

Credit Risk Assessment of Banking Sector Of Pakistan
A Macro Linked-Micro Crisis Exploration Approach

Fareeha Adil & Shahid Mansoor Hashmi

Department of Economics
Pakistan Institute of Development Economics
Islamabad



Fareeha Adil is a Doctoral Candidate of Economics at Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan & works at Higher Education Commission (HEC), Islamabad. Dr. Shahid Mansoor Hashmi is Senior Joint Director, National Institute of Banking & Finance (NIBAF), State Bank of Pakistan, Islamabad, Pakistan. Views expressed in this paper are those of authors and not necessarily of the PIDE or SBP. The other usual disclaimer also applies.

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ABSTRACT

This study performs a credit risk assessment of the Banking Sector of Pakistan by using a panel of 41 banks, covering the period 2001 to 2014.

Using logit discriminant analysis, this study develops a macro linked micro-crisis exploration model which presents the relationship between the Non-performing loans (NPL's); a measure of credit risk of banks and bank's sensitivity to macro factors. The process is such where changes in macro factor and bank sensitivity to those changes affect the NPL's, and NPL's in turn impact the probability of bank's higher credit risk.

The multi factor model constructed in this study has two specifications: the first specification (the indirect test) uses estimated NPL's computed from estimated changes in macro variables and banks sensitivities to those macro variables as proxies of macro factors; whereas the second specification (the direct test) uses bank's sensitivities to macro-economic variables as proxies for macro factors.

The exploration model of credit risk assessment of the stylized Banking sector of Pakistan depicts that macro conditions play a formidable role in determining the credit risk level and potential financial crisis. Further the assessment indicates that NPL's (measure of credit risk) are highly affected by macroeconomic risk factors and bank specific variables; where macro determinant of risk are betas of Term structure (TS); Discount rate growth rate (DDCR) and Risk premium (RP) and the micro determinants of risk are the Capital, Asset, Management, Equity and Liability (CAMEL) category characteristics of Shareholders equity to total asset ratio (SETA), Retained earnings to total asset ratio (RETA) along with Change in net income (CHIN) and Gross advances growth rate (GADVG) exhibiting a negative relation with risk level; The results confirm that Pakistan's banking sector exhibits a high level of credit risk due to piling up of NPL's overtime and their transmission to booked losses category¹.

Keywords: Credit risk, NPL, Banking Sector, Pakistan, Financial Crisis, CAME

¹ See "Risk analysis of the banking sector" *SBP report 2011-2014*

1. INTRODUCTION

What is common between world's three mega economic and financial crisis, The Great Depression; The Asian financial crisis of 1997; and International financial crisis (2007-2009, 2011); that the guilt clause applies to the "banking sector" [Bernanke (1983)]; [Gerali,et al. (2010)]. The credit risk and market risks emerged on the horizon when the fragility and collapse of banking and financial sector accounted for nearly all the major economic crisis - reason; massive buildup of NPL's.

A chain of studies by Bernanke held the banking sector collapse responsible for the depth and persistence of the Depression Crisis, when from 1930-1933 half of US banks failed and financial markets crashed; [Bernanke (1986)], [Bernanke and James (1991)], [Schreft (1990)]. Banking sector was the root cause of Asian crisis of 97 when banking sectors of East Asian economies defaulted at an average of 25% of total loan portfolio, the Indonesian economy, where over 60 banks collapsed during the crisis and nonperforming loans represented about 75% of total loan portfolios; [Caprio and Klingebiel (2002)]. The International financial crisis, (2007-2009, 2011) where mortgage NPL's created enormous liquidity issues in interbank market and led to sudden collapse of major financial institutions. The shocks that erupted in banking sector accounted for the largest share of contraction of economic activity, whereas macro-economic shocks accounted for a limited role. [Gerali,et al. (2010)]

Historically, banking crisis have been linked with gigantic accumulation of nonperforming loans which constituted a sizeable portion of total assets of insolvent financial institutions/banks especially during systematic crisis, a situation where troubled banks account for 20% of aggregate deposits of banking and financial sector. A red alert crisis level of

banking which, ironically the world has witnessed 114 episodes occurring 91 countries since late 1970's; [Dziobek and Pazarbasioglu (1997)].

Despite this apparent link between bank crisis and nonperforming loans, the literature on bank crisis focus the macro determinants of bank crisis, ignoring the various sources of NPL, which are used as variables to assess the intensity of crisis and critical factor leading to crisis, rather than viewed as consequence of crisis. For instance Demirgne-Kunt and Detragiache (1998) classify financial distress episode as a full-fledge crisis rather than an indicator to crisis, if the NPL ratio to total assets exceeds 10%.

2. SIGNIFICANCE & HYPOTHESIS

The significance of the study lies in analyzing *NPL* as an additional measure of credit risk. There are several explanations for NPL; chronic fiscal defaults, balance of payment issues in various countries, mismatch between asset/liabilities maturities, demand for short term – high priced financing in the shape of interbank loans, all contributing to accumulation of impaired loans. However for LDC's (less developing countries) nonperforming loans are an exacerbated phenomenon.

