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The Impact of Political Events on Financial Market Volatility: Evidence Using a Markov Switching Process

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Abstract:

This paper investigates the impact of political shocks (positive and negative) on financial markets. Using data from Pakistan for the period January 1999 to September 2006, we link 'a' political event to the financial market volatility. We use high frequency data from three indicators (currency, stock and money market) of the financial market for empirical estimation. We employ a Markov Switching process to identify the low and high volatility regimes in Pakistan's financial market and then link these regimes to certain political events. We use data on daily observations of exchange rates, stock prices and interest rates to perform empirical test. Finally, we trace the impact of political events moving from one market to another using Granger causality tests within Markov Switching VAR model. The results confirm the changes in the market volatility as a result of some domestic and international events having impact on the domestic economy and the financial market. The results also suggest that the markets have some weak short-run linkages but do not support a long-run causal relationship.

Key Words: Political Events, Market Volatility, Markov Switching Process, Granger Causality, Financial Market Linkages

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1. Introduction

More integrated goods and financial markets have increased country's exposure to shocks leading to macroeconomic volatility. This recent surge in macroeconomic volatility has focused researchers' attention to investigate the impact of macroeconomic volatility on economic growth. Most of this research looks into regional or global financial market integration that could expose the country to external shocks leading to increased macroeconomic volatility. As such, there has been some research investigating the relationship between financial market integration and episodes of external shocks leading to macroeconomic volatility.[2] It is also observed that developing countries are subject to both external and internal shocks and these internal shocks could be more harmful for the economy than the external shocks. These internal shocks cause macroeconomic volatility and then impacts economic growth.[3] Internal shocks could be the result of natural disaster, macroeconomic mismanagement or political instability. However, political instability and frequent regime changes creates economic uncertainties and may impact the growth. Persistent government budget deficits, external borrowing and high reliance of on IMF/World Bank assistance further aggravates problem by continued devaluation (or depreciation) of the domestic currency. If domestic financial markets are integrated then a decline in currency market is transmitted to other markets (such as stock and money markets) and becomes the sources of internal shock and may contribute in economic decline. The aim of this paper is to investigate the impact of internal and external shocks (an event) that could lead to increased market volatility in developing countries. We use Pakistan as a case study for empirical analysis in this paper.

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[2] See Kose, Prasad and Terrones (2003), Evans and Hnatkovska (2006), Partick (2008) and Wang (2010) do not find a positive relationship between financial market integration and increased macroeconomic volatility. Giovanni and Levchenko (2006) and Loayza and Raddatz (2007) concludes the opposite.

[3] Acemoglu, et al. (2003) and Singh (2006) focus on political and institutional factors that lead to macroeconomic volatility in developing countries.

Pakistan experienced major international and domestic political shocks during the decade starting May 1998 when the country decided to go for nuclear test in retaliation to India's nuclear test, the same month. The country was immediately put under international economic sanctions. This put substantial pressure on domestic economy and financial markets. Later events such as, Cargill conflict, military takeover in October 1999 further aggravated the situation for the country's economy and the financial market. However, Pakistan's decision to cooperate with the United States on its war on terror after September 11 events made a way for gradual lifting of all economic sanctions. As such, Pakistan experienced both negative and positive shocks since 1998.

The objective of this paper is not to determine this relationship but to investigate how a shock (or event) impacts market volatility. We use Markov switching (regime switching) models to investigate this issue. We look at the impact of an event on the exchange rate market and how it creates high or low volatility. If domestic financial market is integrated then a negative impact will be transmitted to stock and money market thus leading to overall macroeconomic volatility. In this paper we analyze the impact of these events on domestic financial market. We use daily data from three financial market indicators namely; exchange rates, stock prices and interest rates to investigate if these events lead to changes in financial market volatility. The Markov Switching VAR process identifies high and low volatile periods where the negative events are expected to lead to high volatility and positive events are expected to turn the market into a low volatile regime. We, then, categorize the impact (expected) of political events as negative or positive.

The paper is organized in the following manner. Section 2 provides brief details of the trends of Pakistan economy during the decade of 1998-2007 with a focus on important political events since may 1998. Section 3 reviews the existing literature on this issue. Data

and methodological details are discussed in Section 4 while results are presented in Section 5. Finally, some conclusions are drawn in Section 6.

2. Pakistan economy: on a rollercoaster ride

Throughout the history since independence (in 1947), Pakistan experienced fair economic growth, though with cyclical downturns. The downturns were caused by a multiple of factors including, domestic political instability, border conflicts with India which led to three wars, and most importantly internal macroeconomic mismanagement which resulted into persistent high domestic and foreign debt. The economic reforms initiated in 1990s could not contribute much to economic success due to (and again) a lack of political consensus built to implement these policies, high level of corruption and political instability. In May 1998, the country's decision to retaliate to the Indian atomic explosion by their own nuclear explosion brought severe economic sanctions by the world. The result: by the end 1999, the country had exceptionally high level of debt with foreign exchange reserves enough for mere 3-months of imports. This economic mismanagement led to another military takeover in October 1999. This time, the regime change did not get a nod from the United States and other Western countries and the country went into a complete isolation.[4]

However, the post-September 11 events turned out to be a way out for Pakistan until terrorist activities within Pakistan gained momentum in 2008.[5] Pakistan's decision to become part of US-led war against terrorism opened the doors for soft loans and aid from the United States and other Western countries. Economic sanctions that were imposed in 1998 were gradually removed. Softening of US foreign policy towards Pakistan resulted into some debt relief and loans rescheduling. At the same time, United States strict security regulations

[4] See Ariff and Khalid (2005) for a detailed elaboration of Pakistan economy since 1947.
[5] Terrorist activities within Pakistan gained momentum in the aftermath of the assassination of Benazir Bhutto in December 2008 and also after the collapse of peace dialogue with local Taliban in 2009. The country is going through a difficult security situation. We have excluded this long period of turmoil in this analysis and have only focused on the period from 1998-2005.

