SBP Research Bulletin
Volume 8, Number 1, 2012

ARTICLES

Balance Sheet Channel of Monetary Transmission in Pakistan: An Empirical Investigation

Safia Shabbir*

Abstract: *Using data of non-financial listed firms over a period of 1999-2010, this paper investigates the effectiveness of balance sheet channel of monetary transmission mechanism in Pakistan. By classifying firms as SME and large, it finds a strong evidence for the existence of net worth channel. A tight monetary policy worsens the net worth of both the SMEs and large firms, with SMEs getting more hit on their cash flows, short-term borrowing, and revenues.*

JEL classification: *E52, E50, H32, C33*
Keywords: *Monetary policy, monetary transmission, balance sheet channel*

1. Introduction

An effective use of monetary policy as a stabilization tool requires an understanding of the mechanisms through which it affects the economy. In the economic literature, a number of channels of monetary policy transmission mechanism have been identified including interest rate, exchange rate, other asset prices, bank lending and balance sheet channels.[1] Knowledge of relative importance of various channels helps a central bank to assess the efficacy of different policy instruments. Degree of effectiveness of various channels of monetary transmission may depend upon the depth of financial sector and overall structure of the economy. This is why a review of literature on the subject shows that effectiveness of different channels varies across countries and time. In Pakistan, the financial sector suffers from fiscal dominance which distorts effective transmission of monetary policy, yet it is argued that balance sheet channel may still be effective. Following the theoretical setup presented by

* Deputy Director, State Bank of Pakistan; safia.shabbir@sbp.org.pk. The author acknowledges comments by Riaz Riazuddin and Farooq Arby; and moral and logistic supports by Ahsan Kamal, Arifa Yousaf Khan, Fouzia Aslam, Bashir Zia and Ishrat Omer.
[1] See Mishkin (1996) for a pioneer work.

Bernanke and Gertler (1995), this paper attempts to empirically investigate the balance sheet channel in Pakistan and quantifies the effects of monetary policy on the behavior of large and small and medium size enterprises (SMEs).[2]

In case of Pakistan, several studies have investigated the monetary transmission at the macro level. Agha *et al*. (2005) observed fall in domestic demand accompanied by low investment as a result of tight monetary policy. They also found an evidence for an active interest rate channel and asset price channel in Pakistan. Alam and Waheed (2006) explored sectoral impact of monetary policy shocks and assessed the sector-specific variation in real effects of monetary policy, while Hussain (2009) used VAR to analyze the impact of monetary policy on real GDP and inflation. All these studies used aggregate macroeconomic data, while this study explores firm-level data and attempts to assess how monetary policy in Pakistan affects the behavior of different kinds of firms.

Investigating the impact of monetary policy over non financial listed firms, this paper finds out that an increase in overnight rate erodes the net worth of both SMEs and large firms; however, degree of erosion is higher for SMEs. This phenomenon also holds for cash flow to asset ratio that depletes with a rise in financial expenses to sales ratio leading to lower net profit margin of the firms. Of the sample under consideration, almost 7 percent of the enterprises closed their business activities and their output dropped to zero during the phase of monetary tightening. SMEs, using surplus on revaluation of fixed assets tried to back their net worth up to 24 percent and yet faced heavy losses. However, those who survived eventually adjusted to the trend.

The roadmap of the later sections of the paper is as follows. Section 2 presents a review of literature on balance sheet channel of monetary policy transmission mechanism followed by section 3 that discusses data issues and methodology. Section 4 presents an analysis of results and finally, section 5 concludes the paper.

2. Literature review

Literature on balance sheet channel of transmission mechanism has broadly focused on the theoretical underpinnings; however, a few studies explored the existence of balance sheet channel, often called net worth channel, using micro-database. For example, Gertler and Gilchrist (1994), using quarterly data on

[2] The impact of monetary policy often varies with the size of firms as found by Black and Rosen (2007) that during periods of tight monetary policy, banks reallocate loan supply away from small firms and towards large firms.

manufacturing firms in US, classified firms as small and large on the basis of their gross nominal assets. They found that tight monetary policy increased the short term borrowing for the large firms that was primarily meant for inventory accumulation. However, during the periods of recession, level of their inventories declined sharply after the 2nd quarter. Contrary to that, tight monetary policy left little space for the small firms to borrow in short run, but unlike large firms, their inventories declined steadily over time.