The NPL accumulation and banking crisis originating from it have most affected the countries where government were indulged in excessive borrowing from banking sector and owned a sizeable portion of NPL's ; [Basu (1998)].

Furthermore in LDC' where banks exhibit market power, and operate in a concentrated market, the loans portfolios are heavily skewed towards selective and few sectors and economic agents; [Brownbridge (1998)]. In such scenarios economic contraction can occur and even affect those banks which have higher levels of capital base. The absence of deposit insurance mechanism

further increases the vulnerabilities.

As all these aspects hold for Pakistan where a stylized banking sector operates under monopolistic competition, where commercial banks prefer extending risk free loan to government for the purpose of improving Credit adequacy ratio(CAR), where government crowds out the private investment by acquiring sizeable chunks of private sector credit, where banks corporate loan portfolios are skewed towards specific sectors/giants, where public sector banks finance the loss making public enterprises, all occurring in a sector which lacks sound corporate governance, exhibits underpricing of risk and ad-hoc approaches of risk measurement.

For Pakistan, the prime focus of most of the research concerning the financial aspects and banking sector has been “*Spreads*” [Khan 2009; Khawaja and Din (2007)] and “*Pass-through mechanism*” [Khan and Khawaja (2005); Mohsin (2011)]. This study intends to investigate an equally important aspect of banking sector with deep macroeconomic implications, the NPL.

Concerning NPL's of banking sector of Pakistan, as a measure of credit risk, this study attempts to investigate for Banking sector of Pakistan; whether NPL of banking sector are affected; by macroeconomic risk factors; by bank specific variables and is the credit risk of banking sector of Pakistan of significant level?

3. LITRATURE REVIRW

3.1 THE CREDIT RISK OF BANKING SECTOR

Since the inception of International financial crisis, it is evident that there is a strong interaction between the credit and financial markets and rest of the economy, which is crucial for explaining the macroeconomic fluctuations. Shocks erupting in banking sector account for the largest share

of contraction of economic activity since 2007, whereas macro-economic shocks account for a limited role.

Up till now this trio of credit market, financial market and the rest of the economy have been majorly dealt from the Credit demand side. Credit spreads in these models reflect and emphasize only the riskiness of the borrower (credit risk), even the perfectly competitive banks also accommodate changing condition on the demand side only [Bernanke, et al. (1999)]

Ironically, conditions from the supply side of credit are of equal significance. Since banks represent the main source of lending to households and firms, the supply side conditions of banking sector such as degree of competition, rate setting strategies and financial health needs the due focus.

The survey of literature indicates that one of the most crucial variables for assessing the credit risk in banking is “*likelihood of default*”, which reflects the credit health and quality and this credit health has a critical link with macro variables.

3.2 NPL –A MEASURE OF CREDIT RISK OF BANKING SECTOR

NPL – An Overview

NPL refer to those loans which are unable to generate income for a fairly long time period that is outstanding principal/interest of these loans remains un paid for at least ninety days. [Caprio and Klingebiel (1999)]

There is a variation among criteria for defining NPL across central banks of different regions, owing to multicity of regulators and institutions across countries and marked differences in minimal regulatory capital requirements among countries; [Bloem and Gorter (2001)]. A number of central banks consider the time frame of conversion of standard to substandard loans (including loss/ doubtful loans) to be longer than 90 days, where substandard loans are the loans which remain

unpaid for at least six months and where the debtor is not an a capacity to undertake the repayments. Other central banks assume those loans as nonperforming whose principal/interest remains unpaid for at least three months. However the Basel Commission emphasizes a standardization and internal rating approach based upon aligning banks' capital requirement with risk management and mitigation techniques. Further to implement comparability among banks, Basel sets forth a minimum qualification criterion of internal rating approaches that establishes the credibility of credit risk assessment (internal) of banks. The standardization will lead to uniformity of NPL classification across countries.

The economic and financial implications of such impaired loans are quite significant. Potentially impaired loans negatively affect the private investment, cause credit unavailability or credit crunch situation for private sector through reduction of bank capital, increase deposit liabilities followed by a fall in saving rates due to runs on banks, loan accumulation and higher provisioning to compensate for the losses. An impact upon loan to value (LTV) and capital to asset ratio is basically a supply side shock that is transmitted to real economy. [Gerali,et al. (2010)]

NPL's not only affect the supply side of credits but also affect the demand side by reducing consumption and are a source of economic shrinkage when deposit insurance mechanism is absent to safeguard small depositors particularly when coupled with credit crunch scenario due to depletion of banks capital assets.

3.3 MACRO ECONOMIC RISK FACTORS

The literature upon major economies reflects that macro factors affect credit risk.[Keeton and Morris (1987)] analyzed banking sector data for over 2400 commercial banks of U.S and found

the local economic conditions accounted for variations in loan losses of banks. Empirical studies like; Mueller (2000); Anderson and Sundaresan (2000); Dufresne and Goldstein (2001)], which analyzed asset price structure also found linkage between deteriorating macroeconomic conditions and credit Risk appreciation.