also forced many Pakistani investors and business community to transfer their funds to a relatively safe place, Pakistan. These two factors increased foreign reserves at a historically high level of above US$12 billion and led to a slight appreciation of the currency as well as improvement in country's credit rating. Appendix Table A provides a summary of the basic economic indicators for Pakistan since 1970s with a focus of period since 2000. It can be seen from Appendix Table A that by 2003, for the first time in the last three decades, the country has experienced a growth rate of 5.1 percent with single digit inflation (3.3 percent). This momentum seems to be continued till 2004 when economy registered a growth rate of 6.8 percent. Although, the overall economic growth rate continued to increase in 2005 (reached a level of 7.8 percent), some other indicator show a slowing down in the economy. For example, inflation jumped from 4.5 percent to 9.3 percent in 2005. Fiscal deficit (as a ratio to GDP) increased from -2.1 percent to -4.1 percent. Similarly, trade balance (as a ratio to GDP) increased from -1.3 per cent to -4.1 percent. Whether this declining trend was the result of a negative shock is an empirical question and needs to be verified. But the important question is whether these shocks directly impacted the financial market and then led to a decline in economic growth. On a flip side of the coin, one may ask if the economic recovery in 2001 onward was the result of any positive external shocks. This is our main testable hypothesis. We basically ask three broad questions to prepare testable hypothesis:

a) What would be the nature of an event or shock due to domestic factors or international factors?
b) What would be the expected impact of the event on the economy (positive or negative)?
c) How severe the impact is expected to be, strong, moderate or weak (for the economy).

These three questions becomes the basis of our testable hypothesis for the event analysis. We used two different ways to answer these questions. First we prepared a questionnaire based on these questions and conducted a survey to have some idea of the nature and possible impact of the events unfolded during the period under analysis. Next we used some empirical test to verify the nature and impact of the shocks to financial market indicators. In the empirical analysis of this paper, we use Markov switching process to identify the impact of the events and to compare the empirical findings with survey results. Later, we test if the three components of financial markets namely foreign exchange market, equity market and the money market are interlinked. These tests are also performed using Granger causality tests within Markov Switching VAR framework.

3. Existing Literature

The issue of influence of news announcements and political events on the economy has not been discussed at much length in the literature. Bailey and Chung (1995) study the impact of exchange rate fluctuations and political risk on the risk premium reflected in cross-sections of individual equity returns from Mexico and found evidence of equity market premiums for risk exposures. Kim and Mei (1999) used a jump-diffusion process and found evidence supporting the volatility of the benchmark Heng Seng Index driven by highly related political events. Aggarwal, Inclan and Leal (1999) studied the kinds of events that cause large shifts in the volatility of emerging stock markets. They found that most events tend to be local. The 1987 stock market crash was the only global event that caused a significant jump in the volatility of several emerging markets. Kim and In (2002) examined the impact of the major stock markets such as US, UK and Japan and of the domestic and international macroeconomic news announcements on Australia's financial market. There results confirm that the movements in the three major foreign stock markets do influence the futures and

stock markets in Australia. They also found that some US and Australian macroeconomic news announcements had significant effect on Australian financial markets. Fong and Koh (2002) used an EGARCH model and found strong evidence of regime shifts in conditional volatility. They also found that major political uncertainties were reflected in a switch to the high-volatility regime. Beaulieu, Cosset, and Essaddam (2005) studied the impact of political risk in Canada on the volatility of stock returns and found support for a close link between the two.[6] It is important to note most of the existing research on event analysis focuses on a single regime shift. We did not use 'a priori' regime shift to analyze. This paper uses the data to identify multiple regime shifts. This is an interesting feature of the paper.

As regards to the question of interlinkages of the three financial markets, the existing research is not so thin. Fukuda and Kano (1997) investigate how prices in East Asian economies correlate with those in Japan and the United States and found that overall price levels in East Asia are more correlated to the price level in the United States. Aggarwal and Kyaw (2005) study the equity market integration in the NAFTA region and found evidence supporting an integrated market. Khalid and Kawai (2003) found support for currency market linkages within East Asian region. Khalid and Rajaguru (2005) investigate a global cross-market linkages and found empirical support for it. Pan, Fok and Liu (2006) examine the dynamic linkages between exchange rates and stock prices for seven East Asian countries and found evidence of a causal relationship between the two markets in all countries except Malaysia. Testing Granger causality within Markov switching framework to indentify the causal linkages between three indicators of financial market is another interesting feature of this paper.

[6] Other papers on this issue include Subramanian (1989).

Given the continuous economic fluctuations, Pakistan offers an interesting case to be analyzed. Looking at Pakistan's perspective, there is limited research available investigating the interlinkages and volatility spillover within Pakistan's financial markets. Khalid and Rajaguru (2007), support a link between exchange rates, stock prices and interest rates. The empirical evidence in Qayyum and Kemal (2006) suggests that volatility spillover takes place from stock market to the foreign exchange market but not the vice-versa.[7] The issue of volatility changes as a result of political events has not been researched in reference to Pakistan or for the region. Given a variety of shocks influencing Pakistan's economy since May 1998, it is imperative to explore how these shocks influence the economy and the financial market, in particular.[8] This paper, in this perspective, could be considered as the pioneer to discuss these issues. In this paper, we not only determine the pattern of regime shifts as a result of political events (news) but also use evidence of financial market interlinkages to identify how these volatility changes affecting the currency market are transmitted to the stock and money markets. These are interesting questions to be explored and could have important policy implications.

4. Survey Method, Data and Methodological Details

4.1 Survey Method and Results:

To have a conjecture prior to performing any empirical tests, we performed a detailed search to identify important events during the period 1998-2006. The sources included media reports, statistical reports, reports presented to the President of the United States, and internet reports. We made an effort to verify the authenticity of these reports through multiple sources. We identified a total of 39 major events during the above stated period that we

[7] Hussain and Qayyum (2005) and Hussain (2006) look at the stock market liberalization in Pakistan and the region.

[8] See Hasan (2006) for some discussion on impact of external shocks on Pakistan's deteriorating current account balance of payments.

believe had an impact on the economy and classified these events as domestic and international. These events are listed in Appendix Table B.

To have a conjecture prior to performing any empirical tests on the nature and severity of the impact of these shocks to Pakistan economy, we conducted a survey to assign probable answers based on a majority of responses. Since most of the foreigners may not be aware of the economic conditions in Pakistan, we decided to conduct the survey in Pakistan involving two important academic institutions. Then we developed a questionnaire listing these events and asking respondents to classify if they believe the event was domestic or international, the nature was positive or negative, the expected impact (positive or negative) and the severity of the impact (strong, moderate or weak).

