets of ranks.
The initial step is to obtain a pair of ranks for each firm based on the two variables average relative debtor-creditor status (I) and holding period returns (II). The methods used in obtaining these rankings are the same methods previously described for the Spearman rank correlation coefficient. Suppose five companies (A, B, C, D, and E) have been assigned a pair of ranks using Equation III-1 and Equation III-2, and that the following rankings are obtained:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. D–C Status</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>II. HPR'</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Before \( \tau \) can be calculated, one of the ranks must be in natural order. Either variable may be chosen for this procedure but for this example, we shall let variable I's rankings be rearranged in the natural order; then we have:

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>A</th>
<th>B</th>
<th>E</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. D–C Status</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>II. HPR'</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

The next step in computing \( \tau \) is to compare every pair of ranks assigned by variable II, given that the rankings of variable I are in the natural order. Each comparison yields a score of +1 or -1, depending on whether the pair is in natural or reverse order. The algebraic sum of all the scores, designated \( S \), is the numerator of the coefficient \( \tau \). In this example, variable II's ranking of the five companies A, B, C, D, and E, are respectively, 2, 3, 1, 5, and 4. Beginning with the first number 2, we count the number of ranks to
the right which are greater; there are three such ranks: 3, 5, and 4, = +3. Then we subtract from 3 the number of ranks to right that are smaller; there is only one company (B) for which variable II is smaller. Therefore, the end result is +3 - 1 = +2. This operation is repeated for each successive number in the II ranking. The net result is S = +2 +1 +2 - 1 = +4 for any number of companies (n). The total number of possible pairs to be compared would be:

\[
{n \choose 2} = \frac{n!}{2!(n-2)!} = \frac{n(n-1)}{2}
\]

This would also be the maximum possible value for S. Of course, this maximum value for S could only be reached if the two sets of rankings are in complete agreement. If both ranks are in natural order, every pair of variable II's rankings will receive a +1 score, giving \(\frac{n}{2}\) possible pairs. If the two rankings are in perfectly reverse order, the value of S would be \(-{n \choose 2}\) since each pair would receive a score of -1. The Kendall rank correlation coefficient is the ratio of S to the total number of possible pairs; that is,

\[
\tau = \frac{S}{n(n-1)/2}
\]

When n is larger than 10, \(\tau\) has an approximately normal distribution with \(E(\tau) = 0\), and a standard deviation \(\sigma_\tau = \frac{2(2n + 5)}{9n(n - 1)}\). The null hypothesis that no association or correlation exists between debtor-creditor rank and holding period returns is tested by computing the standardized normal score. By finding the value of Z in a table for the standard normal distribution, the degree of significance can be determined.

\[
Z = \frac{\tau - E(\tau)}{\sigma_\tau} = \frac{\tau}{\left[\frac{2(2n + 5)}{9n(n - 1)}\right]}
\]
The values of \( r_s \) and \( r \) may not be the same even though the data used in both computations are identical. However, both have the same power to detect the existence of correlation between populations. Therefore, one would logically expect the results of these two tests to be very similar.

Actual application of the formulas mentioned for these two rank correlation tests was accomplished using the Statistical Analysis System, 1976 version, to simplify programming. This system is a programmed package which includes the formulas for many statistical tests, among them the Spearman and Kendall rank correlation tests. Along with each correlation coefficient, the number of observations contributing to the correlation coefficient and an approximation of its significance probability is given. The significance probability of a correlation coefficient is the probability that a value of the correlation coefficient as large or larger in absolute value than the one calculated could have resulted by chance, where the two random variables are truly uncorrelated.\(^6\)

**SAMPLE CHARACTERISTICS**

Statistics indicating the characteristics of the samples used in both rank correlation tests for both time periods can be seen in Table III-1. From these statistics, we can see that the mean and median values of the average relative debtor-creditor status were

---

### TABLE III-1

**CHARACTERISTICS OF SAMPLE USED IN RANK CORRELATION TESTS**

<table>
<thead>
<tr>
<th></th>
<th>Period 1 1955-1959</th>
<th>Period 2 1960-1973</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Samples Size</td>
<td>283</td>
<td>204</td>
</tr>
<tr>
<td>II. Monetary Assets - Monetary Liabilities Total Assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Mean</td>
<td>.182</td>
<td>.073</td>
</tr>
<tr>
<td>B. Median</td>
<td>.197</td>
<td>.148</td>
</tr>
<tr>
<td>C. Standard Deviation</td>
<td>.231</td>
<td>.273</td>
</tr>
<tr>
<td>D. Minimum Value</td>
<td>-.462</td>
<td>-.548</td>
</tr>
<tr>
<td>E. Maximum Value</td>
<td>.893</td>
<td>.754</td>
</tr>
<tr>
<td>III. Holding Period Return (Adjusted For Inflation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Mean</td>
<td>248%</td>
<td>272%</td>
</tr>
<tr>
<td>B. Median</td>
<td>253%</td>
<td>169%</td>
</tr>
<tr>
<td>C. Standard Deviation</td>
<td>181%</td>
<td>365%</td>
</tr>
<tr>
<td>D. Minimum</td>
<td>37%</td>
<td>7%</td>
</tr>
<tr>
<td>E. Maximum</td>
<td>2406%</td>
<td>3257%</td>
</tr>
</tbody>
</table>
positive for the samples used in both periods. The mean value in the 1955-59 period was .182 with a median value of .97. In the 1960-73 period, the mean value was .073 and the median value was .148. The median values were larger positive numbers than the mean values, indicating a skewed distribution with the long-tail being on the creditor side.

The samples were large, 283 in the first period and 204 in the second period. Therefore, it is reasonable to assume that the population distribution of the data sample of approximately 900 firms would exhibit similar characteristics to those of these samples. The data indicate that large, well-established firms tended to be net monetary creditors in both periods.

RANK CORRELATION RESULTS

The results of the Spearman and Kendall rank correlation tests are summarized in Table III-2. The results of both tests were consistent with one another in both time periods tested. In the first period, 1955-59, the test statistics for both were positive. For period one, the correlation coefficient of the debtor-creditor variable to the holding period return variable was .082 for the Spearman correlation coefficient and .055 for the Kendall tau method. However, as we can see in Table III-2, for both tests these values indicate approximately a 17% probability that random chance could have accounted for a value as great or greater than was found.

For the second period, 1960-73, the test statistics were both positive and very significant. The test statistics yielded were .300
<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank of Average $\frac{\text{MA-ML}}{\text{TA}}$ vs. Holding Period Return</td>
<td>.082</td>
<td>.300</td>
</tr>
<tr>
<td>Significance Level</td>
<td>0.1678</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

**Kendall Tau $\beta$ Correlation Coefficients**

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank of Average $\frac{\text{MA-ML}}{\text{TA}}$ vs. Holding Period Return</td>
<td>.055</td>
<td>.200</td>
</tr>
<tr>
<td>Significance Level</td>
<td>0.1708</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
for the Spearman rank correlation and .200 for the Kendall method. In both cases these values were significant well beyond the 1% level. That is, there is less than a 1% probability that random chance could account for these results.

Considering the significance of the values yielded in the first period, the null hypothesis that there is no difference in the holding period yields of debtor and creditor firms cannot be rejected with a high degree of confidence. However, we can reject the null hypothesis for the second period at the .99+ confidence level and conclude that the holding period returns of creditor stocks was greater than the holding period returns of debtor stocks during the 1960-73 period.

The most important consideration is that the rank correlation results are consistent with the hypothesis of this dissertation. The hypothesis indicates that the longer the post-war inflation continued, the smaller the unanticipated component of inflation became, therefore, weakening the relationship hypothesized by Keynes and Fisher. This is consistent with the results because not only did debtor benefits decline, but creditors actually outperformed debtors in both periods. The evidence strongly indicates that benefits to debtors not only declined but became negative in the post-1960 period.

It is tempting to speculate with these results. If the public gradually learned to adjust to price increases during the post-war period, inflation could have been on balance fully anticipated in the 1955-59 period. If there was no element of unanticipated inflation, one would expect no benefits to debtors. As we have explained, this hypothesis cannot be rejected for the 1955-59 period. Furthermore,
if unanticipated inflation actually became negative during the 1960-73 period, this fact alone could explain the significant degree to which creditor stocks outperformed debtor stocks during this latter period.

Although this explanation neatly fits the hypothesis of this dissertation, we should compare this explanation with what would be expected in light of previous similar studies and considering the results of economic research on unanticipated inflation mentioned in Chapter II. Such comparisons point out a number of unanswered questions.

**COMPARISONS WITH PREVIOUS STUDIES**

In comparing the results of the Spearman and Kendall rank correlation tests to the findings of similar previous studies, we find the results of both tests are consistent with previous tests conducted over similar time periods. This is true even though other rank correlation tests do not generally include data from the 1950's into the 1970's. This is an important consideration because the varied results of previous rank correlation tests have been suspect due to differences in methods of rank correlation used, overlapping time periods, different sample selection criteria, short time periods, and other inconsistencies. However, because of the time span involved and the consistency of methodology, such reasoning cannot explain the different results found

---

7 Studies conducted using pre-1960 data exclusively found strong support for the Keynes-Fisher Hypothesis, among these are Kessel, "Test of a Hypothesis" (1956), and DeAlessi, "Do Business Firms Gain From Inflation?" (1964). Other studies using data from the 1950's and 1960's found only weak support; these include Bach and Stephenson, "Inflation and the Redistribution of Wealth," and Bradford, "Inflation and the Value of the Firm." Most recently, Bodie, "Common Stocks as a Hedge Against Inflation," and Jaffer and Mandelker, "The Fisher Effect," found negative relationships between debtor status and stock performance.
in the 1955-59 versus the 1960-73 period in this dissertation. In both periods and for both rank correlation tests, the methods used were the same, the time periods did not overlap, and the time spans were as long as those used in the pre-1960 studies which found significant positive correlation between relative debtor status and holding period returns on common stock.

Although the results of the rank correlation tests are consistent with other similar studies and the hypothesis of this paper, a close examination of the evidence presented in Figures II-2 p. 40, II-4 p. 46, and II-5 p. 47, raises some questions. First of all, even though inflation became more fully anticipated during the 1960's, it does not appear to have been fully anticipated. In most periods some element of unanticipated inflation remained. Also, even though the evidence indicates that inflation was overanticipated for a brief period in 1971 and 1972, this hardly seems sufficient to explain the superior creditor performance during the entire 1960-73 period. Therefore, the role of inflationary anticipation alone does not appear to be a wholly satisfactory explanation for the results obtained using rank correlation.

In analyzing the results of the rank correlation tests contained in this dissertation and similar studies, it is important to recognize the limitations of these methods. Rank correlation techniques do not control in any way for a number of important factors which may be related to debtor-creditor status and are also related to holding period returns on common stock. Because of such factors as tax effects, inventory effects, industry bias, and financial leverage, a number of
other plausible explanations must be considered. In analyzing the
different results in the two time periods tested and when comparing
early studies with those using more recent data, we shall examine a
number of phenomena which could explain the results obtained.

One important consideration which could explain the results of
the rank correlation tests in this dissertation and also in early
studies, is the impact of inflation on the value of tax deductions in
the form of depreciation. Any firm which owns assets not fully
depreciated for tax purposes has a positive claim on future money
(in the form of lower taxes). Whether inflation is anticipated or
unanticipated, the value of all such future claims is reduced by inflation.
Depreciation claims are not included as monetary assets, therefore, the
debtor position of all firms with depreciable assets is in reality
overstated. This factor could explain a number of recent studies which
have found significant negative correlation between inflation and
aggregate stock price performance. Furthermore, if the level of relative
debtor status is related to the level of depreciable assets, the tax
effect could also explain why debtor firms have experienced lower
holding period yields in recent inflationary periods. Even if inflation
was not fully anticipated, positive debtor effects could have been
offset or even outweighed by the negative impact the decreased value of
the positive claim on future money via lower taxes. The existence of

8 The May 1976 Journal of Finance, pp. 447-483, contains three such
papers by Bodie, "Common Stocks as a Hedge Against Inflation;" Jaffee
and G. Mandelker, "The Fisher Effect;" and Nelson, "Inflation and Rates
of Return on Common Stocks." These papers were discussed by Donald
the taxation effect does not explain why the results in period one were different from those in period two. However, the interaction of both the debtor and taxation effects could explain such a difference.

As the rate of inflation rose after 1960, as illustrated in Figure I-1 p. 2, the taxation effect became more powerful. The higher the rate of inflation, the greater the reduction in the value of claims on future money via the tax deductibility of fixed depreciation charges. Simultaneously, public anticipation of inflation increased, and even though the rate of inflation was rising, unanticipated inflation fell from 1969 and became negative in 1971 and 1972. Therefore, rather than becoming more significant, the benefit to debtor firms, via decreased value of future cash outflows more than offsetting interest rates, fell and actually became negative. During the 1971–72 period inflation premiums exceeded actual rates of inflation. Thus, an increasingly powerful tax effect and the declining importance of the Keynes-Fisher effect would be logically consistent with the rank correlation results reported in this dissertation and by other researchers.