The essence of the Kent and D' Arcy (2000) study of Australian banks suggested that risk realizes during the business cycle contractionary phase and actually peaks at the top of cycle. Similar evidence was found for Indian Banks by Rajan and Dhal (2003). Argentinian banking system was analyzed by Giovanni and Grimard (2002) study which depicted that credit growth, money multiplier and reserve adequacy affected NPL's. The main monetary instrument, the interest rate is also found significant in many studies, for instance, in a study by Fuentes and Maquieira (2003) for Chilean banks, NPL's, were affected more by interest rates than business cycle.

Emerging literature especially after the international financial crisis of 2007-2009, 2011 has also emphasized the variables of assets, house prices and unemployment as another set of macroeconomic variables affected NPL's and thus the credit risk.

3.4 BANK SPECIFIC FACTORS

Many studies include bank specific factors in addition to macroeconomics factors, for the reason that macro factors in turn depend upon micro factors. Salas and Saurina (2002) analyzed for Spanish banks that in addition to macro variables, market power, bank size and capital ratio accounted for variations in NPL's. A sizable portion of NPL can build up by declining capital to asset ratio, a proxy of deterioration of banks assets or a measure of asset quality. The capital to asset ratio provides cushion to absorb shocks during crisis period and is an indication of financial health and soundness. A comparatively low level of capital to asset ratio of banks shows the

magnitude of credit risk the banks are exposed to and comparatively low levels of equity illustrates constraint to provisions against potential risks and future losses. Although as per frame work of international settlement standards, the ratio should exceed 8% minimum requirement, this threshold is not met for a number of countries.

Bercoff, et al. (2002) found that sound explanations of NPL's are operating efficiency of banks, asset growth and local loan portfolio. Hughes et al (1995) also associates credit risk to banks operating efficiency.

4. METHODOLOGY- RISK ASSESSMENT OF BANKING SECTOR

4.1 NPL – A MEASURE OF CREDIT RISK

The model and methodology of multifactor macro model, systematic risk indirect approach and systematic risk direct approach will be applied to banking sector using a slightly different set of macro variables which include Discount rate growth rate (DDCR), Growth rate of Inflation (DIF), money supply growth rate (DMS), Term structure (TS), Risk Premium (RP), Trade Openness (TRADEPKR) and Exchange rate growth rate (DEXCH), and bank specific financial variables which include CAMEL category variables of Shareholders equity to Total assets (SETA), Retained earnings to Total assets (RETA), Working capital to Total assets (WCTA) and other banking variables which include Change in net income (CHIN), Gross advances growth rate (GADVG) and a dummy variable ,1 if net income negative for current year, 0 otherwise (NNI).

Since Pakistani banking sector is unique due to its stylized features; market power; interest rates stickiness: accumulation of bank capital: is unique due to its stylized products, loans and deposits contracts; homogeneous financial products from a composite basket, differentiated at different prices: is also unique due to its stylized credit risk (only banking and insurance sector have to deal

with both the idiosyncratic and systematic risk where the former is non-diversifiable) and balance sheet composition, we set NPL to gross advances ratio (NPLGA) as a measure of credit risk of banking sector (supply side).

Deun Li Kao (2000) articulates that credit risk of banking sector is an event where default is the ultimate outcome, but the prior credit events like distress, risk grade, risk migration have more significant impact in pricing of credit risk of banking. Contrary to most models which consider default as the only event, the prior spectrum is an appropriate measure. Secondly the balance sheet heads of banking sector only represent the realizations which have occurred in a point in time (i.e. does consider any transitory phases). A non-performing loan on the balance sheet is not a booked loss until it loses its potential of performance which can take place by rescheduling/incurred recovery/litigation costs/write off in course of time. Thus a fresh NPL from initial aging report to balance sheet reported NPL are all events of credit risk, until booked as a loss. Literature supports this aspects and a number of credit risk models even use NPL minus provisioning; [Hussein, et al. (2011)] as a measure of credit risk of banking sector. Applying the same argument to our logit default probability model, where the NPL is a measure of credit risk, as the realization of default has not taken place and the spectrum in point in time is of credit risk.

The stock returns are not employed in the risk assessment model of banking sector of Pakistan, for the reason that SBP restricts banks' exposure to stock market. Banks are limited to place a maximum exposure of 20 % of their equity at stock market. As a consequence, Banks can even absorb severe shocks disrupting the stock prices; as per a sensitivity analysis², even a drop in listed shares by 50% will only decrease the CAR of the banks by negligible 76 basis points.

² Risk analysis of banking sector; SBP report H1-CY12

4.1.1 The Model

Goldstein and Turner (1996) in their study highlight that accumulation of NPL is attributable to number of macroeconomic factors including macro volatility, macro downturns, GDP per capita, exchange rate appreciation, deteriorating terms of trade, higher interest rates and inflation, dependency upon inter bank borrowings and moral hazard. Also studies include bank specific factors in addition to macroeconomics factors, for the reason that macro factors in turn depend upon micro factors.

