# Determinants of Systematic Risk in Commercial Banks of Pakistan

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## ABSTRACT

Various efforts are made to quantify and explain risk taking behavior including systematic risk with in financial institutions. This study is about determining various factors affecting commercial banks systematic risk in Pakistan. Sample included in the study consisted of twelve commercial banks listed in PSX (Pakistan Stock Exchange), these banks hold 81.3% market share of customer deposits. Data was collected from 2010 to 2016. The systematic risk for this study was calculated through stock beta (SB) and value at risk (VaR). To determine systematic risk the independent variables used are liquidity, firm size, asset quality, firm growth, return on assets, business mix, operating efficiency and loan growth. The result shows that liquidity, asset quality, return on assets and firm size have significant impact on systematic risk of banks in Pakistan.

**Keywords:** Systematic risk, Asset quality, Operating efficiency, Business mix
**JEL Classifications:** G21, G32

## 1. INTRODUCTION

Risk controlling in financial institutions is connected with safeguarding interest of stakeholders and maintaining discipline and stability within financial system. Various efforts are made to quantify and explain risk taking behavior including systematic risk within financial institutions. However, in economic growth stability of financial system is a key determinant, while a sound banking system is essential for financial system stability (Khan et al., 2019). Macroeconomics shocks make the banking system vulnerable. But the excessive risk taking by banks also adds to the vulnerability of banking crisis. Therefore understanding factors influencing risk taking capacity of banks nowadays is getting importance in the theoretical and empirical banking research.

The available literature on factors influencing the risk taking and management of commercial banks includes the following factors. First the under estimation of business cycle by the management and ownership which leads to excessive bank lending. It results in financial accelerator effect and also creates financial bubbles. Second, the agency problems between ownership and management. Third, the moral hazard also contributes to the risk taking by banks in the form of deposit insurance, limited liability of shareholders and bailout plans. Fourth, the franchise value is also a determining factor of bank risk taking, as bank risk reduced with higher franchise value of the bank.

In Pakistan, banking sector has gained strength and has shown quite considerable growth (Hussain et al., 2019). After the introduction of reforms in financial sector, there is a considerable change in performance, structure, and size of the commercial banks. These reforms were introduced to make financial sector competitive, to sustain various types of risk, and to improve quality assets. Previous research shows banking considerably a

risky business in Pakistan. Commercial banks take risk but they should do it consciously. Banking operations are very fragile and are built on depositors' trust, brand reputation and leverage. The failure and collapse of banks can make spillover effects or shock waves throughout the economy. Bank management, therefore, should identify the type and degree of risk exposures and means to manage them. Risk taking is proportionate to return. But excessive risk taking and its inefficient management may result in great financial and brand reputation losses.

## 2. LITERATURE REVIEW

Management of market risk due to adverse conditions and fluctuations in market risk factors is an important apprehension for risk managers in banking institutions. Market risk in banks arises because of two important activities. First because of asset transformation and second due to agency and brokerage activities for providing products or services to businesses or households.

Previous research on market risk analyzed relationship among systematic risk measures and accounting variables. However, in financial and banking sector non-performing loans are the actual source of systematic risk. Paul (2012), stated many factors like inflation, unemployment rate, real interest rates, and short term interest rates are due to increase in non-performing loans. For banking sector, the impact of macroeconomic instability on the bank balance sheet is vital source of systematic risk. This macroeconomic instability effects the loan portfolio of banks. The non-performing loans ratios and credit expansion are expected procyclical in the economic cycle (Schinasi, 2005).

