Substitution of trade credit for bank credit:
empirical study of financing behaviour of Indian manufacturing companies using panel data

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Abstract

The hypothesis that companies substitute trade credit for bank credit during period of restricted monetary policy has been subject of empirical investigation for the reasons that it helps us to understand the linkages between the financial sector and real sector of economy. This paper examines whether companies in India substitute trade credit for bank credit during restricted monetary policy years. Using panel data econometric method the study uses time-series cross-section company level data of 828 manufacturing companies covering period from 1990 to 2001. The findings suggest that the magnitude of substitution of trade credit for bank credit is statistically significant during the monetary restrictive years. These results assume significance as about 40 per cent and 30 per cent of current assts constitute the trade credit and bank credit respectively. Both these put together is about 35 per cent of total asset of sample companies in India. The results also suggest that magnitude of substitution vary depending on the size of company.

Key words: Trade Credit, Bank Credit, Indian Companies, Short-term Financing

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1. Introduction

Companies use various short-term financing sources to meet their working capital requirements. Trade credit and bank borrowings under cash-credit systems are two important sources of finance to meet working capital requirements of companies in India. These two sources account for about 35 per cent of total assets and 70 per cent of total current assets of companies in India. The bank borrowing and trade credit as percent of current assets are about 30 per cent and 40 per cent respectively. These two items represent the bulk of the total short-term borrowing accounting for about 93 per cent. Given the significance of these two sources in company's financial structure their mix assumes critical significant. The companies would be using these sources depending on their costs, flexibility and timing. The macro-economic factors such as interest rates and money supply/credit conditions are likely to have significant impact on the composition, mix and pattern of these sources of funding. One area of research, which has received attention, has been whether companies substitute trade credit for bank credit during monetary policy restrictive years.

The hypothesis that companies substitute trade credit for bank credit during period of restricted monetary policy has been subject of empirical investigation for the reasons that it helps us to understand the linkages between the financial sector and real sector of economy. Two specific thoughts have emerged in this area. These are: *money channel* and *credit channel*. *Money channel* or *interest rate channel* argument suggests that financial sector is irrelevant. Monetary policy restrictions are transmitted to the real sector through the increase in cost of capital affecting the cost sensitive spending and thereby slowing down the economic activity.

On the other hand, *credit channel* proponents challenge this and suggest that credit plays important role in propagation or mitigation of monetary shocks into the real economy (Bernanke and Gertler 1995). There are two hypotheses proposed to explain the credit channel. These are *broad credit channel* and *bank lending channel*. Broad credit channel suggest that given imperfections in credit market, information asymmetry problem between lenders and borrowers may amplify the policy-induced

impact (Oliner and Rudebusch 1996). This view argues that rise in interest rates followed by a monetary policy contraction reduces the value of collateral of companies, raising the cost of the external finance premium of all sources of finance. As external finance of all types becomes more costly, companies having lesser internal resources are likely to be affected most adversely by the tightening of monetary policy. Therefore the use of trade credit goes up during the period of restrictive monetary policy - when the supply of and the demand for bank credit declines, and decrease in the liberal monetary policy period - when companies make greater use of bank credit due to falling interest rates.

The *bank lending channel* suggests that during restricted monetary policy bank lending goes down and as a result companies substitute trade credit for bank credit to meet some of their financial requirements (Meltzer 1960, Bernanke and Blinder 1988, Kashyap, Stein and Wilcox 1993). This view argues that banks reduce their supply of loans during monetary policy contraction, and bank dependent companies experiencing financial constraint have to cut down on their inventory levels and may be other investments and obligations such as dividend payment. Pandey and Bhat (2004) find that monetary policy restrictions do have impact on cost of raising funds, and the information asymmetry between lenders and borrowers increases that forces companies to reduce their dividend payout. However, this may disproportionately affects smaller companies and other companies that do not have access to credit markets.

Companies which have access to trade credit are likely to substitute this for bank credit during periods of monetary policy tightening (Meltzer 1960). In some sense the availability of trade credit may soften the impact of monetary policy tightening on companies having access to this source. However, bank-dependent companies not having access to other sources of financing may have to cut back on their inventory holdings if access to trade credit is not available. The paper makes an attempt to study whether the bank lending channel work in Indian situation by studying the use of trade credit in response to changes in the monetary policy environment. The findings

of this paper will help us to understand the impact of macro-economic factors on the composition and mix of these two sources of finance. Specifically the paper examines the trade credit–bank credit substitution hypothesis during monetary policy transmission in context of India by examining panel data of manufacturing companies. The present study focuses on two questions:

- Do companies in India use more trade credit during monetary policy restrictive years than in normal years and whether they substitute trade credit for bank credit?
- Does the size of company matter? Do monetary policy restrictions affect all companies in same way? Is the inventory of bank-dependent companies more sensitive to the extent to which they can avail trade credit, as compared to other companies having greater internal resources and easier access to other sources of finance?

2. Theories of monetary policy transmission

There are various schools of thought regarding the channel of monetary policy transmission mechanism. These can be divided into two categories:

- money channel or interest rate channel
- credit channel

Money channel

According to the traditional 'money view' monetary policy affects output through the interest channel. The *interest rate channel* or the *money channel* of monetary policy transmission argues that as a result of a fall in money supply the real interest rates go up and therefore result in increase in the cost of capital (k_o). This forces companies to cut down on their investment levels. Besides, rise in interest rates also leads to a decline in aggregate demand as the benefits from savings increase. This consequently brings about a fall in output. The IS-LM framework supports the traditional 'money channel or interest channel view', which holds that interest rates work as a mechanism during

monetary policy transmission, a rise or fall has a direct impact on the aggregate output. Interest rates thus have a direct effect on the IS curve, which shows the positions at which investment equal savings, and LM curve, which shows positions at which the demand for money (suggesting liquidity preference) equals money supply, that determine the equilibrium values of output.

Credit channel

Other authors argue about the existence of the *credit channel* of monetary policy. This is based on the assumption that tight monetary policy directly restricts the availability of credit to companies. There are two views regarding how the credit channel brings about a monetary policy transmission. One view holds that it is through *broad credit channel* of monetary policy transmission and second it is through *bank lending channel*. These are discussed in following sections.

Broad credit channel

While the bank-lending channel of monetary policy affects bank credit on the supply side by reducing the supply of bank loans, the broad credit channel operates through the demand side of credit. Proponents of the broad credit channel argue that a rise in the bank lending rate arising due to shrinkage in loan supply increases not only the interest rates of banks but also the cost of external finance for companies. As a result of higher interest rates the retained profits of companies reduce. This in turn affects the value of collateral offered by companies and forces cost of external finance to increase. This makes borrowing expensive and hence lowers the demand not only for bank loans but for all types of external finance. Thus, monetary policy transmission may take place through the broad credit channel, where a rise in interest rates weakens the balance sheets of borrowers (therefore this is also known as balance sheet channel) which in turn reduce the overall credit available to companies in general, and not bank lending in particular (Oliner and Rudebusch 1996). The researchers have also argued that tightening of monetary policy is likely to affect small companies more adversely than large companies (Oliner and Rudebusch 1996 and Blasio 2003).

On demand side interventions the bank sometimes may not necessarily use interest rates as a mechanism to meet demand and supply gaps in credit market but use credit rationing approach. It is well predicted that asymmetric information between the lender and the borrower does not allow banks to distinguish between good and bad borrowers. A rise in interest rates as a response to tightening of monetary policy would drive away good borrowers having positive net present value projects and would attract marginal borrowers with risky and negative net present value projects, thus increasing the risk of default and lowering the expected profits of banks. Hence, banks choose not to raise interest rates but instead opt for credit rationing, where the total amount of loan granted to borrowers is curtailed.