In order to explore this “*indirect link*” of exposure of bank specific variables to macro factors, the following multi factor model is set.

NPL's are assumed to follow a model in the form

$$NPLGA_{it} = a_i + \sum_{k=1}^K \beta_{ik} f_{kt} + e_{it} \quad (4.1)$$

Where

a_i = Constant term

β_{ik} = macro factor beta k for bank i

f_{kt} = realization on factor k in time t

e_{it} = error term

In the first step the $NPLGA_{it}$ are regressed on a set of macro variables which affect NPL systematically. The macro explanatory variables are Discount rate growth rate (DDCR), Growth rate of Inflation (DIF), money supply growth rate (DMS), Term structure (TS), Risk Premium (RP), Trade Openness (TRADEPKR) and Exchange rate growth rate (DEXCH).

4.1.2 Banking Sector – Systematic Risk Indirect Approach Model

In the methodology, the multifactor model presents the relationship between the NPL (NPL's) of banks and bank's sensitivity to macro factors. The process is such where changes in macro factor and bank sensitivity to those changes affect the NPL's, and NPL's in turn impact the probability of bank's higher credit risk.

Therefore a 2 step logit discriminant analysis is applied as used in Maddala (1986), Thomson (1992) and Theodossiou et al (1996) for the purpose of estimating bank's infection ratio, the infection ratio will then be used as representation of macro sensitivity indicating bank's credit risk level. In other words, bank's Non-performing loan to Gross advances ratio from multifactor model presents macroeconomic effects incorporated in the micro crisis predictive model. The estimated NPL's from the multi-factor model is presented as a link to micro-crisis model.

The micro-crisis model and macro factors imply following specifications of indirect test

$$PRFD_{it} = prob(Y_{it}=1) = \frac{1}{1+(e^{-z_{it}})} \quad (4.2)$$

$$Z_{it} = \beta_0 + \beta_1 NPLGA_{it} + \beta_2 (SETA)_{it-1} + \beta_3 (RETA)_{it-1} + \beta_4 (GADVG)_{it-1} + \beta_5 (CHIN)_{it-1} \quad (4.3)$$

Where

Z_{it} = log odd function

$X_{j,it}$ = Financial characteristic j of bank i

Y_{it} = is assigned value of 1 if net income of bank negative for current year, 0 otherwise

Estimated infection ratio completely reflects the bank's sensitivity to macro conditions as well as micro. Because the bank's actual NPL reflect both the systematic and bank specific risk, the

motivation of the two step logit is to isolate the systematic risk in which the banks got affected by economic crises in the economy as a whole.

Actual NPL's present both the systematic risk and bank specific risk, where F presents systematic

$$NPL_i = \beta_{0,i} + \beta_{1,i} F + e_i$$

factors and e_i contains bank specific risk. As financial characteristics of the bank are related to the bank specific risk, the use of actual NPL's along with financial characteristics as explanatory variables of model will be double consideration of bank specific risk. So the appropriate measure is to find a proxy of systematic risk that corresponds to banks credit risk. The estimated NPL_i will exclude the bank specific risk and will only capture the systematic risk of the bank. Then Non-performing loan to gross advances ratio and financial characteristics combine the systematic and bank specific risk as a presentation of explanatory variables to macro related micro-crisis model without making the bank specific risk redundant.

To estimate infection ratio, NPLGA is regressed on a set of macro variables as mentioned previously to obtain β macro factors in the form of β_{DDCR} , β_{TS} , β_{RP} , β_{DIF} , β_{DMS} , $\beta_{TRADEPKR}$, β_{DEXCH} ,

$$NPLGA_{it} = \beta_0 + \beta_{DDCR} DDCR_t + \beta_{TS} TS_t + \beta_{RP} RP_t + \beta_{DIF} DIF_t + \beta_{DMS} DMS_t + \beta_{TRADEPKR} TRADEPKR_t + \beta_{DEXCH} DEXCH_t + e_{it} \quad (4.4)$$

After obtaining $NPLGA^{\wedge}$ (estimated), Z_{it} (log odd function) equation (4.3) is calculated.

The Indirect specification uses estimated NPL's computed from estimated changes in macro variables, eq. (4.4) and banks sensitivities to those macro variables, eq.(4.3) as proxies of macro factors. The estimated infection ratios of 41 banks of banking sector along with bank specific variables of all banks are used to find the probability of higher credit risk of banks.

4.1.3 Banking Sector – Systematic Risk Direct Approach Model

In this approach bank's sensitivities to macro-economic variables are used as proxies for macro β factors. The construction for both financial and economic variables remains the same as of systematic risk indirect approach model.

