Monetary Policy and Risk Taking Behavior of Banks in Pakistan

Shabbir, Safia and Rana, Faisal and Iqbal, Javed

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Safia Shabbir, Monetary Policy Department, State Bank of Pakistan,safia.shabbir@sbp.org.pk

Faisal Rana, Monetary Policy Department, State Bank of Pakistan, Faisal.Rana@sbp.org.pk

and

Javed Iqbal, Monetary Policy Department, State Bank of Pakistan, Javed.Iqbal7@sbp.org.pk

Abstract

Using quarterly data on commercial banks operating in Pakistan over a period of 2002-2014, this study finds that banking sector in Pakistan takes more risk during ease and infection ratio increases with a rise in policy rate. In addition, with lower return on asset and small capital base, banks might turn fragile and be vulnerable to solvency risk. Observing the bank characteristics we observe that small size banks with high liquidity and strong capital base are more likely to carry risk during monetary ease.

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Contact of author for correspondence
Name: Safia Shabbir
Designation: Deputy Director
Department: Monetary Policy Department
State Bank of Pakistan
I.I.Chundrigar Road
Karachi- 74000
Pakistan

Non-Technical Summary

The dynamics of Pakistan economy suggests that stabilization policies such as monetary and fiscal policies affect the lending behavior of banking sector in Pakistan. In simple bank lending channel framework, banks increase their credit disbursement when policy rates are low. However, in the presence of excess liquidity and search for higher yield, banks take excess risk and extend credit manifold, which sets foundations for risk taking channel.

Exploring the presence of risk taking channel, we observe that during monetary ease (2001-2004), banks take excessive risk and extend credit at a very low risk premium due to strong bank-borrower relationship. This results into moral hazard issues, and amplifies the impact of easy monetary policy. In the case of Pakistan, loans are disbursed at flexible price, and are linked with the benchmark rate, say kibor, which co-moves with the policy rate. Therefore, monetary contraction after 2004 reduces the borrower's capacity to repay and thus results into higher NPLs to loans ratio. In line with the theory, we find that although history of infected loan portfolio matters, still any rise in policy rate increases the infection ratio as well as the insolvency risk. Bank characteristics like asset quality, capitalization and liquidity matter. Top five banks of the banking sector hold almost 53 percent share in the assets of total banking sector. Given their strong asset base, they are less vulnerable and less exposed to insolvency risk and bad loans. Small and medium size banks take on more risk with a rise in their asset base. In contrast, liquidity provides an incentive to the banking sector to take more risk. This implies that monetary policy has long term effects on the lending behavior of the banking sector. Once, the banks accumulate bad debts, it gets harder for them to recover; this calls for strong prudential measures, which can limit the undue exposure of the banking sector.

I. Introduction

The recent global financial crisis has ignited discussion on the effectiveness of monetary policy. In particular, easy monetary policies pursued by central banks of advanced economies are blamed for turmoil in the financial markets and wider economy. It is widely believed that low interest rates regimes encouraged excessive risk taking that set the stage for financial disaster. Nevertheless, the macroeconomic literature has primarily focused on the impact assessment of easy credit lending, ignoring the effect of monetary policy stance on bank risk taking.

In a simple bank lending channel framework, banks increase their credit disbursements when policy rates are low. However in the presence of excess liquidity and search for higher yield, banks take excessive risk and extend credit manifold, which sets the foundation for risk taking channel.[1] By definition, bank risk taking are considered actions that increase the volatility of return on bank assets (Nicolo et al. 2010). There is a growing literature that examines the various dimensions of bank risk taking channel. The consensus from this literature suggests that monetary easing typically induces bank risk taking. More specifically, a negative association is established between policy rate and bank risk taking.

In this study, we explore whether bank risk taking channel exists in Pakistan. An affirmative answer to this question would highlight the negative consequences of easy monetary stance pursued in the past. Our results suggest that during the period of monetary ease (2001-2004), commercial banks have taken excessive risk by extending credit at a very low risk premium, thereby resulting in moral hazard issues.

