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The determinants of trade credit

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CHAPTER I. INTRODUCTION

This paper analyzes the trade credit practices of manufacturing firms in the United States with special reference to the factors or determinants influencing the granting of trade credit, the manner in which firms approach the trade credit decision, and the exogenous influence of monetary policy on the trade credit decision.

Chapters II and III contain an examination of the theoretical and empirical literature on trade credit. Although the volume of trade credit literature is currently rather small, interest in this subject has grown in the last decade, primarily because of a renewed interest in the effects and the effectiveness of monetary policy. The main thrust of the literature, therefore, has been to specify the interrelationship between monetary policy and trade credit and to estimate the impact of trade credit on the alleged differential effects of monetary policy.

A formal model of the workings of the trade credit mechanism is presented in Chapter IV. In specifying the model, attention has been given to the following questions: (1) What are the factors influencing the level of trade credit granted by firms? (2) How does monetary policy influence the granting of trade credit? (3) Does the evidence support the view that monetary policy discriminates against smaller firms? (4) Does the evidence support the view that monetary policy is made more general in effect by credit reallocation from the larger firms to the smaller firms through the trade credit mechanism?

The results obtained from empirically testing the model are presented in Chapter V. Chapter VI contains a summary of the work and the conclusions drawn from it.

CHAPTER II: THEORETICAL OVERVIEW

Most of the literature on trade credit is concerned with its relationship to monetary policy. The issue is whether trade credit can, by releasing funds for other uses, and thus increasing the velocity of the existing stock of money, act as a deterrent to monetary policy. The question is a modern day outgrowth of an issue that was debated as far back as the early nineteenth century.

Many of the earlier thoughts on credit theory in general were concerned with the determination of the price level. Discussion centered around how credit affected the quantity theory of money. Two viewpoints arose, the "currency" view and the "banking school" view. Proponents of the former included David Ricardo and Robert Torrens, who were of the opinion that the price level was determined only by the supply of money. Credit, being limited by the money supply itself, exerted no influence on the price level. John Stuart Mill argued the "banking school" theory. This theory took the position that money was simply another form of credit. Prices did not depend upon money but upon purchases. Since credit could be used for purchases in the same manner as money, it therefore influenced prices. Credit was a substitute for money (Levitt, 1964).

Years later, the Radcliff Committee was to echo this sentiment. Consequently, they argued that monetary policy should seek to control not only the money supply but the economy's entire stock of liquidity. The Radcliff stand was widely opposed. Opponents argued that credit represents a transfer of, rather than an addition to, total liquidity.

Reduction of the money supply, they claimed, becomes general as it creates a diffuse difficulty of borrowing. The issue remains an empirical question (Levitt, 1964).

This study is aimed in part at analyzing the role that trade credit has in influencing the levels of economic activity. Historically, the theoretical views have been confusing, but an examination of some of the earlier writings will facilitate an understanding of how trade credit can affect economic activity.

John Stuart Mill's position on the effects of trade credit on the economy is clear. A loan of cash from one firm to another is a mere transfer of purchasing power. But the manner in which the loan is utilized may cause an increase in purchasing power. Mill seemed to be hinting at utilization of idle balances and thus an increase of velocity. For credit, Mill used a closed circuit of dealings between firms. Trade credit is an added store of liquidity that can be used as purchasing power.

> ...one single exertion of the credit power in the form of book credit is only the foundation of a single purchase: but if a bill is drawn, that same portion of credit may serve for as many purchases as the number of times the bill changes hands, while every bank note issued renders the credit of the banker a purchasing power to that amount in the hands of all the successive holders without impairing any power they may possess of effecting purchases on their own credit. Credit, in short, has exactly the same purchasing power with money; and as money tells upon prices not simply in proportion to its amount, but its amount multiplied by the number of times it changes hands, so also does credit; and credit transferable from hand to hand is in that proportion more potent than credit which only performs one purchase (Mill, 1929, p. 532).

Note that for major impact, credit must be negotiable. This is not a feature of most book credit issued today. Thus, if credit is not a direct substitute for money, velocity becomes the important factor for determining the total impact of trade credit.

Irving Fisher viewed trade credit as a means of financing transactions with a lower stock of money. Trade credit did not replace the use of money, but only postpone its use. As the credit became due, money must be paid in the same manner as though cash had originally been spent. Thus, the economic impact of trade credit was the result of net increases in trade credit, that is, the difference between credit granted and credit paid off. This effect can be seen in the Fisherian treatment of trade credit in the equation of exchange. It is treated as a one time occurrence:

$$MV + M'V' + E'' - E''' = pq \text{ (Fisher, 1929, pp. 370-71)} \qquad (2.1)$$

where M refers to cash, M' to bank deposits, V and V' their respective velocities, E'' is new credit given and E''' is credit repaid.

Levitt (1964) wrongly interpreted Fisher to mean that gross trade credit was not important. He cited R. S. Sayers in disagreeing with the Fisherian approach. The disagreement, however, can be easily reconciled.

Levitt and Sayers appear to have confused the macroeconomic netting procedure with a microeconomic netting procedure. When Fisher refers to a net increase in trade credit, he is referring to net increases in the total gross credit outstanding in the entire economy. Fisher's net increase or decrease in trade credit is simply new gross trade credit minus paid off gross trade credit for the economy. Sayers' contention that gross trade credit at the firm level is significant is well taken.

It represents purchasing power for the firm. Taken at the macroeconomic level, this is fully consistent with Fisher's equation. Sayers says:

> An entire closed circle of firms in manufacturing industry may begin giving credit more freely, and all of them proceed to place large orders with each other; there is no doubt about the increase in effective demand, although the increase in credit granted by all the firms together is balanced by the increase in credit taken by all the firms together. No one would seriously suggest that bank credit should be 'netted out' by deducting the debts people owe to the banks, ...(Sayers, 1960, p. 713).

This was exactly what Fisher had stated. What occurs in Sayers' closed circle is that more credit in the gross sense has been created than repaid. Hence E''- E''' increases and shows an economic impact on pq, or aggregate economic activity. The disagreement is semantic. Sayers views net credit as accounts receivable minus accounts payable, which is appropriate in a microeconomic framework. Fisher views net credit as new accounts receivable minus accounts receivable paid off, which is an appropriate measure of impact on the economy.

Since the present study will incorporate an analysis of both gross trade credit and net trade credit in examining the relationship between trade credit and economic activity, it is important that an understanding of the terms be gained before proceeding. Furthermore, it is necessary to have a theoretical understanding of how the trade credit mechanism functions. As will be noted below, the impact of trade credit on economic activity is based upon its ability to affect the velocity of the existing stock of money.

Brechling and Lipsey (1963) have categorized and presented compactly the various theories of trade credit. They are divided into gross trade credit theories and net trade credit theories, where net trade credit for the individual firm is defined as total trade receivables minus total trade payables. Some of the theories presented by Brechling and Lipsey are inapplicable because they assume that trade credit is conducted through negotiable instruments. Only the theories that are applicable to the present study will be examined.

The first of these theories assumes non-transferability of credit issues and a fixed credit period. It argues that increases in gross trade credit alone can create additional demand. This is the argument presented by Sayers above. Brechling and Lipsey argue that this theory is of little consequence. The immediate result, they maintain, is to merely increase velocity; more transactions are conducted with the same quantity of active money. The increased velocity does create an impact, but only for the period for which the credit is granted. At the end of the credit period cash must flow for payment:

> If there were no trade credit, a rise in production and sales would entail an immediate rise in money flows; with trade credit the rise in money flows is postponed for the period of the credit, but it then rises just as if there had been no trade credit, so that the problem of financing the increased money flows asserts itself in exactly the same way as if there had been no credit (Brechling and Lipsey, 1963, p. 623).

Thus, the ability of trade credit to increase the velocity of a given stock of money is limited to the period of the credit, if the credit period is fixed. Modification of the credit period leads to another gross credit theory.

If firms do not collect the credit due at the end of the trade credit period, but rather extend the period, the analysis is changed significantly. General extension of the trade credit period means that firms may reduce their overall cash flows between firms. This creates an added fund from which income creating payments can be financed. The cash is freed only so long as the flows between firms are reduced. Effectively, the result is an increase in the velocity of the money stock.

The amount of cash that can be freed in this manner is related to the proportion of weekly sales that is held in precautionary balances. Let E_t be the extension of the credit period in weeks, a be the proportion of weekly purchases covered by precautionary balances, x be the required cash payments as a proportion of weekly purchases and t be the time measured in weeks. The time for which the added cash can be made available is:

$$t = \frac{a}{x} E_t \tag{2.2}$$

Thus, if the period of credit is steadily rising in a period of monetary tightness, it is quite possible that at least some portion of monetary policy is being frustrated. Brechling and Lipsey insert what they term "plausible" values to show the possible offset of monetary policy effects for up to six months.

The net trade credit theories all possess similarities that, in practice, may make it impossible to determine which, if any, is in operation. The first theory assumes that some firms have idle balances which they are willing to decrease. They do this by increasing trade credit given without increasing trade credit taken. An identical result arises in the second theory which hypothesizes that weak firms must increase trade credit given but are unable to pressure other firms into giving them added trade credit. The third net trade credit theory supposes that firms do not have idle balances to run down. But they respond to increases in trade credit given by taking added trade credit only after a time lag. Cash flows are offset for the period of the lag.

The net trade credit theories require that idle cash be put to active use, increasing the velocity of money. Brechling and Lipsey accept all of the net theories as plausible. They state that the net trade credit mechanism, at least theoretically, is capable of frustrating monetary policy for a significant time. It remains an empirical question whether such offsets occur.

CHAPTER III: EMPIRICAL OVERVIEW

At this point, attention is focused on the empirical studies concerning trade credit. Only a few such studies have been published. Some of these will be examined in detail because they provide the basic background and framework upon which this study is based. Particular aspects of the models associated with the previous studies will be adopted; other aspects will be challenged and discarded. The issues--the relationship of trade credit and monetary policy, the reallocation of credit through the trade credit mechanism, and the formal behavioral model of the trade credit decision--will, in general, remain the same.

Empirical studies of trade credit fall into two general categories: those testing the ability of trade credit to offset monetary policy and those testing the ability of trade credit to bring about a more general monetary policy from its initial differential effects. In most of these studies, the determinants of trade credit are hypothesized without an extensive theoretical framework.

Brechling and Lipsey (1963) formulated their behavioral equations into trade credit given and trade credit taken:[1]

$$TC_{g_i} = G(S_i, M, e_i) \qquad (3.1)$$

$$TC_{t_i} = T(P_i, M, u_i) \qquad (3.2)$$

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[1]Notation used throughout is altered for consistency in the paper.

where TC_{g_i} is trade credit given by firm i, TC_{t_i} is trade credit taken by firm i, G and T are functional notations, S is sales, P is purchases, M is an indicator of the strength of monetary policy, and e_i and u_i are error terms. The multiple regression technique for testing was rejected on the grounds that it is not easy to get a good "quantitative estimate of the relative strength of monetary policy for a ten year period" (Brechling and Lipsey, 1963, p. 629). The approach adopted was to regress trade credit given and taken against sales and purchases respectively and then observe the behavior of the error terms over time.

A sample of the sales data for 75 firms was taken. These firms had combined sales of over four billion pounds sterling, with an aggregate income-sales ratio of 27%. The firms accounted for approximately 5.4% of the national income of the United Kingdom. Annual data were taken from the ten year period of July 1950 to June 1959. The initial simple regressions tested were:

$$TC_{g_i} = a_i + b_i S_i + g_i \quad (3.3)$$

$$TC_{t_i} = c_i + d_i P_i + t_i \quad (3.4)$$

where a_i and c_i are intercepts, g_i and t_i are the residuals. These regressions were computed for each of the 75 firms, yielding a mean R^2 of .81 and .69 respectively. This suggested that the level of turnover was the predominant determinant of trade credit, as expected.