In recent years there has been growing interest in developing framework to understand the impact of impact of macro-economic variables on financing decisions of companies. The monetary policy through its impact on interest rates has been one important areas of investigation to study these impacts. This transmission of this impact assumes greater significance in the presence of information asymmetry between borrowers and lenders. In providing finances, the providers of all types of external finance will charge some premium over and above the cost of finance in comparison to the cost of internal funds (Gertler 1988). In the presence of information asymmetry lenders will be incurring costs in evaluating projects, monitoring and enforcing outcomes. The premium is required to compensate the providers for these costs. Oliner and Rudebusch (1996) describe the relationship between information asymmetry and financing costs using Figure 1. Given a company where F is the amount of internal funds available, its resulting cost of funds schedule is shown by S_1. The cost of these internal funds is r_1 which can be decomposed into risk free rate (r_f) and risk premium (φ). The risk-free rate (r_f) can be treated as an outcome of monetary policy instruments. The risk premium φ is risk adjusted for the company under consideration. When the investment requirements exceed internal generated funds and assuming capital markets are perfect, external generated funds are also available at r_1 rate. However, in the presence of information asymmetry between borrowers and lenders, there are more chances of company defaulting on its debt to outsiders because

of moral hazard problem - a predictable outcome of information asymmetry problem. This explains the shape of S_1 why it rises beyond F. The difference between r_1 and actual cost of borrowing would be the premium for this moral hazard risk. This premium will increase with the level of borrowing, as more debt will intensify the moral hazard problem. This link between the premium and borrowing produces the upward slope of S_1 curve.

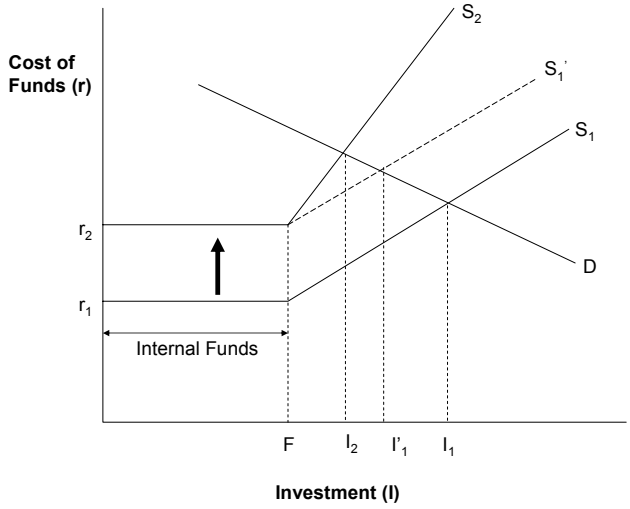

Figure 1 (adapted from Oliner and Rudebusch (1996)

Changes in risk-free rate can also produce upward shift in the curve. This is because the increase in risk-free rate will lower down the discounted value of borrower's collateral, thereby increasing moral hazard problem. The dependence of this premium on risk-free rate produces linkages with the macro-economic policies. For example, monetary policy changes can produce changes in risk-free rate. With the increase in this rate because of monetary policy restrictions, the cost of funds will go up and there would be upward shift from S_1 to S_2 curve. This rise in cost of funds would have implications for the investments which fall from I_1 to I_2. Capital market imperfections magnify any macroeconomic shocks that affect borrowers' moral hazard (Stiglitz 1992). This is the reason why new supply schedule is S_2 and not S'_1. The restrictive monetary policy intensifies the effect on cost of debt and external financing by pushing it up and increasing the spread at various levels of financial requirements. The theory

predicts that with the change in macro-economic policy which results in increase in risk-free rate, the cost of funds will go up and thereby reduce the availability of funds for proposed investment requirements.

Bank lending channel

The bank lending channel is based on premise that bank loans assume significant importance in monetary transmission mechanism**.** Proponents of the bank lending channel argue that restrictive monetary policy brings about a reduction in the overall supply of bank loans. For example, the purchasing of securities through open market operations to influence money supply affects the cash reserves of banks by the same amount. The balance sheet equation of banks is such that *cash reserves plus securities plus loans* (assets side) equals to *demand deposits and time deposits* (liabilities side). The *demand deposits* are subject to cash reserve requirements. Hence, monetary tightening compels the bank to reduce the proportion of demand deposits if cash reserve goes down. Since the adjustment on liabilities side (demand deposits and time deposits) of the balance sheet is not possible to meet these requirements in short-run, the cash reserves are maintained by reducing either loans or securities. Bernanke and Blinder (1988) have used an expansion of conventional IS-LM framework to explain this by including the impact of bank lending rate as a complementary mechanism that strengthens the direct interest rate effects. They argue that two conditions need to be satisfied for the bank lending channel to exist. Not only should loans and securities be imperfect substitutes in bank portfolios, loans and securities should also be seen as imperfect substitutes for borrowers. The securities and loans are not perfects substitutes of each other because the credit risks associated with the loans may give rise to liquidity problem in future and, therefore, the two are not seen as perfect substitutes. As discussed earlier the banks prefer to ration loans to meet the requirement of the contraction in monetary policy and explain why a reduction in bank reserves causes a reduction in the supply of loans by banks. When the bank lending goes down companies explore alternative options for meeting their financial requirements. Trade credit is one such source.

Why trade credit is important?

Trade credit is an important source of financing the operations of a business whether there is or there is no monetary restriction in the system. There are several theories which have been put forward to explain the use and availability of trade credit as a source of finance. Petersen and Rajan (1996) divide these explanations into three broad categories. These are:

1. Financing advantage of trade credit
2. Price discrimination through trade credit
3. Transactions costs explanation

The financing advantage theory is based on premise that supplier in comparison to traditional lenders would be relatively in better position to assess credit worthiness of his client. They are also in better position to monitor and ensure recovery. This produces cost advantage and this is because of three reasons: advantage in information acquisition about business and its timing at lower costs, better control on buyer behaviour through stipulating various conditions and influencing the availability of goods thereby ability to affect operations and better capacity to recover value based on collateral (Petersen and Rajan 1996). In comparison to these the financial institutions and banks would have less flexibility in these areas.

The other reason for existence of trade is because of its use as a mechanism to discriminate on price. Trade credit reduces the effective price to low quality borrowers. In a highly price elastic market, this may be quite critical. Many times producers would like to increase the sales, credit becomes an important instrument. When the producers see the seller as part of their distribution network and has long-term interest in ensuring that the buyer survives, the suppler even in risky case may extend the credit. In these situations the seller is taking into account the long-term discounted value of all future profits which would accrue to supplier. Petersen and Rajan (1996) suggest this is the value of supplier's implicit equity stake in buyer's business and therefore for this the seller offers short-term financing support.

Transaction cost theory suggests that trade credit helps in reducing the transaction costs of reducing the bills (Ferris 1981). Rather than paying the bills every time the buyers places an order and goods are delivered, the buyer develops a system of collating these payments and paying them once in a month or once in a quarter. The payment cycle is separated from delivery schedule to reduce transaction costs. Particularly in situations where businesses are subject to seasonalities in demand and production, the trade credit is an effective way to reduce the financing costs in holding the inventories (by receiving the trade credit) as well as reducing the storing costs (by giving credit) without affecting prices.

However, during the monetary restrictions the use of trade credit assumes more significance. Based on the above arguments the bank credit and trade credit substitution is explained in Figure 2. After monetary policy restrictions the cost of external finances (including bank credit) relative to internal funds increases. This shift in relative finance costs causes shifts in investments.

