Effects of Monetary Policy on Corporations in Brazil. An Empirical Analysis of the Balance Sheet Channel

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Abstract

This paper investigates the transmission mechanism of monetary policy in Brazil. It is an empirical analysis of the effects of monetary policy on the behavior of corporations in Brazil. We use the balance sheet theory to investigate how corporations respond to monetary contractions. Our results show that small firms are more sensitive to monetary contractions than large firms.

Preliminar Version

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[2] This paper is still a work in progress. Comments and suggestions are very welcome. The ideas expressed in this paper do not in any way reflect the official opinions on the subject of the Central Bank of Brazil
[3] Citations are not allowed

1-Introduction

It is by now a well-established fact for OECD economies[4] that traditional monetary mechanisms of monetary policy are not capable of explaining completely the reactions of private agents to monetary shocks. Credit market imperfections related to informational asymmetries between financial institutions and households or firms play an increasing important role in the propagation of monetary policy in these economies.

Contrary to what is known in developed economies, very little is known about non-traditional monetary mechanisms operating in emerging markets. These economies have capital and credit markets much less developed than OECD countries. So one would suspect that market imperfections would play an even greater role in amplifying monetary shocks in these economies. In particular, monetary contractions should create more agency costs between banks and private agents. In the aggregate, this could lead to a much more severe downturn in the economy compared to a downturn if only traditional mechanisms were in place.

Brazil, for example, is a very special case of an emerging market where asymmetries of information could play a very important role in the transmission mechanism of monetary policy. Brazil has a very interesting financial system. In some of its aspects, like its means of payments for instance, Brazil financial system rivals that of developed countries. However, as far as volume of credit to households and firms and depth of the capital markets is considered, Brazil still lags behind OECD countries.[5]

The cost of capital in Brazil is incredibly high compared to international standards. The spread banks charge on their loans even for very good rated companies is well above what is charged worldwide. This high cost of capital creates enormous agency costs between private agents and financial institutions. The consequence of this looking at a micro perspective is that firms invest less and individuals consume also less than they could. In the aggregate, this could imply a very important role to the financial accelerator[6] theories of the monetary transmission mechanism.

[4] See Bernanke (1993) or Mishkin (1997)
[5] The total credit to the private sector is around 30% of GNP, while in the USA, for example, it is over 100% of GNP.
[6] This is the how the literature defines credit market imperfections in general terms

This paper fills a gap in the literature of transmission mechanism of monetary policy related to capital market imperfections, by analyzing empirically the impact of monetary shocks in an emerging market such as Brazil. We take account of asymmetries of information between financial institutions and firms. We use credit channel theories of monetary policy, specifically, the balance sheet theory to study the impact of monetary contractions in corporations in Brazil since the implementation of the Real Plan in July 1994.

Credit channel theories can be decomposed in two distinct theories: the bank lending and the balance sheet theories. In the former, monetary contractions increase the adverse selection problems between firms and banks, which may decrease the volumes of loans from banks to firms and households. The reason for this is that banks experience a decrease in the volume of demand deposits that can lead to a decrease in the volumes of loans if they are not able of substituting demand deposits by other financial instruments.

The balance sheet channel of monetary policy arises because the shifts in policy affect not only market interest rates but also the financial positions of borrowers, both directly and indirectly. A tight monetary policy directly weakens borrowers balance sheets in at least two ways. First, rising interest rates directly increase interest expenses, reducing net cash flows and weakening the borrower's financial position. Second, rising interest rates are also typically associated with declining asset prices, which among other things shrink the value of the borrower's collateral. In the aggregate, these effects could a lead to a substantial impact in aggregate demand

To study the balance sheet channel theory in Brazil, we look at public companies due to the difficulties in finding good data related to non public companies in Brazil[7]. Of course, we are aware of the fact that public companies are relatively large companies. But even among them in Brazil, there are important differences on their capacity to access financial markets. Large public firms (defined by relative assets), as Oliveira and Novaes (2004) show, have much more access to domestic and external financial markets than small public firms.

[7] There is some information on private companies at IBGE, but it is mostly related to labor considerations. We are right now working on a database sponsored by Exam a business magazine in Brazil. It has some information on private firms. The problem is the information is not as detailed as in the case of public companies and its sample period is short.

We document the reactions of public companies in Brazil with respect to monetary contractions. We consider monetary contractions because we understand they are much more relevant to verify the effects of monetary policy on firms in Brazil than monetary expansions. As Gertler and Bernake (1995) indicate there seems to be even in developed countries much more evidence of firms reacting to monetary contractions than to monetary expansions.

Our classification scheme is based on differentiating firms depending on their access to the financial markets. We choose size defined as total assets as our criteria to classify firms in small or large. We verified that size is highly correlated to other financial characteristics of firms that indicate the degree in which firms access the financial markets. Some of these characteristics are total short-term debt, long term debt, short and long term commercial paper, total market value of ordinary and preferred stocks in the market.

There is a very important peculiarity of corporations in Brazil as far access to financial markets is concerned. Due to the high costs of capital, many corporations look for a public development bank BNDES-Banco Nacional de Desenvolvimento Econômico e Social- for long term financing. Not only interest rates are much lower but also maturities are much longer. Monetary Policy affects only indirectly the long-term interest rates set by BNDES in its loans.[8]

We started to study the reactions of firms to monetary policy beginning in the third quarter of 1994, just after the implementation of the Real plan. The final quarter of the sample period is the third quarter of 2005. This choice of the sample period is important because the high inflation period prevalent in Brazil before the third quarter of 1994 could very much distort our results. The decisions of investment and finance in periods of high inflation can be very different from those of low inflation. In high inflation periods, the information asymmetries get so magnified and monetary policy much less

[8] We are at the moment looking at all off-balance financial statements of corporations in Brazil since July 1994 to verify if a corporation had outstanding loans with BNDES during our sample period. After we complete this task, the idea is to use this information as a regressor in our empirical analysis. We think that this can be a source of omitted variable problem and our econometric analysis should improve by using this regressor.

effective that it is not reasonable to discuss credit channels theories of monetary transmission mechanism.

Our results so far indicate that small firms in Brazil react somewhat differently from large firms to monetary contractions. Smaller firms seem to be more sensitive to monetary policy than large firms. Inventories, sales, and operational revenues that are directed linked to the balance sheet explanations of the monetary transmission mechanism respond differently to monetary shocks for small firms if compared to large firms. Our results seem robust to structural and non-structural analyses, different specifications, and different samples of small and large firms, different time periods and aggregation or not of data of small and large firms.

The rest of the paper is organized as follows. Section 2 discusses the Theoretical background. Section 3 describes the data we use. Section 4 shows non-structural analyses of the data. Section 5 shows structural analyses with aggregated data. Section 6 continues the structural analyses with individual data. Finally, Section 7 concludes.

2. Theoretical Background

As Bernanke and Gertler (1983) discuss credit channels are not in fact an alternative view to the traditional monetary transmission mechanism. They are a set of factors that amplify the conventional mechanisms. They are a set of mechanisms that enhance the propagation of monetary policy, not an independent or parallel channel. They emphasize how asymmetric information and costly enforcement of contracts creates agency problems in financial markets.

As considered by the credit channel, there exists a financial premium, that is a difference between the cost of funds raised externally (issued by equity or debt) and the opportunity costs of funds raised internally (by retaining earnings). The size of the external finance premium reflects imperfections in credit markets. The dynamics of this premium can improve the explanation of the timing and strength of monetary policy provided by traditional mechanism.

Credit channels depend on market imperfections. Contrary to traditional monetary transmissions mechanism, credit channel theories rely on some form of informational asymmetry between market participants. Credit channels can be decomposed in two distinct theories: the bank lending and the balance sheet theories. In the former, monetary contractions increase the adverse selection problems between firms and banks, which may decrease the volumes of loans from banks to firms and households. The reason for this is that banks experience a decrease in the volume of demand deposits that can lead to a decrease in the volumes of loans.

Monetary policy may affect the external finance premium by shifting the supply of credit, particularly loans by commercial banks. According to this view, banks play a special role in the financial system because they are especially well suited to deal with certain type of borrowers, specifically small and medium firms. If the supply of banks loans is disrupted, bank dependent borrowers may be shut off from credit. Therefore, decreasing the supply of loans is more likely to increase the external finance premium and reduce real economic activity.

The empirical evidence on the bank-lending channel is not very convincing. As Mishkin (1996) explains commercial banks, nowadays, can issue a variety of financial instruments that can serve as substitutes for demand deposits. By doing this, they can relax the restrictions that otherwise would be imposed by a monetary contraction, like for instance, loosing demand deposits.

One interesting approach for testing the credit channel is provided by Kashyap, Stein, and Wilcox (1993). The authors establish a simple model that explains that two necessary conditions must be satisfied if monetary policy is to impact aggregate demand in part through a distinct lending channel. The first condition is that loans and commercial paper must be imperfect substitutes in bank assets. The second condition is that loans and commercial paper must be imperfect substitutes in corporate liabilities. Their empirical evidence suggests that both conditions are satisfied.

Contrary, to credit channel theories, balance sheet channel theories of monetary policy focus on the balance sheet of borrowers (households or firms) and not on the institutional details of financial institutions. In the balance sheet explanation, shifts in

monetary policy affect the financial situation of borrowers, both directly and indirectly. A tight monetary policy directly weakens borrowers balance sheets in at least two ways. First, rising interest rates directly increase interest expenses, reducing net cash flows and weakening the borrower's financial position. Second, rising interest rates are also typically associated with declining asset prices, which among other things shrink the value of the borrower's collateral.

For firms there is also an indirect effect related to the deterioration in consumers expenses of its products. The firm's revenues will decline while its various fixed or quasi-fixed costs do not adjust in the short run. The financing gap, therefore, erodes the firm's net worth and credit worthiness over time.

