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## Monetary Policy and the Survival Analysis of the Firms in Pakistan

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### Abstract

*Using the information on 629 companies listed at Karachi stock exchange over a period of 40 years (1975-2014), this study finds out the effect of monetary policy and industrial dynamics over the hazard rate of both the financial and non-financial companies. The study concludes that monetary contraction increases the probability of exit of the companies by 44 percentage points, while LSM growth and age reduces the hazard rate. Further companies in textiles are most likely to exit, while firms working in food & beverages, cement & construction and chemical & engineering are less likely to exit. On the other hand, credit growth increases the risk of exit for the financial companies and rise in weighted average lending rate reduces the probability of exit. Moreover, well-established companies are less likely to leave the market.*

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## **I. Introduction**

Flourishing industrial and financial sector is vital for any growing economy. Establishment of new plants not only increases the overall productivity but it also increases the employment opportunities and keep up the competitive environment through innovation and modernization in the industry (Porter, 1990; Bruderl et al., 1992; Wagner, 1999 ). Further, stabilization policies conducive for economic growth affects the post-entry performance of the firms and thus help the industries to flourish and stay in the market over the longer period of time (Mata and Portugal 1994; Audretsch and Mahmood, 1995; Arrighetti and Vivarelli, 1999). The financial crisis of 2008-09 affected a large number of firms across the world and resulted into major defaults by the several industries. This not only closed the overall economic activity but also increased the unemployment rate across the world. Large open economies were more vulnerable to the financial crisis. This proved that survival of a company is more important than opening up of new firms, which default and exit the market quickly.

Although Pakistan economy does not comprise of a very huge industrial and financial sector, nevertheless, the industrial sector contributes around 20.3 percent in the GDP. Further, textiles and food products are the biggest industries of the country in terms of labour deployment and contribution to the GDP growth. Although the role stabilization policies towards price stability, is limited, nevertheless, monetary policy affects the industrial growth through an effective credit channel in Pakistan (Choudhary et. Al. 2012, Shabbir, 2012; Shabbir, 2013). The evidence on bank lending channel of Pakistan also suggests that financial sector of the country is prone to take excessive risk during the phases of easy monetary policy and also extend loans on the basis of political grounds (Atif and khwaja, 2004). Since, industrial sector of Pakistan heavily relies on financial sector to meet its liquidity requirements for working capital, therefore, any change in monetary policy affects the cash flows and

profit margins of the industrial sector. In this situation, evaluating the role of monetary policy for the survival of the both the financial and non-financial companies is vital for economic growth.

In an attempt to observe the role of monetary policy along with other industrial dynamics, overall credit and industrial conditions on the survival of the companies, this study utilizes information on 629 companies listed at Karachi Stock Exchange over a period of 40 years. i.e 1975-2014. The study uses standard cox proportional hazard model to evaluate the survival of the firms. Findings of the study prove that monetary contraction increases the probability of exit for the listed companies, while age reduces the hazard rate. Further splitting the sample into financial and non-financial companies, the study concludes that companies in textiles are more vulnerable to exit/default, while cement & construction, food & beverage and chemicals & engineering companies are less likely to default or exit from the market. LSM growth helps the manufacturing companies to grow, whereas, PSC growth increases the probability of default for the financial companies. Weighted Average Lending Rate (WALR) improves the financials of the financial companies and thus reduces the probability of default for financial companies.

The study is distributed in several sections. Section II reviews the literature on survival analysis, while Section III discusses the dataset and methodology. Section IV provides discussion on results, whereas Section V concludes the study.

## **II. Literature review**

Several studies are undertaken to assess the role of innovation, age, capacity utilization and the effect of economic indicators on the survival rate of the industries. The main idea behind conducting these studies is to evaluate the reasons for the failure of firms, so the policy directions can be set accordingly. Key studies in the area are discussed as under.