Bernanke and Gertler (1995) presented an in-depth analysis of the credit channel. They applied VAR technique using quarterly data for the period of 1965-1994 and discussed the role of bank lending channel and the balance sheet channel on housing market. They pointed out that tight monetary policy directly weakened the borrower's financial position through increase in their interest expenses, and reduction in their net cash flows. Among other factors, increase in interest rate caused asset prices to fall and therefore, lower the value of their collateral. Tight monetary policy also affects the aggregate demand in economy that resulted into sharp decline in firms' revenues, cash flow squeeze and a rise in coverage ratio. They mentioned that banks, during this phase, reallocated their funds and lent to the large firms considering them less risky. Similar results were obtained by Oliner and Rudebusch (1996) who studied 7000 manufacturing, mining and trade corporations in US over a period of 1973-1991 (quarterly data). They calculated the impulse response functions using VAR and concluded that monetary contraction redirected credit from small firms to large firms.

To figure out the effectiveness of balance sheet channel of monetary policy on Austrian economy, Wesche (2000) utilized firm level micro-data of almost 2000 non-financial firms over the period of 1979-1998. The study found that tight monetary policy put a cap on the funds available for firm's borrowing, and thus affected the borrowing of the small firms. Additionally, the study observed that small and medium firms reacted more to the financial variables, and these firms had higher average interest expense and a lower investment-to-sales ratio. In case of Ukraine, Zaderey (2003) observed that monetary contraction caused equity prices to fall and interest expenses to rise, leading to a squeeze in firms' net cash flows and depletion of net worth of the borrowers. Firms with limited access to the capital market depended on their internal funds to meet their liquidity requirements, finance working capital and to invest further.

Another attempt was made by Guariglia and Mateut (2006) to investigate the credit channel, trade credit channel and inventory investment in UK. They used a set of 609 firms over a period of 1980-2000 to estimate the error-correction inventory investment equation. Evidence proved that both the trade and credit

channels operated side by side in UK, with trade channel predominating over the credit channel of monetary policy. While coverage ratio played stronger role in inventory investment and the small firms were observed financially constrained during the phase of tight monetary policy.

Most of the studies on credit channel confined themselves to find the impact of financial constraints of small and large firms during monetary tightening. In this regard another attempt was made by Abdul Karim (2010) who tried to pin down the impact of monetary policy on firms' fixed investment spending. Following the Blundell and Bond (1998), they used the dynamic GMM estimation technique to investigate the interest rate channel as well as the credit channel, and found that small firms were more financially constrained than the large firms.

Characterizing the firms as small, medium and large on the basis of employment level, and then further differentiating them by their export orientation, Özlü and Yalçin (2010) analyzed non-financial firms to explore the effectiveness of trade credit channel in Turkey. They found that SMEs, with lower export share, were more financially constrained during monetary contraction. While large and export orientated firms had more access to the funds. They explored that credit channel became ineffective, when firms held large trade credits.

To sum up, literature on balance sheet channel is confined to the impact of financial constraints that is availability of short term borrowing to different groups of firms and the reallocation of supply of credit by the banks. This paper broadens the debate by also quantifying the impact of monetary contraction on net worth and cash flow of SMEs and large firms.

3. Data and methodology

This study uses firm level data of 160 non-financial companies listed at Karachi Stock Exchange over a period of 12 years (1999-2010). These companies broadly belong to textile, cement, fertilizer, chemical, sugar, oil, and automobile sector. The source of this micro-database is annual reports of these companies which include information of audited accounts of the companies in the form of their financial statements i.e. balance sheet, profit and loss account, cash flow etc. Since the number of listed companies at Karachi Stock Exchange varied over time due to mergers and acquisitions, new listing, delisting and renaming of companies, and the complete set of annual reports for all companies is not available; this micro-database is limited to 160 companies observed over a span of 12 years. Therefore, prime source of data for the key variables - shareholder's equity, surplus on revaluation of assets, bank and non-bank borrowing, short term and long term

borrowing, inventories, total assets, net sales, cost of sales, operating profit, financial as well as administration and selling expenses, profit after tax are company's own annual reports and annual audited accounts. Further ratios are calculated using this basic database. However, data on real GDP, nominal GDP, and inflation is collected from Economic Survey (2010-11) published by Ministry of Finance, Pakistan. While the source of data on overnight interest rate, money supply (M2), SLR and CRR is State Bank of Pakistan.