Donald Nichols, in discussing studies by Bodie, Jaffee and Mandelker, and Nelson, contends that time is a key factor in determining the impact of inflation on holding period yields for common stocks. This argument involves market adjustments which occur the moment a new forecast of inflation is made, and long run adjustments which may occur much later. The logic of this view is that the value of the future money due to tax deductions from depreciation decreases during

---

9 D. Nichols, "Discussion."
inflation. Therefore, one would expect an instantaneous adjustment in stock prices as soon as inflationary expectations increase. Once this instantaneous adjustment is made, the price of the stock should increase over time to reflect the increasing value of goods to which it represents a claim. If inflation proceeds at the higher rate forecast, the stocks value should grow in nominal terms at a higher rate as well. The longer the time period tested the greater this lag effect should be in relation to the instantaneous adjustment.

Studies which have found negative correlation between rates of return on common stock and the rate of inflation over short periods of time, may have captured the instantaneous adjustment while missing most of the long run effects. Also, it should be noted that Nichols' analysis assumes a one-shot forecast of higher inflation rates. As previously noted in Figure II-2, inflationary expectations grew throughout the 1960-73 period tested in this dissertation. Therefore, rather than one instantaneous adjustment, the market was subjected to continual revisions in inflationary expectations causing continual adjustments in common stock prices. Because of the dynamic process involved, it may only be possible to capture the long run impact of inflation by using a lag structure for holding period returns.

In addition to the effect of time and taxes, there are other factors which rank correlation techniques cannot hold constant when comparing the holding period returns of the common stocks of debtor and creditor firms. One such factor is the possibility of a differential wealth transfers due to the impact of inflation on taxes via historical
The understatement of inventory cost is largest for FIFO, smaller for moving average costing, and least when LIFO is used. In fact, if the level of inventory increases during the year and LIFO is used, an overstatement of inventory costs could result, giving the firm a lower tax liability. In general, an understatement of inventory costs would be most likely, with the amount of understatement being proportional to the rate of inflation. If the methods of inventory costing used or the relative importance of inventories is in any way related to debtor or creditor status, the rank correlation results may be affected.

Rank correlation results may be subject to industrial bias, due to the fact that debtor-creditor status is very consistent within industries. In most industries firms are all debtors or all creditors with few industries having both debtor and creditor firms. This can logically be related to such factors as the nature of the assets being financed, the variability of cash flows, and the degrees of operating leverage. If debtor and creditor firms are from different industries, this could bias the results of rank correlation tests for many reasons. For example, different industries are subject to different degrees of business risk. Also, the sales of some industries are very sensitive to the general level of economic activity, some are relatively insensitive, and a few are even counter cyclical. Because of these biases mentioned and others which may be less obvious, it is very possible that the results of any rank correlation tests including

---

those conducted in this paper reflect the combined effects of numerous factors other than the debtor-creditor status of the firm.

The rank correlation results in this dissertation, though consistent with other earlier similar studies, are not consistent with research dealing with unanticipated inflation. In fact, none of the studies conducted thus far have found evidence of a debtor effect which is generally consistent with measurements of the magnitude of unanticipated inflation. Most recent studies, those including post-1970 data, have found no evidence that the stocks of debtor firms have holding period yields superior to those for stocks of creditor firms. Quite the opposite, most of these recent studies have found that creditor stocks outperformed debtor stocks, even in periods where economic studies indicate that unanticipated inflation existed.\(^{11}\)

It is likely that this result is due to the fact that the main effect of inflation on corporations since 1960 is a wealth transfer from business to government. This effect is brought about through a tax system where depreciation charges remain fixed while replacement cost rise. Therefore, depreciation is understated and profits are overstated, causing firms to pay larger amounts in taxes. This effect cannot be separated from the debt effect using rank correlation, therefore, the more powerful effect dominates the results.

The limitations of rank correlation techniques does not explain the results of the regression study by Hai Hong.\(^{12}\) Hong examined the

---

\(^{11}\) Bodie, "Common Stocks as a Hedge Against Inflation"; Jaffee, "The Fisher Effect"; and Nelson, "Inflation and Rates of Return on Common Stocks."

\(^{12}\) Hai Hong, "Inflation and the Market Value of the Firm."
impact of risk, inventory, and taxation effects apart from the impact of the debtor-creditor status of the firm. Hong's intent was to measure the impact of each of these factors through the use of a multiple regression. The results of Hong's regression tests are summarized in Table III-3. The first line for each period contains the regression results for each variable tested. In all three periods the debt variable was insignificant, indicating no evidence of a wealth transfer from creditors to debtors.

An apparent contradiction exists between the results of Hong's research and economic studies which found evidence of unanticipated inflation during the 1954-58 period. As with the rank correlation results, a number of factors could explain this contradiction.

One factor which may cause the absence of debtor benefit in Hong's study is the use of short time periods and no allowance for a lag between debt acquisition and debtor benefit, measured in terms of holding period returns. His results are based on a cross-sectional regression of mean monthly returns regressed on risk and wealth transfer variables. Longer time periods or a lag between debtor-creditor calculations and the calculating of holding period returns may enable one to capture debtor benefits not apparent in shorter time periods.

A second factor which could cause one to doubt Hong's results is the nature of correlation between the explanatory variables in his regression equation. As we can see in Table III-4, intercorrelation exists between the plant (depreciation) and inventory variables and between debtor status and plant. More important than this slight
TABLE III-3

CROSS-SECTIONAL REGRESSION OF MEAN MONTHLY RETURNS ON RISK AND WEALTH TRANSFER VARIABLES

\( Y_t = \alpha + \alpha_0 R_t + \alpha_1 X_{t1} + \alpha_2 X_{t2} + \alpha_3 X_{t3} \)

<table>
<thead>
<tr>
<th>Period</th>
<th>Const.</th>
<th>Sys. Risk</th>
<th>Debt</th>
<th>Plant</th>
<th>Inv.</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1964-68)</td>
<td>( \alpha = 0.0083 )</td>
<td>( \alpha_0 = 0.068 )</td>
<td>( \alpha_1 = 0.0086 )</td>
<td>( \alpha_2 = -0.014 )</td>
<td>( \alpha_3 = -0.0099 )</td>
<td>0.73</td>
</tr>
<tr>
<td>( p = 0.033 )</td>
<td>(2.75)</td>
<td>(3.18)*</td>
<td>(0.18)</td>
<td>(-3.86)*</td>
<td>(-1.57)**</td>
<td></td>
</tr>
<tr>
<td>(1959-63)</td>
<td>( \alpha = 0.0165 )</td>
<td>( \alpha_0 = 0.055 )</td>
<td>( \alpha_1 = -0.0194 )</td>
<td>( \alpha_2 = 0.0079 )</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>( p = 0.012 )</td>
<td>(8.71)</td>
<td>(1.61)**</td>
<td>(-4.80)*</td>
<td>(-1.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1954-58)</td>
<td>( \alpha = 0.023 )</td>
<td>( \alpha_0 = 0.015 )</td>
<td>( \alpha_1 = -0.0063 )</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( p = 0.016 )</td>
<td>(0.68)</td>
<td>(-2.10)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Figures in parentheses are \( t \)-values.
2. (*) indicates significant at the 5% level on a one-tail \( t \)-test. (**) at 10%.

### TABLE III-4

**Correlation Matrices and Mean Sample Values of Explanatory Variables**

<table>
<thead>
<tr>
<th>Period</th>
<th>Correlation Matrix</th>
<th>Mean Sample Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>$X_1$</td>
</tr>
<tr>
<td>1964-68</td>
<td>$\beta$</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>$X_1$</td>
<td>0.294</td>
</tr>
<tr>
<td></td>
<td>$X_2$</td>
<td>-0.370</td>
</tr>
<tr>
<td></td>
<td>$X_3$</td>
<td>0.379</td>
</tr>
<tr>
<td>1959-63</td>
<td>$\beta$</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>$X_1$</td>
<td>0.468</td>
</tr>
<tr>
<td></td>
<td>$X_2$</td>
<td>-0.196</td>
</tr>
<tr>
<td></td>
<td>$X_3$</td>
<td>0.196</td>
</tr>
<tr>
<td>1954-58</td>
<td>$\beta$</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>$X_1$</td>
<td>0.294</td>
</tr>
<tr>
<td></td>
<td>$X_2$</td>
<td>0.283</td>
</tr>
<tr>
<td></td>
<td>$X_3$</td>
<td>-0.121</td>
</tr>
</tbody>
</table>

multicollinearity, the correlation matrix exhibits a puzzling mixture of signs. The explanatory variables are positively correlated in some periods and negatively correlated in others. Hong admits he can only speculate what the instability of these relationships indicates.

A third problem with Hong's approach is statistical and related to his controlling risk by forming portfolios. By so doing, he reduces the number of observations for his regression to 24 portfolios. Since he uses four explanatory variables, this procedure reduces the validity of the $R^2$ and could induce a bias resulting in regression results which appear more significant.

Finally Hong's tests must be based on the assumptions of all regression analysis: for the results to be valid, the data must generally conform to the characteristics of a normal distribution. No tests for normality were mentioned. Without knowing the nature of the underlying distributions, the validity of the results is open to question.

**SUMMARY AND CONCLUSIONS**

The findings of the rank correlation techniques presented in this Chapter and similar tests reported in other studies tends to support the hypothesis of declining debtor benefits as unanticipated inflation declines. However, neither this dissertation or previous studies found evidence indicating that debtor benefits reappeared as unanticipated inflation returned in the late 1960's. Considering this contradiction and the shortcomings of rank methods used in this Chapter and by other researchers, rank correlation results cannot be considered
conclusive evidence of declining debtor benefits. Also, considering the complications associated with Hong's regression study and the apparent conflict of his results with research on unanticipated inflation, that approach does not appear entirely satisfactory.

Two questions naturally arise out of the conflicting evidence and methodology problems just mentioned. (1) What other method could be used in an attempt to determine whether the validity of the Keynes-Fisher Hypothesis did, in fact, diminish as inflation became more fully anticipated? (2) Did this Hypotheses regain its validity with the reappearance of unanticipated inflation? An attempt will be made to answer these questions in the following chapter. In Chapter IV, we will explain the development and results of a series of tests designed to isolate and test the significance of debtor benefits from unanticipated inflation.
CHAPTER IV

THE EFFECT OF DEBTOR-CREDITOR STATUS ON SECURITY RETURNS

In this chapter a series of tests are developed to isolate and measure the significance of debtor-creditor status on holding period yields on the common stocks of the corporations selected. Unlike other recent tests, the intent of these tests is to examine only the effect of debtor-creditor status on holding period yields (HPY). The tests used in this chapter are designed for the purpose of avoiding ambiguities associated with rank correlation results and the complications associated with multiple regression techniques.

The portfolio tests in this chapter are based on the formation of separate portfolios of debtor and of creditor firms which have been made as identical as possible, except for debtor-creditor status. Therefore, any statistically significant difference in holding period yields between these portfolios of stocks can be attributed to differences in debtor-creditor status.

The validity of any conclusions based on these tests will depend primarily upon the degree to which ceteris paribus conditions can be established and maintained. Realizing this, every effort was made to

---

1 It should be noted that holding period yield (HPY = HPR - 1), is the performance measure used in this chapter while holding period returns was the measure of performance used in Chapter III. Also, HPR in Chapter III was deflated, whereas holding period yields are not adjusted for price changes.
control those factors through which inflation affects holding period yields as identified by previous researchers. In attempting to create portfolios as nearly identical as possible, these elements were considered in order of the magnitude of their impact on holding period yields.

Several factors affecting HPY's during inflation were business risk, percentage of fixed assets, accounting treatment, method of inventory costing, and the cyclical or seasonal nature of cash flows. Because of the intraindustry consistency of these factors, the number one priority in controlling for influences other than debtor-creditor status was to construct portfolios with identical industry compositions. Financial risk was also deemed to be an important determinant of HPY and was controlled by matching debt ratios as closely as possible. Less predictable influences on HPY, such as acquisitions, mergers, strikes, etc., were controlled for by eliminating "outlier" firms. These factors along with the methods of controlling for their influences on HPY are described in detail later in this chapter.

If our findings are consistent with the findings of economic research on unanticipated inflation previously discussed in Chapter II, it is expected that debtor portfolios will be found to generate significantly higher holding period yields only if the debtor position was established and/or maintained during the period with high unanticipated inflation. It is expected that portfolios of firms exhibiting debtor positions when unanticipated inflation was approximately zero will derive little or no benefit from their debtor positions. As outlined in Chapter II, the period 1955-74 can be divided into three major

Therefore, we expect our tests to show firms which held debtor positions during the 1955-59 period generating significantly higher HPY's compared to firms which were debtors during that period. As inflation became almost totally anticipated from the end of 1959-1967, such debtor benefits should decline and perhaps disappear. Finally, with the reappearance of unanticipated inflation after 1967, significant debtor benefits should reappear. The absence of such findings would indicate that either, contrary to accepted theory, there is no benefit to debtors even when inflation is unanticipated or ceteris paribus conditions were not established.

SELECTION OF TIME PERIOD

The time period selected was 1954-1976. It was desired to consider a time period which included both subperiods used in the rank correlation tests. Using comparable periods aids in making comparisons between the two sets of results. The reader should note, however, that because of a five lag structure used in this chapter, it was not possible to obtain results for debtor-creditor positions after 1972.

