

Financial Reforms and Economic Growth: Comparison of China and Pakistan¹

Abstract

In this paper, the finance-fluctuation nexus hypothesis is tested for China and Pakistan over the period of 1960-2005. It is concluded that greater financial development increases access to credit markets, which leads to greater consumption and investment smoothing. This in turn reduces the volatility of real growth. The ARDL approach to cointegration is conducted to establish the existence of a long run relationship between financial developments and macroeconomic fluctuations. The study uses deposit liability to nominal GDP ratio (DLR) and credit to private sector to nominal GDP ratio (CPS) as proxies of financial development. Furthermore, this research makes suggestive policy implications for the further development of the financial sectors of both countries in order to get stable economies and sustainable growth.

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¹ We thank Stephen G. Cecchetti, Sheharyar J. Bukhari and Nadeem Akhter for valuable suggestions. Any remaining errors are our own. The opinion, analysis and conclusion in this paper are our own and do not necessarily represent those of the State Bank of Pakistan and Wuhan University.

The Finance-Fluctuation Nexus: Further Evidence from Pakistan and China

1 Introduction

A retrospective study of South East Asian economies shows that they had low inflation, a balanced budget and a remarkable record of almost eight percent growth in the previous three decades, but even then they faced financial crises in 1997. The main loophole was in its financial system (Denizer et al 2002). After this setback, the role of a well functioned financial system has been fully recognized, so as to minimize macro-economic fluctuations.

However, it is still believed that a good financial system dampens fluctuation only in the developed countries. The infant literature on the finance-fluctuation nexus presents a contradictory debate on the role of financial system to dampen the volatility in developing countries. Because a convincing conclusion requires a combination of a long time series and sufficiently high quality data for real consumption, real income, various instruments and measures of financial development have been used in the estimation. It is much easier to carry out this analysis for the industrialized countries where the quantity and quality of data is really good. In contrast, in observing the less developed countries, a researcher would have to start by asking whether there is clear reduction in the volatility of GDP growth and then see if it occurs around the time of a visible change in financial system arrangements. Without the former, there is nothing to study. Without the latter, one should probably be looking elsewhere. This creates a motivation to analyze the relationship between financial development and macro-economic volatility in the context of developing countries.

The undertaking task carries the same objective. We selected two developing countries, Pakistan and China, to test the finance-fluctuation nexus hypothesis. The relationship between financial development and macro-economic fluctuation is not well researched in these countries despite of its importance. Importantly, if there are some studies [see Khan et al (2005) for Pakistan and Liang and Teng (2006) for China] they discuss only the role of financial development to determine the level of growth but don't address the fluctuation. The aim of this study is to fill this gap.

We take a time series, from 1960 to 2005 with credit to private sector to GDP ratio and deposit liability ratio as measure of financial depth. Then we analyze the impact of financial depth on the variability of real per capita GDP, real per capita investment and real per capita consumption using two alternative techniques. We find that as these two countries have continued to develop their financial systems, their macroeconomic fluctuation have become less volatile.

We classify our study as follows. Section 2 contains literature review. Section 3 defines the variables, explains their measurement and analyzes data through the graph, descriptive statistics and correlation matrix. Section 4 discusses the econometric specification and methodological issues to test the cointegration. The main results of the paper are contained in Section 5. Section 6 contains personal comments and some policy implications for the developing countries.

2 Literature Review

Economists have produced a comprehensive literature on the finance-growth nexus². All the three possibilities i.e. finance leads to growth, growth leads to finance or no relationship between finance and growth, have been discussed in the literature. On the other hand, empirical testing of finance-fluctuation nexus is relatively a recent effort by the researchers. Despite being in its infancy, this dimension of research is covering a lot of aspects of the finance-fluctuation relationship from traditional financial development measures to financial innovation and risk management analysis (Dynam et al 2006).

Research finds that countries with less developed financial systems were more volatile and showed a slower pace of economic growth (Aghion et al 1999) than countries with more developed financial systems. Denizer et al (2002) divided the financial-fluctuation nexus literature into three main stream lines. First, well developed financial systems increase the ability of economy to absorb macro-economic shocks. Second, effect of financial market imperfections and information asymmetries on economic growth fluctuations. Third, the effects of financial developments in the long run macro-economic fluctuations.

However, literature suggests ambiguous linkages between financial development and macroeconomic volatility. A major chunk of literature suggests that a negative relationship between financial developments and macroeconomic fluctuations exist only in the developed countries (Basu and Taylor 2002, Buch et al 2002 and Buch and Piedzioch 2005) and these benefits are more likely connected with financial integration. Aghion et al (1999) also mentioned that financial sectors are less developed in the non-industrial countries, and this may be one of the reasons of more volatile behavior of these economies. Additionally, Kose et al (2003) tested the data of 76 countries, out of which 55 were developing countries. This study shows that the higher financial developments are associated with higher volatility, specially in consumption.