The residuals, g_i and t_i were then treated as abnormal trade credit. They were summed over the 75 firms and plotted over time. The plots were compared to four indicators of monetary policy over time; consol yield, the bill rate, the ratio of money to gross national product (the income velocity of money) and the ratio of bank advances to gross national product (the income velocity of bank advances). All of the indicators were adjusted for time trend. The comparisons clearly showed a considerable increase in both abnormal trade credit given and taken during periods of tight money.

Abnormal trade credit was then framed into gross and net credit given to determine the passing-on of credit. Gross credit is increased by giving more or taking less credit. Conversely, it is decreased by giving less and taking more credit. Abnormal gross credit given and taken is formulated by:

$$\text{Abnormal gross credit given} = g_i + (t_i^-) \tag{3.5}$$

$$\text{Abnormal gross credit taken} = t_i + (g_i^-) \tag{3.6}$$

where t_i^- is any decrease in abnormal credit taken and g_i^- is any decrease in abnormal credit given. Net abnormal trade credit is the difference between abnormal trade credit given and taken:

$$\text{Net abnormal trade credit} = g_i - t_i \tag{3.7}$$

Credit passed on is credit that is both given and taken by the same firm. For an individual firm, it is the smaller of trade credit given or trade credit taken. In the aggregate, passing on is the difference between gross and net credit. Brechling and Lipsey formulated the aggregates as follow:

$$\text{Aggregate gross credit given} = \Sigma g_i^+ + \Sigma \left| t_i^- \right| \quad (3.8)$$

$$\text{Aggregate gross credit taken} = \Sigma t_i^+ + \Sigma \left| g_i^- \right| \quad (3.9)$$

$$\text{Aggregate net credit given} = n^+ = \Sigma n_i^+ = \Sigma (g_i - t_i)^+ \quad (3.10)$$

$$\text{Aggregate net credit taken} = n^- = \Sigma n_i^- = \Sigma (g_i - t_i)^- \quad (3.11)$$

where the minus superscripts indicate decreases and the pluses indicate increases. The study indicated that about 40% of gross credit movements were accounted for by passing on.

The final step in the Brechling and Lipsey paper was to evaluate the inflationary and/or deflationary impact of abnormal net trade credit. Inflationary impact was alleged when the increase in net trade credit given was not offset by decreases in inventories, or when the increase in net trade taken was not offset by increases in money balances or financial securities. The inflationary net trade credit was then compared with other financial flows to attain a measure of the relative importance of trade credit as an inflationary force. Of the 75 firms in the sample, only 30 published income-sales ratios, which were taken as representative of the whole economy. The sales of the firm multiplied by the income-sales ratio was taken as the income generated by the firm. The abnormal inflationary trade credit as a percent of income generated was then extended to the whole economy. The inflationary effect of trade credit was found to be a significant frustrator of monetary policy.

The findings of this study were seriously challenged by White (1964) on the grounds of statistical and conceptual errors that led to heavy exaggeration of the inflationary effects. White maintained that the data given supported the conclusion that the expansion of trade credit provided a very weak offset to monetary policy. White presented a list of objections, some well taken, others questionable. Only two of the major points will be presented here.

The first objection was that the Brechling and Lipsey study compared inflationary net trade credit against the increase in bank advances in the year rather than against the difference in bank advances in a normal year minus the advances in a tight money year. Thus the relative impact of inflationary trade credit was overstated. Secondly, White attacks the comparison of flows of bank credits with stocks of inflationary trade credit outstanding. What should have been used for comparison is the change in inflationary net trade credit from one year to the next; that is, first differences. Had this been done, the procedure would have shown that trade credit not only did not offset but served to reinforce monetary policy. In the absence of actual empirical figures by White, the last comment may be an overstatement. The criticism, however, is in the spirit of the reconciliation of Fisher and Sayers presented in Chapter II. In all, White presented a critique that substantially reduced the impact of the Brechling and Lipsey empirical results. He did not intend to attack the basic theoretical construct of the study. Rather, he attacked their interpretation of the empirical results.

The questionable nature of the Brechling and Lipsey study was enlarged by a study conducted by Coates (1967). Coates examined the accounts of 50 of the larger companies in the British Board of Trade statistics for the period 1956-63. He tested the hypothesis that trade credit is expanded to abnormal levels during periods of tight money, and that this credit is most likely to originate in firms with strong short term financial positions. The method of analysis was to form ratios of trade credit to turnover, take the first differences over time and observe their behavior. This was done for aggregated data and for individual firms. First differences of this ratio were expected to show a rising pattern in periods of tight money if firms were increasing trade credit abnormally. No noticeable pattern emerged, however.

Examination of the firms on an individual basis yielded no support for the hypothesis and found that only six of the fifty companies were able to expand their credit-turnover ratios by one percent or more during both of the tight money periods covered in the analysis. Furthermore, Coates examined the liquidity positions and working capital positions of the firms over the periods of monetary restraint and found that the majority of them evidently had the ability to expand their credit. A shortage of liquid assets was not associated with the credit squeeze. This finding suggested to Coates that in periods of tight money the pressures for more trade credit were small or that the firms had objectives of a higher order pertaining to their liquidity positions.

At least one comment is in order concerning Coates' analysis. His data do seem to support the position that trade credit does not expand sufficiently to act as a major offset to monetary policy for the entire economy. The study indicates, however, that monetary policy is not very effective in restraining large firms. Their liquidity and working capital positions remained strong. Sales continued to rise throughout both of the tight money periods and fell only after relaxation of tight money in one period. The credit-turnover ratio fell in only one of the two periods. A strong possibility exists that these results hold only for large firms with strong credit lines such that their availability does not suffer in periods of restraint. If this is the case, it would give support to the argument that differential effects of monetary policy exist.

The second type of empirical work that has been conducted involving trade credit is centered around the controversy of discriminatory or differential effects of monetary policy. One of the primary interests of this paper will be to examine the trade credit mechanism to determine if any evidence of credit discrimination exists. Given evidence of discriminatory effects, the next step will be to investigate how the trade credit mechanism reacts. The primary empirical work in this area was done by Meltzer (1960, 1963), which was in part a reply to Galbraith (1957).

Galbraith argued that the impact of monetary policy is uneven to the extent that it discriminates against smaller, more competitive firms. This effect presumably occurs because credit rationing tends to favor larger, more stable firms. Meltzer argued that the differential effects of monetary policy are modified and become more general as the trade credit mechanism redistributes financial resources from the large to the small firms. Meltzer's studies are an important contribution to trade credit analysis. Consequently, a fairly thorough examination will be given here.

Meltzer began by noting that during the tight money period of 1955-57 the increase in trade credit was three times larger than the growth of the money supply. The extension of trade credit in this period seems to have favored the firms that were supposedly discriminated against by credit rationing. The analysis began with an examination of the relationship between the liquidity position of firms of varying sizes and some measure of monetary tightness.

The liquidity position was defined as:

$$LQ = \frac{C+G}{CL} \tag{3.12}$$

or the ratio of cash holdings plus holdings of government securities to current liabilities. The money market variable, or the indicator of monetary policy, was taken as:

$$M = i \cdot \frac{FR}{TR} \tag{3.13}$$

where <u>i</u> is the rate of interest on three month treasury bills and $\frac{FR}{TR}$ is the ratio of free reserves to total reserves.

Using seasonally adjusted quarterly data from the <u>SEC-FTC Quarterly Financial Report for Manufacturing Corporations</u>, Meltzer then ran the following regression for firms in seven asset size groups:

$$LQ = a + bM + u \tag{3.14}$$

where <u>u</u> is the error term. The results showed a tendency for the marginal effect of M on LQ to increase with firm size. The differences were not large except for the two smallest asset groups. Overall, while the money supply was increasing by only one billion dollars in the 1955-57 tight money period, the cash and government security holdings of all the firms decreased by five billion dollars.

Meltzer then defined the net trade credit position (R) of firms as the net receivables to sales ratio:

$$R = \frac{r-p}{S} \qquad (3.15)$$

where r is accounts and notes receivable, p is accounts and notes payable and S is sales. He then noted that tight money periods are likely to affect firms through decreased sales to customers who cannot maintain their inventory position. To offset this sales loss, firms may grant trade credit more freely and on easier terms. A second equation is then specified:

$$R = a + b_1 LQ + b_2 S + u \qquad (3.16)$$

This regression was tested for all seven asset sizes. The results showed that the groups with the largest dollar decline in liquid assets had the strongest negative relationships between liquidity and the net receivables-to-sales ratio. Only the two largest and one smaller asset size had a positive relationship between R and S, indicating that larger firms tended to be the principal lenders if credit reallocation takes place.

Meltzer admitted several shortcomings of his work. The data did not allow separation of effects by type of industry or product classification from effects of size. The aggregated form of the data made it difficult to infer the manner of decision making by individual firms. Finally, the data are for the manufacturing sector only.

In his second paper on trade credit, Meltzer (1963) utilized the same approach but with different data. The data were selected in an attempt to overcome some of the shortcomings noted in his earlier study. The data came from 86 firms selected in the following manner: 40 firms came from Moody's where they reported quarterly balance sheets; the remaining 46 firms were based on a sample drawn from the Thomas Register. To get this latter group, 1372 firms were selected randomly and sent questionnaires in two mailings. There were 185 responses of which 46 contained usable data. In this analysis, both regressions cited above were computed for each of the 86 firms in the sample. A new step in the analysis was added: the regression of net receivables against the monetary policy indicator.

The results revealed that about two-thirds of the firms showed a positive relationship between R and M, and a negative relationship between LQ and M, with about 60% of the results significant. By classifying the results by asset size, industry and liquidity position, Meltzer found that the sign of the regression coefficient was related to size only. No significant difference was noted for classification by industry or liquidity position. The latter finding was contrary to the results of the first study, which used aggregate data. A high liquidity position did not appear to serve as a good predictor of trade lending. An important result showed that smaller firms had a tendency to increase their liquidity and lower their net receivables-to-sales ratio in periods of monetary restraint.

By interpreting the results of equation 3.16, Meltzer considered either b_1 less than zero or b_2 greater than zero as evidence that a firm extends credit by increasing receivables. The results were not as conclusive as the previous regressions but generally supported the conclusions above.

As a final step in his analysis, Meltzer classified the firms as "lenders", "strict non-lenders" and "others". Lenders were defined as those that displayed one of the following characteristics:

(a) a significant relationship between M and R that is greater than zero

(b) a significant relationship between L and R that is less than zero

(c) a significant relationship between S and R that is greater than zero,

and neither of the other two relationships has the reverse sign. Strict non-lenders follow a reverse pattern. He found 25 lenders and 18 strict non-lenders; the remaining 43 firms were classified as "others". Comparison was then made of the mean and median changes in R and LQ for all groups during the tight money period 1955 II to 1957 III. Three factors differentiated the lenders from the other groups. First, the mean change in R did not differ significantly from zero for non-lenders or others, but was clearly positive for lenders. Secondly, the mean change in R differed significantly from the mean change for non-lenders. Thirdly, all but one of the lenders increased R during the period, but only three of the non-lenders displayed this characteristic. Again, size of firm was the primary determinant that separated lenders from non-lenders. Comparisons made of the mean changes in liquidity positions between lenders and non-lenders displayed no significant difference.

Meltzer's results led him to conclude that while the initial impact of monetary policy would seem to favor large, more liquid firms, the mechanism of trade credit promotes an overall general impact. Mayer

(1966) has suggested that this conclusion must be qualified by two considerations. First, the cost of trade credit is much more expensive than the cost of bank loans, if one considers the implicit rate of interest on trade credit.[1] Second, since trade credit is a competitive weapon, it places smaller firms who find it harder to borrow at a competitive disadvantage relative to large firms. These considerations, Mayer maintained, show that monetary policy still discriminates against small firms and gives a competitive benefit to larger firms.

It is possible that Mayer's comments are considerably overstated. Note that many firms evidently utilize trade credit even when monetary policy is loose and funds freely available. Firms must therefore feel that trade credit possesses certain advantages despite the higher implicit interest cost. Also, it is not established that firms generally consider the implicit cost as a cost at all. Mayer's second point overlooks the ability of firms to pass on trade credit. As a matter of balance sheet arithmetic, the smaller firms conceivably could receive trade credit from larger firms, and pass it on to their customers, as trade or consumer credit, to support their sales.