2 The graphs summarize the finds of S. J. Turnovsky, "Determination of Price Expectations," and J. A. Carlson, "A Study of Price Forecasts." Both of these studies deal with the measurement of unanticipated inflation and generally agree on the time periods during which unanticipated inflation existed.
As in Chapter III, it will be especially interesting to compare results for the period prior to 1960 to those following 1960. Such comparisons are important since empirical evidence indicates a change in the nature of the expectations generating process occurring about 1960.³

**SELECTION CRITERIA**

The general sample from which the portfolios were constructed is again based on the Compustat Primary Industrial File, dated 1954-76. Using this sample, a portfolio of debtor firms and a portfolio of creditor firms for each year under consideration was formed.

Initially some firms were eliminated by computer screening due to incomplete data. If complete data were lacking in any year for the initial five year period used to establish debtor-creditor status, or the following five year span used to calculate holding period yield, the company was screened out by the computer. Companies with inconsistent fiscal years were eliminated in the same manner. After the computer screening, the remaining criteria were applied through inspection of the computer printouts. This was a rather painstaking and time-consuming method, but one which was necessary to insure that the portfolios of debtor and creditor firms were as accurately matched as possible.

The general sample was screened to insure availability of all necessary data. In order to classify firms according to relative debtor-creditor position, monetary assets minus monetary liabilities divided by total assets was needed for each five year interval from 1954-71. Since a lag structure is employed, the holding period yield for the subsequent five year period for each firm was necessary for the period 1958-1976. For example, if the firms were ranked according to debtor-creditor status for the period 1966-70, the holding period yield was calculated for the period 1971-75. It was also necessary to be able to calculate the debt ratio, total debt divided by total assets, during the same years in which the debtor-creditor status was established. As in Chapter III, all firms selected were required to have all fiscal years ending December 31. This was done in order to avoid seasonal or cyclical inconsistencies in HPY's or debtor-creditor classification. Any company with incomplete data in any of these areas in any year was excluded from the samples involving that five year span. Exclusion in one five year moving interval, however, would not exclude the company from being included in other periods where data were available.

PORTFOLIO FORMATION PROCEDURE

The selection criteria were established with the intent of forming portfolios as nearly identical as possible in every respect except debtor-creditor status. Given that all necessary data were available, the initial step was to find industries within which both debtor and creditor firms existed. To identify industries, four-digit Compustat codes were used. Compustat classifies companies into industries using the U.S. Department of Commerce's Standard Industry Classification.
(SIC) codes. For a firm to be selected, at least one debtor and one creditor firm must have been listed under the identical four-digit SIC code.

Identical industry composition was the number one portfolio selection criterion for a number of reasons. Within industries there is likely to be general consistency in accounting methods. Therefore, it is expected that pairs of companies chosen from the same industry will use similar methods of depreciation. Even more important, one can assume very similar asset composition. In particular, the percentage of depreciable assets will be quite consistent. The selection of pairs of companies from identical industries was the method chosen to equalize the inflationary impact of depreciation (via tax effects) between the debtor and creditor portfolios being examined.

Equalization of inventory effects due to inflation is also considered in the pairings by industry. Companies in the same industry producing similar products, in addition to having similar relative amounts of fixed assets, are likely to use the same types and relative amounts of inventories. Also, due to the similarity in accounting procedures, the methods used for costing inventories would generally be consistent within industries. Therefore, identical industry pairings equalize the impact of inflation due to the relative size of inventories and the methods of costing inventories.

Another factor associated with industry which, if uncontrolled, might cause differences in holding period returns, is business risk. Business risk is generally defined as the risk inherent in the assets,
that is, the variability of cash flows due to the nature of the assets employed and the product produced and sold. This factor is also controlled by industry pairings. Logically, firms using similar assets to produce a similar product will experience the same seasonal, cyclical, and secular trends in cash flows.

The inflationary effects associated with depreciation (via tax effects), inventory, and business risk, have all been identified in previous studies as factors through which inflation affects HPY's. Therefore, the highest priority was given to the requirement of identical industry composition for all portfolios tested. Additionally, other consistencies, perhaps less important and less apparent, also exist within industries and are controlled by this procedure.

The second step in forming portfolios required that firms be classified as either debtors or creditors on the basis of monetary assets minus monetary liabilities. For a firm to be classified as a debtor or a creditor for any five year span, it must have maintained a debtor or creditor status for at least three of the five years. In addition, companies classified as debtors or creditors must have maintained an average debtor or creditor position over the five year period. If more than one pairing was possible within an industry, the firms with the largest relative debtor or creditor position were chosen. If the firms were approximately equal in the relative significance of their debtor or creditor positions, the firm which was a debtor or creditor for the largest number of years during the period was chosen. Therefore, most of the firms selected were not
only debtors or creditors on the average, but were also firms which maintained that position each year.

These criteria used to establish debtor and creditor firms are more thorough than the methods used in previous studies. Prior studies often classified companies as debtors or creditors based only upon their status at the beginning of the period being tested. Other researchers classified companies according to their average status over the period being tested. Either of these methods can lead to unreliable results due to two important reasons. First, many companies switch frequently from debtor to creditor position or vice versa. Therefore, using one year's status to classify firms does nothing to insure they maintain their original status. Second, in terms of the impact of inflation, many firms are essentially neutral, even though they may have a slight average debtor or creditor position. Such firms will bias the results because their monetary assets are approximately equal to monetary liabilities. For these reasons a criterion was chosen which considered both the relative size of the average debtor or creditor position and also the consistency in maintaining that position.

The third step in the formation of portfolios involved the ratio of total debt to total assets. One might expect that those companies

---

4 R. Kessel, "Inflation Caused Wealth Redistribution."

5 H. Hong, "Inflation and the Market Value of the Firm."
with more monetary liabilities than monetary assets may exhibit superior
HPY's due to the greater risk acceptance of their management. To
minimize the effect of differences in financial risk, companies were
also matched by their overall debt ratios. The debt ratio is a more
complete indicator of a firm's risk profile than only considering
its monetary assets versus monetary liabilities. Often several firms
which met the debtor-creditor criterion existed within an industry.
In such cases the pair or pairs of firms with the most nearly identical
debt/total assets ratio was chosen. The objective was to establish
portfolios of debtor and creditor firms with statistically significant
debtor-creditor status while the portfolios were required to have debt
ratios which were not statistically different. The test used and
results are described elsewhere in this chapter.

This procedure may appear repetitious due to the fact that all
companies were previously classified and matched according to debtor-
creditor status within industries. However, the definition of debtor
and creditor firms used in this dissertation cannot be equated to the
measurement of leverage via debt ratios. In many cases, firms main-
taining a debtor status according to the monetary assets minus monetary
liabilities measure of inflationary impact, actually had lower debt
ratios than creditor firms in the same industry. Therefore, one
should not confuse or equate the debtor position of monetary liabilities
exceeding monetary assets to a position of high financial risk as
measured by the total debt ratio.

One criterion which could take precedence over the others mentioned
involved the possibility of "outlier" firms. These would be defined
as firms, which due to some factor which could not be controlled by other criteria, could bias the results of the tests because of unusually high or low holding period yields. Any company with extreme values (+3.0 standard deviations from the industry average in any five year period) was considered an outlier. Such unusual variance could be caused by merger activity, acquisition attempts, tender offers, anti-trust suits, or other activities which could affect holding period yields apart from the impact of inflation. Therefore, such companies were excluded from consideration for selection in any period.

As a result of screening for incomplete data, eliminating "outlier" firms, and the selection procedures relating to identical industry pairings and similar debt ratios, the great majority of firms were eliminated. However, in forming portfolios, the size of the final samples was not deemed as important as the accuracy of the pairings. The sample size could have been expanded, but only at the expense of some sacrifice in ceteris paribus conditions—conditions essential to the logic of the method. Consequently, the largest portfolio contained thirteen securities and the smallest only seven.

TESTS OF PORTFOLIO PERFORMANCE

The statistical method chosen for testing the performance of portfolios of debtor versus creditor firms was dictated by the nature of the data being tested. The method chosen had to be a statistical test which yielded results based on small samples. This was essential because none of the pairs of portfolios constructed contained more than 13 firms. Due to the selection process, larger samples were unattainable.
Furthermore, it was necessary to select a test applicable to dependent samples, because the selection of each debtor or creditor firm was dependent upon the existence of a firm with the opposite debtor-creditor status in the same industry. Since the firms are paired, the two portfolios for each year are of equal size, so the selection of a test requiring identical sample size presented no problem.

The method finally selected was the t-test for small dependent samples. While statistical inference about the mean of a single population on the basis of a small sample is an important application of the t-distribution, the purpose of these tests was to make inferences about the difference between the means of two populations.

When making inferences about the differences between two means, one of two separate assumptions are possible. One assumption is that the two population variances are different. Under this assumption, the computation of the number of degrees of freedom is quite involved. Such involved calculations can be avoided if one can apply the normal approximation; however, this requires large samples. However, in our tests it is unnecessary to test the population variance because we are hypothesising that any differences in portfolio performance are due to random error. Under this assumption, the computation of the number of degrees of freedom is a simple process (n-1). We can then

apply the t distribution, and small samples present no special problem.
Due to the fact that our portfolios were all small, dependent samples, the latter assumption was made.

The tests statistics were derived in the following manner. Given two portfolios, each of size n,

Portfolio 1: $X_1, X_{12}, \ldots, X_{1n}$

Portfolio 2: $X_{21}, X_{22}, \ldots, X_{2n}$

the expected difference between their respective means is equal to the difference between the means of populations from which the samples are taken. That is,

$$E(D) = E(\bar{X}_1 - \bar{X}_2) = \mu_1 - \mu_2.$$  

Because of the pairing of debtor and creditor firms, the standard error of the difference is expressed as

$$\sigma_D^2 = E(\bar{X}_1 - \bar{X}_2 - \mu_1 + \mu_2)^2$$

$$= E[(\bar{X}_1 - \mu_1) - (\bar{X}_2 - \mu_2)]^2$$

$$= E[(\bar{X}_1 - \mu_1)^2 + (\bar{X}_2 - \mu_2)^2 - 2E((\bar{X}_1 - \mu_1)(\bar{X}_2 - \mu_2))$$

$$+ \sigma_1^2 + \sigma_2^2 - 2E(\bar{X}_1 - \mu_1)(\bar{X}_2 - \mu_2).$$

This last term consists of two units of the covariance of $\bar{X}_1$ and $\bar{X}_2$ which is not 0.

However, we need only consider the matched samples as a single sample of D's; that is,

$$D_1 = X_{11} - X_{21}, D_2 = X_{12} - X_{22}, \ldots, D_n = X_{1n} - X_{2n}.$$  

Thus we obtain the mean differences

$$\bar{D} = \frac{1}{n} \sum_{i=1}^{n} D_i = \frac{1}{n} \sum_{i=1}^{n} X_{1i} - \frac{1}{n} \sum_{i=1}^{n} X_{2i} = \bar{X}_1 - \bar{X}_2.$$
and the estimated standard error for \( \bar{D} \)

\[
\hat{S}_D = \sqrt{\frac{\hat{S}^2_D}{n}} = \frac{\hat{S}_D}{\sqrt{n}}
\]  

(IV-1)

where

\[
\hat{S}_D = \frac{\sum (D_i - \bar{D})^2}{n-1}
\]

We now compute

\[
t = \frac{\bar{D} - E(\bar{D})}{\hat{S}_D/\sqrt{n}}
\]  

(IV-2)

which has a t-distribution with \( n-1 \) degrees of freedom. The confidence interval for \( E(\bar{D}) \) is estimated just as for a single mean with \( \bar{X} \) and \( \hat{S}/\sqrt{n} \) replaced by \( \bar{D} \) and \( \hat{S}_D/\sqrt{n} \), respectively. Then, any hypothesis about \( E(\bar{D}) \) can be tested in the usual way by applying equation 4-2 with \( n-1 \) degrees of freedom.

Due to the fact that we are primarily concerned with differences in performance of holding period yields over time, required significance levels will not be specified. Rather, the results will be reported and analyzed without such references. It is expected that the degree of significance should be higher the greater the degree of unanticipated inflation.

Using the portfolios in Table IV-1 as an example, the steps in testing the differences in holding period yield were as follows.