We also decided to ask these questions to individuals who have some economics background and should be able to understand the meaning of these questions. A sample from undergraduate economics and finance students, MBA students and a group of teaching staff and teaching fellows were selected from two institutions in Pakistan, Lahore University of Management Sciences (LUMS) and CIIT (Comsats Institute of Information Technology) . Students and staff of these two institutions are believed to have good understanding of the economic conditions in Pakistan and the economic and geo-political changes that this country faced during the period under analysis. LUMS is a private university located in the second largest city in Pakistan while COMSATS Institute of Information Technology is a public sector university located in the capital city. LUMS is a premier Business school and attracts students from all over Pakistan. As such a sample from LUMS and CIIT students could be considered as a representative sample all four provinces of Pakistan. The survey was

performed during classes and the questionnaire was distributed to a total of 133 individuals. We received 131 completed responses. The survey results are summarized in Table 1 and 2.

INSERT TABLE 1 HERE

INSERT TABLE 2 HERE

In the questionnaire, we reported all events in a chronological order and asked respondents to indicate what they think was the nature of event, its expected impact and the degree of impact. The results of the survey are collated in a table format (see Table 1). Based on the details of the events (as reported in Appendix Table B), we split the time period into 5 sub-periods while reporting these results. Each sub-period reflects an expected shift in the path of the economy (or movement of financial market) as a result of a major shock (positive or negative). The results of the survey suggest that during the first sub-period (1 January 1999 – 2 September 1999), the country experienced two shocks, one is believed to be positive and expected to have moderate positive impact. The second is however is negative and expected to have strong negative impact on the economy. The second period (3 September 1999 – 13 August 2000) indicates only one positive shock of moderate nature and is expected to have positive impact on the economy. During the third sub-period (14 August 2000 – 28 December 2001), Pakistan experienced 3 shocks, 2 positive (one strong and one moderate) and one negative and strong. The forth sub-period (post 9-11 period) turned out to be the most volatile when the country received 16 shocks of varying nature and degrees. The fifth and final sub-period (6 October 2004 – 13 September 2006) reports only 2 shocks, one negative and strong and one positive and moderate. The survey results suggest a total of 25 positive and 14 negative shocks during the entire sample period. The respondents believed

that 28 of these were due to international factors while the remaining 21 due to domestic factors. They did not anticipate any shock to have weak impact. 12 shocks were believed to have moderate impact while the remaining 27 were believed to have strong impact on the economy.

4.2. Data

For empirical analysis, we use daily observations on exchange rate (WMR; against US dollar), stock prices (MSCI index) and interest rate (30-day repo) for the period 1 January 1999 to 13 September 2006. All variables are used in natural logarithmic form. For empirical estimation, we split the sample into two windows: (1) Estimation window covers the data from 1 January 1999 to 31 December 2004 and (2) Prediction window covers the sample from 1 January 2005 to 13 September 2006. We use the sample from estimation window for estimating regime switching model. In addition to predicting the political events within the estimation window, we use the estimated regime switching model to predict the events in the post-sample (prediction window) period. All data is obtained from DataStream database.

4.3 Unit Roots

It is well known that the data generating process for most macroeconomic time series is characterised by unit roots, which puts the use of standard econometric methods under question. Therefore, it is important to analyse the time series properties of the data in order to avoid the spurious results generated by unbounded variances of parameter estimates due to unit roots in the data. To ensure the robustness of the test results, three most commonly used unit-root tests are applied here, namely the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and KPSS unit root tests on the relevant variables. The departing feature of these three test procedures is that the null hypothesis in ADF and PP is the alternative hypothesis in

KPSS. In particular, while the former (ADF and PP) is derived under the null hypothesis of unit roots the latter (KPSS) is obtained under stationary null hypothesis. The results reported in Table 3 shows that all variables are non-stationary at 5% level of significance. The non-rejection of the unit root hypothesis leads to testing the second unit root, that is, a unit root in the first differences. The test results in the first differences reported in Table 3, and it confirms that all the series are I (1). The results based on stationary alternative (ADF and PP) and non-stationary alternative (KPSS) in our exercise ensure that the results are robust and are not affected by weak power of the standard unit root test procedures.

4.4. Co-integration

Since the unit root results presented shows that all variables are non-stationary, we test for co-integration among exchange rate, stock price and interest rates to examine the presence of long-run relationships between them. The multivariate co-integration test based on the Johansen-Juselius (1990) method is used to test for these relationships.

Johansen-Juselius (1990) procedure involves estimating a vector of *n*-variables z_t posses the *p*-th order Gaussian vector autoregression (VAR) process

$$z_t = \mu + \sum_{i=1}^{p} \Pi_i z_{t-i} + \sum_{i=1}^{k} \Phi_i w_{t-i} + \xi_i, t = 1,2,\cdots,T \quad (1)$$

Where μ is a vector of constants and ξ_t is a normally and independently distributed *n*-dimensional vector (n = 3 in our exercise) of innovations with zero mean non-singular covariance matrix Ω. And z_t and w_t are vector of endogenous and exogenous variables respectively, where $z_t = (ER_t, SP_t, IR_t)'$ and w_t is a null vector as all variables are treated endogenous. It is convenient to rewrite the above process in the following error correction form:

$$\Delta z_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta z_{t-i} + \Gamma_p z_{t-1} + \sum_{i=1}^{k} \Phi_i w_{t-i} + \xi_t \quad (2)$$

Where $\Gamma_i = \sum_{j=1}^{i} \Pi_j$, i = 1,2,…,*p*. The long run *n*×*n* matrix Π is equal to $-\Gamma_p$ and it determines how many linear combinations of z_t are stationary. In particular, the rank of the matrix Π, *r* gives the number of independent co-integrating vectors. The co-integrating rank *r* (0<*r*<*n*) and hence, the number of distinct co-integrating vectors can be formally tested using both trace test and maximum eigen value test. The trace test (λ_{trace} statistic) test the null hypothesis that H_0: *r*=*g* vectors against the alternative that r ≤ n and it is given by

$$\lambda_{trace}(g) = -T \sum_{i=g+1}^{n} \ln(1-\lambda_i) \qquad (3)$$

Where λ_i's are the Eigen values of Π such that $\lambda_1 > \lambda_2 > \ldots > \lambda_n$.