In the preceding papers, the determinants of trade credit have been formulated without a strong theoretical framework. That is, the determinants have been suggested in an *ad hoc* manner. Nadiri (1969) has presented an analysis of trade credit that features an optimality model based on the theory of the firm. He examined the opportunity costs of

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[1] For a discussion of the implicit cost of trade credit, see Weston and Brigham (1968, pp. 348-50).

extending and receiving trade credit in a model which treated trade credit as a selling expense analogous to advertising.

The model was specified as follows. The quantity of sales is postulated as a function of product price, the volume of trade credit, and monetary policy:

$$q = f(p, TC, M) \tag{3.17}$$

Cost is a function of production cost, c(q), and selling expense, D:

$$C = c(q) + D \tag{3.18}$$

D is the sum of newly advanced trade credit, $\dot{TC}$, and the replacement of trade credit lost due to bad debts or other reasons. The replacement component of D is δTC, with δ being the rate of depreciation of trade credit. To find the optimal product price, maximize:

$$f_1(p, TC, M) = \int_0^{\infty} e^{-rt} \left[pf(p, TC, M) - c(q) - D\right] dt \tag{3.19}$$

subject to the constraint:

$$D = \dot{TC} + \delta TC \tag{3.20}$$

Once the optimal price has been obtained, the optimal level of trade credit is obtained by maximizing:

$$f_2(TC, M) = \int_0^{\infty} e^{-rt} \left[\hat{p}f(TC, M) - (r + \delta)TC\right]dt \tag{3.21}$$

The solution, taken from Nerlove and Arrow (1962), is:

$$\frac{\hat{TC}}{pq} = \frac{v}{\eta(r + \delta)} \tag{3.22}$$

where r is the rate of discount and v and η are elasticities of demand with respect to trade credit and price respectively. Nadiri concludes that in general:

$$\widehat{TC}_t = g(pq,\ u,\ M) \qquad (3.23)$$

where pq is sales and u is the user cost or opportunity cost of credit which equals $r + \delta$.

From the above, Nadiri formulates the hypotheses that (a) trade credit is positively related to sales, (b) trade credit is negatively related to user cost and (c) the effect of monetary policy cannot be specified *a priori* but depends upon how the demand and supply functions of trade credit shift.

Nadiri then sets out to identify the user or opportunity cost of trade credit. Three components are selected: (s), the adjusted carrying cost of trade credit, (δ) the rate of depreciation on trade credit and (LQ) the liquidity position of the firm, which is a proxy for the ability of the lender to finance receivables. Thus:

$$u = s + \delta + LQ \qquad (3.24)$$

Carrying costs (s_1) consist of interest foregone by tying up funds (r), adjusted for the normal capital gain or loss, and changes in the price level:

$$s_1 = r + \frac{\dot{P}_b}{P_b} + \frac{\dot{P}}{P} \qquad (3.25)$$

where r is the prime commercial rate.[1]

The carrying cost is also influenced by the discount period of the trade credit, which affects the creditor's carrying cost. Thus s_1 must be adjusted to obtain s:

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[1]Nadiri does not specify which prime rate he uses.

$$s = [\, 1 - \frac{t}{T} \,]\, s_1 \qquad (3.26)$$

where t is the discount period and T is the net period of credit. Finally, the depreciation rate of trade credit consists of two parts, the percent of bad debts and the delinquency rate on accounts outstanding.

The equations tested by Nadiri were:

$$AR_t = g_1(pq,\ u,\ M) \qquad (3.27)$$

$$AP_t = g_2(pq,\ u,\ M) \qquad (3.28)$$

Nadiri biased the results by searching for the most appropriate form for the estimating equations. They were:

$$\ln(AR_t) = a_o + a_1\ln(S_t) + a_2\ln(u_t) + a_3 d\ln(M_t) + a_4\ln(AR_{t-1}) \qquad (3.29)$$

$$\ln(AP_t) = b_o + b_1\ln(P_t) + b_2\ln(u_t) + b_3 d\ln(M_t) + b_4 on(AP_{t-1}) \qquad (3.30)$$

where S is sales and P is purchases. Nadiri tested four different indicators of monetary policy and found that the rate of change of the money supply yielded the best results.

Nadiri's results showed the elasticities of AR_t and AP_t, as given by the regression coefficients, with respect to S_t and P_t respectively, to be substantially different. He interpreted this to mean that "A unit increase in manufacturing sales to other sectors seems to generate more trade credit that a unit increase in sales of other sectors to the manufacturing sector" (Nadiri, 1969, p. 416). AR_t was negatively related to u, as predicted, and the relationship was stronger than that of u and AP_t, suggesting that as the cost of credit rises, manufacturers seem to increase payables and reduce or postpone extending receivables. The dominant influence in the user cost element was liquidity. Re-estimating the equation using only liquidity for user costs, the coefficients became larger and were significant in both equations. Thus liquidity appeared to be an important determinant of trade credit. Nadiri pointed out that the Durbin-Watson statistic indicated some serial correlation in the residuals. The Durbin-Watson statistic, however, is generally unreliable when the lagged dependent variable is present in the equation (Wallis, 1969).

To compare the results of his model with those of Meltzer, Nadiri reformulated the equations in terms of net trade credit:

$$\ln(AR_t - AP_t) = a_o + a_1\ln(S_t) + a_2\ln(u_t) + a_3 d\ln(M_t) + a_4\ln(AR_{t-1} - AP_{t-1}) \quad (3.31)$$

Nadiri found no strong evidence supporting the proposition that tighter money leads to an increase in net trade credit. Thus it would not add to inflationary pressure. Nadiri stated that his results differed from Meltzer's in two ways. First, he finds liquidity a significant determinant of trade credit and second, he does not find that net trade credit increases during tight money periods. These statements, however, misinterpret Meltzer's findings. Recall that in his first paper, Meltzer, using data from the same source as Nadiri, also found liquidity to be a significant factor in the determination of trade credit. In the same paper, he found the net trade credit-to-sales ratios increasing only for the two largest groups and one smaller group by asset size as monetary policy tightened. Nadiri's results are, therefore, not comparable to Meltzer's. In any case, Meltzer was more concerned with the reallocation of credit than with the aggregate relationship between the volume of net trade credit and monetary policy.

To make a comparison with Brechling and Lipsey, Nadiri ran the simple regression:

$$\ln(AR_t - AP_t) = b_o + b_1 \ln(S_t) + \text{residuals}. \qquad (3.32)$$

The residuals were plotted and compared with monetary policy. Nadiri noted that during most of the period, a tighter monetary policy was associated with a contraction of net trade credit, contrary to the findings of Brechling and Lipsey, using British data.

Nadiri's final conclusions were that: (1) Trade credit can be treated as a selling expense. (2) Accounts receivable, accounts payable and net trade credit all respond to changes in user costs. The effects of monetary policy are felt through the liquidity element. (3) Gross trade credit granted or received responds positively to changes in monetary policy, but net trade credit is insensitive. (4) The equations of accounts receivable and accounts payable respond differently to the determinants and should be examined separately. Simply estimating net trade credit conceals some of the dynamic behavior of the accounts.

CHAPTER IV. A MODEL OF TRADE CREDIT DETERMINATION

Comments on Previous Work

The work done by Meltzer (1960, 1963) is probably the best and most complete study to date on trade credit. Still, several points arise. First, Meltzer utilized ordinary least squares to test a model which is, by its nature, a simultaneous-equation system. To avoid the possibility of simultaneous-equation bias, a simultaneous-equation estimation method, such as two-stage least-squares, should have been employed.

Second, the formulation of the liquidity equation by Meltzer is an oversimplification. Although a good R^2 is obtained by using one dependent variable, namely monetary policy, the explanation of liquidity determination for businesses must be regarded as incomplete. The use of one explanatory variable is suitable to Meltzer's goal of linking monetary policy and trade credit; but a satisfactory answer to the issue demands a more complete specification.

Further, no sound justification is given by Meltzer for using an interest rate adjusted by the ratio of free reserves to total reserves as the indicator of monetary policy. The interest rate would be expected to rise during periods of tight money and the normal expectation would be for the ratio of free reserves to total reserves to fall. Superficially, the adjustment would appear to be a smoothing process of two separate monetary policy indicators.[1] This indicator is not necessarily incorrect,

[1]Hypothetically, use of interest rates of .02, .04 and .05 with ratios of .2, .1 and .05 respectively would yield identical levels of monetary policy.

but some justification should have been given for its use.[1] Finally, the primary purpose of Meltzer's model was not trade credit determination. Its intent was to show that there exists a relationship between monetary policy and trade credit which compensates, at least in part, for the differential effects of monetary policy. A more formal statement of trade credit determination was left for others. This was what Nadiri attempted to provide.

Nadiri's primary contribution lies in the introduction of trade credit as a decision variable in the firm's profit maximization scheme and in examining the opportunity costs of such credit. At this point, two criticisms of Nadiri's work can be made. The most serious shortcoming was the failure to test the model across data for all asset sizes available in the FTC-SEC Quarterly Financial Report for Manufacturing. Failure to do so makes some of his conclusions unjustifiable. Although the asset sizes themselves are aggregations, their use does add an extra dimension to the investigation that should not be overlooked. It is reasonable to expect that firms of different asset size differ in many other aspects as well, including the manner in which they conduct their trade credit operations. This is the essence of the Meltzer study. Thus, when Nadiri declared that net trade credit does not increase during tight money periods, he is unable to say anything about the reallocation of credit

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[1]This paper will utilize the loan-to-deposit ratio as a measure of overall credit availability. Since a bank's loans outstanding, relative to the deposits it possesses, is an indication of the bank's ability to lend further, this seems an appropriate measure.

between firms. By examining net trade credit by asset sizes, information of this nature can be derived. Much of this information is obscured by aggregation. Consequently, Nadiri's challenge to Meltzer's results are not well founded, especially when considered in light of the fact that Meltzer obtained similar results using similar data.

With respect to the elements of user cost, Nadiri found that only liquidity was a significant factor. On the basis of this finding, he declared user costs to be a significant factor. The results do not fully substantiate this position. While it cannot be denied that liquidity could be treated as a user cost, a valid theoretical question remains as to how businesses view the relationship between liquidity and the granting of trade credit. That is, since liquidity is the only significant element of user cost, might not managers be viewing it in an altogether different perspective? This paper will maintain that this is the case and will present an alternative hypothesis of the determination of trade credit.

Trade credit is granted to encourage or to maintain sales and thus to increase or to sustain profits. A question not easily answered is: What places constraints on the granting of trade credit, if anything? As long as credit-worthy customers exist and need trade credit to buy, the rational businessman would extend credit indefinitely in the absence of some constraints. Unless constraints exist, the decision to grant or not to grant trade credit would logically be a passive one.

It is plausible to view the trade credit mechanism as functioning within the wider scope of the firm's asset and liability management. The trade credit decision, whether active or passive, must relate not only to the firm's profit and sales goals but to the firm's asset and liability portfolio as well. It is in the latter area that the constraint on the granting of trade credit must lie.

Risk, Liquidity and Trade Credit

The volume of cash and government securities held by business firms depends upon the cash flows needed to maintain operations. The assets held to satisfy those needs take the form of a normal transactions balance and a contingency, or precautionary, balance. Short term government securities may well satisfy the latter requirement. The level of liquidity needed to satisfy these requirements also depends upon the variability of the firm's cash inflows. As the variability of the firm's cash inflows increases, the financial risk,[1] which must be covered by precautionary balances, increases also, *ceteris paribus*. Therefore, it would appear desirable for firms which experience high sales variability to maintain high liquidity levels to protect themselves from financial risk. Other considerations, however, work to mitigate this situation.