Step 1: Calculate the sum of the differences in HPY.

\[
\sum_{i=1}^{9} D_i = 1.92
\]

Step 2: Calculate the average difference.
### TABLE IV-1

**HOLDING PERIOD YIELDS ON DEBTOR AND CREDITOR PORTFOLIOS**

Debtor-Creditor Status 1966-1970
Holding Period Yields 1971-1975

<table>
<thead>
<tr>
<th>Debtor Name</th>
<th>% HPY</th>
<th>Industry No.</th>
<th>Creditor Name</th>
<th>% HPY</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohasco Corp.</td>
<td>- .29</td>
<td>2510</td>
<td>Kroehler Mgf. Co.</td>
<td>- .46</td>
<td>.17</td>
</tr>
<tr>
<td>McGraw-Hill Inc.</td>
<td>- .16</td>
<td>2731</td>
<td>Grolier Inc.</td>
<td>- .83</td>
<td>.67</td>
</tr>
<tr>
<td>Diamond Shamrock</td>
<td>1.63</td>
<td>2800</td>
<td>Koppers Co.</td>
<td>1.52</td>
<td>.11</td>
</tr>
<tr>
<td>Squibb Corp.</td>
<td>.04</td>
<td>2830</td>
<td>(G.D.) Searle &amp; Co.</td>
<td>.00</td>
<td>.04</td>
</tr>
<tr>
<td>Sun Chemical Corp.</td>
<td>- .25</td>
<td>2890</td>
<td>Inmont Corp.</td>
<td>- .14</td>
<td>- .11</td>
</tr>
<tr>
<td>Atlantic Richfield</td>
<td>.54</td>
<td>2911</td>
<td>British Petrol. Co. Ltd.</td>
<td>.23</td>
<td>.31</td>
</tr>
<tr>
<td>Union Oil of California</td>
<td>.38</td>
<td>2911</td>
<td>Royal Dutch Petrol. Co.</td>
<td>.19</td>
<td>.19</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>- .23</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>- .31</td>
<td>.08</td>
</tr>
<tr>
<td>Beneficial Corp.</td>
<td>- .31</td>
<td>6145</td>
<td>Liberty Loan Corp.</td>
<td>- .77</td>
<td>.46</td>
</tr>
</tbody>
</table>

\[ \frac{\sum_{i=1}^{9} D_i}{9} = 1.92 \]
Step 3: Calculate the standard error of the mean difference.

\[
\hat{S}_D^2 = \frac{\sum (\bar{D}_i - \bar{D})^2}{n - 1} = \frac{(0.17 - 0.21)^2 + (0.67 - 0.21)^2 + (0.11 - 0.21)^2 + (0.04 - 0.21)^2 + (-0.11 - 0.21)^2 +
\end{array}
\right]
\]

\[
\hat{S}_D^2 = \frac{0.077}{9 - 1} = 0.077
\]

Step 4: Calculate the value of t.

\[
t = \frac{\bar{D}}{\hat{S}_D} = \frac{0.21}{0.077} = 2.73
\]

With eight degrees of freedom, this value is significant at the .05 level.

The procedure detailed in this example was duplicated for each of the 14 pairs of portfolios selected over the 1954-1971 period for five year holding period yields calculated from 1959-1976. The results of these tests are summarized in Table IV-2, and the entire group of portfolios, provided in Appendix A to this chapter, are analyzed in the next section.

The t-test was also used to determine if a significant difference existed between the debt ratios of debtor firms versus creditor firms. If differences in financial risk existed, observing superior holding period returns for debtors might be the result of that risk rather
<table>
<thead>
<tr>
<th>Debit-Creditor Period</th>
<th>5-Year Lagged</th>
<th>$\bar{D}$</th>
<th>HPY %</th>
<th>$\sigma_{\bar{D}}$</th>
<th>t-value</th>
<th>Degrees of Freedom</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1954-58</td>
<td>1959-63</td>
<td>.51</td>
<td>.287</td>
<td>1.78</td>
<td>6</td>
<td>.15</td>
<td></td>
</tr>
<tr>
<td>1955-59</td>
<td>1960-64</td>
<td>.64</td>
<td>.33</td>
<td>1.94</td>
<td>6</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>1956-60</td>
<td>1961-65</td>
<td>1.15</td>
<td>.50</td>
<td>2.25</td>
<td>6</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>1957-61</td>
<td>1962-66</td>
<td>.20</td>
<td>.10</td>
<td>2.0</td>
<td>6</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>1958-62</td>
<td>1963-67</td>
<td>.29</td>
<td>.20</td>
<td>1.45</td>
<td>7</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>1959-63</td>
<td>1964-68</td>
<td>.37</td>
<td>.30</td>
<td>1.23</td>
<td>7</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>1960-64</td>
<td>1965-69</td>
<td>.04</td>
<td>.22</td>
<td>.173</td>
<td>8</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1961-65</td>
<td>1966-70</td>
<td>- .054</td>
<td>.19</td>
<td>.28</td>
<td>6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1962-66</td>
<td>1967-71</td>
<td>.018</td>
<td>.17</td>
<td>.12</td>
<td>9</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1963-67</td>
<td>1968-72</td>
<td>.05</td>
<td>.14</td>
<td>.36</td>
<td>7</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1964-68</td>
<td>1969-73</td>
<td>- .097</td>
<td>.11</td>
<td>.9</td>
<td>9</td>
<td>.10</td>
<td></td>
</tr>
<tr>
<td>1966-70</td>
<td>1971-75</td>
<td>.21</td>
<td>.08</td>
<td>2.73</td>
<td>8</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>1967-71</td>
<td>1972-76</td>
<td>.24</td>
<td>.18</td>
<td>1.33</td>
<td>12</td>
<td>.10</td>
<td></td>
</tr>
</tbody>
</table>
than debtor-creditor status. This test revealed that even in those periods where debtors significantly outperformed creditors, no significant differences existed in the debt ratios of debtor and creditor firms. Appendix B illustrates this test procedure for the 1966-70 period. For this particular period, the debtor holding period returns were greater than those for creditors at the .05 level of significance.

ANALYSIS OF PORTFOLIO TESTS

In examining the results of the portfolio tests summarized in Table IV-2, we find the results of these tests consistent with our expectations based upon the results of economic research into the changing nature of inflationary anticipations in the post-war period.

As illustrated earlier in Figures II-4, II-5, and II-6, a relationship between anticipated rates of inflation and actual rates of inflation has been documented by a number of researchers. In general, these findings indicate that expectations adapted slowly to the existence of continuing inflation in the post-war period. By 1959, however, anticipations had adjusted; from 1959 to 1967, estimated rates of inflation very closely approximated actual rates of inflation. This relationship deteriorated after 1967 and was destroyed following the removal of wage and price controls in 1972 and the so-called shortage inflation caused by the Arab oil embargo of 1973-74.

If the research concerning unanticipated inflation accurately reflects the conditions which existed, one would expect firms which

---

8Two such studies, which together, span most of the period under consideration are: S. J. Turnovsky, "Formation of Price Expectations," and J. A. Carlson, "A Study of Price Forecasts."
established or maintained a debtor position prior to 1959 and following 1967 to have holding period yields superior to those of firms which maintained creditor positions during those periods. Furthermore, one would not expect to find a significant difference in the performance of firms which held debtor or creditor positions during the intervening 1960-67 period of correctly anticipated inflation.

Upon examination of the results summarized in Table IV-2, we find that as hypothesized, the portfolios of firms which maintained a debtor position in the pre-1959 period do show significantly superior holding period yields compared to the portfolios of firms which maintained creditor positions during that period. However, we see this relationship weakening in the 1958-62 and 1959-63 periods and disappearing entirely after the structural break of 1960. As hypothesized, the portfolio tests indicate that no significant difference existed between the performance of portfolios of firms which maintained debtor or creditor positions from the 1960-64 period through the 1963-67 period. During this period of correctly anticipated inflation, the differences in the performances of debtor and creditor portfolios were not statistically significant at any level. Then as expected, with the reappearance of unanticipated inflation debtor portfolios once again outperformed creditor portfolios.

The only periods where creditors outperformed debtors, at any significance level, were the 1964-68 and 1965-69 periods. These results are not significant at high levels, .85 and .74 respectively. However, when considered in the context of the rising demand for debt capital and increasing uncertainty during these periods, these
findings are not surprising. There was a major movement of corporations into the debt market during the post-1965 period. The impact of this trend will be examined in the next chapter.

One additional finding which should be noted is the difference in significance levels in the pre-1960 period when compared to the post-1967 period. Why, when unanticipated inflation reappeared at levels comparable to pre-1960 levels, didn't the superior performance of debtor firms reemerge just as before? This may also be related to the rapid increase in the demand for debt capital. However, an even more likely cause was the growing uncertainty associated with inflationary forecasts, particularly after 1970. This trend will also be analyzed in Chapter V.
As we mentioned at the conclusion of Chapter IV, the extremely rapid increases in the actual rate of inflation which occurred after 1967, particularly the double-digit inflation of 1973-74, brought about a resurgence of unanticipated inflation. According to the hypothesis of this dissertation, one would expect this rise in unanticipated inflation to bring about an equally strong reoccurrence of superior debtor performance. However, even though the degree of unanticipated inflation which reappeared was even larger than that which existed in the 1955-59 period, portfolios of firms maintaining a debtor position during the latter period did not outperform creditor firms as significantly as in the earlier period, as shown in Table IV-2.

In this chapter we shall examine recent changes in the degree of uncertainty associated with forecasts of inflation, and changes in recent trends in the overall debt positions of corporations. These factors will be examined in order to point out possible explanations of the portfolio results reported in Chapter IV. An analysis of these trends will provide insight into the probable impact of unanticipated inflation on debtor and creditor firms.
CHANGES IN THE UNCERTAINTY OF EXPECTATIONS

The crucial role of expectations has been mentioned frequently in this dissertation. Most businessmen would agree that many decisions depend on expectations, and often forecasting accuracy determines the difference between success and failure. Despite the fact that the importance of expectations has long been realized, only recently have economists and financial experts begun to bring inflationary expectations into the mainstream of their analysis of economic behavior.¹

The emergence of anticipation as a key concern is largely due to the increasingly important role inflation premiums have played in interest rate determination, particularly since 1960. Researchers have come to realize that by understanding the expectations generating process relating to inflation, they are likely to discover the factors which determine actual inflation. This view has been responsible for a great deal of the research into interest rate determination reviewed in Chapter II.²

Two key questions in this area are: how much uncertainty surrounds the inflationary outlook, and how does the existence of uncertainty effect interest rates? Until 1972, these questions had been largely


²A number of studies dealing with the role of price expectations in interest rate determination were reviewed in Chapter II. These included: William Gibson, "Interest Rates and Inflationary Expectations," S. J. Turnovskiy, "Empirical Evidence on Price Expectations," Yohe and Karnosky, "Interest Rates and Price Level Changes," and Kajal Lahiri, "Inflationary Expectations: Their Formation and Interest Rate Effects."
ignored, partially because of the cost of gathering data on expectations and partially because of the difficulty of quantifying anticipations. The existence of uncertainty about the future rate of inflation may be the most costly aspect of our current bout with inflation and the most difficult aspect to control. This factor is a growing concern among policymakers attempting to control inflation, economists trying to predict inflation, and businessmen learning to cope with inflation.

The most pronounced and unanticipated inflationary surges in the post-war period occurred with the outbreak of the Korean War in 1950, and the so-called "shortage inflation" of 1973-74. Due to the fact that this study does not consider pre-1952 data, only the latter episode will be analyzed. There is little doubt that the double-digit inflation of 1974 and 1975 caught many forecasters by surprise. After years of reliable estimates, their forecasting tools had started to lead them astray. As a result of these forecasting failures, businessmen and policymakers were required to adjust to rapidly rising prices on very short notice. Of course, a large part of these forecasting failures can be attributed to a sequence of unforeseeable events. The oil embargo, the removal of wage-price controls, and agricultural shortages all added to inflationary pressures and all of these factors were difficult to predict. Nonetheless, there was a general loss of confidence in economic forecasts. Due to the lack of accuracy in recent forecasts, businessmen, policymakers, and the general public are more uncertain

---

about the accuracy of inflation forecasts. This increase in uncertainty has important implications for interest rates and, thus, the benefit derived by debtor firms during unanticipated inflation.

It would be illogical to expect interest rates to be the same regardless of the degree of uncertainty associated with forecasts of inflation. For example, if people are certain that next year's inflation rate will be 6 percent, we would expect a 6 percent inflation premium will be added to the pure rate of interest. Therefore, on a riskless security, if the pure rate of interest is 4 percent, with the added inflation premium the rate of interest will become 10 percent. However, a different result would be expected if the expectation is for 6 percent inflation, but the public believes that any rate between 0 and 12 percent is possible. The added element of uncertainty becomes a factor.

In this example, holders of fixed return securities suffer a capital loss on fixed return securities if inflation is underestimated, causing interest rates to rise more than was expected. Therefore, a rational lender would demand more than just the 4 percent risk-free rate plus the expected rate of inflation of 6 percent. This is particularly likely if lenders realize that the probability of the actual rate of inflation being below the expected rate is less than the probability of the actual rate exceeding the expected rate.

As was shown in Figure II-6, historical evidence indicates that actual rates of inflation generally exceed predicted rates. Furthermore, when large forecasting errors are made, they are usually due to an underestimate of the actual rates. Rarely have predicted rates of inflation fallen short of actual rates. Lenders will take these past tendencies into consideration in determining required rates of return.
Even though an additional element of risk due to uncertainty in inflationary forecasts appears to be a logical hypothesis, it is a rather recent hypothesis. Despite the evidence that inflation has generally been underestimated in the post-war period, some confusion still exists about whether or not this implies irrational lender behavior. This lack of unanimity can be attributed to the tendency to assume that expectations are rational, and therefore, unbiased estimates. A careful examination of the literature reveals that, in general, researchers have found that rational expectations are not synonymous with unbiased or on average accurate expectations.

Hai Hong expressed the opinion that, "we should not be surprised to find that the average effect of expectations in various periods is to wash out net debtor gains or losses due to inflation." Hong believes that if expectations are rational, in the sense that forecasts incorporate all available information, the net effect over the long run should be zero. If one assumes that forecasts consider only the past history of inflation, the assumption that people make rational inflation forecasts is easy to test using the Livingston Survey data. These data have also been tested using more complex models; namely, the extrapolative, 


5 This view of the rationality of expectations has gained widespread acceptance due to research conducted by J. F. Muth, "Rational Expectations and the Theory of Price Movements," *Econometrica*, (July, 1961), pp. 315-355.

adaptive, and weighted expectations models. Tests using the naive model and more complex models have generally confirmed the rationality of Livingston's survey data. Since these surveys sample the opinions of well-informed business, economic, and financial experts, it is reasonable to assume these surveys closely approximate the anticipations of the market as a whole. However, evidence offered by a number of researchers indicates that since World War II, forecasters have usually underpredicted the rate of inflation. Therefore, rationality does not necessarily guarantee accuracy.