The maximum eigen value test (λ_{max} statistic) test the null hypothesis that H_0: *r*=*g* vectors against the alternative that *r*=*g*+1 and it is given by

$$\lambda_{\max}(g) = \lambda_{trace}(g) - \lambda_{trace}(g+1) \qquad (4)$$

Both trace test and maximum eigenvalue test to establish the number of co-integrating vectors are reported in Table 4. The optimal lag length *p* (=2) is determined by SC (Schwartz) criteria. The results based on the Johansen's procedure indicate the absence of long-run equilibrium relationship among exchange rate, stock prices and interest rate at 5% level of significance. Since the variables are not co-integrated, we proceed with estimating Markov Switching vector autoregressive model in first differences in the following section.

4.5 Markov Switching Model

In this section, we discuss the regime switching model for financial market indicators namely, the exchange rate, stock prices and the interest rate. It is established from the unit root test results that logarithm of exchange rate, stock prices and interest rates are I(1), we construct VAR(p) model for first differenced of exchange rate, stock prices and interest rates. Moreover, mean and variances of the all series in the VAR system are assumed to be in unknown for all regimes. Let S_t be a discrete latent variable that identifies which one of the N regimes the market is in at time t. That is, $S_t = i$, where i = 1,2,…,N. Though the market is in which regime at time t is unidentified, one could identify the conditional probability that the market was in a given regime i. For example, in a two-state switching model, $S_t = 1$ and $S_t = 2$ may be a high-volatility regime and low-volatility regime respectively or a regime of surviving bubbles and a regime of collapsing bubbles, etc. Consider the following N-state regime switching model for exchange rate:

$$\Delta z_t = \begin{cases} \mu_1 + \sum_{i=1}^{p} \varphi_{1i} \Delta z_{t-i} + \varepsilon_{1t} & if \quad s_t = 1 \\ \mu_2 + \sum_{i=1}^{p} \varphi_{2i} \Delta z_{t-i} + \varepsilon_{2t} & if \quad s_t = 2 \\ \quad . & \\ \quad . & \\ \mu_N + \sum_{i=1}^{p} \varphi_{Ni} \Delta z_{t-i} + \varepsilon_{Nt} & if \quad s_t = N \end{cases} \qquad (5)$$

Where $z_t = (ER_t, SP_t, IR_t)'$ is the vector of variables of interest at time t, $\mu_j = (\mu_{ER,j}, \mu_{SP,j}, \mu_{IR,j})'$ is the mean vector for j-th regime and $\varepsilon_{jt} = (\varepsilon_{ER,jt}, \varepsilon_{SP,jt}, \varepsilon_{IR,jt})'$ is the vector of residuals for j-th regime at period t. And the coefficient matrix for the lag i and the

regime j is denoted by $\varphi_{ji} = \begin{pmatrix} \phi_{11,j,i} & \phi_{12,j,i} & \phi_{13,j,i} \\ \phi_{21,j,i} & \phi_{22,j,i} & \phi_{23,j,i} \\ \phi_{31,j,i} & \phi_{32,j,i} & \phi_{33,j,i} \end{pmatrix}$. Here all variables are expected to have different mean and variances at different regimes. That is, the variances at different regimes are denoted as $\text{var}(\varepsilon_{ER,jt}) = \sigma^2_{ER,j}, \text{var}(\varepsilon_{SP,jt}) = \sigma^2_{SP,j}, \text{var}(\varepsilon_{IR,jt}) = \sigma^2_{IR,j}$ for $j = 1, 2, ..., N$. The estimated variances will help us differentiate the low-volatile regimes from the high-volatile regimes. The state variable s_t is assumed to follow an ergodic first-order Markov process and is characterised by the matrix Π consisting of transition probabilities p_{jk} from state j and state k:

$$\Pi = \begin{bmatrix} p_{11} & p_{12} & . & . & . & p_{1N} \\ p_{21} & p_{22} & . & . & . & p_{2N} \\ . & . & . & & & . \\ . & . & & . & & . \\ . & . & & & . & . \\ p_{N1} & p_{N2} & . & . & . & p_{NN} \end{bmatrix}, p_{jk} = \Pr(s_t = k \mid s_{t-1} = j) \qquad (2)$$

Once the coefficients of the model and the transition matrix have been estimated, the probability $\Pr(s_t = j \mid z_1, z_2, ..., z_T)$ of being in state j, based on the knowledge of the computed series, can be calculated for each date (for details of algorithm see Krolzig, 1997). The series of probabilities will be referred as smoothed probabilities $\Pr(s_t = j \mid z_1, z_2, ..., z_t)$ of being in state j based on the information up to date t – the filtered probabilities- which is also calculated. Moreover, it can also be shown that the smoothed probability is equal to filtered probability when t=T. The autoregressive order p is determined by Schwartz criteria.

5. Empirical Results

Political Events and Market Volatility

In order to determine the number of regime for our model, we start with the arbitrary state of 4 regimes. The results didn't show any evidence of regime switching with 4 states. We subsequently re-estimated the model with 3 states and then 2 states. The regime switching model with 2 states able to explain the dynamic linkages between three financial markets with low and high volatile regimes. The estimated results are reported in Figure 1. The optimal lag length is justified by Schwartz criteria. The results show that the exchange rates are expected to move between two regimes where the mean and variances are different in each state. The transition probabilities are reported in Table 5. If the exchange rate is regime 1 then it has about 81% chance that it will continue to stay in low volatile regime 1 and has about 19% change that it will move to high volatile regime. On the other hand, if the exchange rate is in high volatile regime then it will strict to high volatile regime in about 94% of the cases while it will move to regime 1 in about 6% of the cases.