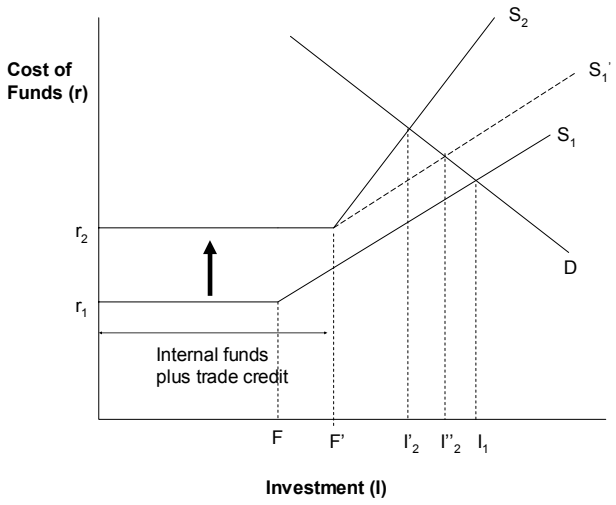

Figure 2

The amount of investments would be subject to availability of internal funds and will be sensitive to such changes after monetary policy restrictions. As a result of this to ensure availability of funds companies may depend more on trade credit to meet the

investment requirements in inventories. Under capital market imperfections, the effect of restrictive monetary policy would be significant than during normal times. Pandey and Bhat (2004) provide evidence that Indian companies reduce their dividend payout to augment internal resources to meet their requirements during monetary policy restrictions. As a result by augmenting these resources there would be shift in availability from F to F′ thereby increasing availability of funds from I_2 (from Figure 1) to I'_2 (in Figure 2). The amount of investment I'_2 is greater than I_2 by the amount difference in F′ and F which results because of the higher use of trade credit under monetary restrictive years. The empirical results presented in this paper provide evidence whether the macro-economy variables have any influence on use of trade credit.

Bernake and Gertler (1995) argue that it is difficult to separate the money channel from broad credit channel; rather they should be seen as complementary to each other. They argue for the existence of a credit channel in general that strengthens the interest effects of monetary transmission mechanism. Empirically it is also difficult to confirm the existence of the bank lending channel as bank lending is influenced both by demand for as well as supply of the same. Nevertheless, some authors have attempted to distinguish the demand and supply side factors affecting bank lending, by comparing the behaviour of the change in the ratio of bank loans to non-bank borrowings, which is expected to be low if companies substitute bank loans for other alternative sources of financing. This is based on the hypothesis that if banks restrict credit, companies would be forced to use alternative finance sources.

3. Empirical research

A number of studies have attempted to examine the credit channel of monetary policy transmission by testing the impact of monetary policy on the behaviour of short-term as well as long-term sources of financing of companies. The empirical findings are mix. There are studies which find empirical support of the bank lending channel, and other studies claim about the existence of a broad credit channel that affects the financing and investment pattern of companies. At the same time there are studies which find no

conclusive evidence about the existence of a credit channel for monetary policy transmission. We review some of these studies in this section.

Kashyap, Stein and Wilcox (1993) test the bank lending channel by examining the changes in the composition of bank loans versus commercial paper and find that following monetary contractions, companies in aggregate increase their borrowing form the commercial paper market relative to borrowing from banks.

Oliner and Rudebusch (1995) raise questions about the approach used in the model of Kashyap, Stein and Wilcox (1993) as it only investigates changes in the bank credit-commercial paper mix and ignores other types of non-bank financing. Besides they point out that their findings are based on aggregate data which does not account for the shift in credit from small companies to large companies. They point out that the financing patterns should be studied separately for companies of different sizes as large-sized companies are less bank-dependent and may have wider access to other sources of finance as compared to small-sized companies. Oliner and Rudebusch (1996) also point out that small-sized companies do not have access to the commercial paper market. Nilsen (1999) suggest that out all types of companies, including those not having access to commercial paper may have access to trade credit during monetary contractions. By studying changes in financing mix separately for small and large companies, Oliner and Rudebusch (1996) find no alteration in the proportion of bank-debt to other debt following monetary contractions. Their study finds significant impact on shift of bank credit from small-sized companies to large-sized companies and also a significant decline in all types of credit for small-sized companies, which is consistent with the broad credit channel view of monetary policy.

The broad credit channel assigns importance to internal funds as all types of external financing becomes costly following monetary contractions. The link between internal funds and capital spending is expected to strengthen during monetary tightening. Kashyap, Lamont, and Stein (1994) observe strong correlation between internal liquidity and change in inventories when they use the inventory investment model

including the liquidity variable to measure the impact of changes in monetary policy on the sample companies. Their argument is based on Meltzer's hypothesis (1960) that credit constrained companies are likely to increase their use of trade credit. Using percentage of trade credit paid late and the amount of trade credit discounts foregone to indicate the demand for trade credit, Peterson and Rajan (1997) find that credit rationed companies, whose loan applications have been denied by banks, increase their use of trade credit. These studies suggest that ignoring the use of trade credit as a financing alternative will not give a true picture of the financial constraints faced by companies after monetary contractions. Nilsen (1999) examines the trade credit behavior of small and large companies following monetary contractions, and find that all types of companies irrespective of size increase their use of trade credit following monetary policy restrictions. Using bond ratings as an indicator of capital market access, they find that larger companies with a bond rating do not increase their use of trade credit during such periods. Their results support the bank lending channel of monetary policy transmission, where companies not having access to bank loans as a result of reduction in its supply, finance their investments with trade credit. when monetary policy tightens.

Guido de Blasio (2003) examine a panel of 3862 companies in the Italian manufacturing sector over a period of 18 years where 5 significant monetary contraction episodes took place for testing the trade credit and bank finance substitution hypothesis and find the substitution effect is quite modest. Kashyap, Lamont and Stein (1994) use the standard inventory model augmented by the liquidity variable for measuring the impact of monetary tightening on companies with the assumption that internal resources of the company matter the most when bank credit declines, and hence expect a strong correlation between liquidity and investment during periods of monetary contraction. Guido de Blasio (2003) argue that trade credit cannot be ignored as it can be used to substitute bank finance, and hence liquidity alone cannot capture the financial constraint faced by companies. In order to examine the net impact of monetary restriction they include the measures of liquidity and trade credit along with interaction terms for monetary policy contraction years that capture the effect of

monetary policy on the trade credit and bank credit substitution in their standard inventory model.

4. Methodology and data

Kashyap, Lamont and Stein (1994) include liquidity variable in standard inventory model for testing the bank-lending channel of monetary policy transmission. Based on the production smoothing and buffer-stock arguments of Lovell (1961), their study uses the following model:

$$\Delta \text{Log}\,(INV_{i,t}) = \lambda_0 + \lambda_1 \text{Log}\,(INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{Log}\,(S_{i,t}) + \lambda_3 \Delta \text{Log}\,(S_{i,t-1}) + \lambda_4 LIQ_{t-} + \varepsilon_{i,t}$$

where INV is inventory, S is sales LIQ denotes cash plus marketable securities as ratio of total assets. Variables INV/S and S are to control for the non-financial determinants of inventories, where these denote start of the period inventory to sales ratio, growth in sales for last two periods to capture the effect of backlog of unfulfilled orders. LIQ has been defined at the beginning of the period. A positive significant coefficient of liquidity variables is viewed as evidence that liquidity constraints reduce the inventory investment. The other control variables also included industry dummies.

The model expects the coefficient of LIQ to be positive, suggesting that companies not having sufficient internal resources will have to cut down on their investment during monetary policy tightening. Alternative specification of this model also included interaction variables such as LIQ*B where B represents bond market access dummy which takes a value of 1 for companies having credit market ratings and 0 otherwise. Adding the variable is based on the premise that companies with B=0 are bank-dependent and they are likely to have stronger correlations between liquidity and investment during monetary policy tightening, as compared to B=1 companies. The model expects the coefficient for LIQ*B to be zero, suggesting that companies with a bond rating are not likely to have liquidity problems as they have access to other sources of finance during monetary contractions. Besides, the authors also run their

model augmented by the liquidity variable separately for companies with bond rating and companies without bond rating.

As discussed in previous sections, the access to and availability of trade credit is likely to play an important role. The above model has been augmented by including the variable for trade credit by Guido de Blasio (2003) as follows:

$$\Delta \text{ Log } (INV_{i,t}) = \lambda_0 + \lambda_1 \text{Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 \Delta \text{ Log } (S_{i,t-1}) + \lambda_4 LIQ_{i,t-1} + \lambda_5 TC_{i,t-1} + \varepsilon_{i,t}$$

The author argues that tight monetary conditions are not only likely to intensify the correlations between liquidity and inventory investment for bank dependent companies, but also between trade credit and inventory investment, which is used as an alternative mode for financing during restrictive monetary periods. Hence the model is modified to include the trade credit along with the liquidity variable. Besides, these two variables are interacted with the monetary restriction dummy variable. The monetary restriction (MR) dummy variable takes the value of 1 in tight monetary years and 0 otherwise.