The trade credit policy of the firm should be jointly determined with the liquidity position. The decision to grant trade credit, *ceteris paribus*, is also a decision to reduce the firm's liquidity level. Granting trade credit involves a loss of liquidity that increases the

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[1]The term financial risk is used here to mean risk of firm failure resulting from financial causes.

firm's financial risk. Nonetheless, trade credit is a competitive device. Failure to grant trade credit may result in the loss of a sale to other competitors, especially in periods of tight money. Thus, the consideration of the firm's financial risk must be tempered by the consideration of its potential sales loss and the consequent reduction in cash flow if trade credit is not granted. Furthermore, if the firms have high sales variability, which results in high variation of cash inflows, they may look upon the granting of trade credit and the consequent lowering of the liquidity position as a method of stabilizing the variation.

This line of reasoning suggests that the firm may have some minimum level of liquidity below which it would prefer not to go. Until this level of liquidity is reached, the granting of trade credit may be a passive response to demand from credit-worthy customers. Given a supra-minimal level of liquidity, the firm would tend to give priority to both aspects of sales risk, especially since trade credit contributes directly to the primary goals of the firm--sales and profits. The financial risk would not be a significant constraint until the actual liquidity level of the firm was close to or below the minimum acceptable level. At this point, the firm's trade credit policy should become active rather than passive.

Note that in Nadiri's model, the relationship between liquidity and accounts receivable is expected to be negative and significant. Under the risk hypothesis, however, this would only be the case when firms either ignore financial risk or are considerably restrained by monetary policy. A positive association with accounts receivable would be consistent with the hypothesis that firms maintained near minimal liquidity levels when monetary conditions were easy. More logically, firms would decrease liquidity somewhat, but perhaps not significantly if they feared financial risk.

Thus, the level of liquidity is a factor in trade credit determination but is itself subject to many interrelated forces. The model presented below will incorporate liquidity as a possible constraint on the granting of trade credit. The question yet to be raised is: Does the liquidity level of firms actually reach such low levels that it serves as a significant constraint to the granting of trade credit? The answer to this question has important consequences for the effectiveness of monetary policy.

The purpose of a restrictive monetary policy is, in general, to eliminate the marginal borrower from the market for loanable funds and, thus, to restrict the growth of aggregate demand. In this context, the marginal borrower can be viewed as one who proposes to debt-finance an expenditure which promises only a marginal contribution to the growth in aggregate supply. Marginal borrowers, by this definition, are so classified according to the projects they propose to undertake through debt-financing. A general monetary policy should not, therefore, systematically exclude particular types of firms or individuals in each tight money period. When such an exclusion occurs, monetary policy is said to operate in a discriminatory manner or that differential effects arise from the exercise of monetary policy. It is this sort of effect which Galbraith (1957) claimed, which Christian and Mazek (1969) and Silber and Polakoff

(1970) supported empirically. Meltzer (1960, 1963) argued, however, that the trade credit mechanism compensated for these discriminatory effects. In particular, Meltzer showed that a restrictive monetary policy would have the effect of redistributing liquidity from the large firms who received favored treatment by the banking system to the smaller firms who were discriminated against. It has been hypothesized above, however, that firms, even large firms, may have a minimum acceptable level of liquidity, which corresponds to some maximum acceptable level of financial risk. There also exists, by hypothesis, a maximum acceptable level of sales risk. Under conditions of a restrictive monetary policy, the extent to which the trade credit mechanism compensates for a discriminatory allocation of financial resources by the bank credit mechanism should depend significantly upon the lending firms' relative sensitivity to financial risk and sales risk. A lending firm which is relatively sensitive to sales risk should display a much stronger propensity to extend trade credit during tight money periods than one which is sensitive to financial risk. Thus, as the relative sensitivity of firms to sales risk increases, their use of the trade credit mechanism to compensate for the discriminatory effects of monetary policy should increase also.

The Model

Within the framework presented above, it is hypothesized that there exists an optimal or desired level of trade credit for the business firm. Since, in a given period, the firm may not achieve this desired level, its reaction is assumed to follow a partial adjustment scheme. Thus, the change in accounts receivable in time period t is expressed as:

$$(AR_t - AR_{t-1}) = (1-\lambda)(AR_t^* - AR_{t-1}) \tag{4.1}$$

where AR_t^* is the desired level of accounts receivable, λ is the partial adjustment coefficient and AR_{t-1} is the level of accounts receivable in the previous period. The desired level of accounts receivable is treated as a function of sales (S) and the firms liquidity position (LQ), giving:

$$AR_t^* = \emptyset_1 S_t + \emptyset_2 LQ_t \tag{4.2}$$

The liquidity position, as in the previous studies mentioned, is defined as the quick asset ratio; the ratio of cash plus government security holdings to current liabilities. Substituting 4.2 into 4.1, and solving for accounts receivables yields:

$$AR_t = \emptyset_1(1-\lambda)S_t + \emptyset_2(1-\lambda)LQ_t + \lambda AR_{t-1} \tag{4.3}$$

But liquidity itself is a jointly dependent variable in the model. The optimal, or desired, level of liquidity is hypothesized to be a function of the expected availability of bank credit to the firm and the sales variance the firm normally experiences. The measure of credit availability to the firm employed in this study is the loan-to-deposit ratio (L/D). No *a priori* sign will be attached to the relationship between desired liquidity and the expected loan-to-deposit ratio because two opposing forces are at work. If the firm places emphasis on the financial risk aspect, it would desire to increase liquidity, or at least protect it, when tighter monetary conditions were expected. But if the firm is feeling relatively strong sales risk pressures, it would be willing to deplete its liquidity position if necessary.

Similarly, the sign on sales variance will not be assigned a priori. The firm's reaction to high sales variance is influenced by dual and opposing considerations. If the firm increases its liquidity level in response to high sales variability, hence high cash flow variability, it is indicating that it is sensitive to financial risk. If the firm decreases its liquidity level as sales variance increases, sensitivity to sales risk is indicated if the firm is increasing its trade credit at the same time. In the current period, it would be logical to expect a negative relationship between sales variance and liquidity in any case, since sales variance contributes directly to variation in the firm's cash inflows. Thus, the comparison of liquidity with lagged sales variance may say more about the relationship between sales risk and financial risk than comparison with current period sales variance.

Thus, desired liquidity at time t (LQ_t^*) is formulated as:

$$LQ_t^* = \alpha_1 (L/D)_t^{**} + \alpha_2 V_t \tag{4.4}$$

where $(L/D)_t^{**}$ is the loan-to-deposit ratio expected in time $t-1$ to prevail in period t, and V_t is the sales variance for period t.

Similar to accounts receivable, the firm is hypothesized to have a desired level of liquidity. When the desired level of liquidity is not attained, the firm is assumed to adjust partially in the following manner:

$$(LQ - LQ_{t-1}) = (1-\rho)(LQ_t^* - LQ_{t-1}) \tag{4.5}$$

where ρ is the adjustment coefficient. Substituting 4.4 into 4.5 and solving for liquidity yields:

$$LQ_t = (1-\rho)\alpha_1(L/D)_t^{**} + (1-\rho)\alpha_2 V_t + \rho LQ_{t-1} \tag{4.6}$$

Assuming that the expected loan-to-deposit ratio for the next period follows adaptive expectations gives:

$$[(L/D)_t^{**} - (L/D)_{t-1}^{**}] = (1-\mu)\ [(L/D)_t - (L/D)_{t-1}^{**}] \tag{4.7}$$

where μ is the adjustment coefficient. Solving 4.7 for the expected loan-to-deposit ratio yields:

$$(L/D)_t^{**} = (1-\mu)(L/D)_t + \mu(L/D)_{t-1}^{**} \tag{4.8}$$

Expressing 4.6 as the <u>t-1</u> period equation, the liquidity equation becomes:

$$LQ_{t-1} = (1-\rho)\alpha_1(L/D)_t^{**} + (1-\rho)\alpha_2 V_{t-1} + \rho LQ_{t-2} \tag{4.9}$$

Solving for the expected loan-to-deposit ratio yields:

$$(L/D)_{t-1}^{**} = \frac{1}{(1-\rho)\alpha_1} LQ_{t-1} - \frac{\alpha_2}{\alpha_1} V_{t-1} - \frac{\rho}{(1-\rho)\alpha_1} LQ_{t-2} \tag{4.10}$$

Substituting 4.10 into 4.8 gives:

$$(L/D)_t^{**} = (1-\mu)(L/D)_t + \frac{\mu}{(1-\rho)\alpha_1} LQ_{t-1} - \frac{\mu\alpha_2}{\alpha_1} V_{t-1} - \frac{\mu\rho}{(1-\rho)\alpha_1} LQ_{t-2} \tag{4.11}$$

Substituting 4.11 into 4.6 gives:

$$LQ_t = (1-\rho)\alpha_1(1-\mu)(L/D)_t + \mu LQ_{t-1} - (1-\rho)\mu\alpha_2 V_{t-1} + (u+\rho)LQ_{t-1}$$

$$-\mu\rho LQ_{t-2} + (1-\rho)\alpha_2 V_t \tag{4.12}$$

Collecting terms, the equation for liquidity becomes:

$$LQ_t = (1-\rho)\alpha_1(1-\mu)(L/D)_t + (1-\rho)\alpha_2 V_t - (1-\rho)\mu\alpha_2 V_{t-1} + (\mu+\rho)LQ_{t-1} - \mu\rho LQ_{t-2} \quad (4.13)$$

Forming a recursive two equation simultaneous system for the joint determination of liquidity and accounts receivable results in the following model:

$$u_1 = LQ_t + \beta_{12}V_t + \beta_{13}V_{t-1} + \beta_{14}LQ_{t-1} + \beta_{15}LQ_{t-2} + \beta_{16}(L/D)_t \quad (4.14)$$

$$u_2 = \beta_{21}\widehat{LQ} + AR_t + \beta_{27}S_t + \beta_{28}AR_{t-1} \quad (4.15)$$

The reduced form of the accounts receivable equation is:

$$AR_t = \phi_1(1-\lambda)S_t + \phi_2(1-\lambda)[(1-\rho)\alpha_1(1-\mu)\ (L/D)_t + (\mu+\rho)LQ_{t-1} - \mu\rho LQ_{t-2} + (1-\rho)\mu\alpha_2 V_{t-1}] + \lambda AR_{t-1} \quad (4.16)$$

The model also was reformulated and tested in terms of net receivables. The empirical results and comparisons of both forms are presented in the next chapter.

CHAPTER V. EMPIRICAL RESULTS

The data used for the analysis were taken from the FTC-SEC Quarterly Financial Reports for Manufacturing Corporations with the exception of the loan-to-deposit ratio, which was compiled from various issues of the Federal Reserve Bulletin. Observations cover forty quarters from 1960 II through 1970 I. The sales variance variable was computed by taking a twelve quarter moving variance based on current sales and the sales of the previous eleven quarters.

After the tests were run on the full forty quarters, the period was divided into two subperiods of twenty quarters each. Subperiod I covers 1960 II through 1965 I and subperiod II covers 1965 II through 1970 I. First, dividing the period allows comparison of empirical results for periods in which monetary policy was clearly different, and thus provides additional information concerning the effect of monetary policy on trade credit. The first subperiod is one of monetary ease almost throughout. The second subperiod is marked by monetary restraint, especially in the years 1966, 1968 and 1969.[1]

Second, the results of the full period tests were in conflict with the findings of other studies, which suggests that the relationships may not be stable. Testing across two periods with different degrees of monetary restraint provides evidence on the stability of the functions.

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[1]For a good discussion of the status of monetary policy during the period 1960-68, see Hart, et al., (1969).

The results of the regression equations are presented in Tables 1 through 10. Table 1 contains the results for the total manufacturing sector in the aggregate. For convenience, the tables for the asset sizes are ordered by dependent variables. Table 2 contains the results for the full period stage two liquidity equation; Tables 3 and 4 contain the results for subperiods I and II respectively. Tables 5, 6 and 7 are the results of the stage two accounts receivable equations in the same order and Tables 8, 9 and 10 are the results for the stage two net receivables equations similarly arranged.

The asset sizes, in dollars, are abbreviated as follows:

LOM - less than one million

OFM - one-to-five million

FTM - five-to-ten million

TTF - ten-to-twenty-five million

TFF - twenty-five-to-fifty million

FOH - fifty-to-one-hundred million

HTF - one-hundred-to-two-hundred-fifty million

TFB - two-hundred-fifty million-to-one billion

OOB - over one billion

TOT - totals, all asset sizes.