Lower net worth means that lenders in effect have less collateral for their loans, and so losses from adverse selection are higher. A decline in net worth, which raises the adverse selection problem, thus leads to decreased lending to finance investment spending. Lower net worth of business firms also increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in business firm's net worth leads to a decrease in lending and hence in investment spending. [9]

In contrast to bank lending theory, balance sheet channel theory has had much more success empirically in explaining the reactions of firms to monetary policy, as posited by Gertler and Gilchrist (1994)[10]. Gertler and Gilchrist study the effects of a tightening of monetary policy on large and small manufacturing firms. They find that the effect of cash flow squeeze on economic behavior depend largely on firms' ability to smooth the drop in cash flows by borrowing. Gertler and Gilchrist point out that in the case of firms, the balance sheet channel can be much more relevant for relatively small firms than for large firms. The classification of small and large firms for them is related to their capacity to access the financial markets[11]. For Gertler and Gilchrist this capacity is very much correlated to the size of these firms, measured by their total assets. Relatively

[9] Caballero et al (2001) and Caballero et al (2003) are theoretical approaches of the balance sheet theory from the perspective of firms
[10] See also Krugman (1998) and Krugman (1999)
[11] We will take much the same approach in this paper

smaller firms depend much more on banks for financing than larger firms. The latter have in general much more access to capital markets than smaller firms.

The large firms can be at least temporally able to maintain their levels of production and employment in the face of higher interest costs and declining revenues through other sources of short-term credit like commercial paper. However, the small firms, who have more limited access to short-term credit markets, tend to loose inventories by cutting work-hours and production. .[12]

The literature on the empirical relevance of balance sheet channel in developed countries is by now well established, Mishkin (1996). However, very little is known in this literature for emerging market economies. Mishkin (2001) stresses that these economies experience much more market imperfections in their financial markets than developed economies. They have much less developed financial markets, in particular much less developed capital markets. Therefore one can infer that balance sheet theory of monetary transmission can be even more relevant in emerging market economies than in developed economies.

The credit view as a whole is interesting and important for several reasons. First, if the credit view is correct, it means that monetary policy can affect the real economy without much variation in the open-market interest rates. Second, the view can explain how monetary contraction influences investment and inventory behavior. In addition, understanding the credit channel will offer insights on how innovation in financial institutions might affect the potency of monetary policy. Finally, the credit view also implies that the impact of monetary policy on economic activity is not always the same. It is also sensitive to the state of firms' balance sheet and health of the banking sector.

In the next section, we will start describing the data we will later use in our econometric analysis.

[12] Caballero et al (2001) and Caballero et al (2003) are theoretical approaches of the balance sheet theory from the perspective of firms

3. Data

We divide our description of the data in two parts. In the first part, we show how we classify firms in respect to their access to the financial markets. We take size, measured by total assets, as our classification criteria following Gertler and Gilchrist (1994). We observed that size is highly correlated with other financial variables that indicate the capacity firms have to access the financial markets. We classify corporations therefore in small and large. We will show that our small corporations have relatively less access to the financial markets than large corporations. After sorting out firms, we proceed to explain how we identify the monetary contraction shocks. For this we use the SELIC rate as our main measure of monetary contractions and the Boshen-Mills (1995) index as our second measure.

3.1 Classifying Firms in Large or Small

Our interest in separating firms in large and small ones is that, as Gertler and Gilchrist (1994) point, is that by doing this we can infer the level of access to the financial markets of the corporations. In theory, small firms will depend much more on bank loans than large firms. The latter will also issue much more short and long term commercial paper and have much more access to capital markets.

Our classification scheme of small and large firms is the following. Our sample period starts in the third quarter of 1994 and ends up in the third quarter of 2005. In the first place, we exclude from our sample of public corporations in Brazil financial institutions and firms that do not report all balance sheet characteristics that we need for our empirical analysis in our sample period. We keep track of the firms whose financial statements are not available in all periods, because there were not public firms yet or because they closed their capital, or because there was a takeover or fusion or even because they went bankrupt during our sample period. For firms in these situations we treat the absent information as not available in our database.

Later on, in our empirical analysis we will study the reaction of three variables to monetary contractions. The variables are growth rates of inventories, sales and short term debt. These variables are as pointed out by Gertler and Gilchrist (1994) as the most important variables to identify the balance sheet channel. We are assuming that size of firms, which is the criteria we use to select our sample, is independent of these growth rates. This assumption guarantees that our selected sample is unbiased and that our ordinary least squares estimators are consistent and unbiased as well.

We consider a possible candidate for being small, a firm whose total assets are less or equal to the percentile 30 of the distribution of total assets in any quarter. In a similar fashion, we consider a possible candidate for being a large firm, one whose total assets are greater or equal to the percentile 70 in any quarter. To choose the small firms, we consider those that we consider to be small in all quarters. By doing this we obtain 73 small firms and 55 large firms.

We look at every quarter at the skewness of the distribution of small and large. We could have problems in our sample selection if the distribution of small firms were skewed to the right or if the distribution of large firms were skewed to the left. This could indicate that our cut-off for small and large is not a good one. The average of skewness (considering all periods) we observed for small firms was 0.80 and for large firms was 1.5. These results indicate that our classification scheme is not a bad one as far as the cut-off is size concerned.

Panel A of Table 1 lists mean values of some financial characteristics of small and large firms for the whole sample. As we can easily verify, large firms have greater debt in average than small firms. Large firms issue much more long and short-term commercial paper relatively than small firms, as well more preferred and ordinary stocks.

Panel B of Table 1 shows the small and large firms separated by the sector of the economy they belong to. As one would imagine, large firms come from the concessionaries sector while small firms come mostly from the textile sector.

Panel C of Table 1 shows some mean tests for these characteristics considering the financial statements of the last quarters of the years 1999, 2002 and 2005. As one can

see all p-values of the differences of characteristics means between large and small are close 0. Therefore, small firms in our sample differ from large firms as far as access to the financial market is concerned.

Finally, Panel D of Table 1 shows correlations of several balance sheet characteristics of the firms that we will us as control variables in our regressions. As it is clear, the size of the company (measured by assets) is positively related to the other financial characteristics related to access to the financial markets.

3.2 Measures of Monetary Contractions

After having classified firms in small and large, we now move to explain how we define a monetary contraction. A prerequisite for all our tests is a good indicator of monetary policy. However as Bernanke and Mihov (1998) point out there is no consensus in the literature as to the best indicator of monetary stance. We decided to use two measures of monetary policy[13]. Our first measure is the SELIC rate. Our second measure is the Boshen-Mills (1995)..

Bernanke and Blinder (1993) advocate that the interest rate set by the Central Bank in its open market operations is a good indicator of monetary policy except in periods where the interest is very volatile, which was not the case in Brazil in our sample period (that goes from the third quarter of 1999 to the third quarter of 2005).

We use the quarterly series of the effective SELIC rate. SELIC rate is a nominal interest rate, that the Central Bank of Brazil sets as its target in open market operations. We consider this series more relevant to characterize monetary contractions than the real SELIC rate because the latter depends on expectations on inflation. Only recently, have expectations of inflation of the private agents became public. If we used this series therefore this would hamper our capacity to perform empirical tests.

[13] Bernanke and Mihov (1998) proposed another form of identifying monetary shocks, in particular monetary contractions. They build a flexible VAR model that nests previous VARs based on more specific assumptions about FED´s monetary policy, such as funds rate target, and non-borrowed reserves target. The methodology is useful for calculating high frequency monetary shocks or as indicator of the overall stance of monetary policy. We decided not to use this methodology because we think the two we use in the paper are sufficient for our purpose of identifying monetary shocks in Brazil

We define a monetary contraction by looking at the first difference of SELIC. A monetary contraction occurs in the quarter in which we observe that the modulus of the first difference of the SELIC is greater than the mean of the series plus one standard deviation. Panel A of Table 2 shows descriptive statistics of the series of the first difference of the SELIC rate in several sub samples.

Using this criteria, we observed 3 monetary contractions. They occurred in the following quarters: fourth quarter of 1997, fourth quarter of 1998 and second quarter of 1999.

Our second methodology of identifying monetary is related to the Boshen-Mills (1995) index. Boshen and Mills read the FOMC documents and classified monetary contractions in five categories: strongly expansionary, mildly expansionary, neutral, mildly contractionary, and strongly contractionary. The classification was based on relative weights they perceived the FED put on the short term tradeoff between inflation against unemployment.

To build Boshen-Mills (1995) index for Brazil we read all COPOM documents since its creation and for each document classified monetary policy in one of the five categories mentioned above. Panel B of Table details the results of our classification. We identified four COPOM meeting that can be categorized as strongly contractionary. These meetings were in the fourth quarter of 1999, the fourth quarter of 1998, the second quarter of 1999 and in the third quarter of 2002. Of the four, the first three are the same we identified using the SELIC rate methodology. The category egory with more observations is the neutral category, with more fifteen observations.

After having described our sample of small and large firms as well as our monetary contractions, we proceed to our empirical analysis. We will divide it in there distinct parts. In the first place, we will try to understand how small and large firms reacted to monetary policy by looking at some time series evidence of growth rates of inventories, short-term debt and operational revenues around the quarters of monetary contractions. In the second place, we will do some non-structural analysis of the reaction of small

versus large firms considering impulse responses related to a VAR. In the third place, will proceed by doing two kinds of structural analysis.

In the first one, we will use aggregate data on these series and estimate univariates dynamics for our sample of large and small firms. Finally, we will end our empirical analysis by looking at a random effect unbalanced panel of large and small firms.