The model used in the present study is based on the models used by Kashyap, Lamont and Stein (1994) and Guido de Blasio (2003). We have used both LIQ and TC variables in specifying our model. The final model also includes interaction terms. We also include size and growth variables to control for company specific characteristics. These are total assets and growth in total assets. Finally we have used the following model in this study:

$$\Delta \text{ Log } (INV_t) = \lambda_0 + \lambda_1 \text{ Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 LIQ_{i,t-1} + \lambda_4 TC_{i,t-1} + \lambda_5 MR_t^* TC_{i,t-1} + \lambda_6 MR_t^* LIQ_{i,t-1} + \lambda_7 \Delta \text{ Log } (TA_{i,t-1}) + \lambda_8 \text{Log } (TA_{i,t-1}) + \varphi_i + \theta_t + \varepsilon_{i,t}$$

where the dependent variable is the change in the log of inventories at the end of the year, Independent variables include log of inventory-sales ratio in the beginning of the year, change in the log of sales in the current year i.e., growth in sales, LIQ (cash and marketable securities divided by total assets in the beginning of the period), TC (trade

credit divided by short-term borrowings, where short-term borrowings include trade credit, commercial paper, short-term bank borrowings and other short-term borrowings). The other variables included in the model estimation are Log ($TA_{i,t-1}$) and Δ Log ($TA_{i,t-1}$) to indicate size and growth variables for control. We run the final model including the interaction terms where LIQ and TC variables interacted with monetary restriction period dummy variable (MR). MR takes value of 1 in 1991 and 1996, and 0 in the other years (see Appendix 1).

The coefficients for LIQ*MRP and TC*MRP are interpreted as follows:

Coefficient for LIQ*MR	**Coefficient for TC*MRP**	**Effect of monetary policy**
Not positive	Not positive	No evidence of credit rationing
Positive	Not positive	Evidence of credit rationing but not trade credit rationing and no evidence for the substitution hypothesis
Positive	Positive	Evidence in favour of substitution hypothesis
Not positive	Positive	Strong evidence in favour of substitution hypothesis since what seems to really matter is the company's access to TC during monetary policy tightening

Our estimation model uses panel data estimation method. Panel estimation is considered superior because it explicitly takes into account the heterogeneity of sample of companies. Panel data allows controlling for unobservable heterogeneity through individual (company) effect (φ_i) and temporal effect (ϕ_t) by including dummies for time variable. Since the sample contains cross-section of companies belonging to different industries there is bound to be some heterogeneity. This also helps in controlling the general effect of all other macro-economic variables. Pooling of time-series cross-sectional data provides more observations, more variability, less collinearity among variables, more degree of freedom and more efficiency (Baltagi 1995). More importantly, pooled data are more proficient to identify and measure effects that are

undetectable in pure cross-section or pure time-series data. Moreover, the measurement biases resulting from aggregation over firms or individuals and biases arising from omitted-variables are reduced (Pindyck and Rubinfeld, 1998, p.250). The merit of a panel data over cross-section data is the ease of modelling the differences in behaviour across individuals (Greene 2003). Moreover, it is only through the cross-section time-series analysis it is possible to examine the effect of monetary policy restrictions of several years and the dynamics of change is studied effectively.

Data

We have used Prowess Database and our sample includes all companies in the manufacturing sector for which annualised data for all years beginning from 1990 to 2001 is available. The initial sample contained 937 companies. The sample excludes all companies for which average net sales is less than ten crores over the 1990-2001 period. This reduced our sample size to 893 companies. Data for companies with accounting year ending in any month during October *t-1* to September *t* has been considered belonging to year *t*. Because of change in accounting year and process of annualising the data, some companies have missing data in more than one year. Companies with missing data for two or more consecutive years have also been excluded from the sample. The final sample consists of 828 companies. There are some companies for which the value of financial variable is equal to zero in some years. Wherever these variables were used to compute the growth, their value was set to 0.01 to facilitate the computation and use of that observation in regression equation.

For the purpose of monetary policy restrictions the study uses the Reserve Bank of India's Economic Survey Reports as a base to identify the restrictive years. There are two monetary policy restrictive years viz., 1991-92 and 1996-97 during the sample period of the study. According to the Economic Survey of 1992 the monetary policy in 1991-92 was highly restrictive for the reasons of containing the growth of aggregate demand to fight the twin problems of high inflation and adverse balance of payments. Further, the Economic Survey of 1997 states that during 1996-1997 the bank lending rates remained sticky for sometime despite the increased liquidity with the banks

following cash credit ratio (CRR) reductions. Banks did not reduce interest rates immediately in order to avoid a dent in the interest rate spread that would have affected profits adversely. With inflation falling sharply, real interest rates rose, contributing to lower demand for credit. Though nominal interest rates fell during the 1996-97 period, real interest rates rose during this period because of falling inflation rates. The period of 1996-97 has also been described as restrictive year (see Appendix 1).

5. Findings

Table 1 provides important statistics of sample companies' financial variables used in the study. Table 2 gives the amounts of various components of borrowings in crores of rupees for the years included in the study. The sources included here are total bank borrowings (TBB), borrowings by financial institutions (FI), commercial paper and fixed deposits (CPFD), borrowings from debentures (DEB), foreign borrowings (FOR), borrowings from other group and non-group companies and borrowings from promoters (PR), other borrowings (OTHER) and trade credit (TC). These are also shown as percentage of the total long term and short term borrowings including trade credit in Tables 3 to 6. Along with the borrowings figures we have also included inventories (INV) and accounts receivable (AR) and have shown them as percent of the sum of inventories plus accounts receivable. Table 4 shows STBB, CPFD, OTHER borrowings and TC as percentage of total short term borrowings (STB) which the sum of these four short term borrowing components. Tables 5 and 6 show these variables as percentage of total assets and as percentage of current assets respectively. Tables 1 to 3 indicate that total bank borrowing account for about 28 per cent of total borrowings and trade credit accounts for about 34 per cent of total borrowings. These two sources account for about 62 per cent of total borrowings. Both these financing sources play important role in meeting the working capital financing requirements for inventory and accounts receivables. Table 4 indicates that these two sources account for 92 per cent of short-term borrowings of companies in India. Table 5 shows that short-term bank borrowings and trade credit as per cent of total assets account for about 14.5 per

cent and 19.5 per cent respectively. These two sources account for about 34 per cent of total assets. Inventory as per cent of total assets is about 25 per cent. Table 6 shows that inventory and accounts receivables as per cent of current assets are 41 per cent and 32 per cent respectively. Short-term bank borrowings and trade credit finance is about 60 per cent of current assets and finance about 82 per cent of inventory and accounts receivables requirements.

Table 7 presents the descriptive statistics of variables used in estimating the regression equations. Table 8 give the correlation matrix of variables used in the study.

We estimate the base model using OLS method without explicitly including the variables of monetary policy restrictions. Table 9 presents the year-wise OLS estimates of basic equations without incorporating the monetary policy restriction effect. As expected that in the years 1991 and 1996 which are monetary policy restriction years the coefficient of TC is positive. The estimated value of these coefficients is 0.0767 and 0.0143 in 1991 and 1996 respectively. In all other years this coefficient is negative. The TC coefficient is positive only in years 1991 and 1996, which suggests that companies increased their dependence on trade credit during these years. The results of pooled OLS are presented in Table 10. The coefficients of MR_t* $TC_{i,t-1}$ is positive and significant at 1 per cent and coefficient of MR_t* $LIQ_{i,t-1}$ is negative and significant at 1 per cent suggesting strong substitution of trade credit for bank finance during restrictive monetary policy years. In this equation we introduce trade credit and monetary restriction year interaction term. However, we know that OLS estimates of pooled panel are not appropriate as it ignores the company and period effect.