Equations for Total Manufacturing

<u>Liquidity equation (4.13)</u>

The results for manufacturing corporations in the aggregate appears in Table 1. In examining the liquidity equation for the full period,

Table 1. Regression results for the total manufacturing sector[a]

A. Liquidity equation (4.13)

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D	$\bar{R}^2$
Full period	-.001 (3.90)	.0004 (2.50)	.988 (5.57)	-.263 (1.56)	-.024 (0.22)	.99
Subperiod I	.002 (1.16)	-.001 (0.54)	.481 (1.22)	-.620 (1.39)	.313 (0.79)	.82
Subperiod II	-.0005 (2.39)	.0002 (0.54)	.731 (1.98)	-.174 (0.58)	-.156 (0.99)	.98

B. Accounts receivable equation (4.15, Stage 2)

	S_t	AR_{t-1}	$\widehat{LQ}$	$\bar{R}^2$
Full period	.140 (3.68)	.895 (17.08)	15.974 (3.32)	.99
Subperiod I	.270 (1.51)	.031 (0.07)	-2.313 (0.21)	.99
Subperiod II	.134 (2.15)	.936 (8.71)	19.874 (2.24)	.99

C. Net receivables equation (4.15 modified for net receivables, Stage 2)

	S_t	$(AR-AP)_{t-1}$	$\widehat{LQ}$	$\bar{R}^2$
Full period	.069 (1.31)	.801 (4.85)	6.537 (0.97)	.99
Subperiod I	.199 (1.92)	.326 (0.83)	11.536 (1.17)	.98
Subperiod II	.077 (1.05)	.713 (2.60)	2.807 (0.24)	.99

[a]"t" values in parentheses.

sales variance, lagged sales variance, and lagged liquidity are significant at the 5% level.[1] The loan-to-deposit ratio is negative but far from significant. Thus, manufacturing firms in the aggregate appear willing to lower liquidity levels, but not significantly, as monetary policy tightens. Examination of the mean elasticities of the equations, for the full period and both subperiods, in Appendix A, Tables 12, 13 and 14 reveal that inordinately large movements of the loan-to-deposit ratio are required to influence liquidity.

Comparison of the results for the two subperiods reveals a positive, but nonsignificant relationship between liquidity and the loan-to-deposit ratio in subperiod I and a negative but nonsignificant relationship in subperiod II. Thus, the relationship changes from positive to negative in moving from a period of monetary ease to a period of monetary restraint. This finding indicates that monetary policy is felt to some extent by manufacturing firms, but the fact that neither coefficient is significant considerably weakens the force of this evidence.

The results do tend to support the hypothesis that financial risk is considered by business firms. The evidence indicates that firms are willing to lower liquidity levels but that they also attempt to prevent liquidity from falling below minimal levels. The move to protect liquidity is supported by the sales variance results described below. If at the same time, firms decrease their responsiveness to the demand for trade

[1]Significance levels are quoted for the one tail test for variables which have their signs predicted *a priori* and for the two tail test for those which do not. The variables with *a priori* signs are lagged liquidity, two period lagged liquidity, sales, lagged receivables, and lagged net receivables.

credit during tight money periods the risk hypothesis will have substantial support. Results supporting this hypothesis will be presented below.

As hypothesized, the coefficient of the lagged sales variance changes signs from that of the current sales variance. The negative sign for coefficients on all but one (TTF) of the asset sizes for current sales variance indicates that firms experiencing high sales variance are unable to prevent their liquidity from dropping, or at least that they do not attempt to avoid it immediately. The inability to maintain liquidity may result from the cash flow variation produced by the sales variation. By the next period firms appear to have sufficiently recovered their liquidity positions; lagged sales variance is positively associated with liquidity in the equation for the full period. The positive association indicates that firms seek to maintain liquidity levels and that they do move to restore lost liquidity fairly rapidly. These results are consistent with the risk hypothesis.

Further support for the risk hypothesis appears in the subperiod equations for liquidity. For the sales variance variables in subperiod II, the same relationship appears to hold true that was indicated for the full period, although the coefficient of lagged sales variance is not significant. The nonsignificant coefficient might be interpreted as evidence that restrictive monetary policy restrains firms from fully recovering their liquidity levels. The results for subperiod I are distinctly different from the full period and subperiod II. The signs on the coefficients of sales variance and lagged sales variance are reversed and neither is significant. The reversal of signs supports the view that firms are not overly concerned with their liquidity position in periods of monetary ease. Thus, financial risk would not be as strong a consideration in easy money periods since funds are more easily obtainable.

Accounts receivable equation (4.15)

For the full accounts receivable equation, all three independent variables are positive and significant at the 1% level. The major point of interest here is the relationship between liquidity and the level of accounts receivable. The positive relationship stands in direct contradiction to the findings of Nadiri (1969) who observed a negative and significant relationship.[1] For subperiod II, the results are similar to the full period, although sales and liquidity are significant only at the 5% level.

For subperiod I, the results are reversed. There is a negative but nonsignificant relationship between liquidity and accounts receivable. The sales coefficient is significant only at the 10% level and the coefficient for lagged accounts receivable is not significant at all. The change of sign on the coefficients for liquidity between the two subperiods provides additional support for the risk hypothesis. In the easy money period, manufacturing firms in the aggregate were willing to decrease liquidity to increase trade credit. In the tight money period, firms were willing to increase trade credit if liquidity increased

[1]Two factors may contribute to the difference in results. One, the time periods involved are different, although there is a four year overlap. Secondly, Nadiri stated that he used seasonal dummies, but does not state if he used a trend dummy. If not, this could account for some, if not most, of the difference. Liquidity levels for firms have trended downward, while levels of accounts receivable have grown.

also.

The low level of significance for the sales coefficient could be the result of a somewhat passive response for the trade credit decision during expansive, easy money periods. The availability of credit in general and the lack of demand for trade credit during such periods may be strong contributory factors in creating a passive response to the granting of trade credit.

Net receivables equation (4.15 modified for net receivables)

The full period net receivables equation does not display the high significance levels that the accounts receivables equation does. Liquidity is not significantly associated with net receivables and the coefficient of sales would be significant only at levels beyond 10%, which are normally not acceptable. The results for the subperiods are similar. In subperiod I, sales is significant at the 10% level and lagged net receivables is nonsignificant. Subperiod II reveals results very close to those for the full period. The signs of the coefficients remain positive on all three independent variables for the full period and both subperiods.

Results by Asset Sizes

Liquidity equation (4.13)

The adjusted coefficients of determination ($\bar{R}^2$) exhibited by the results are generally high. An exception to the rule is found in the liquidity equation for the LOM asset size, in both subperiods and the full period. The general decline in the $\bar{R}^2$ experienced in the two periods is largely the result of the adjustment for degrees of freedom.

Table 2. Regression results by asset sizes: liquidity equation (4.13), full period

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D	$\bar{R}^2$
LOM	-.003 (.38)	.008 (1.01)	.106 (.58)	-.048 (.27)	-.246 (2.30)	.30
OFM	-.039 (2.41)	.035 (2.09)	.540 (2.87)	-.173 (.83)	-.056 (.45)	.94
FTM	-.249 (1.28)	.348 (1.87)	.725 (3.85)	.051 (.26)	-.011 (.05)	.95
TTF	.089 (.75)	-.265 (2.13)	.126 (.78)	.092 (.62)	-.483 (1.82)	.94
TFF	-.193 (1.33)	.053 (.35)	.616 (3.32)	-.298 (1.55)	-.105 (.76)	.97
FOH	-.088 (.62)	-.043 (.32)	.644 (3.39)	.044 (.22)	.258 (.87)	.96
HTF	-.061 (2.34)	.054 (2.17)	.239 (1.07)	.431 (1.90)	-.251 (1.71)	.98
TFB	-.003 (.44)	.002 (.35)	.694 (3.11)	.002 (.01)	-.091 (.50)	.93
OOB	.001 (1.22)	-.001 (.83)	1.011 (5.70)	-.120 (.64)	-.206 (.70)	.98

Table 3. Regression results by asset sizes: liquidity equation (4.13) subperiod I

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D	$\bar{R}^2$
LOM	.005	.014	-.017	-.067	-.381	.29
	(.24)	(.60)	(.05)	(.18)	(1.08)	
OFM	-.004	.003	.010	-.044	.155	.96
	(.19)	(.13)	(.03)	(.15)	(1.13)	
FTM	-.551	.921	.317	-.299	-.973	.92
	(1.79)	(2.91)	(1.19)	(1.15)	(2.24)	
TTF	-.188	.039	1.022	-.286	-.103	.87
	(.93)	(.18)	(3.85)	(1.40)	(.27)	
TFF	.137	.407	.472	-.090	-1.609	.91
	(.35)	(1.05)	(1.13)	(.27)	(2.35)	
FOH	-.307	.288	.750	-.191	.993	.90
	(.69)	(.76)	(2.26)	(.68)	(1.19)	
HTF	-.078	-.007	-.052	-.293	.724	.94
	(1.71)	(.17)	(.15)	(.86)	(1.87)	
TFB	-.071	.038	.408	.153	1.089	.87
	(2.07)	(1.46)	(1.10)	(.41)	(2.16)	
OOB	.014	.010	.342	.016	-.424	.88
	(1.96)	(.81)	(.98)	(.06)	(.57)	

Table 4. Regression results by asset sizes: liquidity equation (4.13), subperiod II

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D	$\bar{R}^2$
LOM	-.002 (.15)	.007 (.47)	.147 (.47)	-.080 (.23)	-.275 (1.33)	.45[a]
OFM	.018 (.57)	-.033 (.96)	.348 (1.26)	-.335 (1.17)	-.650 (2.36)	.72
FTM	-.091 (.48)	.007 (.03)	.440 (1.60)	.035 (.13)	-.685 (2.44)	.75
TTF	.220 (.66)	-.519 (1.65)	-.297 (1.08)	-.136 (.55)	-.373 (.52)	.70
TFF	-.315 (1.55)	-.019 (.09)	.684 (2.28)	-.411 (1.46)	-.176 (1.03)	.88
FOH	.0002 (.002)	-.095 (.87)	.544 (1.79)	.067 (.26)	-.051 (.20)	.86
HTF	-.052 (1.89)	.022 (.78)	.231 (.60)	.038 (.14)	-.457 (2.08)	.93
TFB	-.013 (2.10)	.010 (1.54)	.352 (1.34)	.171 (.63)	-.096 (.45)	.87
OOB	.0003 (.13)	-.0005 (.28)	.898 (2.60)	.118 (.26)	-.356 (.80)	.95

[a]This is R^2 for LOM, not $\bar{R}^2$.

For the full period, the coefficient for sales variance displays a negative sign in seven of the nine asset sizes. Only the coefficients for TTF and the largest asset size, OOB, are positive. Only two of the nine are significant at the 10% level. As with the results for total manufacturing, most of the asset sizes appear to be unable or unwilling to maintain liquidity levels when sales variance is high. One interpretation of this finding is that firms must cover fixed commitments as inflows vary. The firms appear, however, to be able to recover their liquidity positions within one quarter, as evidenced by the positive coefficients on lagged sales variance for six of the nine asset sizes. three of the six are significant at the 10% level. The two asset groups which displayed positive coefficients for sales variance had negative coefficients for lagged sales variance.

The conclusions reached by examining the liquidity equation for total manufacturing are generally supported by the asset sizes equations. Firms recovering liquidity, in lagged response to increased sales variance, is taken as evidence of consideration of financial risk. The subperiod results are also consistent with the equations for total manufacturing.

For subperiod I, only one asset size, HTF, has a negative coefficient for lagged sales variance. But even this coefficient shows a positive movement relative to the current sales variance. Subperiod II reveals five negative coefficients for lagged sales variance. This finding indicates that recovery or building of the liquidity position is restrained more during tight money periods. The fact that four of the coefficients on sales variance are positive and turn negative for lagged sales variance does not, however, support this view.