3- Empirical Analysis

3.1 Time Series Evidence

We study in this paper the reactions to monetary contractions of growth rates of three variables: inventories, operational revenues and short-term debt. Inventories are of interest partly because they are important for business fluctuations and partly because they provide some help in identifying the influence of financial factors.

We construct each one of the three series for small and large firms in following manner. We take an averaged weight of each series based on the size (total assets) of each firm, small and large, at each quarter of our sample from the third quarter of 1994 to the third quarter of 2005.

Graph 1, 2 and 3 show for each type of firms, small or large, the aggregate behavior of the growth rates of each of these series with seasonal adjustments during our sample period.

We consider in the graphs four quarters of monetary contractions. Three are related to the SELIC criteria, fourth quarter of 1997, fourth quarter of 1998, second quarter of 1999. We include another quarter of monetary contraction defined by Boshen-Mills (1995) index. It is the third quarter of 2002. A simple visual observation shows that in general after a monetary contraction small firms tend to show slower growth than large firms in inventories, operational revenues and short-term debt just after a monetary contraction. The only exception is the behavior of inventories in the contraction of the third quarter of 1998.

Graphs 4, 5 and 6 show average growth rates around monetary quarters for the series for large and small firms. As we can see it seems that large firms are responding less to monetary contraction than small firms. The average growth rates for all 3 series decrease for small firms after a monetary contraction, while it does not change much or even increases for large firms.

In the next section we start to analyze the data, looking first at some non-structural analyses first, by using a VAR technique.

3.2 VAR Analysis

We start our empirical analysis by studying how small firms and larges firms respond to monetary contractions using a non-structural approach. We built a 2 variable VAR and look at impulse response functions of the balance sheet variables we mention above, inventories short-term debt and operational revenues.

One of the variables of the VAR is a binary variable equal to one if in the specific quarter there is a monetary contraction and 0 otherwise. This is the more exogenous variable. The other variable is the first difference of inventories, operational revenues or short-term debt. We start with a 2 variable VAR in which growth rates of inventory are one of the variables. We look at the accumulated impulse response function. As Graph 6 shows the accumulated responses of the growth rates of inventories for small and large firms are different. The growth rate of inventories decreases for the former after 10 periods. The growth rate of inventories increases for the latter after 10 periods.[14]

We repeat the same exercise substituting inventories for short-term debt and operational revenues. Graph 7 shows the impulse response function for the growth rate of short term debt. Graph 8 shows the impulse responses for operational revenues. Both graphs show that small firms are reacting differently from large firms to monetary contractions.

[14] We use Akaike and Schwartz to define the number of lags. We also do all necessary diagnosis tests for the VAR

We repeat the exercise above considering monetary shocks defined by Boshen-Mills index (1995) instead of the first difference of the SELIC rate For space considerations we do not show the results but they are similar to the ones using the SELIC rate as a criteria for identifying monetary shocks.

We also did some robustness tests of the previous results. We implemented a 4 variable VAR including in this order, inventories, short term debt, operational revenues and a dummy variable indicating a monetary contraction. We test several combinations of the first 3 variables in the VAR and the impulse responses do not change very much. Due to space considerations once more, we do not report our results here but for all the tests they look very much the same as the ones we reported above. These are first evidences that small and large firms are responding differently to monetary contractions.

The non-structural evidences indicate differences in the responses of large and small firms to monetary contraction. Our next section investigates, still with aggregate data of small and large firms, if these evidences continue to be noticed in a structural analysis of our data.

4. Structural Analysis with Aggregate Data

To perform a structural analysis with aggregate data we need to do two things first. First of all, we need to define a control variable in our regressions that can capture the balance sheet effects of monetary contractions. We also need to specify the dynamics of the growth rates of inventories, short-term debt and operational revenues.

To capture the balance sheet effects we follow Gertler and Gilchrist (1994), and define the coverage ratio. It is the quotient of operational revenues to financial expenses. Gertler and Gilchrist, though, define it a little bit differently. They use cash flow instead of operational revenues in the numerator. We are not able to do this because information on cash-flows of firms is not public yet in Brazil.

We also need to model the dynamics of inventories, short term debt and operational revenues. For inventories we follow Gertler and Gilchrist (1994)[15] and model the dynamics as in equation 1. We divide the dynamics in short term and long term[16]. The long term dynamics is modeled by the co-integration between operational revenues, S_t, and inventories; CR_t is the coverage ratio and L() is the lag operator;

$$(1)\quad \begin{aligned}\Delta \mathrm{I}_t &= \alpha_i\left(S_{t-1} - \mathrm{I}_{t-1}\right) + \alpha_2 selic_{t-1} + \alpha_3 L(CR_{t-1}) + \alpha_4 L(\Delta \mathrm{I}_{t-s}) + \alpha_5 L(\Delta S_{t-s}) \\ &+ \alpha_6 L(\Delta selic_{t-s}) + u_t\beta\end{aligned}$$

To model the growth rate of debt we use an AR(1) specification including lags of the coverage ratio and one lag of the growth rate of operational revenues, following Géczy, Minton and Schrand (1997). Operational revenues show the ability of the firm to provide collateral, which increase the firms capacity for debt. We also include four lags of the coverage ratio.

$$(2)\quad \Delta Debt = \alpha_0 + \alpha_1 \Delta S_{t-1} + \Delta Debt_{t-1} + \alpha_2 L(CR_t) + u_t$$

As for the growth of operational revenues, S_t we follow Bathke et al (1984) and model it as an AR(2) process with the inclusion of the coverage ratio.

$$(3)\quad \Delta S_t = \alpha_1 \Delta S_{t-1} + \alpha_2 \Delta S_{t-2} + \alpha L(CR_t) + u_t$$

Panel A, B and C of Table 3 show the results of our regressions for the case of small and large firms. In these panels we show the results considering several specifications. As we would expect on a priori basis, the coverage ratio (lags 3 or 4) is significant and greater than zero for the regressions of inventories, short term debt and operational revenues for small firms. In all regressions of large firms the coefficients of the lags of coverage ratio are not significant. [17]

We do several robustness tests. We change our sample period. We interact the dummy variable that indicates a monetary shock with coverage ratio. We also include a control

[15] We changed the specification of Gertler and Gilchrist (1994) by considering that $_i\left(\mathrm{E}_{t-1} S_t\right) = S_{t-1t}$, that is revenues follow a random walk.
[16] To avoid endogeneity problems all control variables in our regressions are lagged.
[17] All necessary diagnosis tests were done. In Table 4 we report the LM autocorrelation test, the normality test of the residuals as well as the heterocedasticity tests

variable that indicates a economic crises in Brazil in our sample period. In general, our results do not change. Due to space considerations again we do not report the results.

The structural analyses with aggregate data are in line with the previous VAR exercises. Small firms seem to respond differently to monetary contractions than large firms. In the next section we look a little deeper in the responses of small versus large firms by looking at individual data on firms and doing an unbalanced Panel study.

5- Individual Analysis – Unbalanced Panel Analysis of the Responses of Small and Large Firms

In this section we investigate a little further how small and large firms in our sample respond to monetary contractions. We look at individual data of firms. By doing this, we use in our regressions control variables that describe several specific characteristics of firms. These characteristics may explain their responses to monetary contractions. The characteristics we control for are related to agency costs between banks and firms. Mishkin (2001) discusses how monetary contractions enhance the agency costs between firms and banks. Firms in which agency costs of debt are higher are the ones that are more sensitive to monetary contractions in general.

To verify the existence of agency costs, we use the quotient of market value of firms to the book value of firms and the quotient of fixed assets to total assets. The quotient of market value to book value shows the growth capacity of the firm. The more the market perceives this company as capable of growing, the greater the effects for the company of monetary contractions. The quotient between fixed assets and total assets gives an idea of the level of collateral firms can potentially dispose to offer to banks. The greater this quotient the less the agency costs.

We use as dynamics for inventories, short term debt and operational revenues similar ones to the previous sector. We include in the specifications a binary variable indicating a small firm in some of our specifications. We include it alone and interact it with the lag of the dependent variable in another specification. We augment some of our specifications by using control variables that try to capture agency costs described

above for each firm. We perform a variable effect panel unbalanced analysis with robust standard errors.

Panels A, B and C of Table 4 show the results of the estimation of the dynamics of growth rates of inventories, short term debt and operational revenues for small and large firms.[18] As it is evident from the results the coefficient of small firms has the expected negative sign in several of our specifications. The coverage ratio however is not significant in any of our specifications for large firms. This is another evidence of the fact that small firms react differently from large firms as far as monetary contractions are concerned.

We also did some other robustness tests. One of them included a dummy variable that indicates the existence or not of financial crises. We change the sample periods. We try several different specifications, including a dummy variable that indicates a monetary contraction interacting with the coverage ratio and alone in our regressions. The results we obtain and once again do not report for space consideration are very similar to the ones encountered above.

6. Conclusion

This paper investigates the balance sheet explanation of the monetary transmission mechanism in Brazil. We look at how small and large public companies in Brazil react to monetary contractions.

We use public companies because of the fact that data on non-public companies is not reliable in Brazil yet. Of course, large companies are relatively bigger than non-public companies. But in Brazil even among relatively larger companies there are differences in the way these companies access the financial markets. Some that we classify as large have much more access than the ones we classify as small.

Our results indicate that small firms are much more sensitive to monetary contractions than large firms. The results so far are robust to several different econometric

[18] We use robust standard erros in our regressions to correct for autocorrelation and heterocedasticity

techniques, both structural and non-structural analyses, several different specifications and different sample periods.

These results have of course important policy implications. The effectiveness of monetary policy is different if we consider small or large firms. As far as Monetary Policy is concerned this is this is a very important result. It means that Monetary Policy is effective only to small firms and not to large firms in the short-term.