The empirical results of the Markov switching process suggest 2 regimes changes during the sample period. These regimes are identified as low and high and specific time period are reported in columns 1 and 2 of Table 6. We, then trace the political events in each of these regimes. These political events or news were expected to have a positive or negative impact on the financial market movements (or the economy in a broader sense)[9]. The intensity of these shocks is categories as 'weak', 'moderate', and 'strong'. These events are summarized in columns 3 and 4 of Table 6.[10] These results suggest that the financial market in Pakistan experienced a period of low volatility from 1 January 1999 to 2 September 1999. This could be linked to one positive but moderate international shock. Then the financial market faces a

[9] In order to examine the robustness of the results, we estimated the logistic model by treating the survey based expected impact as a dependent variable. We then compare the predicted outcome based on logistic model with regimes generated by Regime switching model. We find that the direction of correct prediction is about 97.6%. For the sake of brevity, the result for the logistic model is not reported here. However, it can be made available from authors upon request.

[10] A detailed description of these events is provided in Appendix Table A.

regime change and the period of 3 September 1999 to 13 August 2000 is categorized as High volatility period. This period coincides with the military coup on 12 October 1999 and the country facing tough economic sanction and isolation from international world. Pakistan also had worsening economic situation during this period where foreign reserves depleted to the lowest level (equivalent to 3 months of import bill).[11] The regimes observed another shift in August 2000. The empirical results suggest a long regime of low volatility in the currency market which coincides with a number of positive shocks (believed to be mostly positive), all of them related to international factors of high intensity that exerted a positive effect on Pakistan's economy. This is the period of post-September 11 and the country's decision to become a US partner in the war on terrorism. This decision by the political regime in Pakistan lead to the lifting of economic sanctions by the US, the UK, the EU, and the Japan, debt relief, debt rescheduling, approval of loans from IMF and the World Bank and a surge in foreign reserves.[12] The next regime changes came on 29 December 2001 with an increased in terror attacks in the country and lasted until 5 October 2004. This period is categorized as high volatility period but experienced a mix of positive and negative events. However, it may be argued that some negative internal shocks increased the uncertainty in the domestic market. The empirical estimation suggests another regime change during the period of 6 October 2004 to 25 January 2005 and is classified as low volatile period.[13] Finally, the results suggest a high volatile period (27 January 2005 to 13 September 2006). Two important events having significant negative impact on the economy (and the financial market) during this period were the crash of Karachi Stock Exchange (KSE) in March 2005 and the devastating earthquake in October 2005.

[11] This worsening economic situation towards the end of 1999 also lead to the military takeover in October 1999.
[12] Foreign reserves increased substantially as a result of remittances from expatriate Pakistanis abroad, mostly in the U.S.
[13] We could not trace any major activity during this period. However, this low volatility could be linked to positive events that took placed during the period of September-October 2004.

Financial Market Linkages

Since our test in the above sub-section only looks at the impact of 'a' event on currency market. To have a broader picture of the impact on the economy, we use Markov switching VAR to test the intermarket linkages using Granger causality among three financial market indicators and how the shock in currency market are transmitted to stock and money market (and to the economy). The results of Granger causality for the full-sample period are reported in Table 7. These results suggest that changes in exchange rates do cause fluctuations in the stock prices in Pakistan during the sample period. However, the same changes do not have any influence on interest rates. There also an empirical evidence of a causal relationship between stock prices and the interest rates. Finally, the results suggest that changes in interest rates do not affect exchange rates or stock prices over the period under investigation. The results of Granger causality for the Sub-Sample period are consistent with the above findings. In summary, these results establish a link between the three markets where changes in currency market influence the stock market which then lead to some changes in the money market.

The results of Granger causality within the Markov Switching VAR framework, we conclude that the changes in currency market volatility due to some political events could also lead to changes in the volatility in the stock market and the money market through market linkages. These are important results and may have significant policy implications.

6. Concluding Remarks

This paper investigates the impact of internal and external shocks on financial market which can affect the macroeconomic performance. Pakistan experienced major international and

domestic political shocks during the decade starting May 1998 and thus makes it an interesting choice for such an analysis. An autonomy of the historical events unfolded in Pakistan from 1999-2008 suggests that even the external shocks were the results of certain policies of the ruling regime. We term these shocks as events and use Markov switching process to perform an event analysis. The paper first lists a number of events unfolded during the period under analysis using a variety of internet and published sources and then identifies the nature and expected impact of these shocks based on a survey results. Finally, empirical estimation is performed to determine the number of regime changes and the impact of shocks on the currency market. Later, Granger causality within Markov switching VAR framework is used to find evidence of financial market interlinkages. The shocks can affect the macroeconomic performance through spillover effects from one sector of financial market to another.

The empirical evidence of this paper suggests 2 regime changes with low and high volatile periods in Pakistan during the period under analysis. The results show that the financial market is expected to move between two regimes where the mean and variances are different in each state. The empirical results are, in general, consistent with the expectations obtained through of the survey methods. The political events are expected to have positive or negative impact on the financial market consistent with the nature of shocks.

Finally, the empirical evidence on the market interlinkages supports the view that all three markets under the broad category of financial market in Pakistan are closely interlinked. As such, any shock that disturbs the currency market will have spillover effects on the stock and money markets thus leading to slow down of the economy. These are interesting results and have important policy implications. The findings of this paper suggest that regimes should be

mindful of an extreme political decision. Measures such as a reduction in fiscal spending (or cutting budget deficits) and less reliance on external borrowing will help reduce country's exposure to shocks and her capability to absorb them.

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Table 1: Summary of political events and their expected impact

	Political Events			
Dates (Period)	***Number of Events within the Period***	**Nature of Event** *(Positive/Negative)*	**Expected Impact** *(Positive/Negative)*	**Intensity of Event - Domestic/International** *(Strong/Moderate/Weak)*
1 January 1999 - 2 September 1999	*1*	Positive	Positive	International - Moderate
	1	Negative	Negative	International - Strong
3 September 1999 – 13 August 2000	*1*	Positive	Positive	International - Moderate
14 August 2000 – 28 December 2001	*12*	Positive	Positive	International - Strong
	4	Positive	Positive	International - Moderate
	1	Negative	Negative	International - Strong
29 December 2001 – 5 October 2004	*7*	Negative	Negative	Domestic - Strong
	3	Positive	Positive	Domestic - Moderate
	1	Negative	Negative	Domestic - Moderate
	3	Positive	Positive	International - Strong
	1	Negative	Negative	International - Strong
	1	Negative	Negative	International - Moderate
6 October 2004 – 26 January 2005	*0*			
27 January 2005 – 13 September 2006	*2*	Negative	Negative	Domestic - Strong
	1	Positive	Positive	International - Moderate

Source: Survey.