For the loan-to-deposit ratio, only the smallest asset size, LOM, displays a coefficient which is significant at approximately the 5% level. Eight of the nine coefficients are negative. The connection between liquidity and credit availability shows a fairly sharp contrast between the two subperiods. In subperiod I only five of the nine asset sizes have negative coefficients for the loan-to-deposit ratio; two of these are significant at the 5% level. In subperiod II, all nine of the coefficients are negative with three significant. In subperiod I, four of the five smallest asset sizes have negative coefficients for the loan-to-deposit ratio, but only one of the four largest, OOB, is negative. In subperiod II, the t values for the three smallest asset sizes are generally larger than the t values for the larger asset sizes.

The results lend support to the view that monetary policy is effective in influencing the liquidity levels of manufacturing firms. Furthermore, the evidence indicates that the influence is strongest on the smallest asset sizes. The influence, however, is mild, as shown by the number of non significant coefficients for the loan-to-deposit ratio.

<u>Accounts receivable equation (4.15)</u>

In the accounts receivable equation for the full period, the coefficient of sales is positive and significant at the 1% level for all asset sizes. The coefficient for lagged accounts receivable is positive

Table 5. Regression results by asset sizes: accounts receivable equation (4.15), full period

	S_t	AR_{t-1}	$\widehat{LQ}$	$\bar{R}^2$
LOM	.292 (8.23)	.124 (1.22)	5.660 (2.11)	.98
OFM	.175 (4.49)	.247 (2.20)	-4.877 (3.23)	.99
FTM	.272 (3.91)	.129 (.97)	-.897 (1.48)	.97
TTF	.281 (6.70)	.476 (4.56)	1.009 (2.21)	.99
TFF	.333 (4.49)	.382 (3.21)	-.754 (.74)	.98
FOH	.293 (4.38)	.689 (6.03)	1.360 (2.66)	.98
HTF	.313 (5.08)	.352 (3.00)	1.638 (1.05)	.99
TFB	.153 (2.69)	.855 (12.60)	4.865 (1.79)	.99
OOB	.167 (2.30)	.747 (6.27)	.127 (.06)	.99

Table 6. Regression results by asset sizes: accounts receivable equation (4.15), subperiod I

	S_t	AR_{t-1}	$\widehat{LQ}$	$\bar{R}^2$
LOM	.152 (1.57)	.529 (2.20)	-2.535 (.46)	.95
OFM	.324 (4.65)	.197 (1.63)	2.246 (.33)	.99
FTM	.380 (8.54)	.101 (.85)	.227 (.81)	.99
TTF	.201 (1.20)	-.092 (.45)	-3.059 (1.11)	.97
TFF	.506 (4.58)	-.340 (1.79)	-1.744 (1.72)	.98
FOH	.358 (2.02)	.536 (1.37)	.379 (.34)	.88
HTF	.291 (2.19)	.325 (1.71)	2.388 (.70)	.98
TFB	.324 (3.68)	.272 (1.06)	2.292 (1.13)	.98
OOB	.138 (1.44)	.211 (.84)	-.076 (.04)	.99

Table 7. Regression results by asset sizes: accounts receivable equation (4.15), subperiod II

	S_t	AR_{t-1}	$\widehat{LQ}$	$\bar{R}^2$
LOM	.322 (12.45)	-.102 (1.31)	-3.622 (2.46)	.98
OFM	.224 (3.00)	.202 (1.00)	-6.539 (2.61)	.94
FTM	.299 (4.04)	-.245 (1.53)	-3.864 (4.65)	.89
TTF	.274 (3.53)	.481 (2.81)	.467 (.68)	.94
TFF	.306 (5.02)	.283 (3.08)	-2.790 (4.43)	.95
FOH	.344 (4.76)	.592 (4.85)	1.526 (1.72)	.99
HTF	.371 (4.72)	.047 (.16)	-1.119 (.34)	.97
TFB	.203 (1.38)	.548 (1.98)	-6.179 (.77)	.98
OOB	-.102 (.94)	.161 (.06)	19.036 (2.80)	.99

and significant at the 5% level for all but two of the asset groups, LOM and FTM. The most interesting results, however, are found in the coefficients and significance levels of the liquidity variable. Evidence that monetary policy exerts discriminatory effects can be noted in the full period results. Comparison of the two subperiods strongly reinforces this interpretation.

In the full period equation, six of the nine coefficients for liquidity are positive. Three of these, LOM, TTF, and FOH, are significant at the 10% level. Three of the five smallest asset groups have negative signs for the liquidity coefficient, but none of the four largest asset groups display this characteristic. The results are more striking by contrast of the two subperiods.

In subperiod I, the coefficient for liquidity is negative for four sizes but nonsignificant in all sizes. As expected, liquidity appears not to have been a constraint on the granting of trade credit during the period of monetary ease. For subperiod II, however, six of the nine asset sizes have negative coefficients for liquidity and four of these are significant at the 5% level. More importantly, the four significant sizes are among the five smallest asset groups, including the three smallest asset sizes. Only two of the four largest asset sizes have negative coefficients for liquidity, and neither is significant.

When the results of the subperiod II accounts receivable equation are coupled with the results of the subperiod II liquidity equation findings for the loan-to-deposit ratio, the evidence that monetary policy exerts discriminatory effects is quite strong. The ability of the smaller firms to grant trade credit seems to be noticeably restrained by liquidity considerations. The larger asset groups apparently were not subjected to the same constraint. Firms in the largest asset group, OOB, were apparently able to increase liquidity relative to their granting of trade credit.

Net receivables equation (4.15 modified for net receivables)

The net receivables results reveal an interesting relationship between sales and net receivables. As previously noted, manufacturing firms should display a reasonably strong relationship between net receivables and sales since they are generally net lenders on trade account. For the full period, the coefficient on sales is positive and significant at the 5% level for only six of the nine asset sizes. For subperiod I this relationship is true for only two asset sizes and for subperiod II for only four asset sizes. Note that in subperiod II, one size, the largest, has a negative coefficient for sales that would be significant at the 5% level for the two tail test. None of the three largest asset sizes display significant and positive sales coefficients. Thus, sales do not appear to dominate the level of net receivables.

Liquidity appears even weaker. The movements of liquidity with relation to movements of net receivables, however, can be somewhat misleading due to the composition of the two variables. If firms increase net receivables by extending more trade credit than they take, their liquidity level, *ceteris paribus*, should fall; an inverse relationship

Table 8. Regression results by asset sizes: net receivables equation (4.15 modified for net receivables), full period

	S_t	$(AR-AP)_{t-1}$	$\widehat{LQ}$	$\bar{R}^2$
LOM	.051 (2.55)	.452 (3.09)	5.765 (2.57)	.97
OFM	-.004 (.07)	.375 (2.12)	-2.713 (.94)	.84
FTM	.176 (3.45)	.434 (4.06)	-.059 (.17)	.90
TTF	.175 (5.88)	.243 (1.97)	.759 (2.60)	.98
TFF	.174 (2.48)	.617 (5.44)	-.218 (.26)	.96
FOH	.292 (6.35)	.366 (3.20)	.672 (1.93)	.98
HTF	.077 (1.51)	.494 (3.79)	-1.119 (.76)	.99
TFB	.060 (.86)	.828 (6.93)	1.053 (.36)	.99
COB	.164 (2.98)	.357 (1.79)	.376 (.18)	.98

Table 9. Regression results by asset sizes: net receivables equation (4.15 modified for net receivables), subperiod I

	S_t	$(AR\text{-}AP)_{t-1}$	$\widehat{LQ}$	$\overline{R}^2$
LOM	.030 (.44)	.712 (2.76)	.746 (.12)	.90
OFM	.070 (.61)	.580 (1.69)	3.943 (.31)	.92
FTM	.224 (4.73)	.204 (1.11)	.486 (1.73)	.97
TTF	-.067 (.36)	-.177 (.70)	-3.385 (1.22)	.91
TFF	.222 (1.63)	-.136 (.43)	-.713 (.54)	.94
FOH	.209 (1.54)	.406 (1.47)	.821 (1.66)	.91
HTF	.059 (.57)	.754 (4.01)	1.170 (.38)	.95
TFB	.242 (2.52)	.315 (.63)	.176 (.06)	.90
OOB	.032 (.37)	.179 (.38)	-.230 (.11)	.94

Table 10. Regression results by asset sizes: net receivables equation (4.15 modified for net receivables), subperiod II

	S_t	$(AR-AP)_{t-1}$	$\widehat{LQ}$	$\overline{R}^2$
LOM	.082 (3.34)	.101 (.45)	7.297 (3.23)	.94
OFM	.025 (.19)	.418 (1.38)	-.993 (.20)	.22
FTM	.131 (1.67)	.423 (2.17)	-.295 (.47)	.49
TTF	.165 (3.19)	.222 (1.05)	.546 (1.43)	.91
TFF	.165 (2.46)	.387 (2.81)	-1.228 (2.04)	.83
FOH	.360 (5.35)	.219 (1.25)	-.833 (.72)	.94
HTF	.051 (1.00)	-.129 (.57)	-2.999 (1.87)	.96
TFB	.143 (1.28)	.224 (.87)	-9.431 (1.93)	.98
OOB	-.227 (2.52)	.007 (.03)	14.44[illegible] (3.71)	.99

should be noted. On the other hand, if firms decrease net receivables by taking more trade credit than they grant, the result, ceteris paribus, would also be a lowered liquidity level. Decreasing net receivables in this manner would increase the denominator of the liquidity ratio. Thus, it is impossible to determine a priori which relationship should be normal.

Liquidity coefficients in the full period net receivables equation are positive and significant just beyond the 5% level for three asset groups. The coefficient is negative and significant for one asset size. No clear pattern emerges. In subperiod I, none of the asset sizes have a significant coefficient for liquidity, and in subperiod II only one size, LOM, has a significant coefficient at the 5% level. The coefficient is positive. Thus liquidity, again contrary to the findings of Nadiri (1969), does not appear to be a significant factor in the determination of net receivables.

Additional Evidence Relating to the Effectiveness of Monetary Policy

In addition to the previously mentioned effects of monetary policy on liquidity, the ability of monetary policy to affect the levels of trade credit granted will be examined. Under the hypothesis presented regarding financial risk, sales risk, and minimum levels of liquidity, the normal response of firms to tighter monetary conditions would be to increase their levels of trade credit granted until liquidity became a restraining factor. Breaking the full period into two equal subperiods with differing monetary policy emphasis allows a convenient comparison.

This comparison is made in terms of the changes in the reduced form mean elasticities of accounts receivable with respect to the loan-to-deposit ratio. During subperiod I, when easy monetary conditions prevailed, it would be expected that the supply of trade credit would be highly responsive to the demand for trade credit. The financial risk factor would not be a strong influence. During subperiod II, with tight monetary conditions prevailing, the financial risk factor would be stronger. Hence, a lessening of the responsiveness of the supply of trade credit to its demand would be expected as monetary conditions tightened. The difference in the mean elasticities of accounts receivable with respect to the loan-to-deposit ratio between the two subperiods should indicate the change in the responsiveness of the supply of trade credit to the demand for trade credit as monetary conditions tightened.

The mean elasticities are found in Appendix A, Tables 25, 26 and 27. The differences between the two periods have been computed and are presented in Table 11. The total manufacturing sector and six of the nine asset sizes show a decreased tendency to increase trade credit as monetary policy tightened from relative ease to relative restraint.

Also in Table 11 are the changes in the mean elasticities between the two subperiods for net receivables with respect to the loan-to-deposit ratio. The change is negative for the total manufacturing sector and for five of the nine asset sizes. Four asset groups tended to increase their granting of net trade credit when monetary conditions tightened.