The key variables used in the study are described below:

Net Worth: Due to inverse relationship between interest rate and the asset prices, monetary tightening directly affects the value of the borrower's collateral and erodes her net worth, while it indirectly hits her credit worthiness. Therefore, net worth plays a pivotal role in balance sheet channel. Bernanke and Gertler (1995) derived net worth of a firm by netting off her total liabilities to her assets, that is alternatively equal to the sum of a firm's shareholders equity and surplus on revaluation of its fixed assets. This paper follows the alternative approach.

Cash Flow: With monetary tightening interest rate expenses of the firms rise, output drops while their quasi-fixed costs do not adjust immediately, resulting into cash flow squeeze and weak financial position of the firm. Therefore, effect on cash flow together with the effect of monetary tightening on net worth of the firm completes the balance sheet channel of the firm. Following Abdul Karim (2010), this paper defines cash flow as a sum of firm's profit after tax and the depreciation & amortization.

We classify firms into SMEs and large firms on the basis of their total assets: firms below 40^{th} percentile are classified as SMEs, whereas the rest are taken as large firms. Thus 64 firms fall under the category of SMEs and 96 are large firms.

The basic estimation technique of random effect and fixed effect is used with linear panel data model. The baseline model of the linear panel data with random effect is specified as

$$Y_{it} = \alpha + X_{it}\beta + u_i + \mathcal{E}_{it} \qquad (1)$$

Where Y_{it} is the dependent variable showing net worth to assets ratio of the firm i during period t, X_{it} is set of independent variables and u_i is between-entity error and $\mathcal{E}_{it}$ is within-entity error.

While analyzing the cash flow aspect of the balance sheet channel, Y_{it} is considered as cash flow to asset ratio of the firm *i* during period *t*. To capture the effect of individual heterogeneity across the sample, fixed effect technique is used in this linear panel data model. The model is, therefore, specified as

$$Y_{it} = \alpha_i + X_{it}\beta + \mathcal{E}_{it} \quad (2)$$

Where α_i captures firm's fixed effect in the model.

Before estimating the above model, we draw charts of firms' financial performance against overnight interest rate as an indicator of monetary policy. Figure 1 shows that movements of overnight interest rate coincide with the movement in coverage ratio – defined as ratio of interest payments to sum of interest payments and profits (Bernanke and Gertler, 1995). Coverage ratio is the most widely used indicator to measure the immediate impact of tight monetary policy on firms' financial health. With the monetary tightening, the coverage ratio rises because on the one hand, its interest expenses increase and on the other hand its profit is hit adversely with the falling demand.

The net worth and cash flow of firms also deteriorate with tightening of monetary policy. As the interest rate increases, financial expenses of the firms rise, while their production costs as well as their operating expenses do not adjust immediately that lower their profits and deplete net worth. Since SMEs are more financially constrained – already have lower profits along with small equity – they find it harder to survive. The value of their collateral falls due to declining asset prices and their net worth deteriorates manifold than that of large firms who find it easier to generate funds from market by issuing commercial papers, borrowing from sponsors and banks, and manage their liquidity (Figure 2). A similar behavior can be found in case of cash flows. Falling profits squeeze the net cash flows of both SMEs and the large firms; it additionally affects the level of their inventories, cash and bank balances as well as their investment decisions. Since SMEs are more vulnerable to cash flow squeeze their cash flow to asset ratios fall more quickly than the large firms as depicted by Figure 3.

4. Empirical findings

Following the methodology in section 3, we have estimated the linear panel data models. To figure out whether using linear panel data model of random effects is a better fit or the fixed effect should be preferred, we conducted the Hausman test. The results of Hausman test for net worth channel turned out as 0.95 (Prob > chi^2 = 0.95) while 0.53 (Prob > chi^2 = 0.53) for the cash flow channel suggesting the

use of random effects model of linear panel data. Therefore, estimates obtained from linear panel model with random effects for the SMEs are reported in Table 1, while the behavior of large firms is quantified in Table 2. As observed in the previous section through graphical representation, an effective balance sheet channel exists in Pakistan; therefore, basic results of the model are highly significant and are in line with the theory. Monetary policy contraction directly hits the balance sheets, cash flows as well as the profit and loss accounts of the firms and erodes their financial position. SMEs get more hit and become more vulnerable to monetary policy shock than the large firms. It is shown that 1 percent increase in overnight interest rate deteriorates the net worth to asset ratio of SMEs by 4.3 percent, while it erodes large firms' net worth by 3.8 percent.