Howell et al. (2009) ascertained that in China the firms engaged in innovative activities enjoy quite higher rate of survival, through direct subsidies than the non-innovative firms. However, in the long run the local and state protectionism hurts their endurance. Similarly, Polat and Hill (2007) observed around 145 firms in telecommunication industry of USA to examine the impact of group, organization and industrial growth on the survival rate of the newly established firms. He found that the first movers and early followers, patenting their innovations having a scale advantage had a lower likelihood of failure than the late entrants. Using piecewise constant exponential hazard rate model, Buddelmeyer (2006) examined the relationship between innovation and survival in Austria. He also observed that the probability of failure of a firm increased with the current innovation investments but decreased with the innovation capital overtime.

Falk (2013) investigated the survival factors of around 242 ski-lift operator firms of Austria. Using cox proportional and competing risk models, he evaluated the factors influencing the survival of ski-lift companies and found that the seasonal factors and economic downturns leads to a greater deal of survival risk for a firm. A similar studies was done by Bandopadhyayain 1994 to observe the instantaneous probability of firms exit in USA. He also found that the interest burden of the firms in USA and the capacity utilization of the relevant industry adversely affect the survival of the firms unlike their debt-to-assets ratio, number of outstanding shares, the prevailing interest rates or the GNP growth rate.

Similarly, Holmes et al. (2010) investigated the firms' survival factors in North-East England and concluded that the effects of firm-specific variables and the macroeconomic variables on the local firms are different from that on the foreign firms. In their view, an increase in initial plant size of a firm negatively affects the

micro-enterprise survival and the unemployment level also has an impact on the duration of micro-enterprise, unlike the interest rate and exchange rate. On the other hand, analyzing a long panel of 62 years in USA, Clementi and Palazzo (2014) concluded that a firm's entry and exit intensifies the effects of aggregate shocks. However, in this situation, if the new entrants manage to survive and grow larger over time then it generates a wider expansion than in a scenario without entry or exit.

Analyzing the exporter firms in Peru, Fugazza and McLaren (2014) also found that the better the market access conditions relative to the competitors are, the better is the probability to survive for a firm. In addition, they observed that the firms, being the part of international production network enjoy lower hazard rates.

Moreover, Giovannetti et al. (2011) observed that a larger size and technological level of a firm in Italy reduces the risk of failure however, exporting or investing abroad reduces the probability of the firm's survival. Similarly, Helmers and Rogers (2008) studied a panel of 162,000 companies across different regions of Britain and empirically found a significant difference in survival rates for the firms in different geographical regions of the country. In addition, they saw that the IP activity plays its role in improving the prospects of survival. Lobos and Szewczyk (2012) also tried to find out the determining factors of the survival rate amongst the small enterprises in Poland and hence, came up with similar results. They observed that the bigger the firm is, the smaller the chances of close down/ failure are. However, the firms operating in highly competitive markets are more likely to fail.

On the contrary, using parametric and semi-parametric models, Bhattacharjee (2005) observed that in UK, volatility in exchange rate hurts the smaller firms and close them down, while the big firms survive. Further, initially large size for the

young firms reduces the survival rate, but the hazard for a firm's survival gets weaker as it grows older. Similarly, Klos (2008) examined the relationship between the firm's performance and its probability of failure in Ukraine and observed that the firm's meager performance raises the probability of its failure. However, in the long run, other characteristics of the firm like liquidity, size and the age decrease the probability of failure.

Esteve-Perez et al. (2005) concluded that the survival of the manufacturing and exporting firms' in Spain, depends on the product and market characteristics such as size, productivity, export and R&D intensities and the final consumption goods they produce. Further, concerned, Abidgren et al. (2013) analyzed the effect of bank stress on the survival of its 37000 Danish corporate customers from the non-financial sector during financial crisis of 2008-09. They found that survival of a firm depends upon the bank firm relationship as well as the strength of a bank itself. He observed that the probability of default appeared to be significantly higher for the firms with a weaker bank than for the firms with a sound bank.