Table 11. Changes in mean elasticities between subperiods for the loan-to-deposit ratio

Asset size	Mean elasticity difference AR and L/D	Increase or decrease in responsiveness	Mean elasticity difference (AR-AP) and L/D	Increase or decrease in responsiveness
LOM	-.0965	Decrease	-.4712	Decrease
OFM	.4134	Increase	-.0077	Decrease
FTM	.7605	Increase	.3338	Increase
TTF	-.0976	Decrease	-.1847	Decrease
TFF	-.5344	Decrease	.4679	Increase
FOH	-.0824	Decrease	-.2328	Decrease
HTF	.7236	Increase	.0360	Increase
TFB	-.1440	Decrease	.0473	Increase
OOB	-.2135	Decrease	-.3560	Decrease
TOT	-.0201	Decrease	-.1099	Decrease

Although most asset sizes had positive relationships between accounts receivable and the loan-to-deposit ratio during both periods,[1] the positive responsiveness to demand was in general less in the tight money period than in the easy money period. Only two asset sizes, FTM and HTF increased responsiveness in both accounts receivables and net receivables. Changes in the mean elasticities between liquidity and both accounts receivable and net receivables[2] indicate that these asset groups

[1]See Appendix A, Tables 26, 27, 29 and 30.

[2]See Appendix A, Tables 16 and 18.

allowed their liquidity levels to fall as a result. Thus monetary policy was felt but was not effective in reducing either receivables or net receivables for these two asset sizes. The evidence supports the conclusion that monetary policy did restrict the granting of both gross and net trade credit, but because of the levels of significance exhibited by the variables, the degree of restriction does not appear to have been severe.

Evidence Relating to Credit Reallocation

Table 11 can also be used to compare the results of the tests with those obtained by Meltzer (1960, 1963). A positive difference in the mean elasticities for the two subperiods between net receivables and the loan-to-deposit ratio implies that firms were more responsive to demand in granting net trade credit during the tight money period. A negative difference implies less responsiveness.

For the total manufacturing sector, responsiveness decreased, indicating that monetary policy was effective in reducing the granting of net trade credit overall. Overlooking the largest asset group, OOB, there exists a tendency for the larger asset groups to increase their net lending under tighter monetary conditions. This evidence points to some redistributional effect of credit through the trade credit mechanism. Note that three of the four smallest asset groups decreased their net lending responsiveness. Considering the evidence that was cited above and in Table 6 that these groups are discriminated against in tight money periods, the evidence suggests that they do take advantage of trade credit availability. Thus the results support the hypothesis that some redistribution of credit occurs through the trade credit mechanism. Unfortunately, the results do not provide information relating to the extent of the redistribution or the compensation for bank discrimination.

Evidence Relating to the Trade Credit Decision

An examination of the findings reported in Tables 6 and 7 reveals the following information. In subperiod I, sales are less significant as a determinant of trade credit than in subperiod II. In subperiod I, three of the asset sizes and the totals have coefficients for sales that are not significant at the 5% level. Only four of the asset sizes have significant sales coefficients at the 1% level. In subperiod II, seven of the nine asset sizes have significant sales coefficients at the 1% level. Note that these are the seven smaller groups by asset size. Only TFB and OOB, the two largest asset groups are not significant. The OOB asset size even has a negative sign for sales.

The stronger relationship to sales during the tight money period might be interpreted in the following manner. When credit conditions are not restrained, funds may be obtained from various sources that, if the implicit cost of trade credit is computed, are less costly. The demand for trade credit would not be present for many sales. Since liquidity would not be under pressure from monetary restraint, firms should be more inclined to grant trade credit passively, in response to demand.

But when monetary conditions tighten, the alternative sources of credit become both harder to obtain and more costly. Trade credit becomes a more viable source of financing. A larger proportion of customers demand trade credit and, thus, sales become more significantly related to the levels of accounts receivable.

CHAPTER VI. CONCLUSIONS AND CONCLUDING COMMENTS

The primary findings of this study are as follows:

1. Support has been given for the view that the trade credit decision is a passive decision during periods of monetary ease. During periods of monetary restraint, however, the firm's trade credit policy is influenced by liquidity considerations. The evidence shows that most of the asset groups are affected by monetary policy. Firms either decreased their responsiveness to demand in granting trade credit or lowered their liquidity positions or both.

2. Firms appear to recognize and to attempt to protect against financial risk factors. In general, firms seemed willing to lower their liquidity positions during periods of tight money, but not significantly. This reaction is consistent with the hypothesis that firms have some minimal level of liquidity below which they prefer not to go. Only the firms which feel intense sales risk factors would allow liquidity to drop below the minimal desired level. These firms appear to be those of the smaller asset sizes, who are more risky borrowers and find credit less freely obtainable.

3. The liquidity variable lent strong support to the thesis that monetary policy discriminates against the smaller asset sizes. During the subperiod characterized by tight monetary policy, liquidity acted as a strong constraint to the granting of trade credit for four of the five smallest asset sizes, thus constraining their ability to maintain sales. None of the four larger asset sizes were affected in the same manner. Two of these four small asset sizes increased their

responsiveness to demand for trade credit as monetary policy tightened, but only one asset size, FTM, was able to increase its net receivables responsiveness as well, indicating that this asset group felt strong sales pressures.

4. The findings of Nadiri (1969) are seriously questioned. The liquidity variable did not have the influence as a determinant of trade credit that he noted. For the total manufacturing sector, liquidity had a positive and significant coefficient in the full period and in subperiod II. For subperiod I, the coefficient was negative but not significant. For the net receivables equations, the liquidity coefficient was positive but not significant for the full period and for both subperiods. Since liquidity was the element which made user cost significant in Nadiri's model, doubt must be case on the proposition that businesses treat trade credit as a user cost.

5. Finally, evidence was presented that mildly supported the Meltzer (1960, 1963) hypothesis, that the differential effects of monetary policy are mitigated by the redistribution of credit through the trade credit mechanism. The fact that the differential effects were observable even with some credit redistribution supports the view that monetary policy is indeed discriminatory. The tests were not able to measure the extent or the exact redistribution of the credit. It may be that the redistribution is very uneven and that many firms are completely left out of the redistribution process. In any case, much more work at the firm level and across other sectors of the economy must be done before a final conclusion can be made on this issue.

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APPENDIX A. ADDITIONAL RESULTS FROM THE EMPIRICAL TESTS

Table 12. Mean elasticities by asset size and totals, liquidity equation, full period

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	-.0098	.0236	.1060	-.0483	-.5145
OFM	-.0678	.0606	.5461	-.1771	-.1166
FTM	-.0662	.0935	.7391	.0530	-.0202
TTF	.0385	-.1092	.1283	.0960	-.8764
TFF	-.0612	.0168	.6276	-.3096	-.1909
FOH	-.0300	-.0141	.6605	.0459	.4583
HTF	-.0992	.0869	.2443	.4505	-.4843
TFB	-.0266	.0197	.7054	.2108	-.0018
OOB	.0642	-.0430	1.0421	-.1275	-.2711
TOT	-.1828	.1165	1.0075	-.2749	.0425

Table 13. Mean elasticities by asset size and totals, liquidity equation, subperiod I

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.0100	.0235	-.0166	-.0668	-.7420
OFM	-.0036	.0024	.0096	-.0044	.2693
FTM	-.1054	.1760	.3229	-.3104	-1.3912
TTF	-.0400	.0081	1.0339	-.2948	-.1445
TFF	.0292	.8218	.4787	-.0927	-2.2822
FOH	-.0535	.0505	.7700	-.1997	1.3043
HTF	-.0682	-.0065	-.0524	-.3024	1.0512
TFB	-.2696	.1427	.4148	.1588	2.0501
OOB	.1180	.0808	.3483	.0163	-.3802
TOT	.1604	-.0530	.4871	-.6370	.4295

Table 14. Mean elasticities by asset size and totals, liquidity equation, subperiod II

	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	-.0094	.0268	.1469	-.0803	-.6150
OFM	.0492	-.0899	.3521	-.3457	-1.6538
FTM	-.0349	.0027	.4495	.0362	-1.7671
TTF	.1697	-.3752	-.3044	-.1433	-.9148
TFF	-.1482	-.0093	.7013	-.4296	-.4232
FOH	.0001	-.0550	.5578	.0715	-.1311
HTF	-.1482	.0607	.2380	.0410	-1.2403
TFB	-.2447	.1834	.3586	.1780	-.2801
OOB	.0353	-.0534	.9511	.1317	-.7964
TOT	-.3195	.1228	.7543	-.1854	-.3901

Table 15. Mean elasticities by asset size and totals, accounts receivable equation, full period

	S_t	AR_{t-1}	$\widehat{LQ}$
LOM	.6760	.1229	.2835
OFM	.3799	.2440	-.2706
FTM	.5472	.1270	-.1317
TTF	.5390	.4707	.1080
TFF	.6147	.3772	-.0856
FOH	.5615	.6788	.1339
HTF	.6080	.3461	.0909
TFB	.3218	.8335	.1162
OOB	.3523	.7125	.0039
TOT	.2898	.8730	.0990

Table 16. Mean elasticities by asset size and totals, accounts receivable equation, subperiods I and II

	Subperiod I			Subperiod II		
	S_t	AR_{t-1}	$\widehat{LQ}$	S_t	AR_{t-1}	$\widehat{LQ}$
LOM	.3467	.5207	-.1434	.7549	-.1016	-.1630
OFM	.7022	.1942	.1646	.4855	.1990	-.2765
FTM	.7636	.1000	.0462	.6030	-.2421	-.3941
TTF	.3853	-.0908	-.4564	.5253	.4748	.0349
TFF	.9423	-.3344	-.2755	.5613	.2805	-.2240
FOM	.7282	.5287	.0531	.6287	.5821	.0996
HTF	.6016	.3199	.2022	.6893	.0463	-.0397
TFB	.7269	.2665	.0838	.4076	.5330	-.1007
OOB	.3200	.2033	-.0056	-.2074	.0153	.2646
TOT	.5854	.0300	-.0231	.2702	.9104	.0755

Table 17. Mean elasticities by asset size and totals, net receivables equation, full period

	S_t	$(AR\text{-}AP)_{t-1}$	$\widehat{LQ}$
LOM	.3550	.4445	.8733
OFM	-.0202	.3703	-.3431
FTM	.6370	.4304	-.0154
TTF	.5697	.2409	.1380
TFF	.5145	.6110	-.0398
FOH	.8929	.3607	.1056
HTF	.2464	.4849	-.1019
TFB	.2235	.8026	.0451
OOB	.7862	.3377	.0268
TOT	.2851	.7798	.0797

Table 18. Mean elasticities by asset size and totals, net receivables equation, subperiods I and II

	Subperiod I			Subperiod II		
	S_t	$(AR\text{-}AP)_{t-1}$	$\widehat{LQ}$	S_t	$(AR\text{-}AP)_{t-1}$	$\widehat{LQ}$
LOM	.2199	.6966	.1412	.5503	.0997	.9413
OFM	.3313	.5708	.6347	.1261	.4143	-.0985
FTM	.7632	.2014	.1679	.4967	.4212	-.0567
TTF	-.2122	-.1752	-.8276	.5532	.2192	.0712
TFF	.6431	-.1342	-.1751	.4978	.3843	-.1624
FOH	.6873	.3991	.1905	1.0400	.2163	-.0858
HTF	.2079	.7391	.1680	.1515	-.1272	-.1712
TFB	1.0641	.3056	.0126	.4883	.2173	-.2612
OOB	.1977	.1679	-.0452	-.9903	.0066	.4332
TOT	.8829	.3173	.2365	.3205	.6944	.0210

Table 19. Reduced form coefficients, by asset size and totals, for the accounts receivable equation, full period

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.292	.124	-.017	.045	-.600	.272	-1.392
OFM	.175	.242	.190	-.171	-2.634	.844	.273
FTM	.272	.129	.223	-.312	-.650	-.046	.010
TTF	.281	.476	.090	-.267	.127	.093	-.487
TFF	.333	.382	.146	-.040	-.464	.225	.079
FOH	.293	.689	-.120	-.058	2.112	.598	.351
HTF	.313	.352	-.100	.088	.391	.706	-.411
TFB	.153	.855	.015	.010	3.376	.010	-.443
OOB	.167	.747	.0001	-.0001	.128	-.002	-.026
TOT	.140	.895	-.016	.006	15.782	-4.201	.383

Table 20. Reduced form coefficients, by asset size and totals, for the accounts receivable equation, subperiod I