The direct approach model is given as

$$PRFD_{it} = \text{prob}(Y_{it}=1) = \frac{1}{1+(e^{-z_{it}})}$$

Where the direct test, the explanatory factors of bank's probability of credit risk include the banks sensitivity to macro factors and financial characteristics of bank.

$$Z_{it} = \gamma_0 + \gamma_{DDCR} \beta_{DDCR_t} + \gamma_{TS} \beta_{TS_t} + \gamma_{TDPKR} \beta_{TDPKR_t} + \gamma_{DMS} \beta_{DMS_t} + \gamma_{RP} \beta_{RP_t} + \gamma_{DEXCH} \beta_{DEXCH_t} + \gamma_{DIF} \beta_{DIF_t} \\ + \lambda_1 (SETA)_{it-1} + \lambda_2 (RETA)_{it-1} + \lambda_3 (GADVG)_{it-1} + \lambda_4 (CHIN)_{it-1} + \mu_{it}$$

(4.5)

Where

β_s = macro factor β_s

γ = effect of macro factor β 's on log odd of risk (bank)

λ = effects of bank specific variable on log odd of risk (bank)

The macro factors β 's for banks are computed from Non- performing loan to gross advances ratio of each of 41 banks. The macro co- efficient (λ s) obtained presenting systematic risk along with micro variable presenting bank specific risk of every bank are used to determine the probability of level of risk by using logit model. Our anticipation is that both macroeconomic and bank specific variables contribute to build up of NPL's in Pakistan banking sector.

5. DATA

The study of banking sector is based on a limited panel due to un-availability of data. The sample comprises of 41 banks, the scheduled commercial banks, foreign banks, public sector banks and specialized banks, where all the mergers and acquisitions³ are accounted for. The sample period is from 2001-2014.

5.1 VARIABLE CONSTRUCTION

5.1.1 Construction of Macroeconomic Variables

The selection of macroeconomic variables is done after conducting the backward elimination procedure based upon Thiel's criterion; after which a smaller set of variables is selected. The elimination procedure results in producing the macro variables namely risk premium on low grade bonds, money supply, term structure, interest rate and inflation etc. A convention adopted throughout the study is that time subscripts are applied to end of time (period). The macroeconomic variable construction is given in the table as follows:

³ Refer to Annexure I for mergers and acquisition detail over the period

VARIABLE CONSTRUCTION: MACRO VARIABLES

	Variable Construction	Name
1.	RP = F(Column) – E(Column)	<u>Risk Premium</u> RP_t = LOW GB_t - LGB_t
2.	MS = C(Column) DMS= DLOG(MS) $UDMS_t = DMS_t - \left[\hat{a}_0 + \hat{a}_1 \varepsilon_{t-1} \right] = \hat{\varepsilon}_t$ $DMS_t = \alpha_0 + \alpha_1 \varepsilon_{t-1} + \varepsilon_t$ ←	Money Supply Money Supply Growth <u>Unanticipated Growth in Money Supply in</u> <i>which the term in brackets is obtained by residuals from the MA(1) process on the realized DMS_t series.</i>
3.	$ADMS_t = DMS_t - UDMS_t = \hat{a}_0 + \hat{a}_1 \varepsilon_{t-1}$	<u>Anticipated Growth in Money Supply</u>
4.	INF = I(CPI Column) DIF = DLOG(INF)	Inflation Growth Rate $INFT_t = \log CPI_t - \log CPI_{t-1}$ Inflation <u>Inflation Growth Rate</u>
5.	ONIR = D(Column) DONIR = DLOG(ONIR)	Interest Growth Rate $DIR_t = \log ONIR_t - \log ONIR_{t-1}$ Overnight (call money) Interbank Rate <u>Interest Growth Rate</u>
6.	EXCH= B(Column) DEXCH = DLOG(EXCH)	Exchange Rate Growth Rate $DEXCH = \log EXCH_t - \log EXCH_{t-1}$ Exchange Rate <u>Exchange Rate Growth Rate</u>
7.	TS = E(Column) – G_{t-1}(Column)	<u>Term structure</u> TS_t = LGB_t – TB_{t-1}
8.	TDOPN= J(Column)+K(Column)	<u>Trade Openness(Pak)</u> TDOPN=X_t (Exports)+M_t(Imports)/GDP

6. EMPIRICAL RESULTS

This section explains the risk assessment of the crucial Banking Sector of Pakistan via estimated results comprising of a sample of 41 banks, covering a period of 2001 to 2014.

The results of the macro-related micro-crisis prediction models, both indirect and direct tests, are presented in table 6.1.

The results obtained for Y; probability of risk of financial distress; indirect specification model signify that with the exception of GADVG the bank specific variables SETA, RETA and CHIN are significant at a striking 1 % level of significance; again consistent with the findings of literature [Tirapat and NittayagaSetwat, (1999)], exhibiting a relationship where higher the ratios, the lower the probability of risk. A 1unit increase in RETA and CHIN will decrease the probability of risk by 2.52%, 2.61% respectively whereas a 1unit increase in SETA will bring a change of 2.87 % in the risk level.

The estimated NPLGA (NPL to gross advances) ratio is also highly significant at 1% level of significance, implying that a higher infection ratio by 1 unit increases the probability of risk level Y by 5.32%. A larger magnitude of NPLGA is suggestive that NPLs seriously affects the risk, profitability and performance when inspected in the connotation of dependent variable NNI (net income negative for current year).