The non-industrial countries have a lower base of income and investment due to the less access to the credit market. The diversification in investment and reducing the risk is not possible in these economies with less developed financial sectors (Acemoglu and Zilibotti 1997). Aghion et al (2000) argued that there are much possibilities of volatility in the open economies with intermediate level of financial sector. However, Denizer, et al (2002) and Buch and Pierdzioch (2005) mentioned that if domestic financial developments happened it would reduce the volatility in output.

This contradiction among the researchers creates a motivation for the analysis of finance-fluctuation nexus on the country basis. The main task of the research is to take evidences from Pakistan and China, the two developing countries, and will try to analyze the finance fluctuation nexus. We find a clear reduction in the volatility in real per capita GDP, real per capita investment and real per capita consumption of the economies of both countries. We link the reduction in volatility to reforms introduced in the financial sectors of countries³. Specifically, the reduced volatility is correlated with the post reform era in both economies. These evidences will give worth to the specified study.

² See Schumpeter (1911), Robinson (1952), Kuznets (1955), Patrick (1966), Hicks (1969), Goldsmith (1969), Mckinnon (1973), Lucas (1988) Gelb (1989), Roubini and Sala-i-Martin (1992) King and Levine (1993) Esterly (1993) Gertler and Rose (1994), Levine (1997), Ram (1999), Khan and Senhadji (2000), Pagano and Volpin (2001) Levine et al (2000) and Chritopoulou and Tsinas (2004)

³ Financial literature provides a good review on the history of financial sector reforms in Pakistan (State Bank of Pakistan 2000) and China (He 2005, 2007).

3 Variable Construction and Data Analysis

Volatility-dependent variable, and financial development-independent variable, are the main focus of our analysis. We utilize three proxies to volatility and two to financial development. For volatility, we take five year rolling standard deviations of real per capita GDP ($VotY_t$), real per capita investment ($VotI_t$) and real per capita consumption ($VotC_t$). We follow the standard practice, Demetriades and Hussein (1996), by taking the variables in domestic currency. All three real per capita variables are measured as a ratio of real variables to total population. The real variables are measured as nominal variables divided by GDP deflator (2000=100).

Traditionally broad money ($M2$) ratio to nominal GDP is used for financial depth by Gelb (1989); World Bank (1989) and King and Levine (1993). In principal, the increase in ratio means the increase in financial depth. But, in developing countries, $M2$ contains a large portion of currency. Here the rise will refer to monetization instead of financial depth (Demetriades and Hussein 1996). So the amount which is out from the banking system that is currency should be extracted from the broad money. So, ratio of deposit liabilities to nominal GDP (DLR) is more relevant variable here. However, it is possible that credit to private sector remain stagnant, even if the deposits are increasing. The government can increase the private saving by the increase the reserve requirement. The supply of credit to private sector is important for the quality and quantity of investment (Demetriades and Hussein 1996). So, the ratio of credit to private sector to nominal GDP (CPS) is our second variable of financial depth. CPS is not directly available for China, so we take the ratio of domestic credit by the banking sector to GDP (BSC) to proxy of CPS . All variables are transformed into the natural logarithm for the usual statistical reasons. So, LD and LC is the natural log of DLR and CPS .

Besides measure of financial development and economic growth, our study use the other information to control other factors associated with either economic growth or financial development. In this regard, real interest rate and trade ratio are used. The real interest rate, R , is the deposit rate minus the inflation rates, while the trade ratio, TR , is the total value of exports and imports as share of nominal GDP. For comparison purpose, we utilize international data sources. The data of World Development Indicators (WDI) is used for the real variables like GDP, Gross fixed capital formation and trade. While International Financial Statistics 2007 (IFS) is used for the financial variables: like broad money, deposits, and credit to private sectors.

3.1 Chart Analysis

This section has two-fold objective, to show the pattern of financial development and to show the relationship between the financial sector development and macro economic volatility. The research toil carries four main proxies to financial sector development for this section. These are ratio to currency in circulation to GDP (CC), ratio to M2 to GDP ($M2Y$), ratio to deposit liabilities to GDP (DLR) and domestic credit by the banking sector to GDP (BSC)⁴.

Before switching to data, we explain theoretical meanings of these ratios. The higher CC shows that economy tends to using cash in payments and there are not many financial

⁴ As we don't have a reliable data set for the private sector credit for China, so we are using BSC for comparing both countries.

services and instruments are available, specially, for the daily payment. While *M2Y* consists of *CC* and other services like deposits and travelers cheque etc. The increase in *M2Y* implies that the financial sector getting stronger and stronger. The trend of *DLR* shows that how financial system is efficient to collect savings of the economy in a centralized pool. *BSC* implies that how these collections are being mobilized to the agents for the consumption and investment.