### **III. Data description and Methodology**

In order to assess the survival rate of both the financial and non-financial firms, this study utilizes an extensive panel of 629 financial and non-financial companies, listed at Karachi Stock Exchange (KSE). These companies are observed over a period of 40 years. i.e from 1975-2014. The information on company's listing, de-listing, mergers, and suspension is also collected from Karachi Stock Exchange, while the other macroeconomic variables such as discount rate, weighted average lending rate (WALR), the direction of monetary policy, private sector credit are collected from State Bank of Pakistan. Further, the source of LSM growth is Pakistan Bureau of Statistics.

In order to observe the survival of firms in respective industries, we distributed the companies in two major groups say, financial and non-financial companies. Non-financial companies are then further split in textiles, paper and board, food and beverages, energy, chemical and engineering, cement and construction, and others by introducing industrial dummies. The summary statistics are given in Appendix table A1.

The duration of the firms survival is calculated based on its time of listing and the date of delisting, suspension or merger due to inability of the firm to continue its business solely. We have, however, ignored the companies who were only renamed during this period, as renaming of a firm does not change its status, financials or working of the firm. Further, placing a cut on 2014, the companies survived after 2014 are right censored as per standard rules for survival analysis and hazard rate calculations. Of the 629 firms listed periodically between 1975 and 2010, 240 companies exit by 2014. The summary of surviving firms is given in **Table 1**, as follows:

<b>Table 1: Summary of Surviving Firms</b>		
<b>Years of Listing</b>	<b>No. of companies Newly Listed</b>	<b>No. of Companies Exit by 2014</b>
1795-1984	102	41
1985-1994	381	154
1995-2004	95	33
2005-2014	51	12
<b>Total Companies</b>	<b>629</b>	<b>240</b>

The study utilized the standard cox proportional hazard model for calculating the hazard rate of the companies as defined by Cox, 1972. The spell duration is defined by the total number of years the company survived and stayed listed on Karachi Stock Exchange, while the outcome variable or the occurrence of the ‘event’ considered is the exit or delisting of the company from the stock exchange. Therefore, hazard rate is defined by ‘the rate of failure per unit of time’. The model is defined as:



$$h(t | X_i) = h_0(t) e^{X_i\beta}$$

Where  $h$  denotes the hazard rate, and  $x$  denotes the vector of explanatory variables such as Private Sector Credit, credit growth, direction of monetary policy, discount rate, weighted average lending rate, Large Scale Manufacturing growth rate, age of the company, foreign direct investment, and industrial classification for company  $i$ . Further, to evaluate the impact of monetary policy the dummy for the direction of monetary policy is utilized in the model, where MP (Monetary Policy) = 1 during expansion, and 0, otherwise. Moreover, industrial dummies are introduced to capture the industrial dynamics and their impact on survival of the companies in respective industry. The results for all listed companies are reported in **Table A2**, while the results for the financial and non-financial companies are reported in **Table A3** and **Table A4** respectively.

#### **IV. Results**

The results obtained from continuous Cox Proportional Hazard Model for all companies are reported in Table A2. The results show that direction of monetary policy is inversely related to the hazard rate of the firm. Although studies on credit channel in Pakistan (Shabbir 2012, 2013) shows that contractionary monetary policy reduces the volume of loanable funds and thus deplete the net worth and cash flows of the firms. However, the results obtained from Cox proportional Hazard model explains that 1 percent increase in monetary policy increase the risk of exit by 65 percentage points for  $i$ th firm in the sample of 629 firms observed over the last 40 years. Further rise in lending rates also increases the probability of exit for the companies. This effect is found to be around 43 percentage points. All these coefficients are significant at 1 percent. Further, age of a company is one of the prime factors behind its survival. Well-established firms, who stay longer term in the market, are less likely to exit. The effect is observed as

twice. Further industry specific factors also affect the survival rate of the firms (**See Table A2**).