One possible extension of this paper is to increase the sample of firms considering both public and non-public firms and by including the information on which firms had access to BNDES financing during our sample period. We feel that by doing this we can improve our understanding of the balance sheet channel in Brazil dramatically.

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Table 1. Small and Large Firms - Financial Characteristics of Small and Large Firms

Panel A Financial Characteristics

	Large Firms (A)				Small Firms (B)			
Financial Characteristics	**N**	**Mean**	**Median**	**Standard Deviation**	**N**	**Average**	**Median**	**Standard Deviation**
Log(Assets)	55	16.99	13.0	3.42	73	11.28	10.50	3.96
Operational revenues/Assets	55	0.61	1.0	0.50	73	0.28	0.0	0.44
Financial Expenses/Assets	55	0.01	0.0	0.18	73	0.04	0.0	0.18
Imobilized/ Assets	55	0.56	0.45	0.35	73	0.37	0.41	0.52
Market Value/Book Value	55	0.66	0.0	1.33	73	0.39	0.0	2.64
Preferential Shares /(Assets)	55	0.24	0.0	0.50	73	0.14	0.0	0.64
ShortTerm Debt/Assets)	55	0.70	0.62	0.46	73	0.64	0.02	0.45
Short Term Dollar Debt/(Assets)	55	0.45	0.0	0.35	73	0.32	0.02	0.35
LongTerm Commercial Paper/Assets	55	0.23	0.02	0.31	73	0.15	0.04	0.18
ShortTerm Commercial Paper/Assets	55	0.27	0.04	0.34	73	0.08	0.04	0.06

Panel B Small and Large Firms by Sectors of the Economy

Industries	Large			Small			Total
	N	Log(Assets)	Operational Revenues/Assets	N	Log(Assets)	Operational Revenues/Assets	
Chemical Petroleum	5	18.35	0.74	2	17.32	0.64	7
Food and Beverages	4	14.22	0.67	2	12.21	0.35	6
Mining Metallurgy	3	19.32	0.35	7	16.43	0.56	10
Electro/Electronic Equiptment	2	13.25	0.43	3	12.11	0.45	5
Transportation	1	12.22	0.68	4	10.23	0.34	5
Public Services	12	19.12	0.61	0	13.25	0.46	12
Textiles	4	12.24	0.43	18	10.24	0.5	22
Services	4	13.43	0.56	10	11.34	0.61	34
Others	20	11.22	0.67	27	10.01	0.35	55
Total)	55			73			128

Panel C Mean Tests of Financial Characteristics of Large and Small Firms

Mean Tests			
	4T1994	**1T2000**	**3T2005**
Ln(Assets)	4.315 (0.000)	5.005 (0.000)	5.155 (0.000)
Ln(inventories)	2.626 (0.000)	2.987 (0.000)	2.859 (0.000)
Ln(operational revenues)	3.186 (0.000)	4.502 (0.000)	4.782 (0.000)
Ln(short term debt)	3.290 (0.000)	4.255 (0.000)	4.333 (0.000)
Ln(ShortTerm Commercial Paper)	1.23 (0.0)	1.75 (0.0)	1.85 (0.02)
Ln(LongTerm Commercial Paper)	1.25 (0.02)	1.45 (0.04)	1.76 (0.03)

Panel D Correlations of Financial Characteristics between all non-financial corporations

	Log(assets	Operational revenues/Assets	Financial Expenses/Assets	Imobilized/ Assets	Market Value/ Book Value	Preferential Shares /(Assets)	Long Term Debt/Assets)	ShortTerm Dollar Debt/(Assets)
Log(Assets)	0.2							
Operational revenues/Assets	0.07	0.12						
Financial Expenses/Assets	0.03	-0.01	-0.03					
Imobilized/ Assets	0.05	-0.16	-0.02	0.02				
Market Value/Book Value	0.05	-0.03	-0.04	0.02	0.09			
Preferential Shares /(Assets)	0.05	0.01	-0.05	-0.01	-0.15	-0.21		
Long Term Debt/Assets)	0.09	0.03	-0.04	-0.05	0.01	-0.04	0.38	
Short Term Dollar Debt/(Assets)	0.44	0.23	-0.16	-0.09	-0.01	0.04	**(0.5)**	**(0.23)**

Table 2 Monetary Contractions

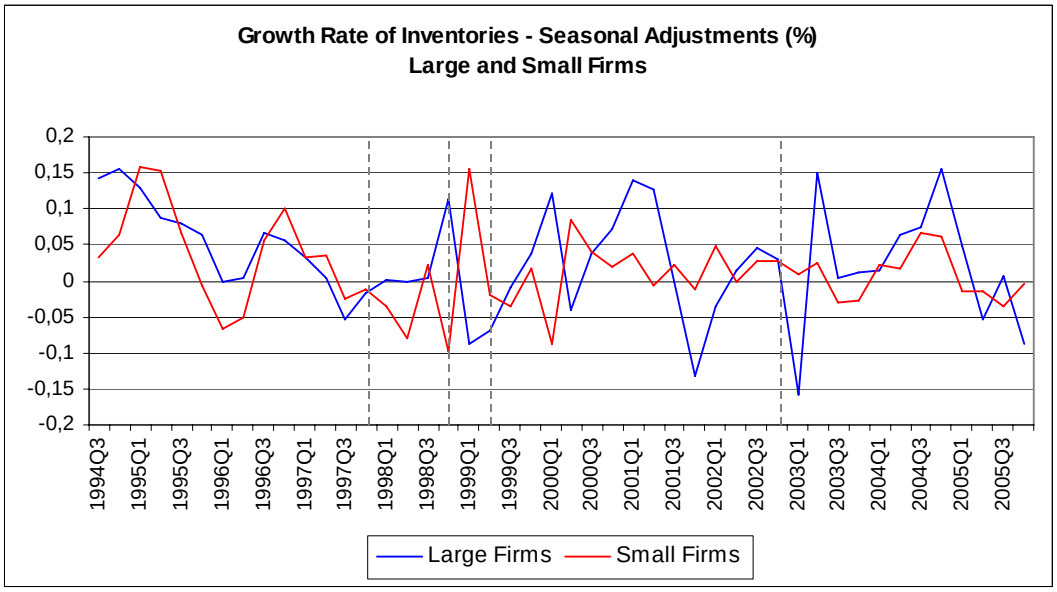
Panel A SELIC Rate

	First Phase of Real Plan	Second Phase of Real Plan	Third Phase of Real Plan	Whole Sample	Shocks
	1994/3 to 1998/4	**1999/1 to 2001/4**	**01/2002 to 2005/4**	**1994/3 to 2005/4**	**1997/4; 1998/4; 1999/2**
Mean of |First Difference|	0.114	0.08	0.08	0.114	0.64
Standard deviations SELIC |First Difference|	0.244	0.09	0.09	0.15	0.18
Median of |First Difference|	0.065	0.053	0.04	0.065	0.32
Mean of Level SELIC	25.88	35.79	19.54	21.85	30.02
Standard deviations of level of SELIC	12.51	20.10	3.65	8.56	22.12
Median level of SELIC	19.88	18.62	19.62	20.12	18.15

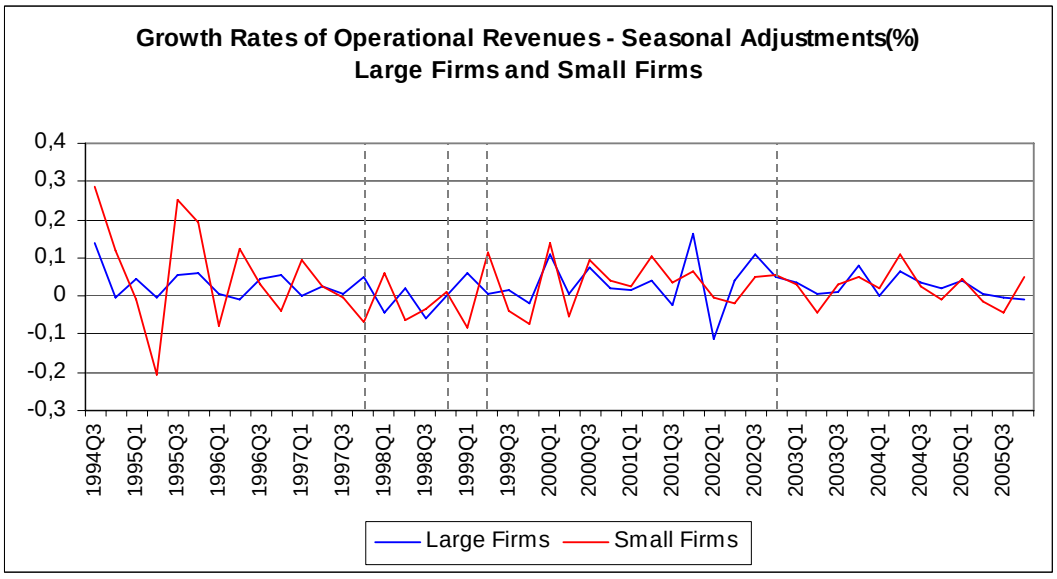
Panel B Boschen-Mills (1995)

	First Phase of Real Plan	Second Phase of Real Plan	Third Phase of Real Plan
	1996/3 to 1998/4	**1999/1 to 2001/4**	**2001/2 2005/3**
Very Expansionist	3	0	0
Moderately Expansionist	2	5	12
Neutral	1	16	13
Moderately Contactionist	1	13	23
Very Contractionist	2 1997/4 and 1998/4	1 1999/2	1 2002/3