We use panel data fixed effect model and random effect model to estimate the equation. Tables 11 to 14 provide estimates of pooled panel data estimates based on fixed effect and random effect models. We also test whether the fixed effect model or random effect model is appropriate in our situation. While estimating the panel data equation we have included the monetary restriction interaction variables taking 1991 and 1996 as monetary policy restrictive years. The monetary restriction period dummy variable,

denoted by MR assumes the value of 1 in 1991 and 1996 and the value of 0 in the rest of the years. We estimate model which includes LIQ and TC interacting with the MR variable.

The two-way fixed effect model that accounts for cross-sectional and time-specific effects is used for the purpose of the analysis, as it is more robust as compared to the one-way fixed effect model that does not account for time dummies. The fixed effect model which controls both for group and time is more robust, as compared to the other models. The Hausman specification test is significant at 1% level suggesting a preference for the fixed effect model over the random effects model. Table 14 report the results of the Hausman test.

The summary results of various models are presented below:

Estimation method	**MR*LIQ**	**MR*TC**
OLS estimates	-0.521*	0.233*
Fixed effect model (only group dummies)	-0.323**	0.177*
Fixed effect model (group means regression)	-0.649	1.198*
Fixed effect model (group dummies and period effect)	-0.161	0.339*
Random effect model (Hausman statistics 529.10*)	-0.241**	0.363*
Size effect (Fixed effect model with group dummies and period effects		
Size Group 1	-0.846*	0.575*
Size Group 2	0.112	0.369*
Size Group 3	0.226	0.226*
Size Group 4	0.073	0.209*
Significance level: * 1 per cent, ** 10 per cent		

The estimates of fixed effect model with group dummies and period effects indicate that the coefficient of MR_t* $TC_{i,t-1}$ is highly significant at 1 per cent with t-value of 7.840 and positive coefficient of 0.3393 while the coefficient of MR_t* $LIQ_{i,t-1}$ coefficient is not positive. This coefficient is not statistically significant. The results provide strong evidence in favour of the substitution hypothesis, meaning that what matters more during monetary policy tightening is the company's access to trade credit. Companies which are not able to get access to trade credit may have to cut down on

their inventory level. Under all estimation methods the sign of TC*MR variable is positive and significant at 1 per cent level.

We also estimate the sensitivity of monetary policy restriction to companies classified by net worth. Previous studies have argued that restrictive monetary policy raises the external finance premium for all types of borrowing. During restrictive monetary policy periods, higher interest rates lower the cash balance of the companies, which has an adverse effect on the net worth of companies. Companies with high net worth are expected to bear a higher external finance premium. Monetary policy restriction further accentuates the problem for companies with low net worth which are expected to have a high cost of external financing. Further, the external finance premium is expected to be higher for the low net worth companies, such companies are expected to be more liquidity constrained, and are expected to rely more on trade credit during monetary restriction periods. Hence, the coefficient of the $MR_t*TC_{i,t-1}$ variable is expected to be higher for companies with low net worth.

The companies are classified into four categories based on their quartile net worth. Table 15 provides the results of the two-way fixed effects with group dummies and period effects for companies classified by net worth. It shows that $MR_t*TC_{i,t-1}$ coefficient is the highest for companies with low net worth and declines for high net worth companies. The results provide evidence in favour of the broad credit channel that low net worth companies are more adversely affected by monetary contractions.

6. Conclusion

This study provides support to Meltzer's hypothesis that companies substitute trade credit for bank credit during restrictive monetary policy period. The magnitude of this substitution in Indian context is statistically significant and as predicted by the theory. The empirical results presented in the paper are based on panel data of 828 Indian manufacturing companies covering the period from 1990 to 2001. Using panel data fixed effect model we estimate the relationships to test the hypothesis. These results assume significance as about 40 per cent and 30 per cent of current assts constitute the

trade credit and bank credit respectively. Both these put together is about 35 per cent of total asset of companies in India. The results also suggest that magnitude of substitution also varies depending on the size of company. The results suggest that low net worth companies are worst affected by the monetary restrictions.

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List of abbreviations

AR	Accounts receivable
AVSALES	Average of net sales (1991-2001)
CA	Current assets
CP	Commercial paper
CPFD	Commercial paper and fixed deposits
DEB	Debentures
FI	Financial institution borrowings
FOR	Foreign borrowings
ICICI	Industrial Credit and Investment Corporation of India
IDBI	Industrial Development Bank of India
IFCI	Industrial Finance Corporation of India
INV	Inventory
LIQ	Cash plus marketable securities
MR	Dummy variable for monetary restriction period
NW	Net worth
OTHER	Other short term borrowings (excluding CP, TC and STBB)
PR	Borrowings from company and promoters
STB	All short-term borrowing (STBB + TC + CP + OTHER)
STBB	Short-term bank borrowings
TA	Total assets
TBB	Total bank borrowings
TC	Trade credit
WC	Working capital
ginv	Δ Log (INV_t)
invs	Log ($INV_{i,t-1}/S_{i,t-1}$)
gs	Δ Log ($S_{i,t}$)
liq	$LIQ_{i,t-1}$
tc	$TC_{i,t-1}$
gta	Δ Log ($TA_{i,t-1}$)
rliq	MR_t* $LIQ_{i,t-1}$
rtc	MR_t* $TC_{i,t-1}$

lnta	Log ($TA_{i,t-1}$)

Table 1: Important Indicators: 1991 and 1996 (Rs. in crores)

	Minimum		Maximum		Average		Standard Deviation	
Variable	1991	1996	1991	1996	1991	1996	1991	1996
TBB	0.00	0.00	375.45	1298.55	13.50	39.71	27.67	99.03
STBB	0.00	0.00	310.34	715.47	10.26	29.85	21.15	64.09
TC	0.00	0.30	498.46	1305.02	16.48	41.57	35.73	99.12
TA	1.87	2.36	3398.99	15038.38	96.78	293.16	239.36	850.24
INV	0.00	0.00	1172.94	1076.57	24.39	50.16	59.48	101.84
AVSALES	10.06	10.06	11699.92	11699.92	225.46	225.46	597.62	597.62
TC/STB	0.00	0.05	1.00	1.00	0.55	0.54	0.23	0.21
STBBSTB	0.00	0.00	0.99	0.91	0.38	0.41	0.22	0.20
TC/TA	0.00	0.01	1.70	1.07	0.21	0.19	0.14	0.13
STBB/TA	0.00	0.00	1.24	1.77	0.15	0.15	0.13	0.12

Table 2: Various components of average borrowings (amount in Rs. crores) - 1990-2001

	TBB	FI	CPFD	DEB	FOR	PR	OTHER	TC	NW	WC	INV	AR
1990	11.56	9.42	2.88	8.95	0.71	0.46	1.77	14.53	23.93	13.62	21.03	12.43
1991	13.95	12.13	2.97	10.49	0.92	0.59	2.13	17.11	29.07	14.47	25.73	15.08
1992	16.68	16.83	3.15	13.73	1.53	0.84	2.89	22.18	35.44	19.95	29.26	19.21
1993	20.46	20.69	3.48	17.16	1.95	0.91	2.89	24.09	47.27	25.57	34.40	24.23
1994	19.36	22.02	5.45	21.45	2.28	1.52	2.99	28.82	67.15	31.82	35.40	28.58
1995	28.87	24.45	4.13	22.01	5.03	2.64	3.23	35.26	98.60	41.88	43.94	34.99
1996	41.35	28.57	3.86	22.00	8.14	2.57	3.75	43.14	122.13	42.79	52.38	43.78
1997	46.72	34.94	4.91	27.39	14.85	3.60	5.26	47.93	135.96	48.85	54.61	49.31
1998	51.42	39.15	7.55	33.55	19.80	2.63	7.58	50.92	147.39	50.18	57.19	52.10
1999	54.41	39.35	10.00	36.76	18.92	3.29	7.82	54.85	151.87	42.50	56.57	52.42
2000	59.69	39.25	10.16	36.71	12.55	3.30	10.74	61.52	162.74	35.31	62.21	55.39
2001	60.35	40.00	9.87	39.92	15.28	3.04	8.15	63.57	165.83	30.45	63.28	58.03