Turnovsky and Mullineaux found evidence which indicates that errors in forecasting do not reflect the misuse of information or lack of rationality. The tendency of forecasters to underestimate inflation merely reflects the fact that the most important factor considered in forecasting models is the recent past period's inflation. When we

---

7 S. J. Turnovsky tested the rationality of Livingston's surveys using more complex structural models. For a discussion of these tests see "Empirical Evidence on the Formation of Price Expectations."

8 For a different opinion on the rationality of the Livingston surveys, one may consult James Pesando, "A Note on the Rationality of Livingston Price Expectations," Journal of Political Economy, (August, 1975), pp. 849-858. Pesando compared the Livingston survey data with forecasts using a distributed lag model and concluded the survey forecasts were not "rational" expectations. However, a distributed lag model is a mechanical forecasting technique, and therefore, incapable of including all relevant available data. For a description and comparison of tests for rationality in expectations, the reader is referred to Marcelle Arak, "Rational Price Expectations: A Survey of Evidence and Implications," Research Paper No. 7716, Federal Reserve Bank of New York, (March, 1977).

consider the inflation history of the U.S. (see Figure I-1), it is not surprising that these errors have not been quickly eliminated.

While the existence of unanticipated inflation is crucial to the hypothesis that debtors benefit from inflation, it is also important to realize that the variance in the accuracy of inflation forecasts is also an important issue. Such changes in uncertainty have been detected and measured using Livingston's survey data, and the results of these measurements are quite relevant to the results obtained in the previous chapter.

MEASUREMENTS OF EXPECTATIONS UNCERTAINTY

It is possible to measure the degree of uncertainty associated with inflation forecasts by calculating the standard deviation of the probability distribution that describes the forecasts of inflation surveys. Using the data from the Livingston surveys, Donald Mullineaux calculated such measures of inflationary uncertainty over time. These calculations were based on the expected rate of inflation forecasts eight months in advance. Figure IV-1 summarizes the results of Mullineaux's calculations. The findings indicate that there was a great deal of uncertainty about the future path of prices after World War II. Some forecasters were predicting depressions, some recessions, and others inflation. Thus, the high standard deviations in inflation forecasts after the war were caused by opposing predictions. We can also observe the decline in uncertainty, reflected by lower standard 

10 Donald Mullineaux, "Inflation Expectations In The U.S.A."
INFLATION UNCERTAINTY HAS BEEN ON THE RISE

Source: Carlson, "A Study of Price Forecasts."
deviations, as forecasters adjusted to continuing inflation. By the 1960's forecasters were in agreement to such a degree, that the standard deviation of inflation forecasts had fallen to one-half of one percent. During this period almost all forecasters expected inflation, and furthermore, the differences in rates of predicted inflation were minor.

The rising uncertainty about inflation which began after 1966 and accelerated rapidly in the early 1970's was unlike the situation which existed after World War II when forecasters predicted both rising and declining prices. By 1967, few if any forecasters expected falling or even stable prices. The post-1966 increase in inflation uncertainty was almost totally due to the fact that there was growing disagreement about how rapidly prices would rise.

As we can observe in Figure V-1, the degree of uncertainty about the future rate of inflation rose rapidly beginning in 1973. Mullineaux's findings indicate that, on average, inflationary uncertainty from late 1973 to 1975 more than tripled relative to the level of uncertainty which existed in the 1960's. Since rational investors demand higher returns as compensation for increased risk, interest rates began to reflect not only expected inflation, but also the uncertainty of that expectation.

THE IMPACT OF UNCERTAINTY ON INTEREST RATES

Edward Shaw has suggested that the rise of "dirty inflation" (i.e., unanticipated inflation) helped distort relative financial
prices in recent years. He hypothesizes that the inability to predict recent inflation rates generates expectations of future errors in inflation forecasts. This uncertainty means short term securities provide a margin of safety over long term securities since long term securities are more price-volatile than short term. In the eyes of investors, long term securities become more risky, and dealings in them take place in a distinctive "risk habitat."

In two separate studies, Joseph Bisignano and Rose McElhattan found evidence which supports Shaw's hypothesis. Bisignano, following the definition developed by Irving Fisher, calculated the anticipated portion of price inflation by subtracting an estimate of the real rate of interest from the nominal (market) rate of interest. He subtracted Standard and Poor's composite dividend yield (an estimate of the real rate) from S & P's high grade bond yield (an estimate of the nominal rate). Then he obtained an estimate of unanticipated inflation by subtracting this estimated anticipated rate of inflation from the observed inflation rate calculated from the Consumer Price Index. Table V-1 provides Bisignano's estimates of unanticipated inflation for the 1960-75 period.

As we can see from this table, the corporate Aaa risk premium increased from 35 basis points between 1960 and 1964 when unanticipated

---


inflation was only .06 percent, to 154 basis points between 1970 and 1975 when unanticipated inflation grew to over two percent annually.

### TABLE V-1

<table>
<thead>
<tr>
<th>Period</th>
<th>Aaa corporate Long-term U.S. Gov't. Bond Spread (basis points)</th>
<th>Unanticipated Inflation (annual rate of change)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1964</td>
<td>35</td>
<td>0.06</td>
</tr>
<tr>
<td>1965-1969</td>
<td>65</td>
<td>1.23</td>
</tr>
<tr>
<td>1970-1975</td>
<td>154</td>
<td>2.32</td>
</tr>
</tbody>
</table>


Figure V-2 shows that the Aaa corporate risk premium over long-term U.S. Governments remained quite stable during the early 1960's but then rose rapidly as unanticipated inflation began to increase after 1965. The spread even continued to expand when unanticipated inflation fell below zero between 1970 and 1972. It appears that risk premiums responded to this decline from the third quarter of 1973 to the fourth quarter of 1974, but then began rising rapidly again reflecting the 11 percent increase in unanticipated inflation which began in 1972. This pattern suggests that unanticipated inflation has become an important determinant in the premium demanded by the holders of private debt.
instruments, and that interest rates respond to changes in unanticipated inflation after a short lag.

FIGURE V-2

UNANTICIPATED INFLATION AND Aaa CORPORATE RISK PREMIUM


Rose McElhattan presented an analysis of the "Preferred Habitat" model of term structure theory which also supports the hypothesis that unanticipated inflation has become an increasingly important component or risk premiums. She demonstrated that this term structure model can be significantly improved by adding inflationary uncertainty. In fact, she found that although uncertainty was a factor in determining risk premiums in the 1955-65 period, inflation uncertainty was the only statistically significant determinant of risk premiums in the
1966-71 period. Also, the risk differential between Aaa and U.S. Governments increased to a much greater degree than the risk premium of Baa corporate securities compared to the Aaa yield. This rise in the risk structure of interest rates seems to reflect the perceived greater risk of corporate securities generally, rather than the greater riskiness of less-than-premium rated corporate securities.

Many theories in finance and economics are based upon the assumption that investors are rational and it is generally assumed that a rational investor will demand higher returns when uncertainty increases. Exactly how much this distaste for uncertainty effects interest rates can only be approximated. Although the exact tradeoff between risk and returns demanded by lenders is not known, it is logical to assume that such a tradeoff does exist. Therefore, a less certain inflationary outlook should produce higher long term interest rates as well as greater variability in all interest rates regardless of maturity.\(^\text{13}\)

In light of the evidence that uncertainty has affected interest rates to a greater degree in the post-1965 period, it is not surprising that the findings reported in Chapter IV are somewhat different after 1965. As was previously mentioned, when unanticipated inflation reappeared in the post-1966 period, debtor benefits did not reappear with the degree of statistical significance noted for portfolios of firms which established debtor positions prior to 1960. At first glance this seems puzzling since the degree of unanticipated inflation in the latter period

\[^{13}\text{For a discussion of empirical evidence which supports these contentions see Eugene Fama, "Inflation and Expected Returns on Treasury Bills," Journal of Political Economy, (June, 1976), pp. 427-448.}\]
was as great as that in the 1955-59 period. However, when we consider the increased uncertainty associated with inflation forecasts in the latter period, this result seems logical.

It is entirely possible that firms maintaining or moving into debtor positions after 1966, not only paid an inflationary premium based on the anticipated rate of inflation, but also paid an additional premium due to the uncertainty associated with such anticipations. This uncertainty, as evidenced by the high standard deviations in inflation forecasts, was the result of the apparent inability of forecasters to accurately predict recent changes in the rate of inflation. If such uncertainty was incorporated into higher interest rates, this would explain why portfolios of debtor firms realized less benefit from the unanticipated inflation in the late 1960's and 1970's.

THE POST-1965 DEBT MOVEMENT

Even though there is evidence to indicate that rising uncertainty affected interest rates, this may not be the entire explanation for the decline in the degree of statistical significance associated with the performance of debtor versus creditor portfolios. Another factor may have been the rapid increase in the degree of debt capital used by corporations. This post-1965 debt movement has been documented, but little has been written about the impact of this trend on the benefits derived by debtors during inflation. We know that corporate

treasurers began to alter the debt/equity ratio of their portfolios in the mid-1960's (Figure V-3). It is important that we examine the changes in interest rates and monetary assets minus monetary liabilities, in order to evaluate the likely inflationary impact of this trend. The reader should remember that in this discussion, as throughout this paper, the terms debtor or creditor refers to the inflationary impact due to the difference between monetary assets and monetary liabilities, not the degree of leverage (debt capital) employed in the capital structure.

FIGURE V-3

CAPITAL STRUCTURE OF MANUFACTURING CORPORATIONS


Most studies of the post-1965 debt movement have been related to capital structure theory. It may be argued that firms make adjustments
in their capital structures in response to past market trends. Specifically, the post-1965 debt movement may have been an adjustment of firms' capital structures in response to observed benefits of leverage. In the words of Herbert Runyon, "The experience of the 1957-65 period illustrated in vivid detail the advantages of debt financing to increase the leverage of the corporate capital structure."\(^{15}\)

The purpose of increasing the degree of financial leverage is to increase the relative return to common stockholders. We can observe in Figure V-2 that corporations followed a relatively conservative capital financing program from the mid-1950's through the mid-1960's. However, after 1965 and until 1970, firms began to increase the degree of debt in their capital structures. For a while corporations were successful in widening the spread between the return on equity and the return on assets.\(^{16}\) This trend was in tune with the mood of the Sixties, when performance was emphasized while risk was de-emphasized and the bottom line took precedence.

In the 1970's, manufacturing corporations, like other firms, faced a more difficult situation. The combined effects of inflation and increased uncertainty led to higher interest rates and increasing effective tax rates. Highly levered firms became exposed to both higher market interest rates and cyclical fluctuations in earnings.


\(^{16}\)Herbert Runyon, "Equity Shares" offers evidence of the initial favorable effects of leverage (p. 27).
These changes emphasized to corporate treasurers the negative aspects of leverage, as the earlier period had emphasized the positive aspects.

Inflationary benefits to firms in a debtor position (measured by monetary assets minus monetary liabilities) may also be related to these trends. As we noted (Figure V-2), from 1957-65 there was little change in the capital structure of manufacturing corporations. Then from 1966-1970 debt ratios rose steadily. From 1970-75 capital structures again stabilized. This pattern strongly suggests that corporations desired the capital structures that existed in the 1957-65 and 1971-75 periods of stability. It has also been hypothesized that the post-1965 debt movement was an intentional adjustment, due to the benefits of leverage which as previously mentioned, became apparent during the 1957-65 period. That is, after firms with higher degrees of leverage demonstrated superior relative returns to equity, the benefits of leverage became widely recognized and the post-1965 debt movement ensued. Firms do make adjustments based on observations of superior performance, and certainly such intraindustry comparisons do occur. Therefore, firms are likely to make adjustments of debtor-creditor positions in response to debtor benefits due to inflation, evidenced by superior holding period yields for other firms in the industry.

If the evidence presented in Chapter IV is correct, debtor firms demonstrated superior holding period yields when compared to their most identical competitors within the same industry. Therefore, even though monetary assets minus monetary liabilities are not necessarily related to debt ratios (see Appendix B; Chapter IV), we would expect firms to
increase their relative monetary debtor position in a manner similar to the post-1965 debt movement. Therefore, we would expect the percentage of debtor firms to increase relative to the percentage of creditor firms following the 1958-1966 period of superior debtor performance. If such a movement did occur, it would tend to offer support for the findings in Chapter IV and, as we shall see, offer an additional explanation of declining debtor benefits.

In order to determine if this hypothesized adjustment in debtor-creditor status actually occurred, a cumulative frequency distribution of net monetary debtor firms was calculated using the same sample described in detail in Chapters III and IV. These data are summarized in Table V-2 and Figure V-4.