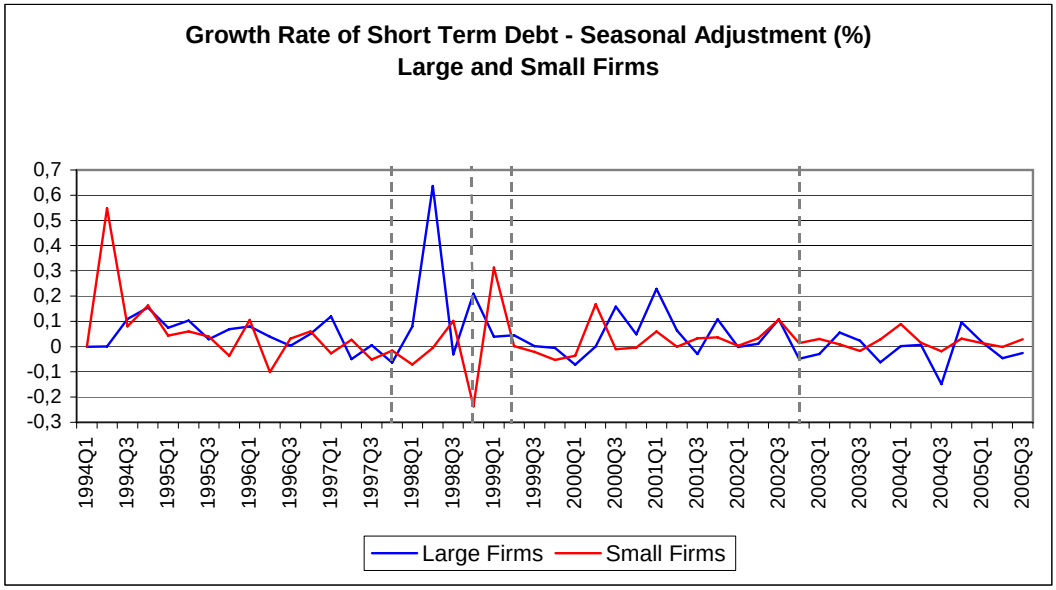
Graph 1 Growth Rate of Inventories



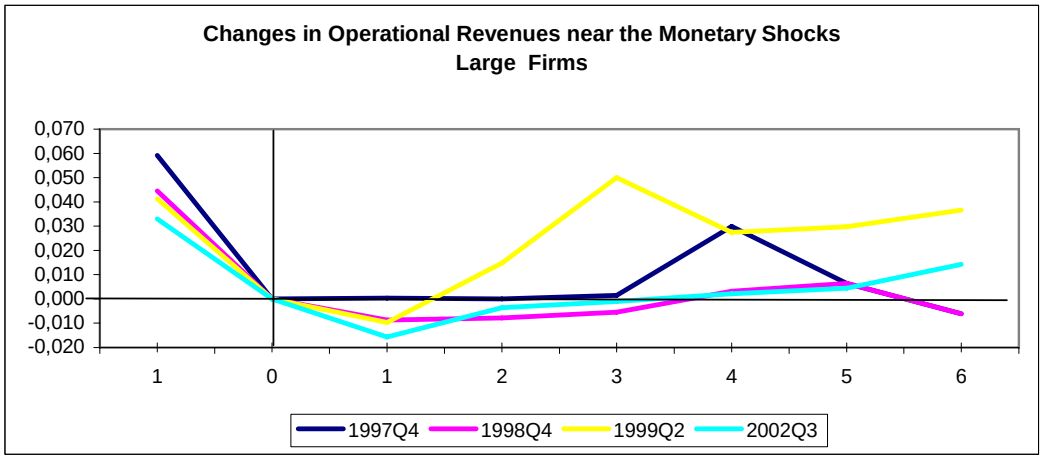
Graph 2 Growth Rates of Operational Revenues

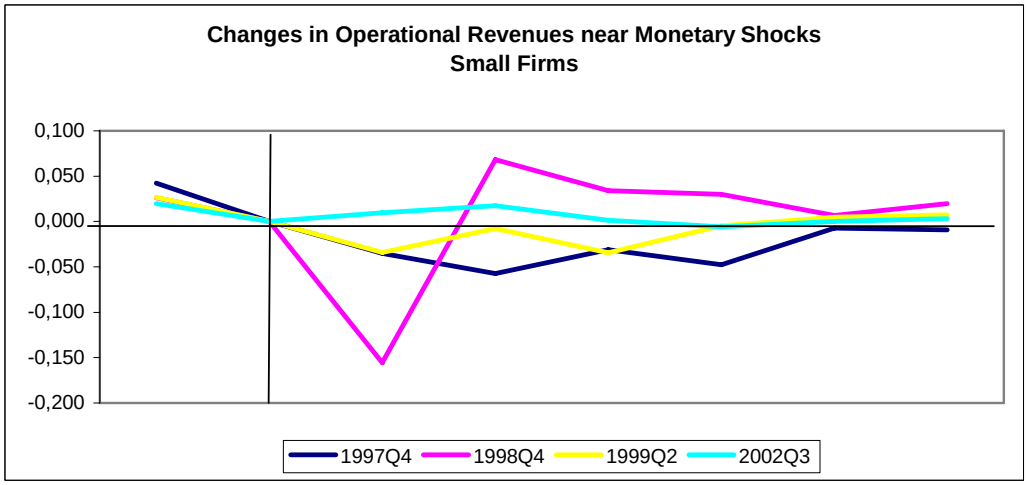


Graph 3 - Growth Rates of Short Term Debt

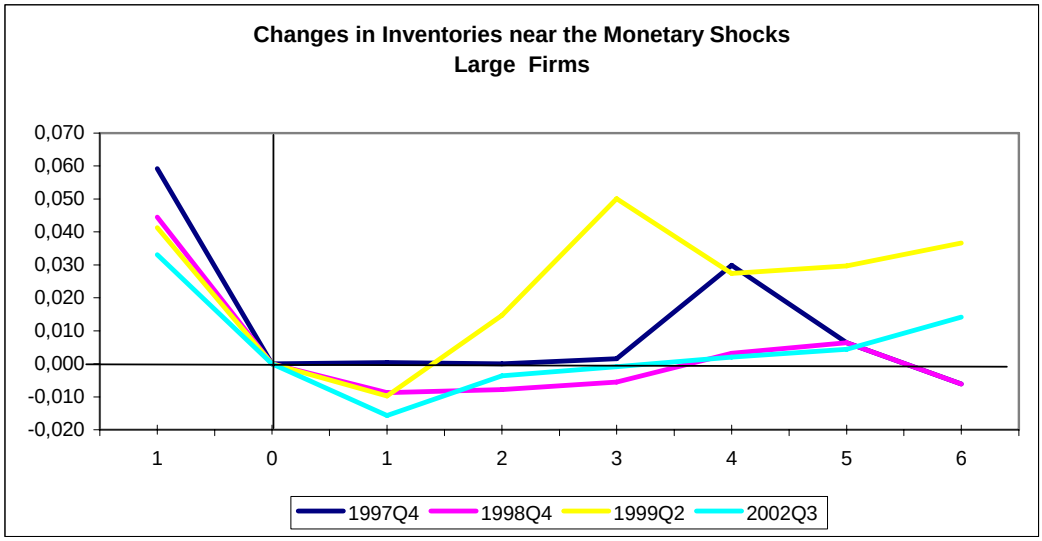


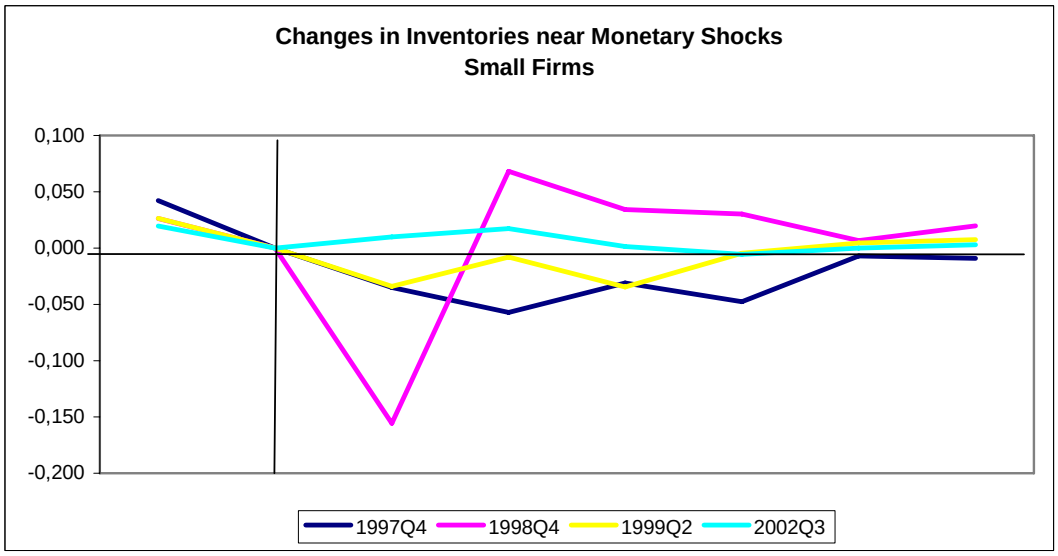
Graph 4 Changes of Average Growth Rates of Operational Revenues after Monetary Contractions