Table 3: Components of borrowings as percent of total borrowing (1990-2001)

Year	TBB	FI	CPFD	DEB	FOR	PR	OTHER	TC	INV*	AR*
1990	27.83	19.74	4.03	7.06	0.31	1.54	3.67	34.41	60.36	39.64
1991	28.43	20.52	3.71	7.38	0.30	1.53	3.85	32.87	61.09	38.91
1992	26.77	20.86	3.38	7.95	0.31	1.94	3.68	33.49	59.62	40.38
1993	27.51	20.77	3.45	8.47	0.31	1.89	3.43	32.34	57.26	42.74
1994	25.39	20.14	4.75	8.16	0.36	2.38	3.28	33.49	56.37	43.63
1995	27.25	18.66	3.39	7.68	0.47	2.70	3.11	34.80	56.37	43.63
1996	29.45	17.80	2.69	6.64	0.56	2.65	3.18	34.99	55.08	44.92
1997	29.30	16.81	3.07	6.71	0.94	2.83	3.14	34.83	54.07	45.93
1998	29.34	16.40	3.80	6.94	1.46	2.65	2.79	34.17	53.45	46.55
1999	28.09	15.97	4.62	7.05	1.43	2.85	2.55	34.82	52.13	47.87
2000	28.21	14.83	4.35	6.75	0.91	2.71	3.35	36.44	52.44	47.56
2001	28.89	14.50	4.01	6.46	0.83	2.97	3.27	36.16	52.16	47.84
Average	28.04	18.08	3.77	7.27	0.68	2.39	3.28	34.40	55.87	44.13

* INV and AR are per cent of (INV + AR.)

Table 4: Components of short-term borrowings as per cent of STB

Year	STBB/STB	CP/STB	OTHER/STB	TC/STB
1990	33.21	0.03	6.95	59.69
1991	38.68	0.10	6.75	54.36
1992	38.66	0.20	6.31	54.83
1993	40.50	0.43	5.91	53.17
1994	37.65	2.42	5.81	54.11
1995	39.48	0.59	5.32	54.61
1996	41.05	0.04	5.36	53.55
1997	40.76	0.41	5.32	53.51
1998	40.37	1.20	4.74	53.69
1999	38.81	1.99	4.49	54.71
2000	37.68	1.76	5.47	55.10
2001	38.54	1.64	5.48	54.34
Average	38.78	0.90	5.66	54.64

Table 5: Borrowings and inventory a percent of TA - 1990-2001

Year	STBB/TA	TC/TA	OTHER/TA	INV/TA
1990	14.41	20.90	3.79	36.77
1991	15.25	20.46	2.53	29.09
1992	14.79	20.78	2.45	28.31
1993	15.33	19.57	2.20	27.28
1994	13.87	18.91	2.02	25.32
1995	13.87	18.87	1.87	24.58
1996	14.39	18.90	1.89	23.81
1997	14.09	18.78	1.89	22.42
1998	13.86	18.36	1.70	21.40
1999	13.66	18.56	1.63	20.20
2000	14.53	19.72	2.27	20.28
2001	15.66	19.81	2.20	19.85
Average	14.48	19.47	2.20	24.94

Table 6: Borrowings and inventory as per cent of current assets - 1990-2001

Year	INV/CA	AR/CA	TBB/CA	STBB/CA	TC/CA
1990	46.02	30.11	32.38	22.07	33.32
1991	46.05	30.11	31.78	24.58	32.03
1992	43.99	30.39	28.74	23.33	32.25
1993	42.61	32.21	29.11	24.49	30.37
1994	40.54	32.08	27.74	22.63	30.50
1995	39.84	31.29	62.09	23.01	37.62
1996	39.90	33.16	30.54	24.86	32.15
1997	38.99	33.39	32.18	25.71	32.36
1998	38.15	33.67	35.39	26.80	33.08
1999	36.93	34.09	36.91	27.68	34.17
2000	36.78	32.88	38.62	29.76	37.17

2001	36.82	33.60	42.65	32.99	39.33
Average	40.55	32.25	35.68	25.66	33.70

Table 7: Descriptive statistics of variables used in the study (9108 observations)

	Variables	Mean	Std.Dev.	Minimum	Maximum	Skewness
ginv	Δ Log (INV_t)	0.0931	0.4961	-8.0209	8.0060	0.8123
invs	Log ($INV_{i,t-1}/S_{i,t-1}$)	-1.5810	0.6829	-10.0983	8.0555	-0.6872
gs	Δ Log ($S_{i,t}$)	0.1062	0.3140	-6.7517	7.0205	-0.2988
liq	$LIQ_{i,t-1}$	0.0413	0.0620	0.0000	3.3094	18.5144
tc	$TC_{i,t-1}$	0.5467	0.2282	0.0000	1.0000	0.2130
gta	Δ Log ($TA_{i,t-1}$)	0.1307	0.2297	-4.0974	3.4844	0.6191
rliq	MR_t* $LIQ_{i,t-1}$	0.0083	0.0450	0.0000	3.3094	45.5222
rtc	MR_t* $TC_{i,t-1}$	0.1039	0.2428	0.0000	1.0000	2.2698
lnta	Log ($TA_{i,t-1}$)	4.4824	1.3883	0.6043	10.2075	0.4892

Table 8: Correlation matrix of variables used in the study

Variables	ginv	invs	gs	liq	tc	rliq	rtc	gta	lnta
ginv	1.000								
invs	-0.284	1.000							
gs	0.387	0.121	1.000						
liq	0.044	-0.032	0.096	1.000					
tc	0.043	-0.194	-0.006	0.196	1.000				
rliq	0.067	0.092	0.155	0.628	0.052	1.000			
rtc	0.173	-0.038	0.130	0.050	0.234	0.384	1.000		
gta	0.431	-0.033	0.441	0.099	0.014	0.173	0.133	1.000	
lnta	0.004	0.044	0.031	-0.040	-0.000	-0.044	-0.088	0.066	1.000

Table 9: Year-wise OLS regression results of

$$\Delta \text{ Log } (INV_t) = \lambda_0 + \lambda_1 \text{ Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 LIQ_{i,t-1} + \lambda_4 TC_{i,t-1} + \lambda_7 \text{ Log } (TA_{i,t-1}) + \lambda_8 \Delta \text{ Log } (TA_{i,t-1})$$

Year	Constant	invs	gs	liq	tc	lnta	gta	Adj R^2	F(6,821)
1991	-1.3662**	-0.7767**	0.7146**	0.8215**	0.0767	0.0425**	0.3534**	0.73	51.31**
1992	-0.2041**	-0.1367**	0.6175**	0.5412**	-0.1073*	-0.0021	0.4197**	0.47	15.63**
1993	-0.2479**	-0.0940*	0.4993**	0.5832**	-0.0262	0.0189*	0.4874**	0.41	18.55**
1994	-0.1372	-0.0798**	0.1706	0.2506	-0.0661	-0.0091	0.7888**	0.29	8.53**
1995	-0.0511	-0.0654**	0.3236**	0.2183	-0.0398	0.0007	0.4580**	0.28	21.15**
1996	-0.2384**	-0.0854**	0.1867**	0.6597**	0.0143	0.0147	0.6051**	0.27	18.89**
1997	-0.1010*	-0.0672**	0.2552**	0.2084	-0.0707	-0.0081	0.8068**	0.34	28.84**
1998	-0.0632	-0.1064*	0.3415*	0.1943	-0.2060*	-0.0141	0.9050**	0.29	7.11**
1999	-0.2615	-0.1897	0.5439**	-0.5703	-0.2261**	0.0049	0.8185**	0.35	8.81**
2000	-0.1335*	-0.0592*	0.4144*	0.0289	-0.0356	0.0066	0.9240**	0.31	9.79**
2001	-0.0358	-0.0401	0.6127*	0.0441	-0.1118	-0.01	0.8747	0.37	8.92**