FIGURE V-4

FREQUENCY OF DEBTOR FIRMS (1955-1973)
<table>
<thead>
<tr>
<th>Period 1 (1955-1965)</th>
<th>%tage of Debtor Firms</th>
<th>Period 2 (1966-1973)</th>
<th>%tage of Debtor Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1955</td>
<td>45.6</td>
<td>1966</td>
<td>51.5</td>
</tr>
<tr>
<td>1956</td>
<td>50.0</td>
<td>1967</td>
<td>60.3</td>
</tr>
<tr>
<td>1957</td>
<td>57.4</td>
<td>1968</td>
<td>63.2</td>
</tr>
<tr>
<td>1958</td>
<td>48.5</td>
<td>1969</td>
<td>70.6</td>
</tr>
<tr>
<td>1959</td>
<td>50.0</td>
<td>1970</td>
<td>72.1</td>
</tr>
<tr>
<td>1960</td>
<td>50.0</td>
<td>1971</td>
<td>72.1</td>
</tr>
<tr>
<td>1961</td>
<td>45.6</td>
<td>1972</td>
<td>70.6</td>
</tr>
<tr>
<td>1962</td>
<td>48.5</td>
<td>1973</td>
<td>69.1</td>
</tr>
<tr>
<td>1963</td>
<td>48.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1965</td>
<td>39.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SUMMARY STATISTICS**

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>57.4%</td>
<td>72.1%</td>
</tr>
<tr>
<td>Average</td>
<td>48.5</td>
<td>66.2</td>
</tr>
<tr>
<td>Low</td>
<td>39.7</td>
<td>51.5</td>
</tr>
</tbody>
</table>
In Table IV-2 it was observed that firms which established debtor positions in the periods beginning 1954-58 and ending 1959-63 began to demonstrate superior holding period yields by the 1959-63 period. In three successive five year periods, 1960-64, 1961-65, and 1962-66, the portfolios of debtor firms generated holding period yields which were superior to those of the creditor portfolios at a .05 or better level of significance. Table V-2 shows that during Period I, 1955-65, the percentage of debtor firms (firms with monetary liabilities in excess of monetary assets) was relatively stable, varying from a high of 57.4% to a low of 39.7%. In all but those two years, the variation from the average of 48.5% was less than 3%.

In 1965 (Figure V-4), the percentage of debtor firms began to increase. This trend continued until 1970 when the percentage reached 72.1%. After 1969 the percentage of debtor firms remained relatively stable, varying from 72.1% to 69.1%. The findings are very similar to the results reported by Runyon.

In Runyon's study superior relative returns to equity on levered firms preceded a general debt movement. The superior returns occurred from 1957 to 1965. A readjustment of corporate capital structures followed from 1965-1970, followed by a period of stability in capital structures. In our examination of debtor-creditor status and inflationary impact, debtor corporations demonstrated superior holding period yields from 1954-1958, with the degree of statistical significance declining after 1966. During 1966, overlapping the period of superior performance by debtors, the percentage of debtor firms began to rise.
It is interesting to note that the readjustment in debtor-creditor status occurred during the period in which debtor benefits from inflation disappeared.

Also, it appears that debtor benefits reappeared at approximately the same time this readjustment process was completed. The percentage of debtor firms increased until 1970, then remained relatively stable. The HPY's of debtor firms again became superior to the HPY's of creditor firms beginning in the 1971-75 period and continuing through the 1972-76 period. As we can see, the adjustment in debtor-creditor status appears to have been subject to the same type of recognition lag as the leverage adjustment.

**INTERPRETATION OF TRENDS**

There are a number of implications which arise from the similarity of these two sets of data. First of all, an examination of the data presented in this chapter and by other researchers provides support for the hypothesis that firms respond to observed stock price performance differentials. The post-1965 increase in the degree of leverage in corporate capital structures followed a period in which leveraged firms demonstrated superior relative returns on equity. The decline in monetary assets minus monetary liabilities, reflected by the growing percentage of debtor firms, followed a period in which debtor firms demonstrated inflationary benefits in the form of superior holding period yields.

It is important to note that the adjustment of debtor-creditor status follows the periods of superior HPY's for debtor firms, as
identified in Chapter IV. This evidence supports the use of a lagged performance measure such as the one used in that chapter. Firms acted as if a difference in market performance did exist related to debtor status, at least in the earlier period, and adjusted their financial structures accordingly. This observation is consistent with the findings reported in Chapter IV, at least for the early period of superior debtor performance.

A second consideration is the hypothesis of papers by Shaw\textsuperscript{17} and Bisignano\textsuperscript{18}, that unanticipated inflation caused the capital markets to operate inefficiently in evaluating risk differentials between Aaa bonds and long-term governments. When one considers the research of Fama\textsuperscript{19} and Mullineaux\textsuperscript{20}, an alternative hypothesis seems more likely. Fama's and Mullineaux's findings indicated that the nature of risk premiums was altered after 1967 due to the increasing degree of uncertainty. Two elements of this rising uncertainty were the error in inflation forecasts, and the growing uncertainty regarding the influence of high rates of inflation on corporate performance. The uncertainty surrounding the rate of inflation caused all interest rates to be higher, while the general uncertainty about corporate performance increased the spread between government and corporate

\begin{flushleft}
17 Shaw, "Inflation, Finance and Capital Markets."
18 Bisignano, "Inflation and the Efficiency of Capital Markets."
19 Fama, "Inflation and Expected Returns on Treasury Bills."
20 Mullineaux, "Inflation Expectations in the U.S.A."
\end{flushleft}
securities. Both of these effects are consistent with the results of the tests in Chapter IV.

Increased uncertainty and higher interest rates would decrease debtor benefits relative to the degree of unanticipated inflation. Adding a premium greater than the expected rate of inflation to interest rates due to the high standard deviations of inflation forecasts would have the same effect as anticipating higher rates of inflation. Given any actual rate that occurred, the effective unanticipated differential would be smaller, and thus debtor benefits less. The same effect would be caused by increasing corporate interest rates due to uncertainty about corporate rates of return during inflation. Therefore, either of these factors or a combination of the two, could explain the decline of statistically significant difference in debtor-creditor performance in the post-1968 period. It is unfortunate that the test results reported here can not include the post-1971 period. Because holding period yields were lagged five years, such results are impossible to obtain at this time.
CHAPTER VI

SUMMARY AND CONCLUSIONS

Academicians and businessmen have become increasingly concerned with the impact of inflation on the business firm as a result of the recent periods of rapidly rising prices. One area receiving considerable attention in the literature has been the comparative performance of debtor versus creditor corporations during inflationary periods. Three groups of studies have examined this question, all yielding different results. This dissertation has shown that due to the changing nature of inflation and its impact on interest rates, these differences should be expected.

One cause of these differences has been the variation in the level of unanticipated inflation over time. Each of these groups of studies use observations from different time periods with different inflationary experiences. If benefits to net monetary debtors always disappear with complete (accurate) anticipation of inflation, then the varying degrees of unanticipated inflation over time would be sufficient to explain the different results yielded by the various studies. It was shown, however, that this relationship did not always hold for previous research. Some studies failed to detect debtor benefits and others found evidence that creditors outperformed debtors even during periods of unanticipated inflation.
Three possible reasons for these unexpected results were considered. First, most of these studies used some form of rank correlation procedure to determine if a relationship existed between debtor-creditor status and holding period returns. However, these tests did not control other factors which could influence holding period returns during inflation. Furthermore, such factors as inventory and depreciation effects (via taxes) reduce earnings and thereby holding period returns regardless of the degree to which inflation was anticipated. The results of rank correlation tests, therefore, measure the inflationary impact of several factors. The separate influence of debtor-creditor status cannot be determined.

Second, previous research has tended to assume that debtor benefits are instantly measurable. In these previous studies, differences in holding period returns were examined over the same period in which debtor-creditor status was measured. Presumably, interest rates reflect anticipated inflation; therefore, any debtor benefits from inflation result from unanticipated inflation, inflation beyond the level forecasted. The market makes instantaneous adjustments when inflation forecasts change because inventory, risk, and depreciation effects have the same impact on firms regardless of the correctness of anticipations. However, debtor benefits due to unanticipated inflation are recognized after the fact. Only after the actual rate of inflation has been established is it possible to know if previous rates of interest included a large enough inflation premium. Consequently, any attempt to measure debtor benefits should use a lagged measure of holding period returns. Since none of the previous studies incorporated
such lagged measurements, it is likely that they were strongly
influenced by inflationary effects other than debtor-creditor status.

A third reason which could explain the inconsistency of some
previous studies in detecting debtor benefits is differences in
methodology, data, and time periods tested. In this dissertation
rank correlation techniques were used over two different periods of
inflation, 1955-1959 and 1960-1973. These tests suggested that the
conflicting results in earlier studies were primarily due to differences
in the time periods involved. These tests showed that the importance
of different data and different statistical tests, previously mentioned
as possible explanations for the different results of prior studies,
was much less than had been claimed.

The tests in Chapter III demonstrated the inability of rank
correlation techniques to detect debtor benefits in periods when
unanticipated inflation existed. Even though evidence indicates
that inflation was generally unanticipated prior to 1960, these
rank correlation test indicated that creditor firms outperformed
debtors in both time periods. In the second period, 1960-1973, this
difference was statistically significant at the .01 level. The
superior creditor performance indicates that after 1960 while inflation
was largely anticipated, factors such as depreciation, inventory,
and risk became more important in determining holding period returns
and debtor benefits became less significant. These results point out
the need for a different approach in order to isolate debtor
benefits.
In Chapter IV tests were conducted to isolate the effect of debtor-creditor status. This was accomplished by establishing ceteris paribus conditions for portfolios of firms. Firms which were similar in all major respects except debtor-creditor status were paired to form one portfolio each of debtor and creditor firms. These tests indicated that when other factors influencing holding period yields were controlled, the common stock of firms which established debtor positions during periods of unanticipated inflation experienced superior performance during the following period.

This dissertation is the first research effort finding evidence of debtor benefits consistent with accepted economic theory with respect to unanticipated inflation. Debtor benefits were detected in the pre-1960 period when a high degree of unanticipated inflation existed; no debtor benefits were found in the 1960-1967 period of correctly anticipated inflation; and debtor benefits reappeared after 1967 as unanticipated inflation re-emerged.

The results indicate that the previous inability to detect debtor benefits was probably due to two factors: the lack of control over other factors which influence holding period yields during periods of inflation, and the necessity of recognizing that debtor benefits, unlike other influences, can only be recognized after the existence of unanticipated inflation is recognized. To detect the influence of debtor-creditor status, it is necessary to measure holding period yields some time after debtor-creditor status is determined.

In Chapter V recent trends in the degree of uncertainty surrounding anticipated rates of inflation and the post-1965 debt movement were
discussed. These trends add support to the findings reported in Chapter IV. Evidence was presented indicating that the increasing use of debt capital after 1965 followed a period of superior returns on equity for more highly levered firms. Therefore, a similar pattern was expected to emerge when comparing "superior" debtor HPY's and the percentage of debtor firms following this period of demonstrated superiority. As expected, the percentage of debtor firms increased greatly following periods when debtor firms exhibited superior returns on equity.

In the test conducted in Chapter IV, debtor firms outperformed creditor firms in the period beginning 1954-1964; following these periods, from 1965-1970, the percentage of debtor firms increased. Firms acted in a manner consistent with what would be expected, given the results reported in Chapter IV. The fact that firms acted as if debtor firms benefited from the unanticipated inflation prior to 1960 lends support to the results obtained in Chapter IV. Also, the fact that this adjustment did not begin until 1965 tends to confirm the lagged nature of debtor benefits, in contrast to the instantaneous nature of the adjustments due to other inflationary influences such as depreciation and inventory effects.

What conclusions can be drawn considering the evidence presented in this study? One important conclusion can be reached by comparing the results obtained in Chapter III versus the very different results reported in Chapter IV. In Chapter IV when factors other than debtor-creditor status were controlled, the results indicated significantly superior holding period yields for debtors following periods of
unanticipated inflation. In Chapter III rank correlation tests indicate no significant relationship in the first period, and significant creditor benefits in the second period. This leads us to believe that other factors such as inventory and depreciation effects decreased the HPY's of debtor firms more than the debtor position of such firms increased the HPY's at least in the short run.

A second conclusion which may be drawn by the evidence presented in Chapter IV is that debtor benefits do exist in periods of unanticipated inflation but when inflation is anticipated, no significant difference exists between the HPY's of debtor and creditor firms. The ability to detect this effect by controlling other influences was a major difference between this dissertation and other studies which found no debtor benefits over similar periods.

Finally, we have presented evidence that recent trends lend support to the results of the tests identifying debtor benefits. The post-1965 debt movement was interpreted as a response to superior performance by more highly levered firms; therefore, the adjustment of monetary assets and monetary liabilities can be viewed as an adjustment in response to superior HPY's of debtor firms in preceding periods. Also, rising uncertainty surrounding inflationary forecasts was interpreted as an additional element of risk adding to interest rates. As such, the effect is similar to more fully anticipated inflation in that debtor benefits are less due to the risk premium for forecast error.

Assuming that the conclusions mentioned above are valid, what then are the implications of these findings for future research, investors, and policy decisions by corporate officers? Before attempting to answer
these questions, certain limitations should be noted. The conclusions of this study are applicable only to large, listed, nonregulated corporations. Moreover, these conclusions are based on tests conducted over the 1952-1973 period. The unique nature of this period must be remembered; the evolution of economic factors which occurred during this period may not be repeated in the future. Whether or not the conclusions of this dissertation are applicable for different time periods and for other types of firms can only be determined by additional empirical testing.