[1] "In the credit channel the increase in lending is due to an improvement in the debtors' collateral and repayment capacity which makes it less risky for banks to lend money. In the risk taking channel lending increases because the banks are more willing to take on higher risks. The risk taking channel is therefore more about the behaviour of banks than about how a change in interest rates affects the situation of the borrowers" (Apel and Claussen, 2012).

Once monetary contraction is in place, borrower's capacity to repay has been eroded, thus amplifying the stock of nonperforming loans. Therefore in line with the theory, we concluded that a rise in policy rate increases the infection ratio as well as the insolvency risk. Our findings further point out that bank characteristic, such as asset quality, capitalization and liquidity matter. Those banks that command strong asset base are found to be less vulnerable to insolvency risk and bad loans. On the contrary, we observe that small size banks with high liquidity and strong capital base are more likely to carry risk during monetary ease.

This study proceeds as follows: Section II offers an extensive review of both theoretical and empirical literature on bank risk taking channel. Section III describes the data used in this study and Section IV examines the empirical model that is used for estimation. Section V discusses the estimation results while Section VI concludes the study.

II. Review of Existing Literature

This section presents an extensive review of theoretical and empirical work on risk taking channel. The focus here is to discuss the main findings from studies that attempted to explore the risk taking channel in a single-country or multi-country settings.

Assessing the monetary and regulatory framework in OECD countries during 2000-2009, Gilles et al. (2003) argued that banks tend to maximize their profits by optimizing their credit portfolio and exploiting all available choices. He observed that sustainable low interest rates during expansion lead to financial instability in the system, while regulatory capital increases which lowers the overall productivity level in the economy. In addition, he argued that the prudential and supervisory role of the monetary authority cannot be denied in this phase. Banks take on more risk on their

off balance sheet items, which weaken the credit channel and lead to excessive risk taking by the banks.

Borio and Zhu (2008) set up the foundations of risk taking channel. They believed that policy rate affects 'risk perceptions or risk-tolerance and hence on the degree of risk in the portfolios, on the pricing of assets, and on the price and non-price terms of the extension of funding'. Change in policy rate not only determines the bank behavior through change in valuation, pricing of asset but also affects their targeted rate of return, which forces them to take risk in search of higher yield. Additionally, effective communication policies of any central bank reduces the uncertainties about the behavior of central bank and its reaction function, which help banks to take on more risk. Focusing on the relationship between capital structure of the banks, prudential regulation and their relationship with the monetary policy, they mentioned that capital structure plays a key role in defining bank behavior. They were of the view that minimum capital requirements have two effects on banks, a) '*capital threshold effect'*, which is associated with the costs banks bear for breeching minimum threshold capital requirements, b) '*capital framework effect'* which pertains to the risks associated with the pricing, perceptions and managerial frameworks of the individual banks.

Focusing on business cycles, Jiménez et al. (2009) study the effect of monetary policy on composition of supply and demand for credit on the balance sheets of banks and firms. Using the loan application data from credit registrar, and the frequency of acceptance of loan application, they observe that although well capitalized banks avoid extending credit to risky firms; they also tend to accept more applications during lower interest rates. On the contrary, small and low capitalized banks take on more risk by lowering their standards for loan collaterals and extending more credit to risky firms. This increases loan default risk in future.

Observing the 'pattern of risk premia and leverage ratios' in US during 2000-2007, Dubecq et al. (2009) modeled risk taking and risk shifting behavior in financial intermediaries. They observed that increase in asset prices is not due to the fall in aggregate risk in the economy, but it is fuelled by greater risk taking behavior of the banks. Accounting for the uncertainties that arise from information asymmetries about the risk exposure of banks, they observed that lower interest rates influence risk perceptions of the economic agents. By considering higher asset prices, as a sign of lower aggregate risk, financial intermediaries take on more risk, while charging less risk premia and maintaining lower capital requirements.