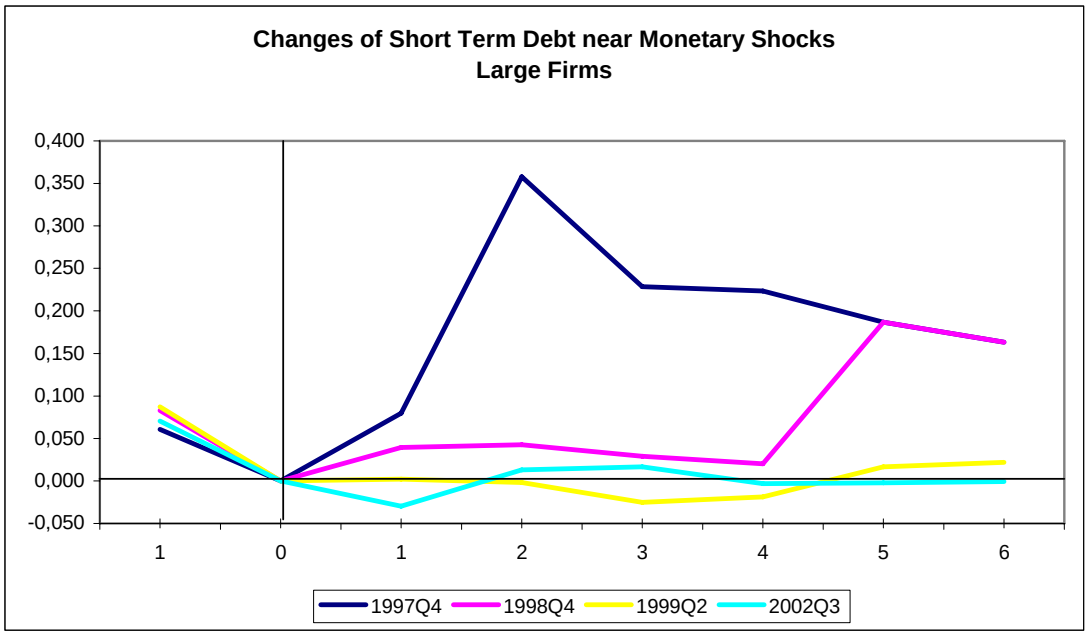


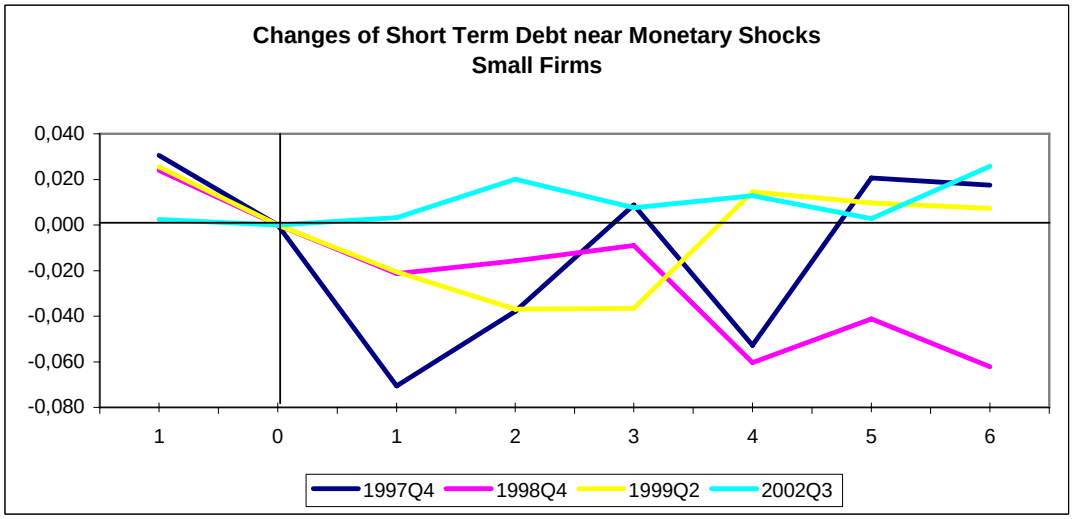
Graph 5 Changes of Average Growth Rates of Inventories after Monetary Contractions





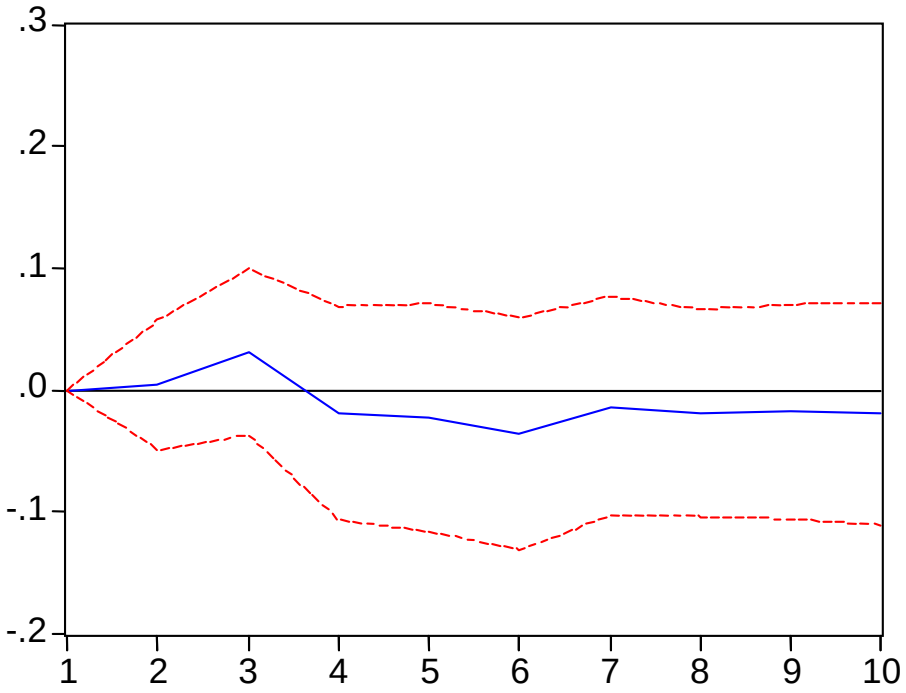
Graph 6 Changes of Average Growth Rates of Short Term Debt after Monetary Contractions

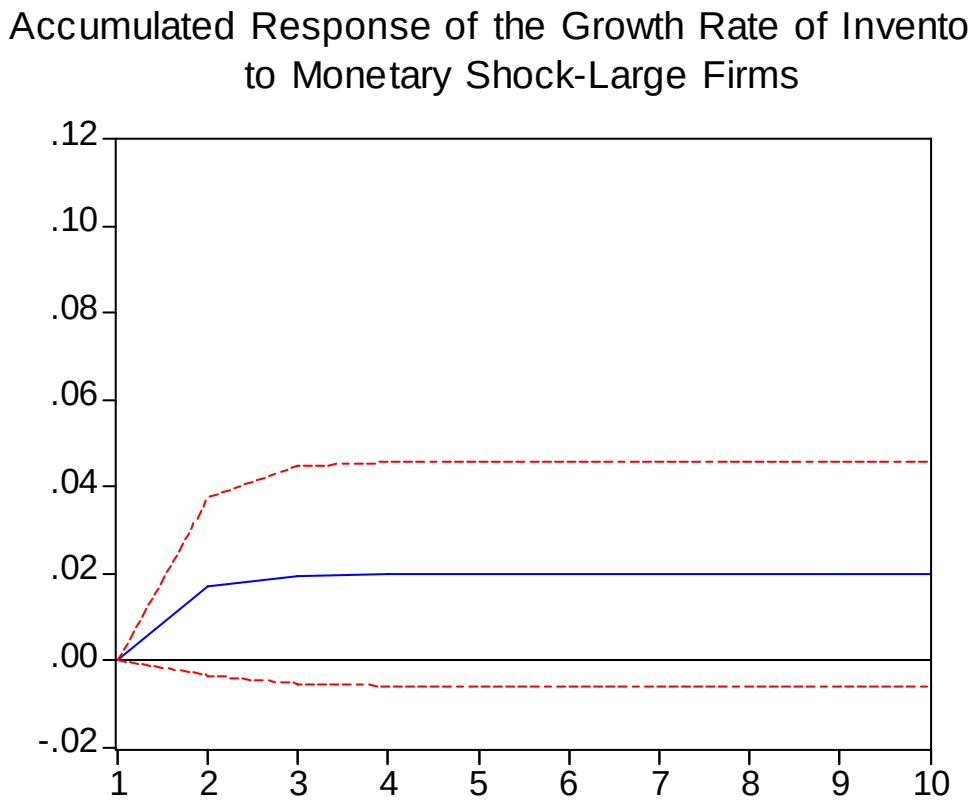




Graph 7

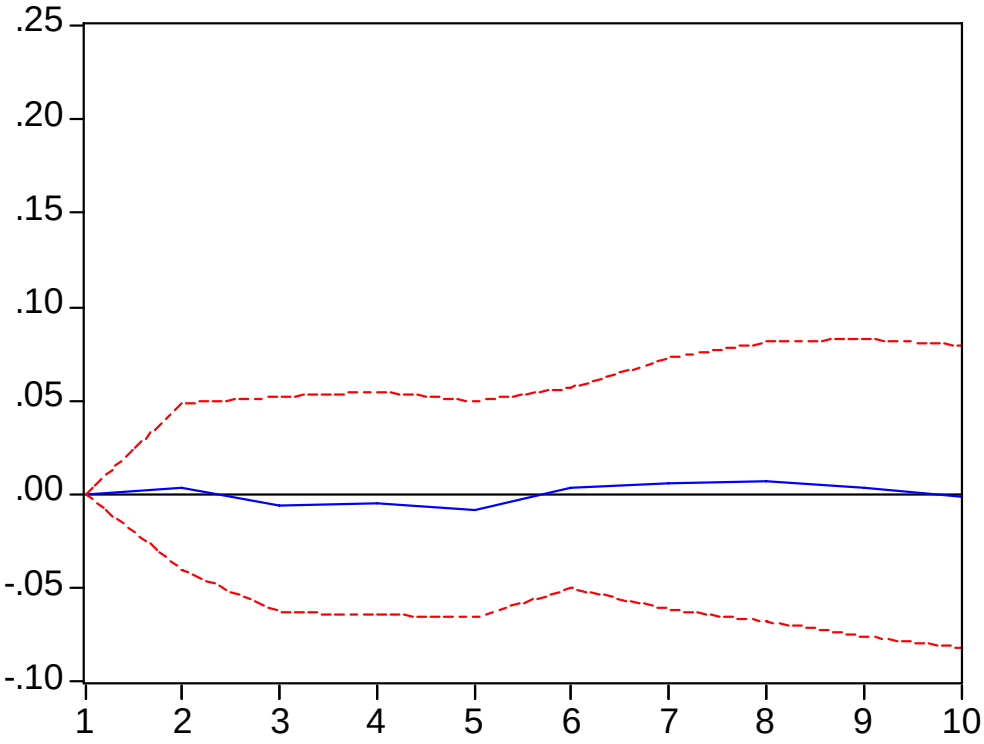
Accumulated Response of the Growth Rate of Inventories of Small Firms to Monetary Contactions