From the investor's viewpoint the downward adjustment of stock prices which ceteris paribus accompanies forecasts of higher inflation rates should be regarded as a market adjustment based on effects other than debtor status. If the anticipated rate of inflation is expected to continue below the actual rate, as it generally has in the past, investors should seek out undervalued debtor firms during such periods of adjustment in anticipation of debtor benefits which will follow. However, if interest rates contain an inflation uncertainty premium, debtor benefits will be less significant. Debtor benefits might disappear entirely if the degree of uncertainty was great enough.

Corporate officers might use the knowledge of these short run and long run adjustments to benefit their firms. For example, in timing security issues the firm should avoid the sale of common stock during a short run adjustment caused by forecast of higher inflation rates. If inflation is not fully anticipated, these short run adjustments will be followed by debtor benefits. Knowledge of the interaction of debtor, inventory effects, depreciation effects and risk could also
prove valuable in timing dividend payments, making investments, and other decisions.

This study has isolated and identified debtor benefits from unanticipated inflation. Even though such benefits have existed in the past, we cannot be sure they will exist in the future. Inflation may become fully anticipated as it was during much of the 1960's. Also, interest rates may rise more than the expected increase in inflation due to uncertainty about the rate of inflation, causing the effect of unanticipated inflation to be diminished. The impact of anticipations, by definition, can only be evaluated in retrospect. However, continuing research in this area should increase the ability of corporate officers to include anticipations in policy decisions.

Future research should address other data samples over various time periods, perhaps employing other techniques to re-examine the conclusions of this dissertation. As the data becomes available, the results of the 1972-1977 period can be examined. Considering the volatile nature of the period, those results should be quite revealing. Still unanswered are questions of whether unanticipated inflation has been eliminated since 1974; whether debtor benefits have declined or been eliminated due to the uncertainty of anticipations; and if the frequency of debtors has risen, declined, or remained constant since 1973. In answering these questions, researchers should gain valuable insight into the formation of expectations as well as their likely impact on business firms during periods of inflation.
BIBLIOGRAPHY

BOOKS


ARTICLES


**OTHER**


## APPENDIX A

### PORTFOLIOS #1

Companies Holding Debtor or Creditor Positions From 1954 to 1958

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>% HDY 1959-1963</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>% HPY 1959-1963</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate Brands</td>
<td>.14</td>
<td>2051</td>
<td>American Bakeries Co.</td>
<td>- .31</td>
<td>.45</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>1.76</td>
<td>2801</td>
<td>American Cyanamid Co.</td>
<td>.32</td>
<td>1.44</td>
</tr>
<tr>
<td>W. R. Grace &amp; Co.</td>
<td>1.73</td>
<td>2801</td>
<td>Rohm &amp; Haas Co.</td>
<td>.20</td>
<td>1.53</td>
</tr>
<tr>
<td>Aerio, Inc.</td>
<td>- .16</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>.19</td>
<td>- .35</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.51</td>
<td>2912</td>
<td>Royal Dutch Petroleum</td>
<td>.32</td>
<td>.19</td>
</tr>
<tr>
<td>Jones &amp; Laughlin Steel Corp.</td>
<td>.33</td>
<td>3310</td>
<td>U. S. Steel Corp.</td>
<td>- .31</td>
<td>.64</td>
</tr>
<tr>
<td>Fruehauf Corp.</td>
<td>.73</td>
<td>3713</td>
<td>White Motor Corp.</td>
<td>1.08</td>
<td>- .35</td>
</tr>
</tbody>
</table>
PORTFOLIO #2

Companies Holding Debtor or Creditor Positions From 1955 to 1959

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>% HPY 1960-1964</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>% HPY 1960-1964</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celanese Corp.</td>
<td>1.98</td>
<td>2801</td>
<td>American Cyanamid Co.</td>
<td>.32</td>
<td>1.63</td>
</tr>
<tr>
<td>W. R. Grace &amp; Co.</td>
<td>2.00</td>
<td>2801</td>
<td>Rohm &amp; Haas Co.</td>
<td>.03</td>
<td>1.97</td>
</tr>
<tr>
<td>Airco, Inc.</td>
<td>-.21</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>.29</td>
<td>-.50</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.75</td>
<td>2912</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.57</td>
<td>.18</td>
</tr>
<tr>
<td>Jones &amp; Laughlin Steel Corp.</td>
<td>-.05</td>
<td>3310</td>
<td>U. S. Steel Corp.</td>
<td>-.35</td>
<td>.30</td>
</tr>
<tr>
<td>Fruehauf Corp.</td>
<td>.27</td>
<td>3713</td>
<td>White Motor Corp.</td>
<td>.05</td>
<td>.22</td>
</tr>
<tr>
<td>TRW, Inc.</td>
<td>.33</td>
<td>3714</td>
<td>Budd Co.</td>
<td>-.36</td>
<td>.69</td>
</tr>
</tbody>
</table>
PORTFOLIO #3

Companies Holding Debtor or Creditor Positions From 1956 to 1960

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>% HPY 1961-1965</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>% HPY 1961-1965</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond Intl. Corp.</td>
<td>1.42</td>
<td>2650</td>
<td>Federal Paper Board Co.</td>
<td>.19</td>
<td>1.23</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>3.14</td>
<td>2801</td>
<td>American Cyanamid Co.</td>
<td>1.08</td>
<td>2.06</td>
</tr>
<tr>
<td>W. R. Grace &amp; Co.</td>
<td>2.71</td>
<td>2801</td>
<td>Rohm &amp; Haas Co.</td>
<td>.22</td>
<td>2.49</td>
</tr>
<tr>
<td>GAF Corp.</td>
<td>.14</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>.43</td>
<td>- .29</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>1.04</td>
<td>2912</td>
<td>Royal Dutch Petroleum Co.</td>
<td>1.00</td>
<td>.04</td>
</tr>
<tr>
<td>Jones &amp; Laughlin Steel Corp.</td>
<td>.48</td>
<td>3310</td>
<td>U. S. Steel Corp.</td>
<td>- .15</td>
<td>.63</td>
</tr>
<tr>
<td>TRW Inc.</td>
<td>.67</td>
<td>3714</td>
<td>Budd Co.</td>
<td>.56</td>
<td>.11</td>
</tr>
<tr>
<td>Debtor Firm</td>
<td>% HPY 1962-1966</td>
<td>Industry Number</td>
<td>Creditor Firm</td>
<td>% HPY 1962-1966</td>
<td>D_1</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>--------------------------------</td>
<td>-----------------</td>
<td>-----</td>
</tr>
<tr>
<td>Cone Mills Corp.</td>
<td>.86</td>
<td>2200</td>
<td>Dan River Inc.</td>
<td>.85</td>
<td>.01</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>.90</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>.77</td>
<td>.13</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>.60</td>
<td>2801</td>
<td>American Cyanamid Co.</td>
<td>.63</td>
<td>-.03</td>
</tr>
<tr>
<td>GAF Corp.</td>
<td>.36</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>.31</td>
<td>.05</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.84</td>
<td>2912</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.42</td>
<td>.42</td>
</tr>
<tr>
<td>Jones &amp; Laughlin Steel Corp.</td>
<td>-.20</td>
<td>3310</td>
<td>U. S. Steel</td>
<td>-.39</td>
<td>.19</td>
</tr>
<tr>
<td>TRW, Inc.</td>
<td>.67</td>
<td>3714</td>
<td>Borg-Warner Corp.</td>
<td>.02</td>
<td>.65</td>
</tr>
</tbody>
</table>
PORTFOLIO #5

Companies Holding Debtor or Creditor Positions From 1958 to 1962

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone Mills Corp.</td>
<td>1.29</td>
<td>2200</td>
<td>Dan River Inc.</td>
<td>1.20</td>
<td>.09</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>1.99</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>1.35</td>
<td>.64</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>.89</td>
<td>2801</td>
<td>American Cyanamid Co.</td>
<td>.37</td>
<td>.52</td>
</tr>
<tr>
<td>Chemetron Corp.</td>
<td>2.05</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>1.14</td>
<td>.91</td>
</tr>
<tr>
<td>GAF Corp.</td>
<td>.55</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>1.02</td>
<td>-.47</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>1.46</td>
<td>2912</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.54</td>
<td>.92</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.65</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>.39</td>
<td>.26</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>.69</td>
<td>3714</td>
<td>Budd Co.</td>
<td>1.23</td>
<td>-.54</td>
</tr>
</tbody>
</table>
PORTFOLIO #6

Companies Holding Debtor or Creditor Positions From 1959 to 1963

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>% HPY 1964-1968</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>% HPY 1964-1968</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cone Mills Corp.</td>
<td>.92</td>
<td>2200</td>
<td>Dan River Inc.</td>
<td>1.00</td>
<td>-.08</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>2.78</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>1.91</td>
<td>.87</td>
</tr>
<tr>
<td>Domtar Ltd.</td>
<td>.04</td>
<td>2600</td>
<td>Crown-Zellerbach</td>
<td>.23</td>
<td>-.19</td>
</tr>
<tr>
<td>GAF Corp.</td>
<td>.57</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>1.43</td>
<td>-.86</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>3.45</td>
<td>2912</td>
<td>Standard Oil Co. Ohio</td>
<td>1.62</td>
<td>1.83</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.45</td>
<td>2950</td>
<td>National Gypsum</td>
<td>.60</td>
<td>-.15</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>2.40</td>
<td>3714</td>
<td>Budd Co.</td>
<td>1.45</td>
<td>.95</td>
</tr>
<tr>
<td>DiGiorgio Corp.</td>
<td>1.45</td>
<td>5140</td>
<td>Fleming Co.</td>
<td>.86</td>
<td>.59</td>
</tr>
</tbody>
</table>
## PORTFOLIO #7

Companies Holding Debtor or Creditor Positions From 1960 to 1964

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>% HPY 1965-1969</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>% HPY 1965-1969</th>
<th>D_i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Con Mills Corp.</td>
<td>- .09</td>
<td>220</td>
<td>Dan River Inc.</td>
<td>- .09</td>
<td>0</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>1.39</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>.15</td>
<td>1.24</td>
</tr>
<tr>
<td>Domtar Ltd.</td>
<td>- .15</td>
<td>2600</td>
<td>Crown-Zellerbach</td>
<td>.11</td>
<td>- .26</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>- .05</td>
<td>2801</td>
<td>Stauffer Chemical Co.</td>
<td>.04</td>
<td>- .09</td>
</tr>
<tr>
<td>Chemtron Corp.</td>
<td>.16</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>.67</td>
<td>- .51</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>2.01</td>
<td>2912</td>
<td>Standard Oil Co. Ohio</td>
<td>1.11</td>
<td>.90</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.26</td>
<td>2950</td>
<td>National Gypsum</td>
<td>.45</td>
<td>- .19</td>
</tr>
<tr>
<td>Jones &amp; Laughlin Steel Corp.</td>
<td>- .28</td>
<td>3310</td>
<td>U. S. Steel Co.</td>
<td>- .12</td>
<td>- .16</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>1.13</td>
<td>3714</td>
<td>TRW Inc.</td>
<td>1.72</td>
<td>- .59</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>----------------------------</td>
<td>-----------------</td>
<td>-----</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>.39</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>-.09</td>
<td>.48</td>
</tr>
<tr>
<td>Celanese Corp.</td>
<td>-.14</td>
<td>2801</td>
<td>Stauffer Chemical Co.</td>
<td>-.13</td>
<td>-.01</td>
</tr>
<tr>
<td>Chemetron Corp.</td>
<td>-.41</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>.30</td>
<td>-.71</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.98</td>
<td>2913</td>
<td>Standard Oil Co. Ohio</td>
<td>.48</td>
<td>.50</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.61</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>.62</td>
<td>-.01</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>-.02</td>
<td>3714</td>
<td>TRW, Inc.</td>
<td>.59</td>
<td>-.57</td>
</tr>
<tr>
<td>Tenneco, Inc.</td>
<td>.27</td>
<td>9997</td>
<td>Textron Inc.</td>
<td>.33</td>
<td>-.06</td>
</tr>
</tbody>
</table>
PORTFOLIO #9