Gaggl et al. (2010) used matched sample of banks and firms from credit registrar to study "search for yield" motives in Austrian banking system over the period 1994 to 2008. He found that when interest rates stayed 'too low for too long', expected default rates increased for credit to private sector businesses, which altered the risk position of the banking sector.

> *"If this channel is at work, monetary policy affects the economy not only through its impact on the valuation of assets, the current riskiness of borrowers and expectations regarding their future development, but also by affecting the risk attitude of lenders. Thus, it may have important implications not only for monetary policy, but also for financial stability. The risk-taking channel implies that monetary policy contributes, in part, to the buildup of financial imbalances, which could – in the worst case scenario – culminate in a financial crisis that is brought about both by excessive lending and, in particular, by the deterioration of lenders' portfolios" Gaggl et al. (2010)*

Nicolo et al. (2010) used quarterly information on a stratified sample of about 400 banks operating in the US during 1997 to 2008. They used OLS technique to assess the behavior of US banking system and exploit their survey based evidence for studying the behavior of banks during the period of persistently low interest rates.

They showed that operationally banks take more risk to maximize their return in search of yield. As most of their portfolio account for changes in policy rate due to flexible rates, therefore, lower interest rates reduce their overall leverage ratio. As banks tend to target a fixed leverage ratio, they start asset substitution and extend more loans; which later turn out risky. Therefore, lower interest rates results into *'moral hazard'* and *'skin-in-the-game effect'*.

Angeloni et al. (2011) developed risk taking model assuming that monetary policy induces banks to take on more risk on their capital and maintain higher leverage ratio. They believe this excessive risk taking among banks takes place on their funding side. Taking into account the behavior of households, and financial intermediaries in DSGE framework, they believed that risk taking leads to fragile banking system and financial imbalances in the economy due to asymmetric information. This channel further reduces the degree of effectiveness of monetary policy for output and growth in economy.

Investigating risk appetite in French banking system under Basel III, Eid (2011) found that during the recent episode of prolonged lower interest rates (1998-2008), risk taking increased manifold among liquid banks. His findings suggest that risk transmission is also higher for commission and fee-based banks. However, risk taking is not linked with bad times of the economy and may be witnessed during the good times.

Satria and Juhro (2011) do not find any evidence for an effective risk taking channel in Indonesia. In contrast, they found that banks tend to avoid taking risk during monetary expansion and vice versa. However, they found evidence for informational asymmetries in Indonesian economy irrespective of monetary ease and monetary contraction.

Ozsuca and Akbostanci (2012) used both the accounting based and market based indicators to assess the risk taking behavior of Turkish banks during the phase of monetary ease. They found that easy monetary policy significantly reduces the short term interest rates and leads to higher risk taking among banks. In contrast, they observed a negative impact when policy rate falls below the benchmark rate. They also observed that risk taking primarily takes place among more liquid and well-capitalized banks, while large banks hold less risky portfolio and are thus less prone to default risk on their loans. The findings of López and Zárate (2012) are also consistent with the literature on risk taking channel. They deployed probit and duration models, considering the loan level information for both the consumers and businesses for Colombia. Their results suggest that prolonged low interest rates below the historical levels lead to excessive risk taking in Colombia. While looking at the difference of bank behavior for consumer loans and commercial loans, they found that risk taking is higher for commercial loans than the consumer loans.

In a theoretical paper, Apel and Claussen (2012) describe that central bank can influence short term interest rates: any such action on the part of central bank leads to behavioral shift in banks and they tend to extend credit to risky borrowers. However, they also emphasized that in long run to avoid recessions and overheating of the economy, a central bank should focus in reducing the gap between short term natural rate of interest and short term real interest rates.