The direct specification model for Y level of risk depicts that all the financial characteristics of the bank are highly significant at 1% level of significance in determining the level of risk, exhibiting a relation where greater the ratios, lower the probability of risk; whereas GADVG which was priory insignificant in indirect model is now significant at 5% level of significance

Table 6.1 : Banking Sector: Systematic Risk Direct/Indirect Model

Explanatory Variable	Estimates of Co-efficient	
	Y Direct	Y Indirect
Constant	-1.811058 (0.253791)***	-2.784091 (0.321803)***
NPLGA_{EST}		5.328617 (1.059658)***
Macro-Economic Factor		
1. β_{DDCR}	-5.042714 (2.000457)***	
2. β_{DEXCH}	-0.501936 (0.442447)	
3. β_{DIF}	-0.072318 (0.167936)	
4. β_{DMS}	-0.131024 (0.225486)	
5. β_{RP}	-77.00603 (30.88373)***	
6. $\beta_{TRADEPKR}$	-2.530009 (6.990009)	
7. β_{TS}	25.95076 (10.89535)***	
Financial Characteristics		
1. SETA	2.518053 (0.728959)***	2.872007 (0.764993)***
2. RETA	-2.413272 (0.693061)***	-2.527188 (0.767329)***
3. GADVG	0.039116 (0.020383)**	0.008686 (0.011105)
4. CHIN	-2.755209 (0.392812)***	-2.613400 (0.379484)***
Total Obs	308	308
Obs with Dep=0	233	233
Obs with Dep=1	75	75

but with a positive sign implying that a 1 unit loans growth increases the risk⁴ by .03%; Impact though minimal, is comprehensible for the reason that across the board⁵ all banks are experiencing increasing NPL's so any growth in loan portfolio signals a nominal growth of NPL's.

As far as macro-factors are concerned, very relevantly for banking sector, the systematic risk of the banks exposed to TS (term structure), DDCR (discount rate growth rate) and RP (risk premium) affects the probability of bank's financial distress.

The co-efficient of macro beta of DDCR with a negative sign imply that a 1 unit increase in the systematic risk of DDCR will decrease the level of risk by 5%. The effect of DDCR is explainable through the pass through mechanism. For Pakistan, there are studies which estimate the pass through mechanism of the T-bill rate on call money rate, saving deposit rates and lending rate [Qayyum, et al. (2005)]. Concerning the Pass through of discount rate on the weighted average deposit rate, overall, banks pass on only 16% of the impact of the policy rate to depositors signifying the overall ineffectiveness of monetary policy and significant lag in its completeness. [Mohsin (2011)]. This issue got marginally addressed by the regulator only in recent years when in 2008 state bank set a mandatory minimum benchmark rate of 5% on all saving deposit rate, which was later increased to 6%.

However the degree of pass through of discount rate on the weighted average lending rate is moderately high, though the pass through is not complete. Moreover there is an interest insensitive supply of non-remunerative deposits (low cost deposits) to banking sector which is one of the main reasons behind higher banking spreads. 25% of the total deposits of banking sector are in current accounts (cost less funds) and 60% of the total saving deposits are low cost/low margin.

⁴ See Lis et al (2000) Bercoff, Giovannio and Grimard (2002)

⁵ See OSEC, 2011 "Pakistani Banking Sector". Business Network Switzerland report

[Khawaja and Din (2007)]. Thus a banking scenario where due to poor pass through and agents showing liquidity preference by extensive supply of cheap funds in shape of current accounts/deposits, any rise in discount rate is beneficial to bank.

The co-efficient of macro beta of TS with a positive sign imply that a 1unit increase in the systematic risk of TS will increase the level of risk hugely by 25%. Term structure risk is due to changes in the fixed income structure. The banking sector consistently faces yield risk, money market volatility causing downward shift of yield curve; banks are exposed to reinvestment risk in the scenario of increasing investments and declining interest rates. The banking sector also experiences term structure risk because of interest rates fixed on liabilities for periods that differ from those on offsetting assets and due to maturity mismatches. Banking sector portfolio composition is such where fixed rate assets are financed with floating rate liabilities, the interest rate volatility⁶ (overnight rates) over the period, due to the massive government borrowing from banks, huge oil payments and a persistent fall in foreign financial inflow caused the rate payable on the liabilities to rise while the rate earned on the assets remained constant; causing a direct blow to profitability.

The macro factors of DIF, DMS and DEXCH are highly insignificant in determining the risk of financial distress for banking sector of Pakistan.

The binary results of risk indicate that out of 308 observations, 75 observations of the banking sector exhibit financial distress, which constitutes 24.3% of total observations.