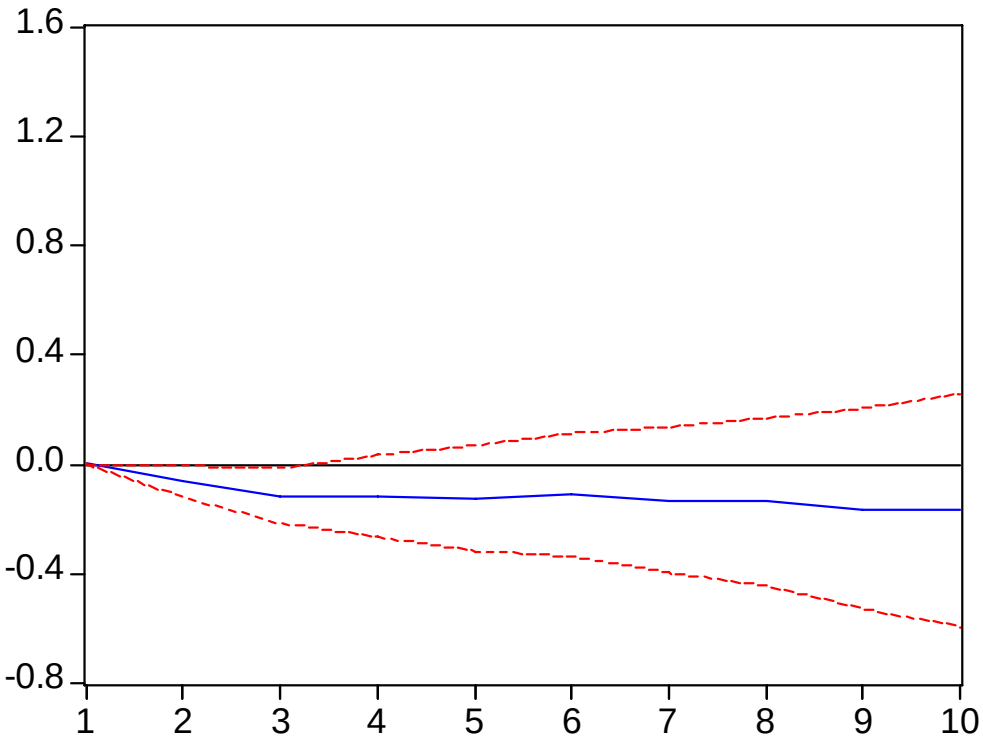

Accumulated Response of the Growth Rate of Inventories
to Monetary Shock-Large Firms
.12
.10
.08
.06
.04
.02
.00
-.02
1
2
3
4
5
6
7
8
9
10

Graph 8

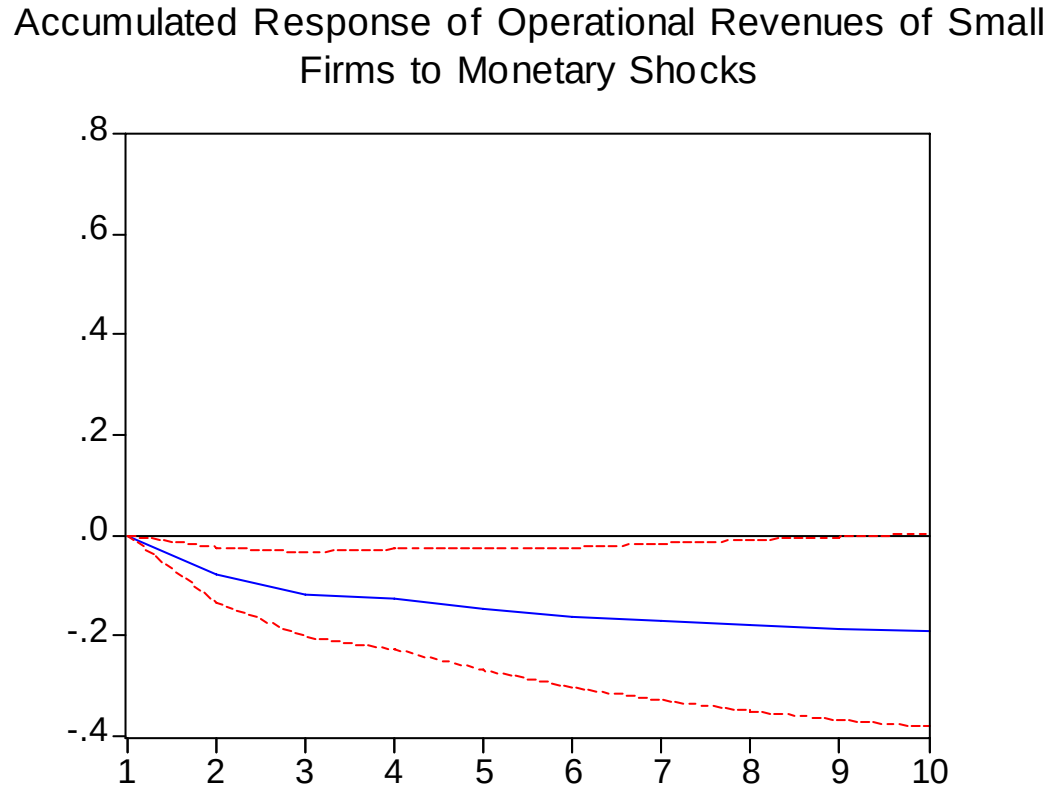
Accumulated Response of Short Term Debt
of Large Firms to Monetary Contractions



Accumulated Response of Short Term Debt
of Small Firms to Monetary Contractions



Graph 9


Accumulated Response of Operational Revenues of Small Firms to Monetary Shocks
.8
.6
.4
.2
.0
-.2
-.4
1
2
3
4
5
6
7
8
9
10

Accumulated Response of Growth Rate of Operational Revenues to Monetary Shocks -Large Firms

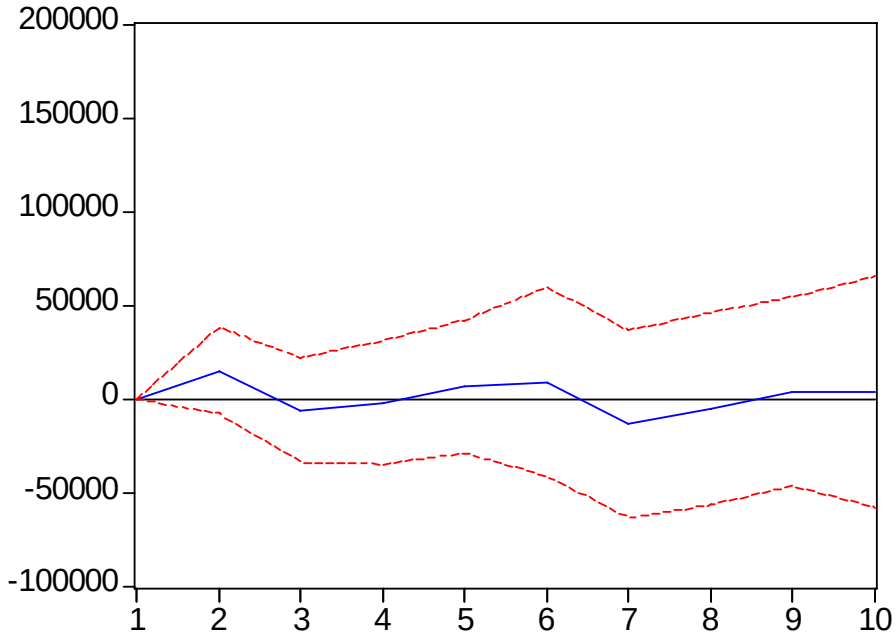


Table 2 OLS with Aggregate Data

Panel A Short Term Debt

$$\Delta Debt = \alpha_0 + \alpha_1 \Delta S_{t-1} + \Delta Debt_{t-1} + \alpha_2 L(CR_t) + u_t$$