Altunbas et al. (2010; 2012) assessed the behavior of banking systems of 16 European countries and the US before and after the global financial crisis. Controlling for various risk factors, and constructing index for monetary easing, they interact the bank characteristic to explore how bank characteristics in pre-crisis period affect the behavior of banks towards risk taking. Their results re-imposed the risk taking hypothesis. It turned out that when interest rate stays lower for a longer period of time, banks tend to take more risk. Further, applying probit model for the banking sector, they found that banks turned more risky after crisis.

Using quarterly data on US banking system from 1990Q1 to 2010Q2, Delis et al. (2012) studied the link between monetary policy and bank lending standards. They used OLS and time fixed effects to capture the effect of monetary policy and bank-borrower relationship on all in drawn spread of the banking system. They found that loan spreads increases during easy monetary policy. Banks tend to take on more risk on their new loans, and further increase their risk premium for risky borrowers. However, owing to relationship lending, banks charge less risk premium to their prime customers and on large loans.

Agur and Demertzis (2012) modeled banking sector to observe how a bank regulator can mitigate the effects of monetary policy decisions over the banking system. They found that a bank regulatory authority cannot control the induced behavior of banking sector towards taking on more risk. However, they can control the capital requirements for additional risk taking, which can somehow reduce the worst effects of monetary ease. They also observed that monetary ease affects both the credit growth and the financial stability of the banking system.

Gersl et al. (2012) explored the risk taking channel in Czech Republic during the period 2002-2010 by deploying instrumental probit and cox proportional hazard rate models for transaction based data on loans. They found that large and liquid banks avoid extending credit to firms with recently bad credit history and thus they have lower chances to face loan default. However, there exists an appetite for taking excessive risk with ease in monetary policy which is compatible with foundations of risk taking channel.

Paligorova and Sierra (2012) presented the foundations of risk taking channel, which they later proved in their study, titled 'Monetary Policy and Bank Risk-Taking: Evidence from the Corporate Loan Market' (Paligorova and Santos, 2012). They reinforced that risk taking channel is primarily supply driven and works with the

induced behavior of banking sector to take on more risk during the times of easy monetary policy. Both the banks and the behavior of firms play an important role. They further explained that risk taking channel may amplify the effects of bank lending channel and firm balance sheet channel. Banks as a result may extend credit to risky firms, maintain the all in drawn spread for less risky and risky firms close to each other; which may later increase the default frequency of loans extended during this period.

Exploring the inverse relationship between persistent low interest rates and risk taking behavior of US banking industry, Dell'Ariccia et al. (2013) exploits loan level information on loan riskiness and defines '*an ex-ante measure'* of bank risk taking. They argued that change in policy rate one one side, determines the effective spread between deposit rates and lending rates, which determine the risk taking attitude of the banks. While on the other side, it determines the risk shifting behavior of the banks, which relates to the liabilities of the bank. Their study focuses on *'integrating macro-prudential regulations with monetary policy frameworks to meet the twin objectives of price and financial stability'.*

Using time-varying and non time-varying data on bank indicators, policy rate and other macro variables, Bonfim and Soars (2013) determined the probability of granting loans during the period of persistently low interest rates in Portugal during the period 1997-2009. In their survival analysis, they found that although Portuguese banks tend to extend credit to the riskier borrowers during this phase, but it does not increase the overall riskiness in the system. Their results are controversial when compared with the traditional foundations of risk taking channel: they found that these loans improved the net worth of their borrowers, which made them more attractive for the banks.

Bruno and Shin (2013) developed a dynamic model for risk taking behavior of banking system through their leverage and monetary policy in international scenario. They built their model proving that relationship between policy rate and risks in equity option studied by Bekaert et al. (2012) and the effects of policy shock on exchange rate as studied by Eichenbaum and Evans (1995) is 'two sides of the same coin'. Moving one step further, they modeled dynamic risk taking behavior of USD in global banking system and riskiness towards global banking.