⁶For a period of 1992-2010, official discount rate has been 12.78%, recording a historical low of 7.5% in Nov 2002 and a historical high of 20% in Oct 1996. Thus the volatile interest rate, along with elevating interest rate risk also alters the borrowing cost which is crucially linked to borrower's repayment capacity. In this context, chronic fiscal deficits, rampant inflation and beyond limits government borrowing are hugely to blame for the interest rates remaining in two digits. OSEC,2011

The results of NPL's as a measure of credit risk shows that Pakistan's banking sector experiences a very alarming level of credit risk; out of 308 observations, 109 observations of the banking sector belong to the credit risk level 1 (primary level) exhibiting an infection ratio (NPLGA) of 10%; 55 observations of the banking sector belong to the credit risk level 2 (secondary level) exhibiting an infection ratio of 20%; 20 observations of the banking sector belong to the credit risk level 3 (highest level) exhibiting an infection ratio of shocking 50%;

Thus the risk assessment of the Banking sector of Pakistan depicts that macro determinant of risk are betas of TS (term structure); DDCR (discount rate growth rate) and RP (risk premium) and the micro determinants of risk are the CAMEL category characteristics of SETA, RETA along with CHIN and GADVG exhibiting a negative relation with risk level; while the estimated infection ratio significance for risk, corresponding to the estimated changes in macro factors, is suggestive of the fact that both the "estimated infection ratio incorporated with systematic risks" and "banks sensitivities to macro variables" are rightful proxies of macro betas which do not alter variable relationships and results when employed in model. The banking sector exhibits a high level of credit risk due to piling up of NPL's overtime and their transmission to booked losses category⁷.

7. CONCLUSION and POLICY IMPLICATIONS

The "Risk assessment of Banking Sector" indicates that NPL are highly affected by macro conditions and micro characteristics, confirming hypothesis that the NPL of banking sector are affected by macroeconomic risk factors and by bank specific variables. Also evident from results

⁷See "Risk analysis of the banking sector" *SBP report 2011-2012*

is that banking sector of Pakistan exhibits a high level of credit risk due to piling up of NPL's overtime.

- The model is useful in providing warning signals of any upcoming crises as it highlights the determinants and magnitude of risk; so that protective measure can be sought for immunizing the economy and protect it from contagious, potentially lethal financial diseases.
 - The study is suggestive of the fact that accounting variables under GAAP (Generally Accepted Accounting Principles), alone are not adequate enough in evaluating credit risk; sensitivities to macro factors should be incorporated to indicate the level of credit risk.
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REFERENCES

- Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The journal of finance*, 23(4), 589-609.
- Altman, E. I. (1984). The success of business failure prediction models: An international survey. *Journal of Banking & Finance*, 8(2), 171-198.
- Beaver, W. H. (1966). Financial ratios as predictors of failure. *Journal of accounting research*, 71-111.
- Bernanke, B. S. (1983). Non-monetary effects of the financial crisis in the propagation of the Great Depression.
- Bernanke, B. S., & Blinder, A. S. (1988). Credit, money, and aggregate demand.
- Bernanke, B. S., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of macroeconomics*, 1, 1341-1393.
- Burmeister, E., & Wall, K. D. (1986). The arbitrage pricing theory and macroeconomic factor measures. *Financial Review*, 21(1), 1-20.
- Castrén, O., Déés, S., & Zaher, F. (2007). How do global macro-financial shocks affect sector expected default frequencies in the Euro Area?. *Forthcoming in Journal of Financial Stability*.
- Chan-Lau, M. J. A. (2006). *Fundamentals-Based Estimation of Default Probabilities: A Survey (EPub)* (No. 6-149). International Monetary Fund.
- Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of business*, 383-403.
- Demirgüç-Kunt, A., & Detragiache, E. (1997). *The Determinants of Banking Crisis: Evidence from Developing and Developing Countries*. Internat. Monetary Fund.
- Doan, T., Litterman, R., & Sims, C. (1984). Forecasting and conditional projection using realistic prior distributions. *Econometric reviews*, 3(1), 1-100.
- Gerali, A., Neri, S., Sessa, L., & Signoretti, F. M. (2010). Credit and Banking in a DSGE Model of the Euro Area. *Journal of Money, Credit and Banking*, 42, 107-141.
- Gertler, M., & Bernanke, B. (1987). Banking and Macroeconomic Equilibrium. In *New Approaches to Monetary Economics*. Cambridge University Press.
- Hashmi, Shahid Mansoor. (1997). "Relationship of Stock Prices with Economic Variables".

M. Phil Thesis, Department of Economics, Quaid-i-Azam University, Islamabad, Pakistan.

Hashmi, S.M. (2011). "Bankruptcy Risk, Macroeconomic Environment and Investment Behaviour in Manufacturing Sector of Pakistan". *PhD Dissertation, Department of Economics, Quaid-i-Azam University, Islamabad, Pakistan.*

Kao, D. L. (2000). Estimating and pricing credit risk: An overview. *Financial Analysts Journal*, 50-66.

Maddala, G. S. (1986). *Econometric issues in the empirical analysis of thrift institutions' insolvency and failure*. Office of Policy and Economic Research, Federal Home Loan Bank Board.

Pesaran, M. H., & Schuermann, T. (2003). Credit risk and macroeconomic dynamics. *Medium Econometrische Toepassingen*, 11(1), 27-32.