Analyzing the hazard rate of non-financial companies, the study find that PSC growth reduces the hazard rate of the companies on average by 4 percentage points, while the LSM growth reduces the hazard rate of the companies by 11 percentage points (**see Table A3**). Whereas, monetary contraction increase the probability of exit of the non-financial companies by 44 percentage points. Observing the industry specific factors, study finds that textile companies are more vulnerable to exit, while the companies in food & beverages, chemicals & engineering and cement & construction are less likely to default.

Observing the financial companies, the study finds that PSC growth increases the probability of exit for the financial companies by 4 percentage points. It might be due to excessive risk taking of the financial companies between 2004-2008 that led many companies exit the market. Further, increase in ending rates reduces the probability of default for the financial companies by 3 percentage points (**see Table A4**). It might be due to that fact that financial companies are primarily involved in investment opportunities and extending credit. Therefore, higher lending rates favorably affect the companies and thus reduce the probability of default.

## **V. Conclusion**

Industrial growth along with the financial deepening is the key for the flourishing economy. The study observed the direction of monetary policy on the survival rate of both the financial and non-financial companies listed at Karachi stock exchange over a long period of 40 years.

The findings of the study are consistent with the credit channel of monetary policy. The direction of monetary policy affects the hazard rate of the firms. Higher the policy rate, the higher is the probability of default for the manufacturing sector. Higher LSM growth reduces the probability of exit, while age of the company is one of the prime determinants of the company's survival rate. The study finds that well-established firms are less likely to default and exit the market. Further analyzing the industrial dynamics, the study observed that companies in textile sector are more likely for default, whereas, being in food & beverages, cement & construction, and chemical & engineering reduces the probability of default for a firm.

Analyzing the financial companies the study finds that increase in lending rates reduces the probability of exit of the financial companies, whereas higher credit growth increases the probability of exit for the companies.

The results of this study are also consistent with the credit channel. Due to limitations of micro data, the study is confined to assessing the impact of monetary policy on firms' probability of exit/default. Nevertheless, a more detailed analysis for both the financial and non-financial companies can be done by using micro data on company's debt profile and ownership structure.

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## Appendix

**Table A1: Summary of the variables**

<b>Variable</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
No. of Companies				630
category	3	2	1	8
Exit	0	0	0	1
age	23	7	0	39
PSC growth	14	9	0	34
Discount Rate	12	3	8	19
FDI	1287	1447	11	5410
LSM Growth	6	5	0	16
WALR	12	2	7	16
MP Direction	1	0	0	1

Table A2: Survival Analysis of Listed Companies							
	I	II	III	IV	V	VI	VII
PSC growth		-0.00415 (0.0090)		0.00747 (0.0098)			
FDI	0.000132** (0.0001)	0.000154*** (0.0001)	0.000130** (0.0001)	0.000196*** (0.0000)	0.000193*** (0.0001)	0.000194*** (0.0001)	0.000127** (0.0001)
LSM growth	-0.0327* (0.0183)		-0.0327* (0.0183)	-0.0101 (0.0162)	0.0541*** (0.0193)	0.0541*** (0.0192)	-0.0336* (0.0183)
MP direction	0.651*** (0.2180)	0.663*** (0.2320)	0.651*** (0.2170)	0.739*** (0.1930)	0.532*** (0.1510)	0.534*** (0.1510)	0.651*** (0.2160)
Lending Rates				0.433*** (0.1550)	0.0908 (0.1670)	0.0905 (0.1670)	
Age	-2.138*** (0.5100)		-2.140*** (0.5100)				
Financial Companies			0.513*** (0.1470)	0.208 (0.3730)	0.494*** (0.1520)	1.457** (0.6320)	0.225 (0.3750)
Textiles				-0.0528 (0.3760)		1.189* (0.6320)	-0.0302 (0.3770)
Food & Beverages				-0.663 (0.4310)		0.611 (0.6670)	-0.661 (0.4330)
Energy				-0.0697 (0.4850)		1.200* (0.7050)	-0.064 (0.4870)
Chemicals and Engineering				-0.841* (0.4650)		0.417 (0.6880)	-0.844* (0.4660)
Cement and Construction				-1.209* (0.7060)			-1.197* (0.7070)
other				-0.287 (0.4130)		1.005 (0.6550)	-0.287 (0.4140)
PSC					0.000681*** (0.0001)	0.000683*** (0.0001)	
paper						1.320* (0.7200)	
Observations	12950	12950	12950	12950	12950	12950	12950