Kick and Prieto (2013) explored bank competition-stability nexus in Deutsche Bundesbank using information on banks mergers, potential risk factors, along with other competition factors for banking sector. They observed that monetary easing does not lead to risk taking among the banks, as greater competition reduces risk level for the most of the banks.

Extending the theoretical model developed by Dell'Ariccia et al. (2010), Buch et al. (2014) used Factor-Augmented Vector Autoregressive model (FAVAR) and observed the absence of risk taking channel in US economy. They utilized Federal Reserve's Survey of Terms of Business Lending (STBL) data and observed that the decrease in policy rate does not affect the leverage of the large banks, as well as the foreign banks. This, however, affects small and more capitalized banks, which hold excess liquidity.

III. Data Description and Definitions

The overall banking sector of Pakistan comprises of 38 commercial banks, which includes not only local and foreign banks but also some specialized banks. Although with a passage of time, concentration in banking sector is decreasing over time, and assets are diversified, but still top five banks dominate the banking sector in Pakistan, holding almost 53 percent share in the assets of the total banking system. Most of these banks are well established which has raised the barriers to entry for the new banks. As a result, we see only three commercial banks opening in last 5 years. This

has, on the one hand, reduced the volatility in the banking sector, but on the other hand, has raised the risk appetite and competition among the banks during the phase of monetary ease. Pakistan economy witnessed the monetary ease during 2001-2004 in which banks lent to the private sector businesses on very low rate, while after 2004 interest rate rose sharply which lead to credit crunch and high NPLs until the financial sector across the world hit the financial crisis into 2008. Therefore, in order to avoid bias, we did not take into account, the banks established after 2008. As a result, this study utilizes financial information on 35 commercial banks over the period of 12 years i.e. from 2002Q4 to 2014Q2. The source of this database is the quarterly as well as annual financial statements of the banks, extracted from Reporting Chart of Accounts (RCoA), State Bank of Pakistan. This includes comprehensive information on assets, liquidity conditions, capital quality and non-performing loans – NPLs. Macroeconomic variables like policy rate, natural interest rate gap (NIGAP), Quarterly GDP, CPI and stock market index are collected from State Bank of Pakistan (see Table 1 for summary statistics).

As mentioned earlier, risk taking channel has been recently explored across the world, and is found as closely related to bank lending channel and the balance sheet channel. Therefore, it is quite challenging to separate risk taking channel from that of bank lending channel. Broadly, literature has defined two measures for assessing risk taking channel, i.e. 'accounting based measures' and 'market based measures'. Accounting based method utilizes the information on banks financials', therefore, it provides a relatively quick measure for the assessment of risk taking behavior of the banking sector. In contrast, 'market based measure' takes into account the credit rating, loans ratings, etc. which makes it relatively complex to use.

In view of the fact that, banking sector of Pakistan is not very complex; we relied on 'accounting based method' for the assessment of risk taking channel in Pakistan. As a result, we used infection ratio and widely used Z-index as key variables of interest. Infection ratio that is described as NPLs to loans ratio is considered as a good

indicator for assessing the asset quality and thus the adverse exposure of the bank. The second key variable, Z-index, is often used to assess the vulnerability of a bank towards its returns on assets and thus insolvency risk. Following Ozsuca (2012), Z-Index is defined as:

$$Z_i = \frac{ROA_i + E/TA_i}{\sigma(ROA_i)} \qquad (1)$$

Where, ROA_i is defined as return on asset of the *i*th bank; E_i is the shareholders equity of the *i*th ban; while, TA_i is the total assets of *i*th bank. Following Cihak et al. (2009) and Ozsuca (2012), standard error of return on asset is calculated using a three year rolling window.