"Risk analysis of the banking sector" *SBP report 2011-2012*

Salchenberger, L. M., Cinar, E. M., & Lash, N. A. (1992). Neural networks: A new tool for predicting thrift failures. *Decision Sciences*, 23(4), 899-916.

Scott, J. (1981). The probability of bankruptcy: A comparison of empirical predictions and theoretical models. *Journal of Banking & Finance*, 5(3), 317-344.

Shah, A., Jhatial, A., Ghumro, I., & Shah, N. (2012). A narrative description of banking sector in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business*, 4(1), 638-56.

Sommar, P. A., & Shahnazarian, H. (2009). Interdependencies between expected default frequency and the macro economy. *International Journal of Central Banking*, 5(3), 83-110.

Theodossiou, P., Kahya, E., Saidi, R., & Philippatos, G. (1996). Financial distress and corporate acquisitions: Further empirical evidence. *Journal of Business Finance & Accounting*, 23(5- 6), 699-719.

Thomson, J. B. (1992). Modeling the bank regulator's closure option: a two-step logit regression approach. *Journal of Financial Services Research*, 6(1), 5-23.

Tirapat, S., & Nittayagasetwat, A. (1999). An investigation of Thai listed firms' financial distress using macro and micro variables. *Multinational Finance Journal*, 3(2), 103-125.

Tahir, Mughees. (2013). "Credit constraint, Firms Investment and Growth". PIDE Thesis.

Yan, E. Y. (1996). Credit rationing, bankruptcy cost, and optimal debt contract for small business.

Zaidi, S. A., 2005. "Issues in Pakistan's Economy". *Oxford University Press, Karachi. 1999c.*

ANNEX I: BANKING MERGERS & AQUASITIONS: 2000-2014

- Atlas Bank acquired the operation of Dawood Bank Ltd. w.e.f 14-2-2006
- After the merger of Metropolitan Bank Ltd and Habib Bank AG Zurich, Habib Metropolitan Bank Ltd. was established w.e.f 16-10-2006
- AEB and Jahangir Siddiqui Investment Bank merged and declared as JS Bank w.e.f. Dec, 06
- merger of Mashreq Bank and Crescent Investment Bank on 9th July 2003, Mashreq Bank Pakistan Ltd. Was established, renamed as Crescent Commercial Bank Ltd. w.e.f. 31st March 2004. Crescent Commercial Bank Ltd was renamed as Samba Bank Ltd. w.e.f 20th October,2008.
- Saudi Pak Commercial Bank Ltd. has changed its name to Silk Bank Ltd effective from June 01, 2009.
- SME declared as a specialized Bank w.e.f Sep 2004
- Standard Chartered Bank (Pakistan) Ltd was established as a result of merger of Union Bank Ltd and Standard Chartered Bank on 19-5-2006.
- Merger of M/s. PICIC Commercial Bank Limited with and into M/s. NIB Bank Limited. 31-12-2007
- Merger of KASB Bank Limited, KASB Capital and Atlas Bank Limited. 07-11-2008
- Merger of Al Baraka Islamic Bank B.S.C Pakistan Branches and Operations with and into Emirates global Islamic Bank Limited. 28-10-2010
- Merger of Atlas Bank Limited with and into Summit Bank Limited. 28-01-2011
- Merger of Mybank Limited with and into Summit Bank Limited. 31-05-2011
- Merger of Faysal bank and RBS. Jan 2011

Source:

Financial Position of the banks 2001-2005; 2006-2010 SBP

Competition Commission of Pakistan

ANNEX II : VARIABLE CONSTRUCTION : BANK SPECIFIC VARIABLES

	Variable Construction	Name
1.	*SETA=A1+A2+A3/C1+C2+C3+C4+C8+C9+C10	<i>Book value of stockholder's equity to total asset ratio</i>
2.	*RETA=A2+A3/C1+C2+C3+C4+C8+C9+C10	Retained earnings to total asset ratio
3.	*WCTA=(C1+C2+C3)-(B1+B2+B3)/ C1+C2+C3+C4+C8+C9+C10	Working capital to total assets ratio Working Capital = Current Assets – Current liabilities
4.	MEQTL = R*/ B1+B2+B3+B4	<i>Mkt. value of equity to book value of total liabilities ratio</i>
5.	DBERM= B1+B2+B3+B4/ A1+A2+A3	Debt To Equity Ratio
6.	GADV = C5 GADVG = DLOG(GADV)	Gross advances Gross advances growth rate
7.	As: NI=D10 CHIN= $(NI_t - NI_{t-1}) / (NI_t + NI_{t-1})$	Net Income Change in net income in current year and previous year
8.	NNI =1 if D10< 0, 0 otherwise	A dummy variable, 1 if net income is negative for current year,0 otherwise
9.	OENEG= 1 if B > C, 0 otherwise	A dummy variable, 1 if total liabilities exceed total assets, 0 otherwise

Source: Financial Position of the banks 2001-2005; 2006-2010 SBP