Operating efficiency (OE) also affects the systematic risk of bank. Gu and Kim (2002), argued that bank systematic risk can be reduced by generating higher profit with a higher OE. In addition, some banking system is risk sharing (Ashfaque et al., 2020). However, Eldomiaty et al. (2009), found a negative relationship between OE and systematic risk of non-financial sector. In financial market liquidity, systematic risk has shown negative relationships. Research by Lee and Jang (2006) also asserted a negative relationship among systematic risk with liquidity Eldomiaty et al. (2009). However, companies are more vulnerable to changes in economic conditions which show higher growth in revenue and assets (Ali et al., 2020; Khan et al., 2018). Study of Borde (1998) shows that there is an existence of a positive relationship between bank systematic risk and growth rate. Research of Chan si Chen (1991) asserted high level of risk in small firms as comparison to large firms, because large firms are less exposed to bankruptcy risk and have more stable financial position. However, a negative relationship existence was recorded by Borde (1998) and Gu and Kim (2002) in the profitability of the financial institution and systematic risk. As higher level of profitability reduces the financial instability of firm.

The systematic risk of bank and relationship between diversification or business mix (BM) has been examined by many researchers like Stiroh (2006) and Fraser et al. (2002), also found in their studies that bank earnings volatility is contributed greatly by non-interest income. Moreover, the study of De Young et al. (2001) showed

an increase in systematic risk due to the increase in non-interest income. The expansion of loan portfolio in a saturated banking system needs significant efforts. The effect of loan growth on bank risk was viewed by many researchers in this respect. The study of Hardy and Pazarbasioglu (1999) stated that extreme financial distress in banking is usually the consequence of rapid credit expansion. Salas and Saurina (2002), stated that credit growth leads to non-performing loans thus, increases the bank risk.

## 3. RESEARCH METHODOLOGY

Secondary financial data source is used in this study, which is collected from websites of concerned commercial banks and from Pakistan Stock Exchange (PSX) website during a period from 2010 to 2016. Sample consisted of twelve banks listed on stock exchange of Pakistan. Which include Allied Bank Limited, National Bank of Pakistan, Muslim Commercial Bank Limited, Habib Bank Limited, Faysal Bank Limited (Faysal), United Bank Limited, Bank Al Habib Limited, Bank Alfalah Limited, Bank of Punjab, Askari Bank Limited (Askari), Habib Metropolitan Bank Limited, and Standard Chartered Bank Pakistan Limited. These selected banks represent 81.3% share of total customer deposits. Share of customer deposit for each bank is given in Appendix I. Monthly stock prices of the selected banks and monthly data of KSE 100 index have been collected from website of PSX.

The dependent variable of the study is systematic risk and is measured through value at risk (VaR) and Stock Beta (SB). VaR measures maximum loss that a stock may incur at a particular confidence level or a given probability during a given time period. VaR is calculated using historical simulation method based on monthly stock prices of each commercial bank at 5% confidence interval.

**Table 1: Independent variables (measurements)**

| Independent variables | Measurements |
|---|---|
| Asset quality | Ratio of non-performing loans to total loans |
| Firm size | Log of assets |
| Operating efficiency | Ratio of total revenues to total assets |
| Growth of firm | Annual percentage change in EBIT |
| Liquidity | Ratio of current assets to current liabilities |
| Business mix | Ratio of non-interest income to total income |
| Loan growth | Difference between median of all banks loans growth rate and bank loan growth rate. |
| Profitability | Return on assets |

**Table 2: Descriptive statistics**

| Variables | Mean | Maximum | Minimum | SD |
|---|---|---|---|---|
| BTA | 0.0035 | 0.00110 | 0.038069 | 0.001 |
| VaR | -0.0368 | -0.01320 | -0.08341 | 0.0131 |
| AQ | 0.0142 | 0.81234 | 0.00084 | 0.01876 |
| LT | 1.2819 | 7.30336 | 0.00109 | 1.1350 |
| FS | 13.026 | 14.6123 | 9.68444 | 1.0879 |
| GF | 22.464 | 10002.5 | -5.87919 | 135.931 |
| BM | 0.4785 | 1.85322 | 0.01506 | 0.51638 |
| ROA | 0.0883 | 0.53827 | 0.01345 | 0.09331 |
| LG | 0.0051 | 0.82701 | -0.9893 | 0.24336 |
| OE | 0.2251 | 2.09663 | 0.01489 | 0.44330 |