Further focusing on the characteristics of the banking system, we included Herfidanl-Hirschman index (HHI) as a proxy for competition and concentration, while, employed log of assets as a measure of the size, equity to asset ratio as a measure of capital, and liquidity to asset ratio as a measure of liquidity. Since, asset base of the previous year affects the risk taking of the banking sector; we have employed the lag of the assets. Nevertheless, understanding that eventually, it's the capital that is hit by the risk taking behavior of the bank, we used capital for the current period. In addition to that, we focused on the size, liquidity and capital quality of the top tier of the banking sector. Treating banks that fall above the 85 percentile in terms of assets are treated as big banks, while rest are treated as small and medium sized. Following the same 85 percentile bracket for capital and liquidity, we defined highly capitalized and more liquid banks. Furthermore, the impact of these variables is observed by using dummy. Going forward, we expect highly capitalized banks, which are also small by size, to take more risk. In contrast, large size banks are likely to be less vulnerable to risk due to their strong asset base.

IV. Estimation Model

As discussed in the previous section, monetary stance of the State Bank of Pakistan (SBP) alters the lending behavior of the banking sector. In addition, economic conditions, banks own history of holding non-performing loans and bank specific characteristics plays an important role. We have therefore, used instrumental variable technique with fixed effects to observe the risk taking behavior of the banking sector.

Our baseline equation takes the following form:

$$Y_{it} = Z_{it}\beta_1 + Xit\beta_2 + B_{it}\beta_3 + D_{it}B_{it}\beta_4 + U_{it}$$

Where, Y_{it} = (NPLs to Total Loans ratio$_{it}$, Z-Index$_{it}$)

Z_{it} is the instrumental regression with the following function;

Z_{it} = *f* (Yit-1, Yit-2….Yit-n, market interest rate (3 month kibor), CPI)

Xit = *f* (Policy rate, GDPt-1, Stock market index, HHI, GINAP)

B_{it} = *f* (capitalization$_{it}$, liquidity$_{it}$, assets$_{it}$)

$D_{it}B_{it}$ = *f* (Capitalization$_{it}$*Dummy, liquidity$_{it}$*Dummy, Assets$_{it}$*Dummy)

Where Dummy = 1, if the bank lies above 85 percentile.

U_{it} = error term$_{it}$

The empirical results obtained by estimating the aforementioned equations have been reported in Table 2 and Table 3.

V. Empirical Results

Hansen J test for over-identification of all instruments is 0.78 (Chi-sq(4) P-val =0.78). The instruments are valid and satisfied the conditions for valid instruments. Table 2 shows that infection ratio increases with a rise in policy rate, this implies that a decrease in policy rate positively impact loans portfolio quality and hence financial soundness of the banking sector. The results are significant at 1 percent level. On average, 1 percent increase in policy rate increases the infection ratio by 20 percentage points. This finding

is consistent with literature (Altunbas et al., 2010; Ozsuca, 2012) that lower rates make more projects feasible and loan repayment for the existing projects become easier by decreasing the interest burden of the borrowers, which in turn, lead to lower loan default rates and vice-versa. Another point to note is that this positive impact of low interest rates on credit risk of bank portfolios might also stem from the fact that the volume of outstanding loans outweighs the new loans in the short term, and hence this effect primarily corresponds to a shorter-term phenomenon as it has also been established as a short-term effect of low interest rates by Jimenez et al. (2009).

GDP growth enters the regression significantly negative at one percent, implying that the probability of loan default is negatively related with the growth rate of GDP. Favorable economic conditions are associated with an increase in the number of projects becoming profitable in terms of expected net present value; which in turn lead to a reduction in overall credit risk of a bank (Kashyap and Stein, 1993; Altunbaş et al., 2010). Moreover, borrowers would earn more and accordingly, their capability to pay back their loans would be higher in times of good economic outlook. This result is consistent with the findings of Gambacorta (2009), Altunbaş et al. (2010) and Lopez et al. (2012).

In our model, stock market index and banking concentration measured by HHI turned out to be insignificant. One of the possible explanations could be the behavior of stock market returns which also depends largely on variables like law and order and speculation etc. which are factors other than economic fundamentals.