Table 2: Details of Survey Results

Events	Date	What do you think is the expected impact of this event on the economy?			What do you think is the nature of this event?			What do you think is the intensity of this event?		
		P	N		P	N		S	M	W
Event 1	**7-Nov-98**	107	16		106	16		28	82	12
Event 2	**26-May-99**	5	119		6	117		88	26	6
Event 3	**27-Oct-99**	104	19		99	21		43	63	15
Event 4	**22-Sep-01**	113	12		104	18		86	42	2
Event 5	**24-Sep-01**	106	19		100	25		44	67	15
Event 6	**26-Sep-01**	103	21		95	29		46	61	13
Event 7	**28-Sep-01**	101	22		94	29		39	55	29
Event 8	**1-Oct-01**	112	13		101	24		22	72	35
Event 9	**5-Oct-01**	105	20		97	28		32	63	21
Event 10	**17-Oct-01**	120	5		114	11		49	50	24
Event 11		113	10		109	14		47	62	12
Event 12		99	25		98	25		59	55	9
Event 13	**24-Oct-01**	107	17		106	18		52	55	6
Event 14		112	12		110	14		41	64	22
Event 15		92	31		84	39		44	59	15

Event 16	**26-Oct-01**	71	53	72	52	67	43	16
Event 17	**30-Oct-01**	87	37	71	53	55	57	8
Event 18	**10-Nov-01**	101	24	88	37	73	47	7
Event 19	**24-Nov-01**	106	14	101	19	32	64	24
Event 20	**Dec-01**	5	119	7	117	54	43	25
Event 21	**Apr-02**	51	71	30	93	73	39	15
Event 22	**May-02**	5	119	7	118	47	46	30
Event 23	**Jun-02**	4	119	4	119	61	39	20
Event 24	**Aug-02**	35	86	20	103	73	40	11
Event 25	**Oct-02**	3	121	7	117	66	41	19
Event 26	**24-Mar-03**	97	26	90	33	41	54	28
Event 27	**24-Jun-03**	12	111	32	92	38	58	25
Event 28	**Dec-03**	101	22	86	39	53	52	15
Event 29	**Feb-04**	15	107	30	92	56	34	27
Event 30	**Mar-04**	10	113	15	109	78	33	18
Event 31	**Apr-04**	16	108	19	105	76	38	11
Event 32	**22-May-04**	84	39	80	43	51	47	21
Event	**19-Jun-04**	108	13	107	13	51	39	26

33										
Event 34	**Jun-04**	86	32		91	29		26	57	36
Event 35	**Aug-04**	20	102		30	91		34	58	30
Event 36		82	38		61	59		47	57	18
Event 37	**Mar-05**	6	115		18	102		88	20	7
Event 38	**Apr-05**	113	9		100	22		49	60	12
Event 39	**Oct-05**	15	84		19	102		102	13	6

Notes:

a) **N: negative; P: Positive: S: Strong; M: Moderate; and W: Weak**
b) **Total respondents: 131. Respondents including both males and females are university students and a few staff.**

Table 3 Unit Root Tests:

	Estimation Window (1 January 1999 – 31 December 2004)		
	ADF	**PP**	**KPSS**
ER	-1.47	-1.51	0.78***
SP	-1.44	-1.58	0.82***
IR	-1.13	-0.97	0.45***
ΔER	-23.49***	-33.32***	0.32
ΔSP	-35.99***	-36.09***	0.13
ΔIR1	-38.29***	-38.42***	0.21

Note: * and ** denotes the rejection of null at 5% and 1% respectively.

Table 4 Co-integration Test
Co-integration between exchange rate, stock price and interest rate

	Estimation Window (1 January 1999 – 31 December 2004)	
	Trace	**Max**
r = 0	18.69	11.12
r = 1	7.57	5.49
r = 2	2.08	2.08

Note: * and ** denotes the rejection of null at 5% and 1% respectively.

Table 5: Matrix of transition probabilities

	Regime 1	Regime 2
Regime 1	0.81	0.19
Regime 2	0.06	0.94

Table 6: Market Volatility and Political Events (Summary Table)

Market Volatility		**Political Events**	
Dates (Period)	**State (Low/High)**	**News (Positive/Negative)**	**Nature (International/Domestic)/Intensity**
1 January 1999 - 2 September 1999	**L**ow	**P**ositive (**1**)	**I**nternational/**M**oderate
3 September 1999 – 13 August 2000	**H**igh	**N**egative (**1**) **P**ositive (**1**)	**I**nternational/**S**trong **I**nternational/**W**eak
14 August 2000 – 28 December 2001	**L**ow	**P**ositive (**16**)	**I**nternational/ **S**trong
29 December 2001 – 5 October 2004	**H**igh	**N**egative (**2**) **N**egative (**2**) **N**egative (**5**) **N**egative (**1**) **P**ositive (**1**) **P**ositive (**1**) **P**ositive (**2**) **P**ositive (**1**) **P**ositive (**2**)	**D**omestic/ **S**trong **I**nternational/ **M**oderate **D**omestic/**M**oderate **I**nternational/ **W**eak **I**nternational/ **S**trong **D**omestic/ **S**trong **I**nternational/ **M**oderate **D**omestic/**M**oderate **D**omestic/ **W**eak
6 October 2004 – 26 January 2005	**L**ow		
27 January 2005 – 13 September 2006	**H**igh	**N**egative (**2**) **P**ositive (**1**)	**D**omestic/ **S**trong **I**nternational/ **W**eak

Sources:

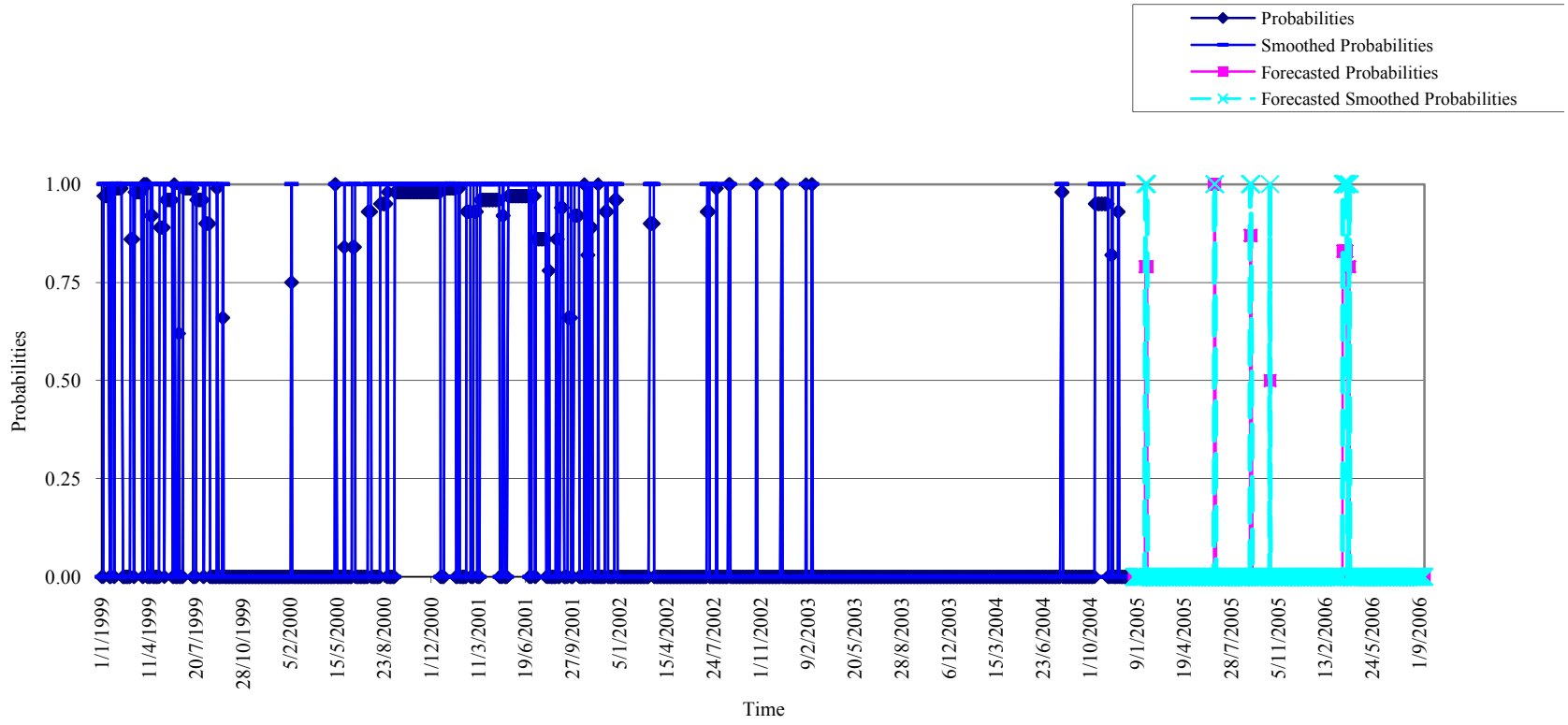
a) Figure 1
b) Appendix Table A

Table 7: Markov Switching Vector Autoregressive Model

	Regime 1			**Regime 2**		
	ΔER	**ΔSP**	**ΔIR**	**ΔER**	**ΔSP**	**ΔIR**
ΔER(-1)	-0.04 (0.05)	0.072 (0.15)	-0.73 (0.54)	-0.04*** (0.01)	-1.33*** (0.46)	-4.41** (2.24)
ΔSP(-1)	0.003 (0.02)	0.028 (0.06)	-0.33* (0.18)	-0.0004 (0.0009)	0.035 (0.03)	-0.27** (0.13)
ΔIR(-1)	0.002 (0.004)	0.005 (0.01)	-0.08** (0.04)	0.0002 (0.0002)	0.003 (0.005)	-0.059** (0.026)
μ	0.00003* (0.00001)	0.0007* (0.0004)	-0.0003 (0.002)	0.00003* (0.00001)	0.0006* (0.0003)	-0.0002 (0.002)
Variance ($\hat{\sigma}^2$)	0.0006	0.018	0.0668	0.007	0.0289	0.096

Note: * and ** denotes the rejection of null at 5% and 1% respectively.

Figure 1: Probabilities of Regime 1



APPENDIX TABLE A: BASIC ECONOMIC & SOCIAL INDICATORS OF DEVELOPMENT IN PAKISTAN

Indicators	1961-70	1971-80	1981-90	1991-95	1996-2000	2000	2001	2002	2003	2004	2005
NATIONAL ACCOUNTS:											
GDP Growth (%)	3.35	4.81	6.19	4.85	3.07	4.26	2.72	4.41	5.0	6.4	7.8
Per Capita GDP (US$)	138.86	180.18	327.06	404.85	438.82	426.64	380.54	439	542	610	709
Private Consumption/GDP	77.71	79.00	76.92	70.81	73.99	74.43	75.15	74.96	73.6	73.3	80.0
Government Consumption/GDP	12.51	13.79	17.06	18.16	15.51	15.01	13.65	15.25	8.9	8.4	7.8
FINANCIAL INDICATOR (%):											
Gross Domestic Savings/GDP	-	13.81	13.83	14.81	13.29	14.4	14.6	13.6	17.5	18.4	12.2
Fixed Capital Formation/GDP	15.37	15.38	16.96	18.07	15.41	14.37	14.29	12.33	16.9	17.3	17.8
Inflation (per year)	3.51	12.42	6.98	11.20	7.30	4.37	3.15	3.29	3.19	4.49	9.32
M2/GDP	36.14	41.76	41.25	43.39	46.63	46.92	48.30	51.74	47.0	49.4	48.9
Fiscal Balance/GDP	-5.17	-7.41	-6.74	-7.67	-6.91	-5.47	-4.71	-4.62	-4.1	-2.1	-4.1
Trade Balance/GDP	-	-8.06	-9.31	-5.15	-3.73	-2.4	-2.3	-0.5	-0.4	-1.3	-4.1
Current Account Balance/GDP	-	-5.35	-2.91	-4.49	-3.17	-0.14	3.41	4.5	4.9	1.9	-1.4
Total Trade/GDP	21.20	28.00	33.59	36.73	35.16	34.30	37.37	35.75	-	31.7	34.1
Debt/Exports	403.90	606.09	509.28	-	-	550.66	260.7	211.2*	189.1*	176.3*	-
Debt/GDP	33.91	61.96	64.15	-	-	90.00	45.7**	48.7**	44.8**	38.0**	-
Foreign Reserves/Imports	21.27	17.98	11.52	14.24	10.56	14.23	34.05	71.86	-	-	-

* Numbers are for external debt to exports ratio. ** Numbers are for Debt to GNI ratio.