**Table 3: Correlation analysis**

|     | BTA | VaR | AQ | LT | FS | GF | BM | ROA | LG | OE |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| BTA | 1.000 | | | | | | | | | |
| VaR | 0.2519 | 1.0000 | | | | | | | | |
| AQ | −0.187 | −0.060 | 1.0000 | | | | | | | |
| LT | −0.160 | −0.091 | 0.5320 | 1.0000 | | | | | | |
| FS | 0.2643 | 0.0804 | −0.3735 | −0.4879 | 1.0000 | | | | | |
| GF | 0.0036 | 0.1231 | −0.060 | −0.0835 | 0.0719 | 1.0000 | | | | |
| BM | 0.0579 | 0.1064 | −0.0323 | −0.1402 | 0.3528 | 0.1397 | 1.0000 | | | |
| ROA | 0.2098 | −0.053 | −0.1327 | −0.2189 | 0.2446 | 0.0447 | 0.2538 | 1.0000 | | |
| LG | −0.030 | −0.083 | 0.0361 | −0.2210 | 0.3229 | −0.041 | −0.039 | 0.1230 | 1.000 | |
| OE | −0.108 | −0.060 | 0.5684 | 0.3319 | −0.2888 | −0.041 | −0.264 | 0.0862 | −0.277 | 1.0000 |

**Table 4: Breusch-Pagan test**

| Nature of test | Critical/SV(Standard Value) | RV |
|----------------|------------------------------|-----|
| Breusch-Pagan Test | 0.05 | 0.001 |

SB, which is measured each bank slope of monthly stock return, and the KSE 100 index monthly return, is another measure to determine systematic risk.

Asset quality (AQ), liquidity (LT), firm size (FS), OE, growth of firm (GF), BM, profitability (ROA) and loan growth (LG), are used as independent variables in the study. For this study independent variables selected are based on the premise that it can help management for the assessment of systematic risk and can exercise their control using firm specific factors. Independent variables and their measurements are presented in Table 1.

The following regression models are applied based on panel data estimations.

Model 1: $VaR = \beta_0 + \beta_1 AQ + \beta_2 LT + \beta_3 OE + \beta_4 FS + \beta_5 GF + \beta_6 BM + \beta_7 ROA + \beta_8 LG + \varepsilon$

Model 2: $SB = \beta_0 + \beta_1 AQ + \beta_2 LT + \beta_3 OE + \beta_4 FS + \beta_5 GF + \beta_6 BM + \beta_7 ROA + \beta_8 LG + \varepsilon$

To understand the various determinants of systematic risk the following hypothesis are put forward:
$H_1$: Systematic risk is positively related to AQ
$H_2$: liquidity is negatively related to systematic risk
$H_3$: Systematic risk is negatively related to OE
$H_4$: FS is negatively related to systematic risk
$H_5$: Firm growth is positively related to systematic risk
$H_6$: BM is positively related to systematic risk
$H_7$: Systematic risk is negatively related to profitability
$H_8$: Loan growth is positively related to systematic risk

# 4. DATA ANALYSIS

Descriptive statistics for banking sector in Pakistan are presented in Table 2. The data for sample banks from 20110 to 2016, shows the mean value of.0035. Which implies the beta value is less than the market index of 1. This implies that during 2010-2016, operations of commercial banks in Pakistan are not exposed to market changes. The mean of the daily average VaR is 3.68%. 0.014 with standard deviation (SD) of 0.018 is AQ mean value.

1.281 with SD is 1.135 is liquidity of banking sector for the period. While the mean value of FS is 13.02 while the SD is 1.087. Mean of the firm growth is 22.464 and SD is 135.931.