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



Table A3: Survival Analysis of non-Financial Companies											
	I	II	III	IV	V	VI	VII	VIII	IX	X	X
PSC Growth		0.0301*** (0.0109)	0.0299** (0.0120)	0.0408*** (0.0118)		0.0297** (0.0120)	-0.0250* (0.0135)	0.0407*** (0.0118)			
FDI			-3.07E-05 (0.0002)	-5.56E-06 (0.0001)	-5.16E-06 (0.0001)		2.94E-05 (0.0001)	-9.25E-06 (0.0001)			
LSM Growth	0.119*** (0.0311)				0.120*** (0.0309)		-0.0484* (0.0261)		0.121*** (0.0312)	0.120*** (0.0314)	0.121*** (0.0312)
MP Direction	0.451** (0.1840)	0.440** (0.1900)	0.338 (0.5480)	0.29 (0.2600)	0.441* (0.2530)	0.463* (0.2410)		0.291 (0.2590)	0.460** (0.1840)	0.465** (0.1840)	0.455** (0.1840)
Age		-1.402*** (0.0209)	1.436*** (0.0308)			1.418*** (0.0486)					
Lending Rate Direction							0.604*** (0.2030)				
Textiles						0.508*** (0.1590)	-0.0602 (0.3750)	-0.0309 (0.3770)	0.19 (0.2230)	0.473** (0.1980)	
Food & Beverages						0.394* (0.2220)	-0.655 (0.4300)	-0.65 (0.4320)	-0.449 (0.3060)	-0.168 (0.2870)	-0.573** (0.2680)
Energy						0.11 (0.2650)	-0.0614 (0.4860)	-0.0597 (0.4880)	0.158 (0.3820)	0.438 (0.3680)	0.0349 (0.3520)
Chemicals & Engineering							-0.834* (0.4650)	-0.831* (0.4670)	-0.634* (0.3540)		-0.757** (0.3200)
Cement & Construction							-1.212* (0.7080)	-1.194* (0.7100)	-0.975 (0.6440)		-1.099* (0.6270)
Others							-0.273 (0.4130)	-0.272 (0.4150)			
Observations	9,006	9,006	9,006	9,006	9,006	9,006	9,006	9,006	9,006	9,006	9,006

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

**Table A4: Survival Analysis of Financial Companies**

	I	II	III	IV	V	VI
PSC growth	0.0473*** (0.0139)	0.0439*** (0.0139)	0.0417*** (0.0141)	0.0091 (0.0192)		
FDI	0.000440*** (0.0001)	0.000394*** (0.0001)	0.000398*** (0.0001)	0.000382*** (0.0001)	0.000363*** (0.0001)	0.000304** (0.0001)
LSM Growth	0.014 (0.0298)	-0.00962 (0.0380)			-0.0206 (0.0400)	-0.0303 (0.0886)
MP direction	1.466*** (0.3800)	1.388*** (0.4630)	1.388*** (0.4600)	1.187*** (0.4520)	1.099*** (0.3890)	1.196*** (0.4560)
Discount Rate		-0.0778 (0.0617)	-0.0705 (0.0492)			
WALR				-0.236*** (0.0915)	-0.309*** (0.0901)	-0.289 (0.1900)
Age						-1.152*** (0.2930)
Observations	3,944	3,944	3,944	3,944	3,944	3,944

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