Financial expenses to sales are also negatively related to cash flow to assets ratio and show that 1 percent increase in financial expenses reduces the cash flow by 1.0 percent for the large firms, but 8.4 percent in case of SMEs, explaining the liquidity crunch for SMEs. These results match with the literature on existence of balance sheet channel of monetary policy. Further reallocation of resources from SMEs to large firms can also be observed in Table 1 and 2. Short term borrowing to assets ratio for SMEs is negatively related to the cash flows, showing that with a credit crunch, short term borrowing of SMEs falls by 20 percent, whereas this drop is 15.9 percent for the large firms.

Findings of this paper also compliment Hussein *et al*. (2011) which provide the evidence of the financial accelerator using countercyclical margins in Pakistan's banking sector.

5. Conclusion

Using the data of 160 non-manufacturing listed companies, this paper attempts to quantify the impact of monetary policy on SMEs and the large firms. This study finds a strong evidence for the existence of balance sheet channel in Pakistan.

Results obtained from linear panel model of random effects show that monetary contraction increases the financial expenses of the firms, reduces their profits and squeezes their cash flow. Large firms, somehow maintain to tap resources internally and externally, while SMEs fail to get access to the credit market, and get more hit. Though SMEs try to back their net worth with revaluation of surplus, their asset prices still fall quickly and their equity erodes manifold of large firms. Additionally, a slowdown in business activity was observed during this phase and almost 7 percent of businesses reduced their output to zero of which 6 percent belongs to SMEs. This phenomenon is in line with the debate on the effects of

monetary policy. However, the impact of fiscal policy in this scenario cannot be over looked, as both the direct and indirect taxes also affect the final demand and the business decisions of the firms. Furthermore, the scope of this paper is limited to find an evidence for the existence of the balance sheet channel, whereas measuring the strength of balance sheet channel requires measuring the impact of monetary policy along with interaction of fiscal policy on economic growth that is yet to be explored.