The data also shows that mean value of BM is 0.478 and SD of 0.516. for return on assets (ROA) mean value is 0.088 and SD is 0.093. The mean value of loan growth is 0.005 while its SD is 0.243. Whereas, for OE, a mean value of 0.225 and its SD is 0.443 is recorded.

## 4.1. Correlation Analysis
Independent variables correlation statistics of beta and VaR are shown in Table 3. Hair et al. (1998), stated if independent variables correlation among them is more than 0.9 than there will be substantial amount of multicollinearity among independent variables. In this study correlation among independent variables is not more than 0.9, thus no problem of multicollinearity.

The correlation analysis also found SB and VaR has negative correlate with AQ. And liquidity is also negatively related to SB and VaR. A positive relationship found between FS, SB and VaR. Thus, FS is positively related to Beta and VaR. The relationship of firm growth with SB and VAR is also positive. BM has also positive correlation with SB and VaR.

ROA has negatively correlated with VaR and positively correlated with stock. There is a negative relationship between loan growth with SB and VaR. OE also negative correlate SB and VaR.

## 4.2. Breusch-Pagan Test
To identify the problem of heteroscedasticity Breuch-Pagan test is performed see Table 4. The reported value as the result of Breuch-Pagan test shows is less than critical value. Thus, it is concluded on the basis of reported value that there is no problem of heteroscedasticity in the data.

## 4.3. Hausman Test
Hausman test is used for panel data in order to select between fixed effect model and random effect model. The null hypothesis for Hausman test was that random effect model was preferred to fixed effect model. A value of 14.211 Chi-squares with p-value 0.223 for model 1 reported by Hausman test. As it shows that the Chi-square value was found to be insignificant. Therefore, we failed to reject the null hypothesis, so for model 1 random effect model was recommended. A value of 2.06 Chi-square with p-value 0.979 was also reported by Hausman test. Which shows that Chi-square value was found to be insignificant for model 2.

**Table 5: Result of random effect model**

| | BTA | | | VaR | | |
|---|---|---|---|---|---|---|
| | **Coefficient** | **Standard error** | **t-stat** | **Coefficient** | **Standard error** | **t-stat** |
| AQ | 0.5814 | 0.1547 | 3.76 | 0.316 | 1.181 | 0.267 |
| LT | -0.1126 | 0.0323 | -3.49 | -0.359 | 0.127 | -2.839 |
| FS | -0.551 | 0.1639 | -3.39 | -0.197 | 0.067 | -2.943 |
| GF | 1.8622 | 0.4913 | 3.79 | 7.031 | 8.403 | 0.837 |
| BM | 0.3603 | 0.2403 | 1.50 | 0.029 | 0.046 | 0.632 |
| ROA | --0.3486 | 0.1375 | -2.54 | -0.562 | 0.140 | -2.40 |
| LG | 0.0035 | 0.0069 | 0.50 | 0.324 | 0.028 | 4.58 |
| OE | -0.9450 | 0.7964 | -1.19 | 1.8622 | -0.232 | -6.28 |
| R-Square = 81.13% | | | | R-Square = 76.65% | | |
| Wald Chi = 61.34 | | | | Wald Chi = 56.31 | | |

Thus we failed to reject he null hypothesis, therefore, for model 2 random effect model was recommended.