P-values are in parenthesis

Independent Variables	ΔShort Term Debt					
	Small Firms (A)			Large Firms (B)		
Constant	0.16 (0.71)	0.52 (0.33)	0.52 (0.36)	-0.07 (0.77)	-0.27 (0.47)	-0.23 (0.52)
Δ(short term debt)(-1)	-0.27 (0.01)	-0.29 (0.03)	-0.43 (0.0)	-0.28 (0.03)	-0.28 (0.02)	-0.27 (0.06)
SELIC(-1)		0.001 (0.12)	0.001 (0.13)		-0.001 (0.56)	-0.001 (0.58)
ΔSELIC(-1)			1.22 (0.13)			1.11 (0.49)
Coverage ratio (-1)	0.21 (0.58)	0.31 (0.38)	0.55 (0.25)	-0.20 (0.63)	-0.10 (0.82)	-0.29 (0.55)
Coverage Ratio (-2)	0.16 (0.67)	0.20 (0.61)	0.01 (0.97)	0.26 (0.52)	0.29 (0.50)	0.44 (0.39)
Coverage Ratio (-3)	0.18 (0.64)	0.28 (0.51)	0.38 (0.41)	0.11 (0.58)	0.12 (0.60)	0.11 (0.63)
Coverage Ratio (-4)	0.45 (0.05)	0.37 (0.09)	0.49 (0.06)	-0.081 (0.79)	-0.01 (0.96)	-0.01 (0.95)
Autocorrelation-LM	(0.78)	(0.31)	(0.40)	(0.48)	(0.54)	(0.009)
Heterocedasticity -White (cross)	(0.58)	(0.19)	(0.10)	(0.99)	(0.89)	(0.21)
Normality (Jarque-Bera)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Significance of the regression (F)	(0.41)	(0.26)	(0.28)	(0.64)	(0.72)	(0.71)
R2 ajust	0.004	0.048	0.46	0.04	0.06	0.06
Sample	1994Q3 2005Q3			1994Q3 a 2005Q3		

Panel B Inventories

$$\Delta \mathrm{I}_t = \alpha_i \left(S_{t-1} - \mathrm{I}_{t-1}\right) + \alpha_2 selic_{t-1} + \alpha_3 L(CR_{t-1}) + \alpha_4 L(\Delta \mathrm{I}_{t-s}) + \alpha_5 L(\Delta S_{t-s}) + \alpha_6 L(\Delta selic_{t-s}) + u_t$$

P-values are in parenthesis

Independent Variables	**Δ(Inventories)**					
	Small Firms			**Large Firms**		
Constant	0.64 (0.47)	0.51 (0.55)	0.47 (0.60)	-0.19 (0.81)	-1.519285 (0.02)	-1.303389 (0.04)
Δ(inventories)(-1)	0.017 (0.95)		-0.19 (0.65)	0.31 (0.01)		0.215067 (0.07)
SELIC(-1)		0.00 (0.56)	0.00 (0.62)		-0.003171 (0.19)	-0.002422 (0.23)
ΔSELIC(-1)			1.99 (0.61)			0.759007 (0.35)
Coverage ratio (-1)	-0.71 (0.19)	-0.85 (0.18)	0.91 (0.20)	0.34 (0.49)	0.474488 (0.35)	0.342878 (0.55)
Coverage Ratio (-2)	0.57 (0.58)	0.47 (0.47)	0.54 (0.59)	-0.09 (0.76)	0.034462 (0.89)	0.041120 (0.92)
Coverage Ratio (-3)	-0.73 (0.30)	-0.87 (0.26)	0.91 (0.33)	0.29 (0.43)	0.200995 (0.63)	0.200845 (0.64)
Coverage ratio (-4)	0.77 (0.05)	0.66 (0.10)	0.70 (0.09)	0.38 (0.12)	0.427993 (0.13)	0.373054 (0.12)
(OperationalRevenues-Inventories)(-1)	0.30 (0.40)	0.28 (0.16)	0.30 (0.40)	0.23 (0.0)	0.107067 (0.11)	0.098186 (0.10)
Operational Revenues (-1)	-0.08 (0.52)			-0.10 (0.08)		
Autocorrelation-LM	(0.86)	(0.29)	(0.32)	(0.77)	(0.47)	(0.71)
Heterocedasticity -White (cross)	(0.00)	(0.00)	(0.07)	(0.10)	(0.58)	(0.87)
Normality (Jarque-Bera)	(0.00)	(0.00)	(0.00)	(0.54)	(0.80)	(0.64)
Significance of the regression (F)	(0.19)	(0.11)	(0.06)	(0.067)	(0.13)	(0.13)
R2 ajust	0.081	0.11	0.25	0.16	0.10	0.12
Sample	1994Q3 a 2005Q3			1994Q3 a 2005Q3		

Panel C Operational Revenues

$$\Delta S_t = \alpha_1 \Delta S_{t-1} + \alpha_2 \Delta S_{t-2} + \alpha_s L(CR_t) + u_t$$

P-values are in parenthesis

Independent Variables	ΔOperational Revenues			
	Small Firms (A)		Large Firms (B)	
Constant	0.018 (0.96)	0.057 (0.86)	0.056 (0.78)	0.13 (0.78)
Δ(operational revenues)(-1)	-0.11 (0.21)	-0.10 (0.25)	-0.35 (0.01)	-0.36 (0.01)
SELIC(-1)		0.00 (0.86)		0.00 (0.75)
Coverage Ratio (-1)	0.11 (0.76)	0.14 (0.74)	0.07 (0.75)	0.04 (0.98)
Coverage Ratio (-2)	0.03 (0.93)	0.026 (0.95)	-0.005 (0.98)	-0.02 (0.86)
Coverage Ratio (-3)	0.48 (0.06)	0.47 (0.08)	0.025 (0.86)	0.02 (0.55)
Coverage Ratio (-4)	0.53 (0.17)	0.54 (0.96)	-0.097 (0.55)	-0.11 (0.49)
Autocorrelation-LM	(0.38)	(0.36)	(0.042)	(0.51)
Heterocedasticity -White (cross)	(0.00)	(0.00)	(0.99)	(0.90)
Normality (Jarque-Bera)	(0.00)	(0.00)	(0.60)	(0.70)
Significance of the regression (F)	(0.49)	(0.62)	(0.26)	(0.36)
R2 ajust	0.01	0.03	0.39742	0.018
Sample	1994Q3 a 2005Q3		1994Q3 a 2005Q3	

Table 3. OLS with Panel data of Small and large firms

Panel A Growth Rate of Operational Revenues

P-values are in parenthesis

Independent Variables	ΔOperational Revenues	
Constant	-2.8 (0.24)	-0.047 (0.90)
Δ(operational revenues)(-1)	-0.19 (0.0)	-0.002 (0.0)
Coverage Ratio (-1)	0.007 (0,73)	-0.001 (0.77)
Coverage Ratio (-2)	0.01 (0,64)	-0.03 (0.92)
Coverage Ratio (-3)	0.56 (0.45)	-0.95 (0.67)
Coverage Ratio (-4)	0.24 (0.43)	0.78 (0.43)
Market Value/ Book Value	0.76 (0.58)	0.78 (0.35)
Fixed Assets/Assets	0.87 (0.47)	0.43 (0.45)
Small	-	-0.006 (0.01)
Small*Δ(operational revenues)(-1)	-	-0.87 (0.76)
DW	2.0	2.5
Significance of the regression (F)	(0.0)	(0.0)
R2 ajust	0.03	0.038
Sample	1994Q3 a 2005Q3	1994Q3 a 2005Q3

Panel B Growth Rate of Inventories

P-values are in parenthesis

Independent Variables	Δ(Inventories)		
Constant	0.032 (0.0)	0.038 (0.0)	0.049 (0.0)
Δ(inventories)(-1)	-0.14 (0.0)	-0.14 (0.0)	-0.08 (0.02)
Small	-	-0.01 (0.018)	-0.023 (0.0)
Small*Δ(inventories)(-1)	-	-	-0.02 (0.37)
Coverage ratio (-1)	0.0 (0.70)	0.75 (0.54)	0.38 (0.15)
Coverage Ratio(-2)	0.04 (0.23)	0.82 (0.32)	0.45 (0.65)
Coverage Ratio(-3)	0.25 (0.23)	0.76 (0.56)	0.34 (0.38)
Coverage Ratio (-4)	0.0 (0.95)	0.98 (0.94)	0.003 (0.04)
(OperationalRevenues-Inventories)(-1)	-0.011 (0.0)	-0.01 (0.0)	-0.001 (0.0)
ΔOperational Revenues (-1)	-0.12 (0.0)	-	-0.16 (0.0)
Market Value/Book Value	0.76 (0.43)	0.34 (0.04)	0.76 (0.35)
Fixed Assets/Assets	0.34 (0.41)	0.45 (0.56)	0.42 (0.23)
DW	2.28	2.04	2.01
Significance of the regression (F)	9.01 (0.0)	18.44 (0.0)	
R2 ajust	0.01	0.05	0.23
Sample	1994Q3 a 2005Q3	1994Q3 a 2005Q3	

Panel C Growth Rate of Short Term Debt

P-values are in parenthesis

Independent Variables	ΔShort Term Debt		
Constant	-1.05 (0.0)	-0.61 (0.0)	-1.24 (0.0)
Δ(short term debt)(-1)	0.92 (0.0)	0.93 (0.0)	0.10 (0.0)
Small	-	-0.43 (0.0)	-0.12 (0.0)
Small*Δ(short term debt)(-1)	-	-0.014 (0.45)	0.029 (0.0)
Coverage Ratio(-1)	0.34 (0.45)	0.51 (0.42)	0.75 (0..43)
Coverage Ratio (-2)	0.43 (0.23)	0.91 (0.37)	0.73 (0.71)
Coverage Ratio (-3)	0.42 (0.32)	0.81 (0..43)	0.21 (0.01)
Coverage Ratio(-4)	0.53 (0.06)	0.41 (0.03)	0.21 (0.45)
Fixed Assets/Assets	0.011 (0.85)	0.0 (0.55)	0.21 (0.0)
Market Value/Book Value	0.067 (0.85)	0.24 (0.0)	0.87 (0.4)
DW	1.50	1.40	1.75
Significance of the regression (F)	68 (0.0)	69 (0.0)	70 (0.0)
R2 ajust	0.21	0.34	0.20
Sample	1994Q3 2005Q3	1994Q3 a 2005Q3	