The bank specific factors show that with a rise in total assets, overall banking industry takes more risk with a lag of one quarter. However, this does not hold true for the large banks. In contrast, we observe that liquidity plays an important role. The coefficient for the banking system liquidity shows that 1 percent rise in liquidity of the banking system increases the infection ratio by almost 4 percentage points. These results are positive and significant at 5 percent. Since, we have used dummy for highly liquid banks (i.e. dummy = 1, when a bank falls in 85 percentile in terms of

liquidity to asset ratio) and then interacted with the liquidity, the interpretation of this coefficient is slightly different. We find that a one percent rise in liquidity of the highly liquid banks tends to increase their infection ratio by 33 percentage points (i.e. 0.046 + 0.284).

Our results for capitalization show that overall banking industry in Pakistan does not take more risk with a rise in their capital. Nevertheless, highly capitalized banks tend to take risk with a rise in their capital base. The results show that 1 percent rise in equity to asset ratio of highly capitalized banks increases the infection ratio by almost 7 percent (0.071 - 0.002). These results are significant at 1 percent. Therefore, we conclude that small, highly liquid and highly capitalized banks take more risk during the period of easy monetary policy. While, large size banks with relatively low capital and liquidity take less risk. This may be due to the culture of relationship lending in case of large banks as compared to small banks who strive for market share and high yield.

Table 3 evaluates the risk taking channel using Z-index. Since, Z-index is an inverse measure of banks' risk, we find that the increase in policy rate enhances the solvency risk and vice versa. Since most of the banks are also listed on stock market, we foresee that a rise in stock market index also increases the insolvency risk of the banking sector. This implies that banking sector especially medium and small banks are prone to adverse shocks in capital market especially when the capital witness steep decline (bubble crash as happened in 2008). Incorporating the effect of natural interest rate gap (NIGAP), we find that NIGAP increases banks' risk taking appetite as shown by its negative coefficient; however the estimates are not robust. In other words, relatively low levels of interest rates cause either a decrease in risk perception or an increase in risk tolerance. This result gives evidence of a change in risk perception or risk tolerance and accordingly, it confirms the impact of the risk-taking channel of monetary policy transmission. In addition, banking characteristics affect the riskiness of the projects. These results are also in line with the literature.

VI. Conclusion

The dynamics of Pakistan economy suggest that stabilization policies affect the lending behavior of banking sector in Pakistan. During the phase of low interest rates (2001-2004), banks took excessive risk and extended credit to the corporate sector at a very low risk premium (Shabbir et al. forthcoming). This has resulted into moral hazard issues, and amplified the impact of easy monetary policy in the form of excess credit lines to the corporate sector. Since, most of the loans are linked with the benchmark rate, say kibor, which co-moves with the policy rate, therefore, monetary contraction after 2004 reduces the borrowers' capacity to repay and thus resulted into higher NPLs to Loans ratio.

The results of our study are in line with the theory, as we find that although history of infected loan portfolio matters, but still any rise in policy rate increases the infection ratio as well as the insolvency risk. Moreover, bank characteristics like asset quality, capitalization and liquidity matters. Top five banks of the banking sector holds almost 53 percent share in the assets of total banking sector. Given their strong asset base, they are less vulnerable and less exposed to insolvency risk and bad loans. While, small and medium size banks take on more risk with a rise in their asset base. In contrast, liquidity provides an incentive to the banking sector to take more risk. This implies that monetary policy has long term effects on the lending behavior of the banking sector. Once, the banks accumulate bad debts, it gets harder for them to recover; this calls for the strong prudential measures, which can limit the undue exposure of the banking sector.

This study is confined to the evaluation of risk taking channel in Pakistan; however, there is a wide room open for further research observing the response of the defaulters firms, and its repercussions on their attitude as well as the role of prudential regulations in controlling the effect of any monetary policy stance on the individual banks.