* denotes significance at 5% level

** denotes significance at 1% level

Table 10: OLS Regression Results of the model all years and all companies

$$\Delta \text{ Log } (INV_t) = \lambda_0 + \lambda_1 \text{ Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 LIQ_{i,t-1} + \lambda_4 TC_{i,t-1} + \lambda_5 MR_t^* TC_{i,t-1} + \lambda_6 MR_t^* LIQ_{i,t-1} + \lambda_7 \Delta \text{ Log } (TA_{i,t-1}) + \lambda_8 \text{ Log } (TA_{i,t-1})$$

Variables		Coefficient	Std. Err.	t-value	Prob
	constant	-0.3594	0.0197	-18.2420	0.0000
Log ($INV_{i,t-1}/S_{i,t-1}$)	invs	-0.2248	0.0065	-34.7600	0.0000
Δ Log ($S_{i,t}$)	gs	0.4578	0.0153	29.9820	0.0000
$LIQ_{i,t-1}$	liq	0.0852	0.0956	0.8920	0.3726
$TC_{i,t-1}$	tc	-0.0985	0.0202	-4.8730	0.0000
$MR_t^* LIQ_{i,t-1}$	rliq	-0.5209	0.1413	-3.6870	0.0002
$MR_t^* TC_{i,t-1}$	rtc	0.2328	0.0208	11.2000	0.0000
Δ Log ($TA_{i,t-1}$)	gta	0.6176	0.0209	29.6100	0.0000
Log ($TA_{i,t-1}$)	lnta	-0.0004	0.0031	-0.1250	0.9003

N = 9108 Adj R^2 = 0.3377 F [8, 9099] = 581.45, Prob value = 0.0000

Table 11: Estimation of Fixed Effect Model: Group Dummy Variables

Variables		Coefficient	Std. Err	t-value	Prob
Log ($INV_{i,t-1}/S_{i,t-1}$)	invs	-0.5239	0.0413	-12.6840	0.0000
Δ Log ($S_{i,t}$)	gs	0.5811	0.0552	10.5240	0.0000
$LIQ_{i,t-1}$	liq	-0.0985	0.1716	-0.5740	0.5661
$TC_{i,t-1}$	tc	0.0061	0.0373	0.1640	0.8701
$MR_t^* LIQ_{i,t-1}$	rliq	-0.3226	0.1779	-1.8130	0.0699
$MR_t^* TC_{i,t-1}$	rtc	0.1767	0.0210	8.4330	0.0000
Δ Log ($TA_{i,t-1}$)	gta	0.5369	0.0723	7.4250	0.0000
Log ($TA_{i,t-1}$)	lnta	-0.0177	0.0122	-1.4510	0.1469

N = 9108 Adj R^2 = 0.46105 F [835, 8272] = 10.33, Prob value = 0.0000

Table 12: Estimation of Fixed Effect Model: Group Means Regression

Variables		Coefficient	Std. Err.	t-value	Prob
	constant	0.0540	0.0210	2.5770	0.0100
Log ($INV_{i,t-1}/S_{i,t-1}$)	invs	0.0014	0.0079	0.1720	0.8634
Δ Log ($S_{i,t}$)	gs	0.5577	0.0507	10.9960	0.0000
$LIQ_{i,t-1}$	liq	-0.0898	0.1703	-0.5270	0.5980
$TC_{i,t-1}$	tc	-0.2672	0.0413	-6.4760	0.0000
$MR_t^* LIQ_{i,t-1}$	rliq	-0.6492	0.4523	-1.4350	0.1512
$MR_t^* TC_{i,t-1}$	rtc	1.1982	0.1900	6.3060	0.0000
Δ Log ($TA_{i,t-1}$)	gta	0.3983	0.0644	6.1860	0.0000
Log ($TA_{i,t-1}$)	lnta	-0.0088	0.0030	-2.9050	0.0037

N = 9108 Adj R^2 = 0.3820 F [8, 819] = 64.90, Prob value = 0.0000

Table 13: Estimation of Fixed Effect Model: Group Dummy Variables and Period Effects

$$\Delta \text{ Log } (INV_t) = \lambda_0 + \lambda_1 \text{ Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 LIQ_{i,t-1} + \lambda_4 TC_{i,t-1} + \lambda_5 MR_t^* TC_{i,t-1} + \lambda_6 MR_t^* LIQ_{i,t-1} + \lambda_7 \Delta \text{ Log } (TA_{i,t-1}) + \lambda_8 \text{ Log } (TA_{i,t-1})$$

Variables		Coefficient	Std. Err.	t-value	Prob
	constant	-1.3061	0.0558	-23.3900	0.0000
Log $(INV_{i,t-1}/S_{i,t-1})$	invs	-0.5316	0.0089	-59.9940	0.0000
Δ Log $(S_{i,t})$	gs	0.5739	0.0145	39.6480	0.0000
$LIQ_{i,t-1}$	liq	-0.1384	0.1044	-1.3250	0.1852
$TC_{i,t-1}$	tc	-0.0285	0.0282	-1.0130	0.3112
$MR_t^* LIQ_{i,t-1}$	rliq	-0.1612	0.1358	-1.1870	0.2353
$MR_t^* TC_{i,t-1}$	rtc	0.3393	0.0433	7.8400	0.0000
Δ Log $(TA_{i,t-1})$	gta	0.4539	0.0212	21.4040	0.0000
Log $(TA_{i,t-1})$	lnta	0.0950	0.0117	8.1480	0.0000

N = 9108 Adj R^2 = 0.4742 F [845, 8262] = 10.72, Prob value = 0.0000

Table 14: Estimation of Random Effect Model

$$\Delta \text{ Log } (INV_t) = \lambda_0 + \lambda_1 \text{ Log } (INV_{i,t-1}/S_{i,t-1}) + \lambda_2 \Delta \text{ Log } (S_{i,t}) + \lambda_3 LIQ_{i,t-1} + \lambda_4 TC_{i,t-1} + \lambda_5 MR_t^* TC_{i,t-1} + \lambda_6 MR_t^* LIQ_{i,t-1} + \lambda_7 \Delta \text{ Log } (TA_{i,t-1}) + \lambda_8 \text{ Log } (TA_{i,t-1})$$

Variables		Coefficient	Std. Err.	t-value	Prob
	constant	-0.9318	0.0463	-20.1120	0.0000
Log $(INV_{i,t-1}/S_{i,t-1})$	invs	-0.4635	0.0083	-55.9990	0.0000
Δ Log $(S_{i,t})$	gs	0.5487	0.0143	38.2360	0.0000
$LIQ_{i,t-1}$	liq	-0.0731	0.1016	-0.7200	0.4716
$TC_{i,t-1}$	tc	-0.0687	0.0263	-2.6150	0.0089
$MR_t^* LIQ_{i,t-1}$	rliq	-0.2406	0.1345	-1.7890	0.0736
$MR_t^* TC_{i,t-1}$	rtc	0.3633	0.0408	8.9060	0.0000
Δ Log $(TA_{i,t-1})$	gta	0.5039	0.0207	24.3430	0.0000
Log $(TA_{i,t-1})$	lnta	0.0386	0.0071	5.4290	0.0000

Fixed vs. Random Effects (Hausman) = 529.10 (8 df, prob value = 0.0000)

Table 15: Estimation of fixed effect model sample classified size of net worth group dummy variables and period effects

Group 1: Adj R^2 = 0.6125 F [224,2052] = 17.06 Prob = 0.0000

Variable	Coefficient	Std. Err.	t-value	Prob
constant	-1.5426	0.1001	-15.4160	0.0000
Log ($INV_{i,t-1}/S_{i,t-1}$)	-0.5140	0.0161	-31.9130	0.0000
Δ Log ($S_{i,t}$)	0.4758	0.0247	19.2700	0.0000
$LIQ_{i,t-1}$	-0.3467	0.2848	-1.2180	0.2234
$TC_{i,t-1}$	-0.0262	0.0656	-0.4000	0.6893
MR_t* $LIQ_{i,t-1}$	-0.8458	0.5129	-1.6490	0.0992
MR_t* $TC_{i,t-1}$	0.5749	0.0980	5.8660	0.0000
Δ Log ($TA_{i,t-1}$)	0.9982	0.0473	21.1030	0.0000
Log ($TA_{i,t-1}$)	0.1958	0.0284	6.8830	0.0000