## 4.4. Regression Analysis
### 4.4.1. Random effect model
To determine the factors effecting systematic risk in the banking sector of Pakistan regression analysis results are presented in Table 5. Independent variables used in the random effect model are AQ, liquidity, FS, BM, firm growth and ROA, loan growth and OE as independent variables. The $R^2$ for model 1 where SB (BTA) is used as dependent variable is 81.13% and for model 2 where VaR is used as dependent variable, the $R^2$ is 76.65%. A positive relationship was found between AQ as measured by non-performing loans ratio and systematic risk according to first hypothesis. The results also confirm the relationship between AQ, SB and VaR are positive but are statistically insignificant. Liquidity has significant negative impact on SB and VaR, Similar findings and supported as evidenced by the study of Lee and Jang (2006) and Eldomiaty et al. (2009). This relationship supports the second hypothesis. The results also show significant negative impact on systematic risk as measured by SB and VaR with FS. Third hypothesis also supports this argument. Firm growth and BM have insignificant positive impact on SB and VaR. It shows that firm growth and BM do not affect the system risk of banking firms in Pakistan, the study of Borde (1998) also supports this argument. The hypothesis of the study also states that systematic risk has negative impact on ROA and OE of firms. The findings of the study show that ROA has a significant negative impact on SB and VAR, the study of (Gu and Kim, 2002) also supports this argument. SB recorded insignificant negative impact from OE while it has a negative significant impact on VaR of banking firms in Pakistan. This finding is also supported by the study of Eldomiaty et al. (2009). The eight hypotheses of the study enumerate positive impact of loan growth on systematic risk. The findings suggest that loan growth has insignificant positive impact on SB with significant positive impact on banking firms Var in Pakistan. This argument supported by the study of Salas and Saurina (2002).

## 5. CONCLUSION

For economic growth, key determinant is stability of financial system, while a sound banking system is essential for financial system stability. Risk controlling in financial institutions is connected with safeguarding interest of stakeholders and maintaining discipline and stability within financial system. Various efforts are made to quantify and explain risk taking behavior including systematic risk within financial institutions. This study is about determining various factors affecting commercial banks' systematic risk in Pakistan. Sample included in the study consisted of twelve commercial banks listed in PSX, these banks hold 81.3% market share of customer deposits. Data were collected from 2010 to 2016. The systematic risk for this study was calculated through SB and VaR. To determine systematic risk the independent variables used are liquidity (LT), FS, AQ, firm growth (GF), ROA, BM and OE, LG 0 (loan growth). The result shows that liquidity, AQ, ROA and FS have significant impact on systematic risk of banks in Pakistan. On the other hand BM of commercial banks has insignificant effect on systematic risk of commercial banks. OE, firm growth and Loan growth exhibited mixed results. OE and Loan growth have significant impact on VaR and insignificant impact on SB. Firm growth has significant impact on SB and insignificant impact on VaR.

From the findings, it is concluded that model 1 where systematic risk was measured by VaR outperform model 2 where systematic risk was measured by SB. This research study adds an important contribution understanding and measuring systematic risk exposures of commercial banks in Pakistan. This study also provides opportunity in better understanding and reporting of various dynamics of market risk for purpose of policy making, risk managers and investors 'concerns for commercial banks in Pakistan. This study can be further extended by including other financial institutions like insurance companies, mutual funds, and Islamic financial institutions in the sample.

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# APPENDIX

**Appendix I: Market share of customer deposits**

| S/No | Bank | Market share of customer deposits (%) | Number of branches |
|---|---|---|---|
| 1 | HBL (Habib Bank Limited) | 16.5 | 1764 |
| 2 | UBL (United Bank Limited) | 10.4 | 1341 |
| 3 | NBP (National Bank of Pakistan) | 12.7 | 1469 |
| 4 | MCB (Muslim Commercial Bank Limited) | 6.9 | 1238 |
| 5 | ABL (Allied Bank Limited) | 6.5 | 1148 |
| 6 | Bank Al Fallah (Limited) | 5.4 | 639 |
| 7 | Bank Al Habib (Limited) | 5 | 518 |
| 8 | Askari Bank (Limited) | 4.1 | 501 |
| 9 | BOP (Bank of Punjab) | 4 | 453 |
| 10 | Habib Metropolitan Bank (Limited) | 3.7 | 307 |
| 11 | Standard Chartered Bank Limited | 3.2 | 101 |
| 12 | Faysal Bank Limited | 2.9 | 355 |
| Total | | 81.3 | 9834 |

Source: KPMG Banking Survey (2016) of Commercial Banks Operating in Pakistan