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Annexure

Table 1: Summary Statistics

	Obs	Mean	Std. Dev.	Min	Max
Z-Index	1586	21	53	-265	500
NPLs to Loans	1250	18	42	0	1297
NIGAP	1645	4	4	-1	13
Stock Market Index growth	1645	7	14	-34	33
GDP growth	1645	16	7	5	26
Policy Rate	1645	10	2	8	15
CPI	1645	2	2	0	8
HHI	1645	859	150	699	1232
Log Asset	1589	5	1	3	6
Liquidity to Asset	1588	42	17	6	100
Shareholders' equity to Asset Ratio	1488	1	92	-953	83

Table 2: Evaluating Risk taking through effect on NPLs of Banking Sector

	NPL/Loan	NPL/Loan	NPL/Loan	NPL/Loan	NPL/Loan	NPL/Loan	NPL/Loan	NPL/Loan
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.NPL-Loan	0.910***	0.910***	0.906***	0.906***	0.906***	0.912***	0.927***	0.927***
	(0.0129)	(0.0128)	(0.0132)	(0.0131)	(0.0131)	(0.0127)	(0.0123)	(0.0123)
Policy Rate	0.211***	0.202***	0.199***	0.258***	0.253**	0.144**	0.118**	0.110*
	(0.0577)	(0.0574)	(0.0574)	(0.0667)	(0.1200)	(0.0583)	(0.0566)	(0.0567)
D.gdp		-6.84e-07***	-6.76e-07***	-7.20e-07***	-7.18e-07***	-7.18e-07***	-7.52e-07***	-7.55e-07***
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
nigap			-0.0448					
			(0.0338)					
Stock Market Index				6.90E-05	6.65E-05			
				(0.0000)	(0.0001)			
HHI					-0.000183			
					(0.0037)			
Size (Lag of log Assets)						2.325***	1.797***	2.036***
						(0.4920)	(0.4800)	(0.4940)
Big Size								
(Lag of log Big Assets)						-1.045	-0.738	-0.945
						(1.9950)	(1.9300)	(1.9300)
Liquidity							0.0461**	0.0475**
							-0.0229	-0.023
Most Liquid							0.284***	0.284***
							-0.0444	-0.0443
Capitalized								-0.00226
								-0.00354
Highly Capitalized								0.0712*
								-0.0374
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R-squared	0.843	0.845	0.846	0.846	0.846	0.848	0.859	0.859
Number of banks	35	35	35	35	35	35	35	35

*** p<0.01, ** p<0.05, * p<0.1 Robust standard errors in parentheses

Hansen J statistics (over identification test for all instruments) Chi-sq(4) P-Val = 0.3

Table 3: Evaluating Banks Risk Taking through Z-Index of Banking Sector			
	Z-Index	**Z-Index**	**Z-Index**
	(1)	(2)	(3)
L.zindex	0.911***	0.857***	0.856***
	(0.0504)	(0.0613)	(0.0614)
Policy Rate	-0.289*	-0.440**	-0.562***
	(0.1690)	(0.1790)	(0.2130)
Stock Market Index	-0.000281***	-0.000275***	-0.000343***
	(0.0001)	(0.0001)	(0.0001)
Log Assets		-24.80***	-24.78***
		(6.6400)	(6.5780)
Log Big Assets		21.32***	21.31***
		(8.0990)	(8.1810)
Liquidity		0.0069	-0.0112
		(0.0212)	(0.0221)
Most liquid banks		-0.251**	-0.238**
		(0.1170)	(0.1140)
Capital		0.0667***	0.0672***
		(0.0253)	(0.0253)
Highly Capitalized Banks		-0.00704	-0.000611
		(0.5490)	(0.5480)
NIGAP			-0.221*
			(0.1160)
Observations	1,480	1,474	1,474
R-squared	0.84	0.845	0.845
Number of Banks	35	35	35

*** p<0.01, ** p<0.05, * p<0.1 Robust standard errors in parentheses

Hansen J statistics (overidentification test for all instruments) Chi-sq(4) P-Val = 0.78