Companies Holding Debtor or Creditor Positions From 1962 to 1966

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohasco Corp.</td>
<td>2.30</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>1.33</td>
<td>.97</td>
</tr>
<tr>
<td>W. R. Grace &amp; Co.</td>
<td>- .28</td>
<td>2801</td>
<td>Stauffer Chemical Co.</td>
<td>.26</td>
<td>-.54</td>
</tr>
<tr>
<td>Chemtron Corp.</td>
<td>- .27</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>.63</td>
<td>-.90</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.87</td>
<td>2912</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.75</td>
<td>.12</td>
</tr>
<tr>
<td>Murphy Oil Corp.</td>
<td>.47</td>
<td>2912</td>
<td>British Petroleum Co.</td>
<td>.73</td>
<td>-.26</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>1.23</td>
<td>2950</td>
<td>National Gypsum</td>
<td>.70</td>
<td>.53</td>
</tr>
<tr>
<td>Wilbilt Corp.</td>
<td>.59</td>
<td>3630</td>
<td>Scovill Mfg. Co.</td>
<td>.69</td>
<td>-.10</td>
</tr>
<tr>
<td>Naqpcos Inds. Inc.</td>
<td>.02</td>
<td>3714</td>
<td>Budd Co.</td>
<td>.25</td>
<td>-.23</td>
</tr>
<tr>
<td>Maremont Corp.</td>
<td>.97</td>
<td>3714</td>
<td>TRW, Inc.</td>
<td>.56</td>
<td>.41</td>
</tr>
<tr>
<td>Debtor</td>
<td>% HPY 1968-1972</td>
<td>Industry Number</td>
<td>Creditor Firm</td>
<td>% HPY 1968-1972</td>
<td>D_i</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>------------------------------------</td>
<td>-----------------</td>
<td>-----</td>
</tr>
<tr>
<td>Cleveland-Cliffs Iron Co.</td>
<td>.58</td>
<td>1000</td>
<td>Amax Inc.</td>
<td>.22</td>
<td>.36</td>
</tr>
<tr>
<td>Warnaco Inc.</td>
<td>.38</td>
<td>2300</td>
<td>CluEtt-Peabody &amp; Co., Inc.</td>
<td>- .03</td>
<td>.41</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>.46</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>.19</td>
<td>.27</td>
</tr>
<tr>
<td>Chemetron Corp.</td>
<td>-.46</td>
<td>2803</td>
<td>Koppers Co.</td>
<td>.20</td>
<td>- .66</td>
</tr>
<tr>
<td>Cities Service Co.</td>
<td>.23</td>
<td>2912</td>
<td>Standard Oil Co. Ohio</td>
<td>.48</td>
<td>- .25</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.23</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>.03</td>
<td>.20</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>-.51</td>
<td>3714</td>
<td>Budd Co.</td>
<td>- .20</td>
<td>- .31</td>
</tr>
<tr>
<td>IT&amp;T</td>
<td>.13</td>
<td>9997</td>
<td>Textron Inc.</td>
<td>- .26</td>
<td>.39</td>
</tr>
</tbody>
</table>
## PORTFOLIO #11

Companies Holding Debtor or Creditor Positions From 1964 to 1968

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Warnaco Inc.</td>
<td>- .67</td>
<td>2300</td>
<td>Cluett-Peabody &amp; Co. Inc.</td>
<td>- .70</td>
<td>.03</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>- .50</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>- .59</td>
<td>.09</td>
</tr>
<tr>
<td>Commercial Solvents Corp.</td>
<td>- .41</td>
<td>2802</td>
<td>Reichhold Chemicals Inc.</td>
<td>- .48</td>
<td>.07</td>
</tr>
<tr>
<td>Chemetron Corp.</td>
<td>- .55</td>
<td>2803</td>
<td>Inmont Corp.</td>
<td>- .74</td>
<td>.21</td>
</tr>
<tr>
<td>Continental Oil Co.</td>
<td>.57</td>
<td>2912</td>
<td>Standard Oil Co. Ohio</td>
<td>1.32</td>
<td>- .75</td>
</tr>
<tr>
<td>Finkote Co.</td>
<td>- .35</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>- .44</td>
<td>.09</td>
</tr>
<tr>
<td>Dunlop Holding Ltd.</td>
<td>- .74</td>
<td>3000</td>
<td>Cooper Tire &amp; Rubber</td>
<td>- .55</td>
<td>- .19</td>
</tr>
<tr>
<td>Napco Inds. Inc.</td>
<td>- .80</td>
<td>3714</td>
<td>Budd Co.</td>
<td>- .57</td>
<td>- .23</td>
</tr>
<tr>
<td>TRW Inc.</td>
<td>- .49</td>
<td>3714</td>
<td>Eaton Corp.</td>
<td>- .18</td>
<td>- .31</td>
</tr>
<tr>
<td>IT&amp;T</td>
<td>- .45</td>
<td>9997</td>
<td>Textron Inc.</td>
<td>- .47</td>
<td>.02</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
<td>-----------------</td>
<td>-----</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>-.51</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>-.43</td>
<td>-.08</td>
</tr>
<tr>
<td>W. R. Grace &amp; Co.</td>
<td>.10</td>
<td>2800</td>
<td>Koppers Co.</td>
<td>.19</td>
<td>-.09</td>
</tr>
<tr>
<td>Sun Chemical Corp.</td>
<td>-.64</td>
<td>2890</td>
<td>Inmont Corp.</td>
<td>-.55</td>
<td>-.09</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.17</td>
<td>2911</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.76</td>
<td>-.59</td>
</tr>
<tr>
<td>Murphy Oil Corp.</td>
<td>.80</td>
<td>2911</td>
<td>British Petroleum Co. Ltd.</td>
<td>-.44</td>
<td>1.24</td>
</tr>
<tr>
<td>Union Oil Co. of Calif.</td>
<td>.25</td>
<td>2911</td>
<td>Standard Oil Co. Ohio</td>
<td>.60</td>
<td>-.35</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>-.32</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>-.41</td>
<td>.09</td>
</tr>
<tr>
<td>Uniroyal Inc.</td>
<td>-.51</td>
<td>3000</td>
<td>Cooper Tire &amp; Rubber</td>
<td>-.51</td>
<td>0</td>
</tr>
<tr>
<td>A-T-O Inc.</td>
<td>-.65</td>
<td>3560</td>
<td>Ingersoll-Rand Co.</td>
<td>1.19</td>
<td>-1.84</td>
</tr>
<tr>
<td>TRW Inc.</td>
<td>-.50</td>
<td>3714</td>
<td>Eaton Corp.</td>
<td>-.34</td>
<td>.16</td>
</tr>
</tbody>
</table>
PORTFOLIO #13

Companies Holding Debtor or Creditor
Positions From 1966 to 1970

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohasco Corp.</td>
<td>- .29</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>- .46</td>
<td>.17</td>
</tr>
<tr>
<td>McGraw-Hill, Inc.</td>
<td>- .16</td>
<td>2731</td>
<td>Grolier Inc.</td>
<td>- .83</td>
<td>.67</td>
</tr>
<tr>
<td>Diamond Shamrock</td>
<td>1.63</td>
<td>2800</td>
<td>Koppers Co.</td>
<td>1.52</td>
<td>.11</td>
</tr>
<tr>
<td>Squibb Corp.</td>
<td>.04</td>
<td>2830</td>
<td>(G. D.) Searle &amp; Co.</td>
<td>.00</td>
<td>.04</td>
</tr>
<tr>
<td>Sun Chemical Corp.</td>
<td>- .25</td>
<td>2890</td>
<td>Inmont Corp.</td>
<td>- .14</td>
<td>- .11</td>
</tr>
<tr>
<td>Atlantic Richfield Co.</td>
<td>.54</td>
<td>2911</td>
<td>British Petrol. Co. Ltd.</td>
<td>.23</td>
<td>.31</td>
</tr>
<tr>
<td>Union Oil of Calif.</td>
<td>.38</td>
<td>2911</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.19</td>
<td>.19</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>- .23</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>- .31</td>
<td>.08</td>
</tr>
<tr>
<td>Benefical Corp.</td>
<td>- .31</td>
<td>6145</td>
<td>Liberty Loan Corp.</td>
<td>- .77</td>
<td>.46</td>
</tr>
<tr>
<td>Debtor Firm</td>
<td>% HPY 1972-1976</td>
<td>Industry Number</td>
<td>Creditor Firm</td>
<td>% HPY 1972-1976</td>
<td>D_i</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>-------------------------------</td>
<td>----------------</td>
<td>-----</td>
</tr>
<tr>
<td>Foote Mineral Co.</td>
<td>1.51</td>
<td>1000</td>
<td>Cleveland-Cliffs Iron Co.</td>
<td>1.35</td>
<td>.16</td>
</tr>
<tr>
<td>Mohasco Corp.</td>
<td>-.43</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>-.53</td>
<td>.10</td>
</tr>
<tr>
<td>McGraw-Hill Inc.</td>
<td>.03</td>
<td>2731</td>
<td>Grolier Inc.</td>
<td>-.86</td>
<td>.89</td>
</tr>
<tr>
<td>Pennwalt Corp.</td>
<td>.46</td>
<td>2800</td>
<td>DuPont (E. I.) DeNemours</td>
<td>.11</td>
<td>.35</td>
</tr>
<tr>
<td>Continental Oil Co.</td>
<td>1.91</td>
<td>2911</td>
<td>British Petroleum Co. Ltd.</td>
<td>.20</td>
<td>1.71</td>
</tr>
<tr>
<td>Union Oil Co. of Calif.</td>
<td>1.02</td>
<td>2911</td>
<td>Royal Dutch Petroleum Co.</td>
<td>.86</td>
<td>.16</td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>-.14</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>.14</td>
<td>-.28</td>
</tr>
<tr>
<td>Sundstrand Corp.</td>
<td>.46</td>
<td>3540</td>
<td>Cincinnati Milacron Inc.</td>
<td>.00</td>
<td>.46</td>
</tr>
<tr>
<td>Ingersoll-Rand Co.</td>
<td>.57</td>
<td>3560</td>
<td>Cooper Inds. Inc.</td>
<td>.12</td>
<td>.45</td>
</tr>
<tr>
<td>Conrac Corp.</td>
<td>.15</td>
<td>3662</td>
<td>Raytheon Co.</td>
<td>.63</td>
<td>-.48</td>
</tr>
<tr>
<td>Eaton Corp.</td>
<td>.26</td>
<td>3714</td>
<td>Questor Corp.</td>
<td>-.44</td>
<td>.70</td>
</tr>
<tr>
<td>DiGiorgio Corp.</td>
<td>-.40</td>
<td>5140</td>
<td>Super Valu Stores Inc.</td>
<td>.83</td>
<td>-1.23</td>
</tr>
<tr>
<td>Household Finance Corp.</td>
<td>-.24</td>
<td>6145</td>
<td>American Investment Co.</td>
<td>-.40</td>
<td>.16</td>
</tr>
</tbody>
</table>
### APPENDIX B

Debt Ratio of Debtor and Creditor Firms From 1966-1970

<table>
<thead>
<tr>
<th>Debtor Firm</th>
<th>Debt</th>
<th>Total Assets</th>
<th>Industry Number</th>
<th>Creditor Firm</th>
<th>Debt</th>
<th>Total Assets</th>
<th>Di</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mohasco Corp.</td>
<td>.44</td>
<td>2510</td>
<td>2510</td>
<td>Kroehler Mfg. Co.</td>
<td>.32</td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>McGraw Hill Inc.</td>
<td>.42</td>
<td>2731</td>
<td>2731</td>
<td>Grolier Inc.</td>
<td>.68</td>
<td>-.26</td>
<td></td>
</tr>
<tr>
<td>Diamond Shamrock</td>
<td>.39</td>
<td>2800</td>
<td>2800</td>
<td>Koppers Co.</td>
<td>.42</td>
<td>-.03</td>
<td></td>
</tr>
<tr>
<td>Squibb Corp.</td>
<td>.33</td>
<td>2830</td>
<td>2830</td>
<td>(G. D.) Searle &amp; Co.</td>
<td>.30</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Sun Chemical Corp.</td>
<td>.59</td>
<td>2890</td>
<td>2890</td>
<td>Inmont Corp.</td>
<td>.39</td>
<td>.20</td>
<td></td>
</tr>
<tr>
<td>Atlantic Richfield</td>
<td>.32</td>
<td>2911</td>
<td>2911</td>
<td>British Petrol. Co. Ltd.</td>
<td>.40</td>
<td>-.08</td>
<td></td>
</tr>
<tr>
<td>Union Oil of Calif.</td>
<td>.34</td>
<td>2911</td>
<td>2911</td>
<td>Royal Dutch Petrol. Co.</td>
<td>.32</td>
<td>.02</td>
<td></td>
</tr>
<tr>
<td>Flintkote Co.</td>
<td>.27</td>
<td>2950</td>
<td>2950</td>
<td>National Gypsum Co.</td>
<td>.19</td>
<td>.08</td>
<td></td>
</tr>
<tr>
<td>Benefical Corp.</td>
<td>.70</td>
<td>6145</td>
<td>6145</td>
<td>Liberty Loan Corp.</td>
<td>.84</td>
<td>-.14</td>
<td></td>
</tr>
</tbody>
</table>
James Franklin Potts was born March 3, 1945 in Lampasas, Texas, to Uel O. and Mildred L. Potts. He attended public schools in Lometa, Texas, graduating in 1963. That fall he entered Baylor University where he was an active member of Alpha Kappa Psi, Omicron Delta Epsilon, and president of Beta Gamma Sigma. In his senior year he was awarded the Humble Oil Company scholarship.

After receiving a B.B.A. degree in June 1966, Mr. Potts entered the graduate program in economics at Baylor as a teaching assistant. He received an M.S. degree in January 1968, and immediately took a full time position at Baylor as an instructor of economics and finance, a position which he held until August 1971.

In the fall of 1971 he entered the doctoral program in finance at Louisiana State University, Baton Rouge, Louisiana, receiving an appointment as a teaching assistant in the Department of Finance. During the summer of 1973 he taught courses in economics and finance as an assistant professor at Southeastern University in Hammond, Louisiana. From January 1975 through August 1977, Mr. Potts was employed as an assistant professor of finance at Baylor, returning to L.S.U. that fall as an instructor of finance while completing work on his dissertation.
EXAMINATION AND THESIS REPORT

Candidate: James Franklin Potts

Major Field: Finance

Title of Thesis: "Inflationary Expectations and the Market Value of the Firm"

Approved:

Don L. Woodland
Major Professor and Chairman

James H. Towaham
Dean of the Graduate School

EXAMINING COMMITTEE:

Don L. Woodland
William R. Lane
William R. Staats
Thomas R. Beard
Loren C. Scott

Date of Examination:

May 11, 1978