Group 2: Adj R^2 = 0.4270 F [224, 2052] = 8.57 Prob = 0.0000

constant	-1.2744	0.1056	-12.0640	0.0000
Log ($INV_{i,t-1}/S_{i,t-1}$)	-0.5499	0.0188	-29.1980	0.0000
Δ Log ($S_{i,t}$)	0.6046	0.0313	19.3040	0.0000
$LIQ_{i,t-1}$	0.2821	0.1944	1.4510	0.1467
$TC_{i,t-1}$	-0.1237	0.0513	-2.4140	0.0158
MR_t* $LIQ_{i,t-1}$	0.1115	0.3261	0.3420	0.7324
MR_t* $TC_{i,t-1}$	0.3689	0.0819	4.5030	0.0000
Δ Log ($TA_{i,t-1}$)	0.2603	0.0417	6.2380	0.0000
Log ($TA_{i,t-1}$)	0.1086	0.0251	4.3310	0.0000

Group 3: Adj R^2 = 0.3403 F [224, 2052] = 6.24 Prob = 0.0000

constant	-0.8676	0.1304	-6.6520	0.0000
Log ($INV_{i,t-1}/S_{i,t-1}$)	-0.3999	0.0181	-22.1270	0.0000
Δ Log ($S_{i,t}$)	0.4615	0.0301	15.3130	0.0000
$LIQ_{i,t-1}$	-0.3707	0.1940	-1.9110	0.0560
$TC_{i,t-1}$	0.0432	0.0525	0.8220	0.4111
MR_t* $LIQ_{i,t-1}$	0.2259	0.4128	0.5470	0.5841
MR_t* $TC_{i,t-1}$	0.2264	0.0834	2.7140	0.0066
Δ Log ($TA_{i,t-1}$)	0.2718	0.0422	6.4370	0.0000
Log ($TA_{i,t-1}$)	0.0489	0.0264	1.8530	0.0639

Group 4: Adj R^2 = 0.5035 F [224,2052] = 11.30 Prob = 0.0000

constant	-1.6003	0.1238	-12.9260	0.0000
Log ($INV_{i,t-1}/S_{i,t-1}$)	-0.7026	0.0181	-38.8540	0.0000
Δ Log ($S_{i,t}$)	0.6765	0.0350	19.3150	0.0000
$LIQ_{i,t-1}$	-0.1279	0.1648	-0.7760	0.4376
$TC_{i,t-1}$	-0.0454	0.0500	-0.9080	0.3641

MR_t* $LIQ_{i,t-1}$	0.0725	0.1859	0.3900	0.6966
MR_t* $TC_{i,t-1}$	0.1508	0.0751	2.0070	0.0447
Δ Log ($TA_{i,t-1}$)	0.2092	0.0361	5.8030	0.0000
Log ($TA_{i,t-1}$)	0.0787	0.0191	4.1240	0.0000

Appendix 1

During the pre-reform period the monetary policy was highly regulated. Following the Narasimham Committee Recommendations there have been a number of financial sector reforms towards liberalising the money market and banking sector in India. With the reduction in cash reserve ratio (CRR) and statutory liquidity ratio (SLR), the liquidity position of commercial banks has significantly enhanced. The bank rate has become an anchor to signal the direction of interest rates. With these reforms the interest rates have eased. Since 1992 the interest rates have shown a downward trend. Although the trend towards deregulation was visible during 1991-92 to 1995-96 periods, the years 1996-97 and 1997-1998 witnessed the beginning of a sharp turning point in the monetary policy regime in India, resulting in a trend of significantly comfortable liquidity conditions and declining interest rates.

Reduction in the nominal interest rates, however, has accompanied by a fall in inflation rates. In real terms, the prime lending rate (PLR) was higher during the period 1995-96 to 2001-02, as compared to the PLR prevailing during the period 1990-91 to 1994-95. The table below indicates this.

Lending Rates: Nominal and Real (%)

Year	PLR Nominal	PLR Real	Inflation
March 1991	16.00	7.05	8.36
March 1992	19.00	6.83	11.39
March 1993	17.00	5.54	10.86
March 1994	14.00	5.79	7.76
March 1995	15.00	2.51	12.18
March 1996	16.50	7.25	8.62
March 1997	14.50	12.13	2.11
March 1998	14.00	10.83	2.86
March 1999	12.50	7.81	4.35
March 2000	12.25	9.25	2.75
March 2001	11.50	8.01	3.23
March 2002	11.50	9.47	1.85

Real interest rates (i) have been calculated after adjusting the nominal interest rates (r) for inflation rate (η) using the equation $(1+i)(1+\eta) = (1+r)$

The following table shows the average real lending rates of financial institutions and scheduled commercial banks prevailing during the 1990-91 to 1994-95 periods and the 1995-96 to 2001-02 periods.

Average Real Lending Rates (%)		
Institution	1990-91 to1994-95	1995-96 to 2001-02
IDBI	5.52	9.11
IFCI	5.82	9.99
ICICI	5.67	8.38
SCBs	6.80	12.50

* Source: Report on Currency and Finance, 2001-2002

As it is evident from above tables, the years 1996-97 and 1997-98 witnessed significant softening of lending rates, but only in nominal terms. The situation is just the reverse when interest rates are examined in real terms. The following classification can be made based on average real lending rates:

- The 5-year period beginning from 1990-91 to1994-95. This denotes the period when real interest rates were low.
- The 5-year period beginning from 1995-96 to 2001-02. This denotes the period when real interest rates were comparatively higher.

Restrictive Years

It is difficult to clearly identify the stance of monetary policy with a single indicator. Hence, neither bank rate, nor lending rate, nor the interest rate spreads were used individually as parameters to identify the restrictive years. Instead, we have used the Economic Survey as a base to identify the restrictive years. Beginning from 1991 to 2001, two years have been clearly identified as restrictive years. These years are 1991-92 and 1996-97. For example, the Economic Survey of 1992 states that the stance of monetary policy in 1991-92 was restrictive to contain the growth of aggregate demand to fight the twin problems of high inflation and adverse balance of payments. The discussion in Economic Survey also suggests the following policy changes in monetary policy during the period:

- Bank rate was revised twice and was raised from 10 per cent to 12 per cent.
- Interest rates on term deposits (particularly short-term deposits) were raised significantly.
- Interest rates on bank advances of all categories underwent upward revision.
- The credit policy of the RBI in the first half of the financial year 1991-92 announced incremental cash reserve ratio (CRR) as an instrument for credit control, which was introduced with effect from 4 May 1991.
- The credit policy for the second half of the financial year (announcement date 8 October 1991) also had the same stance of restraint in the growth of money supply.
- Upward revisions were made in the lending rates of scheduled commercial banks (SCBs).
- Net bank credit to the government and bank credit to the commercial sector recorded lower growth rate of 17.1 per cent and 4.8 per cent respectively during 1991-92 (up to 10 January 1992), as against 17.6 per cent and 7.8 per cent respectively in the corresponding period of 1990-91.
- The net increase in RBI credit to the Central Government has been of a lower order in 1991-92 than in the last financial year.

The year of 1996-97 has also been described as a period of restrictive monetary policy. The Economic Survey states that during 1996-1997 the bank lending rates remained sticky for sometime despite the increased liquidity with the banks following CRR reductions. Banks did not reduce interest rates immediately in order to avoid a dent in the interest rate spread that would have affected profits adversely. With inflation falling sharply, real interest rates rose, contributing to lower demand for credit. Though nominal interest rates fell during the 1996-97 period, real interest rates rose during this period because of falling inflation rates.