Figure 1. Coverage Ratio and Overnight Interest Rate

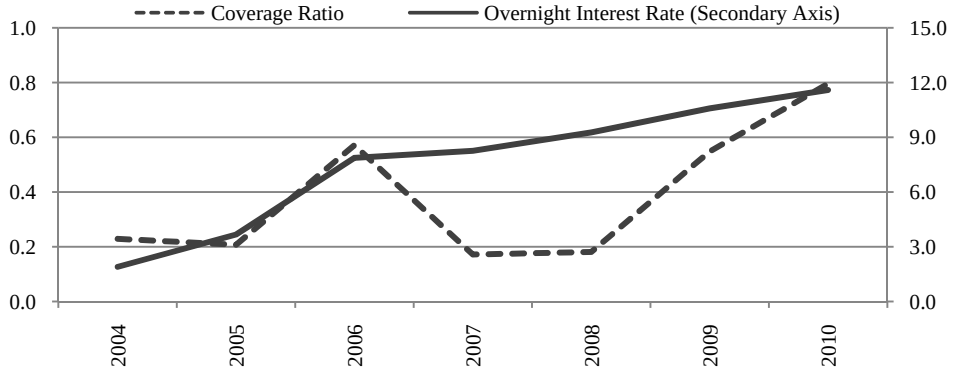

Figure 2. Impact of Monetary Tightening on Firms' Net Worth

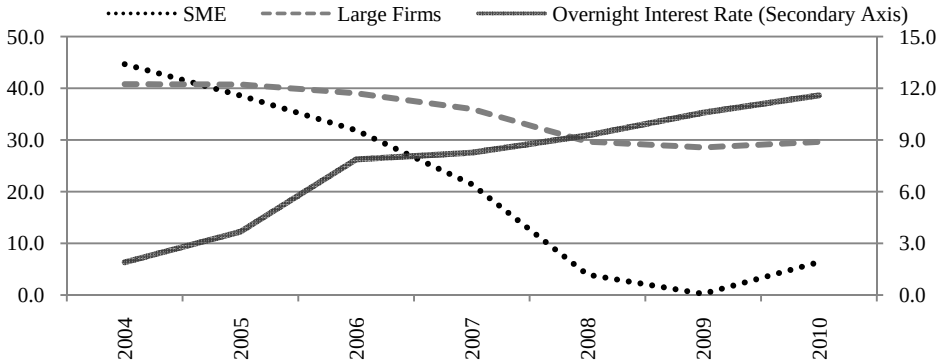

Figure 3. Impact of Tight Monetary Policy on Firms' Cash Flow

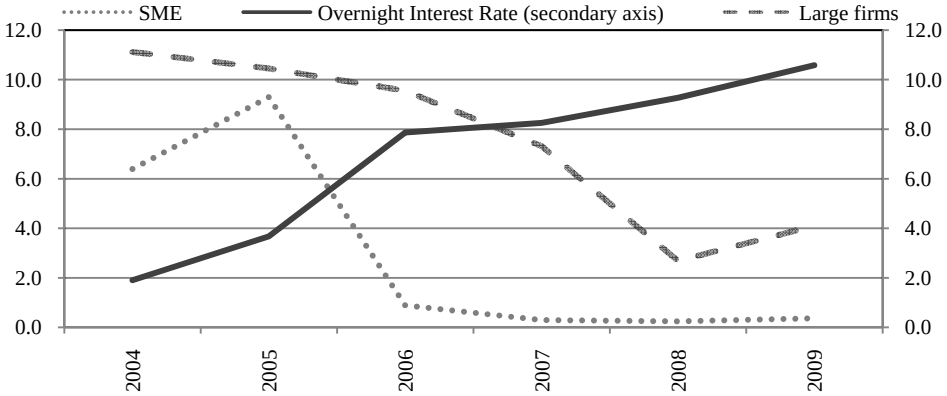

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Table 1. Balancesheet Channel of Monetary Policy: Behavior of SMEs

	Net worth/Asset	Net worth/Asset	Net worth/Asset	Cash flow/Asset	Cash flow/Asset	Cash flow/Asset	Cash flow/Asset
Financial expenses to sales				-0.0843***	-0.0930***	-0.0932***	-0.0889***
				(0.0256)	(0.0277)	(0.0288)	(0.0279)
Overnight interest rate	-0.0433***	-0.0344***	-0.0436***				
	(0.0049)	(0.0038)	(0.0048)				
Inventories to Assets					0.033	-0.0516	-0.0000036
					(0.0352)	(0.0335)	(0.0000)
Borrowing to sales							
Short term borrowing to sales		0.0000147					
		(0.0000)					
Short term borrowing to assets					-0.215***		-0.200***
					(0.0380)		(0.0350)
Long term borrowing to assets						-0.0523**	-0.0476**
						(0.0243)	(0.0235)
Sales to assets			0.142***				
			(0.0265)				
Constant	0.536***	0.559***	0.393***	0.0567***	0.0971***	0.0809***	0.106***
	(0.0710)	(0.0500)	(0.0757)	(0.0080)	(0.0117)	(0.0118)	(0.0113)
Observations	604	447	603	544	447	447	447
Number of id	63	60	63	61	60	60	60

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 2. Balancesheet Channel of Monetary Policy: Large Firms Behavior

	Net worth/Asset	Net worth/Asset	Net worth/Asset	Net worth/Asset	Cash flow/Asset	Cash flow/Asset	Cash flow/Asset
Financial expenses to sales			-0.0997***			-0.00165***	-0.00172***
			(0.0024)			(0.0006)	(0.0005)
Overnight interest rate	-0.0382**	-0.0175*		-0.0395**	-0.0103**		
	(0.0153)	(0.0095)		(0.0155)	(0.0045)		
Inventories to Sales							-0.0259*
							(0.0134)
Borrowing to sales		-0.00464***					
		(0.0002)					
Short term borrowing to assets							-0.159***
							(0.0360)
Debt to equity			-0.000129				
			(0.0016)				
Sales to assets				0.0252			
				(0.1100)			
Inventories to Assets						0.00701	
						(0.0456)	
Long term borrowing to assets						-0.0364***	-0.0364***
						(0.0069)	(0.0068)
Constant	0.478**	0.444***	0.335***	0.525***	0.222***	0.0826***	0.114***
	(0.2100)	(0.0758)	(0.0207)	(0.1820)	(0.0356)	(0.0120)	(0.0106)
Observations	1,020	921	921	1,010	917	908	908
Number of id	96	96	96	96	96	96	96

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1