Source: IMF International Financial Statistics (CD-ROM), World Development Report (Various Issues) and Asian Development Outlook (various issues); Ariff and Khalid (2005).

Appendix Table B: Market Volatility and Political Events (Detailed Description of Events)

Market Volatility		Political Events		
Dates (Period)	**State (Low/High)**	**Date**	**Details**	**Expected Impact**
1 January 1999 - 2 September 1999	Low	7 November 1998	Partial removal of economic sanctions	Positive
3 September 1999 – 13 August 2000	High	26 May 1999	India-Pakistan Cargill conflict	Negative
		27 October 1999	President Clinton waived (for Pakistan) the restrictions on USDA credits and U.S. commercial bank loans and transactions	Positive
14 August 2000 – 28 December 2001	Low	22 September 2001	US removed all economic sanctions	Positive
		24 September 2001	US agreed to reschedule $379 million of its debt.	Positive
		26 September 2001	IMF determined that Pakistan had met the requirements to become eligible for $135 million, to complete disbursement of a $600 million loan.	Positive
		28 September 2001	US president invoked the authority granting him to provide $50 million in Economic Support Funds (ESF) to Pakistan.	Positive
		1 October 2001	US president made another $50 million available to Pakistan, partly to support Emergency Migration refugee Funds (EMRF) to Pakistan.	Positive
		5 October 2001	The US president made another $100 million available for	Positive

			management of the emerging Afghan refugee crisis.	
		17 October 2001	The U.K. announced a £15 million debt relief package to Pakistan.	**P**ositive
		17 October 2001	US House removed last Pakistan sanctions.	**P**ositive
		24 October 2001	The World Bank approved a US$300 million loan to promote privatized banking, and planned to provide an additional assistance bringing the total for fiscal year to about $600 million.	**P**ositive
			The Asian Development Bank announced plans to give Pakistan a total of US$950 million in 2001, increased from US$626 planned prior to September 11.	**P**ositive
			The Islamic Development Bank approved a US$25 million to help finance imports of energy products.	**P**ositive
			The US started negotiating with the IMF for a line of credit for Pakistan of up to US$1 billion.	**P**ositive
		26 October 2001	Japan joined the E.U, the U.S., and Canada to life economic sanctions against Pakistan.	**P**ositive
		30 October 2001	President Bush signed legislation giving him authority to waive "democracy sanctions" on Pakistan	**P**ositive

			imposed following the October 1999 coup, opening the door for the sale and licensing of military equipment through 30 September 2003.	
		10 November 2001	President Bush announced more than US$1 billion support to Pakistan, including direct budgetary assistance, funds for control of its borders, anti-terrorism assistance, Afghan refugee relief, financial support through IMF, debt relief, and trade assistance.	**P**ositive
		24 November 2001	Pakistan signed a new cooperation agreement with the European Community, replacing the 1986 agreement.	**P**ositive
29 December 2001 – 5 October 2004	**H**igh	December 2001	India blamed Pakistan for a terrorist attack in Indian Parliament in New Delhi Kashmir killing 14 people.	**N**egative
		April 2002	A controversial referendum legitimized General Musharaf as President.	**??**
		May 2002	India blamed Pakistan for a terrorist attack in Kashmir killing 34 people.	**N**egative
		June 2002	A car bomb exploded outside a hotel in Karachi, killing 14 people including 11 French military technicians.	**N**egative

		August 2002	President Musharaf unilaterally announced Legal Framework Order (LFO) of constitutional changes enhancing powers to the President.	**N**egative
		October 2002	A car bomb exploded outside U.S. Consulate in Karachi, killing 13 people.	**N**egative
		24 March 2003	Pakistan had its first elections held since October 1999 military coup. Mr. Jamali elected as Prime Minister.	**P**ositive
		24 June 2003	US imposed limited sanctions on Pakistan in response to purchase of missiles from North Korea.	**N**egative
		December 2003	President Bush (in a meeting with president Musharaf in Washington, DC) pledged to provide Pakistan with $3 billion in US military and economic assistance from FY2005-FY2009.	**P**ositive
		February 2004	Two attempts made to assassinate President Musharaf.	**N**egative
		March 2004	Dr. Abdul Qadeer Khan admitted that he overseen the transfer of Pakistani nuclear technology to Iran, Libya, and North Korea.	**N**egative
		April 2004	Pakistan's military began operations against foreign Islamic	**N**egative

			militants in South Waziristan, local militants joined in fighting against government forces.	
		22 May 2004	The Commonwealth announces that Pakistan will be re-admitted after a five-year ban.	**P**ositive
		19 June 2004	India and Pakistan resume talks	**P**ositive
		June 2004	A Bill passed creating a National Security Council, consisting of military and civilian leaders.	**??**
		August 2004	Prime Minister Jamali resigned and the cabinet dissolved.	**N**egative
			Shaukat Aziz was elected as new prime Minister and took charge of his office.	**P**ositive
6 October 2004 – 26 January 2005	**L**ow			
27 January 2005 – 13 September 2006	**H**igh	March 2005	Karachi Stock Market (KSE) crashed by 2,595 points from its record high of 10,303, losing about $13 billion in market capitalization (and a quarter of its value) in just two weeks.	**N**egative
		April 2005	President Musharaf visited India and the tow nations agreed to increase cross-border transport links and to work to promote trade between them.	**P**ositive
		October 2005	An earthquake caused widespread devastation in Northern Pakistan and Kashmir, killing more than	**N**egative

			73,000 people and leaving about 3 million homeless.	

Source: Various internet sites.