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.152	.529	-.004	-.033	.043	.170	.966
OFM	.324	.197	-.009	.007	.022	-.099	.348
FTM	.380	.101	-.125	.209	.072	-.068	-.221
TTF	.201	-.092	.575	-.119	-3.126	.875	.315
TFF	.506	-.340	-.239	-.710	-.823	.157	2.806
FOH	.358	.536	.116	-.109	-.284	.072	.376
HTF	.291	.325	.186	.017	.124	.480	-1.729
TFB	.324	.272	.163	.087	.935	.351	2.496
OOB	.138	.211	-.001	-.001	-.026	-.001	.032
TOT	.270	.031	-.005	.002	-1.113	1.434	-.724

Table 21. Reduced form coefficients, by asset size and totals, for the accounts receivable equation, subperiod II

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.322	-.102	.001	-.003	-.053	.029	.100
OFM	.224	.202	-.118	-.216	2.276	2.191	4.250
FTM	.299	-.245	.352	-.027	-1.700	-.135	2.647
TTF	.274	.481	.103	-.243	-.139	-.064	-.174
TFF	.306	.283	.879	.053	-1.908	1.147	.491
FOH	.344	.592	.0003	-.145	.830	.102	-.078
HTF	.371	.047	.058	-.025	-.258	-.043	.511
TFB	.203	.548	.080	-.062	-2.175	-1.057	.593
OOB	-.102	.161	.006	-.010	17.094	2.246	-6.777
TOT	.134	.940	-.010	.004	14.528	-3.458	-3.100

Table 22. Reduced form coefficients, by asset size and totals, for the net receivables equation, full period

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.051	.452	-.018	.046	.611	-.277	-1.418
OFM	-.004	.375	.106	-.095	1.465	.469	.152
FTM	.176	.434	.249	-.021	-.725	-.051	.001
TTF	.175	.243	-.068	.201	-.096	-.070	.367
TFF	.174	.617	.042	-.012	-.134	.065	.023
FOH	.292	.366	-.060	-.029	.433	.030	.173
HTF	.077	.494	.068	-.060	-.267	-.482	.281
TFB	.060	.828	-.003	.002	.731	.002	-.096
OOB	.164	.357	.0003	-.0003	.380	-.045	-.077
TOT	.069	.801	-.007	.003	6.459	-1.719	.157

Table 23. Reduced form coefficients, by asset size and totals, for the net receivables equation, subperiod I

	S_t	$(AR\text{-}AP)_{t-1}$	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.030	.712	.004	.010	-.013	-.050	-.284
OFM	.070	.580	-.016	.012	.039	.173	.611
FTM	.224	.204	-.268	.448	.154	-.145	-.473
TTF	-.067	-.177	.636	-.132	-3.459	.968	.349
TFF	.222	-.136	.098	.290	.337	-.064	-1.147
FOH	.209	.406	-.252	.236	.616	-.157	.815
HTF	.059	.754	-.091	-.008	-.061	-.343	.847
TFB	.242	.315	-.012	.007	.072	.027	.192
OOB	.032	.179	-.003	-.002	-.079	-.004	.098
TOT	.199	.326	.023	-.012	5.549	-7.152	3.611

Table 24. Reduced form coefficients, by asset size and totals, for the net receivables equation, subperiod II

	S_t	$(AR\text{-}AP)_{t-1}$	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.082	.101	-.015	.051	1.073	-.584	-2.007
OFM	.025	.418	-.018	.033	-.346	.333	.645
FTM	.131	.423	.027	-.002	-.130	-.010	.202
TTF	.165	.222	.120	-.283	-.162	-.074	-.204
TFF	.165	.387	.387	.023	-.840	.505	.216
FOH	.360	.219	-.0001	.079	-.453	-.056	.042
HTF	.051	-.129	.156	-.066	-.693	-.114	1.371
TFB	.143	.224	.123	-.094	-3.320	-1.613	.905
OOB	-1.227	.007	.004	-.007	12.970	1.704	-5.142
TOT	.077	.714	-.001	.0002	2.052	-.488	-.438

Table 25. Mean elasticities for the accounts receivable reduced form equation, full period

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.6760	.1229	-.0024	.0063	-.0301	.0136	-.1458
OFM	.3799	.2440	.0182	-.0163	-.1477	.0480	.0316
FTM	.5472	.1270	.0086	-.0122	-.0973	-.0070	.0027
TTF	.5390	.4707	.0042	-.0118	.0138	.0103	-.0947
TFF	.6147	.3772	.0052	-.0014	-.0537	.0265	.0162
FOH	.5615	.6788	-.0040	-.0018	.2135	.0621	.0613
HTF	.6080	.3461	-.0090	.0078	.0221	.0409	-.0440
TFB	.3218	.8335	.0036	.0023	.0820	.0002	-.0246
OOB	.3523	.7125	.0001	-.0001	.0041	-.0001	-.0010
TOT	.2898	.8730	-.0303	.3802	.0994	-.0268	.0042

Table 26. Mean elasticities for the accounts receivable reduced form equation, subperiod I

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.3467	.5207	-.0004	-.0032	.0024	.0096	.1065
OFM	.7022	.1942	-.0006	.0004	.0016	-.0074	.0443
FTM	.7636	.1000	-.0048	.0081	.0149	-.0143	-.0644
TTF	.3853	-.0908	.0182	-.0037	-.4720	.1239	.0657
TFF	.9423	-.3344	-.0804	-.2266	-.1319	.0256	.6291
FOH	.7282	.5287	.0028	-.0026	-.0409	.0106	.0694
HTF	.6016	.3199	.0138	.0012	.0106	.0419	-.2126
TFB	.7269	.2665	.0219	.0119	.0348	.0133	.1722
OOB	.3200	.2033	-.0006	-.0005	-.0019	-.0001	.0021
TOT	.5854	.0300	-.0047	.0017	-.0112	.0147	-.0099

Table 27. Mean elasticities for the accounts receivable reduced form equation, subperiod II

	S_t	AR_{t-1}	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.7549	-.1016	.0001	-.0005	-.0023	.0013	.0100
OFM	.4855	.1990	-.0137	-.0252	.0974	.0957	.4577
FTM	.6030	-.2421	.0136	-.0010	-.1769	-.0144	.6961
TTF	.5253	.4748	.0059	-.0131	-.0106	-.0050	-.0319
TFF	.5613	.2805	.0331	.0020	-.1570	.0963	.0947
FOH	.6287	.5821	.00001	-.0054	.0556	.0070	-.0130
HTF	.6893	.0463	.0058	-.0024	-.0094	-.0016	.0492
TFB	.4076	.5330	.0247	-.0183	-.0361	-.0179	.0282
OOB	-.2074	.0153	.0098	-.0149	.2512	.0350	-.2114
TOT	.2702	.9104	-.0247	.0184	.0581	-.0141	-.0300

Table 28. Mean elasticities for the net receivables reduced form equation, full period

	S_t	$(AR-AP)_{t-1}$	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.3550	.4445	-.0079	.0196	.0927	-.0421	-.4493
OFM	-.0202	.3703	.0232	-.0207	.1873	.0608	.0402
FTM	.6370	.4304	.0174	-.0014	-.1950	-.0140	.0004
TTF	.5697	.2409	-.0053	.0151	-.0177	-.0132	.1211
TFF	.5145	.6110	.0024	-.0006	-.0248	.0123	.0076
FOH	.8929	.3607	-.0032	-.0014	.0698	.0486	.0482
HTF	.2464	.4849	.0100	-.0087	-.0248	-.0458	.0494
TFB	.2235	.8026	-.0013	.0008	.0319	.00001	-.0095
OOB	.7862	.3377	.0009	-.0008	.0280	-.0034	-.0072
TOT	.2851	.7798	-.0262	.0107	.0807	-.0220	.0034

Table 29. Mean elasticities for the net receivables reduced form equation, subperiod I

	S_t	$(AR-AP)_{t-1}$	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.2199	.6966	.0013	.0031	-.0023	-.0092	-.1016
OFM	.3313	.5708	-.0023	.0017	.0063	.0284	.1708
FTM	.7632	.2014	-.0177	.0296	.0542	-.0520	-.2338
TTF	-.2122	-.1752	.0331	-.0067	-.8557	.2437	.1193
TFF	.6431	-.1342	.0051	.1437	.0839	-.0162	-.3993
FOH	.6873	.3991	-.0100	.0094	.1440	-.0374	.2438
HTF	.2079	.7391	-.0114	-.0010	-.0088	-.0507	.1765
TFB	1.0641	.3056	-.0031	.0018	.0052	.0020	.0260
OOB	.1977	.1679	-.0048	-.0030	-.0158	-.0008	.0110
TOT	.8829	.3173	.0446	-.0218	.1154	-.1509	.1018

Table 30. Mean elasticities for the net receivables reduced form equation, subperiod II

	S_t	$(AR-AP)_{t-1}$	V_t	V_{t-1}	LQ_{t-1}	LQ_{t-2}	L/D
LOM	.5503	.0997	-.0076	.0255	.1386	-.0756	-.5782
OFM	.1261	.4143	-.0049	.0090	-.0348	.0341	.1629
FTM	.4967	.4212	.0019	-.0001	-.0255	-.0020	.1000
TTF	.5532	.2192	.0120	-.0267	-.0216	-.0102	-.0654
TFF	.4978	.3843	.0240	.0014	-.1139	.0698	.0686
FOH	1.0400	.2163	-.000004	.0047	-.0478	-.0061	.0110
HTF	.1515	-.1272	.0253	-.0105	-.0407	-.0069	.2125
TFB	.4883	.2173	.0648	-.0474	.0936	-.0466	.0733
OOB	-.9903	.0066	.0141	-.0224	.4124	.0572	-.3450
TOT	.3205	.6944	-.0047	.0009	.0158	-.0039	-.0081

APPENDIX B. SOURCES AND DESCRIPTIONS OF THE DATA

With the exception of the loan-to-deposit ratio the data are taken from the FTC-SEC Quarterly Financial Report for Manufacturing Corporations. The data are compiled, on a quarterly basis, by the joint efforts of the Division of Financial Statistics in the Federal Trade Commission and the Office of Statistical Studies in the Securities and Exchange Commission. The estimates are representative af all firms required to file U.S. Corporation Income Tax Form 1120. Each firm filing this report has a known probability of being included in the sample taken from these returns, which changes each quarter by one-eighth of the firms. Further, the changes made in the sample each quarter reflect corporate births, deaths, acquisitions, spin-offs, and mergers.

The composition of the sample as of 1970 included 1/40 of all corporate firms of asset size less than one million dollars, 1/4 of those with one-to-five million dollars in assets, 3/4 of those with five-to-ten million dollars, and all corporate firms with assets over ten million dollars.

The sample accounts for about six percent of the total number of corporations which possess about 88 percent of the total corporate assets. The final data estimates are based on the sample figures. An aggregated financial statement is then compiled for manufacturing by industry classification and asset size grouping.

The exact title of the table used to gather data for this study is:

Table 9. Financial statement for all manufacturing corporations, by asset size and industry group.

The following items were utilized from the table:

AR: Other notes and accounts receivable (net).

This is equal to total receivables minus receivables from U.S. Government, excluding tax credits.

AP: Trade accounts and notes payable.

S: Sales (net of returns, allowances, and discounts).

LQ: This was defined as the ratio of cash plus government securities held to current liabilities.

C: Cash on hand and in bank.

G: U.S. Government securities, including Treasury savings notes.

CL: Total current liabilities.

This includes short term bank loans with maturities of 1 year or less, advances or prepayments by the U.S. Government, trade accounts and notes payable, Federal Income Taxes accrued, installments due in 1 year or less on debts, and other current liabilities.

The data for the loan-to-deposit ratio were taken from the Federal Reserve Bulletin, 1960-1970. The series used were as follows:

L: Taken from the table--Loans and investments, not seasonally adjusted

D: Taken from the table--Details of deposits and currency. Includes the sum of not seasonally adjusted demand deposits adjusted and not seasonally adjusted time deposits in commercial banks only.