In China *M2Y* was, on average, around 30 percent during the pre-reforms era that is from 1960 to 1977. Importantly, it was stagnant if we ignore the cyclical fluctuations. But, it shows a magnificent growth in the post reforms period that is from 1978 onward. It was 32 percent in the start of financial sector reforms and reached to 164 percent till the end of 2005. That means, there is five and a half times bigger than 1978. While the currency in circulation to GDP (*CC*) ratio was about 6 percent, on average, in the pre reform era and reached to 13 percent at the end of 2005 in China (see Figure 1). That is one the highest amongst the world (He 2005). However, in Pakistan, *CC* ratio dropped significantly after the reforms period that is from 1990. *M2Y* ratio remained volatile within an increasing band in the post reform era (Figure 1 and Figure 2).

This means that China's economy is more cash oriented than Pakistan. The level and growth rate of *M2Y* in China is much higher than Pakistan. Importantly, the growth of *M2Y* is much higher than growth of *CC* ratio in China. While *M2Y*, in Pakistan, is much fluctuating in an increasing band. So, so far, it can be safely concluded that the financial sector reform has done better job in China than Pakistan.

Lets put it an other way. Two other ratios are displayed in Figure 3 and Figure 4 that is *DLR* and *BSC*. Here again, the both ratios have grown steadily. The *DLR* was at 30 percent in 1978 but end up with 138 percent in 2005, while the *BSC* was 50 percent in the 1978 and 115 percent in 2005. In Pakistan, *BSC* and *DLR* increased marginally. *DLR* decreased significantly due to the sharp decrease in nominal interest rates after 1999 to 2001. But after then it is still rising despite of the negative real interest rate. *BSC* also decreased in this era despite of the very low or even negative interest rates. The main reason was the excess liquidity, in the economy, after 9/11 event. But except this time period the Pakistan's financial sector has done a good a job to mobilize the resources.

The ratio analysis shows that China's financial sector is more developed than Pakistan. Is there a relationship between financial development and macroeconomic volatility? To derive the answer of this question we have to see the Figures 05 to 07. From the figures it is evident that the volatility in per capita real GDP, per capita real investment and per capita real consumption is decreasing over time. There is a clear reduction in volatility in China for per capita real GDP and per capita real investment. While per capita real consumption moves in a narrow and down trended band. On the other hand the economy of Pakistan is more volatile than China. As mentioned above, apparently, the financial sector of China is more developed than Pakistan. Here we can link up that a developed financial sector is helpful to stabilize the economy. We can observe that the improvement in stability of China's economy is more obvious after the post reforms era.

3.2 Data Description and Contemporaneous Correlation Analysis

Campbell and Perron (1991) and Hakkio and Rush (1991) suggest that the span of data is more important than the number of observations. There is no gain in the time series, specially in vector autoregressive (VAR) framework by switching from low frequency to high frequency data. So, it is not advisable to switch over quarterly or monthly data to increase the number of observations. Keeping in view these points, we use annual data from 1960 to 2005.

We have developed the argument, through chart analysis, that both countries gained a considerable achievement after introducing reform in their financial sector. We also argue that growth and growth volatility is connected, along with the other factors, with the strength of financial sector. It is evident from the Table 01. The table presents the descriptive statistics and contemporaneous correlations⁵ matrix among the financial indicators and, level, growth rate and standard deviations of the macro economic indicators. It is evident that all macroeconomic indicators are highly correlated with financial development indicators in both countries. While the growth indicators have low or negative correlation with financial indicators. This phenomenon, similar to those findings in other studies (e.g. Liuntel and Khan 1999). This suggests that there exist a long run relationship between financial development and economic growth in China and Pakistan.

The expected signs of contemporaneous correlation between financial development indicators and macroeconomic volatility (standard deviation of macroeconomic indicators) are negative. This implies that higher the financial development will be a cause of lower volatility. It is evident that correlations among financial indicators and standard deviation of per capita real GDP is negative and around 0.5. And this coefficient is extremely low in Pakistan. Standard deviation of per capita real investment has good magnitude and priori sign for both countries. Standard deviation of per capita real consumption has a low magnitude with expected sign in China and with alternative sign in Pakistan is visible. These low correlations magnitudes suggest that the relationship between financial development and macro-economic volatility also exist in the long run.

4 Econometric Specification and Estimation Strategy

The main motivation of the study is to check significance of the hypothesis ‘increase in financial development reduces the macroeconomic volatility’. This means that the dependent variable is volatility of macroeconomic variables and main independent variable of interest is financial development. A priori expectation is that we will find the coefficient estimate for the interaction dependence and financial development is negative and significant.

We can derive three main dimensions from the literature of finance-growth nexus which has also linkages with financial development and volatility. First, the savers and investors can match more efficiently in a developed financial market. As a result, it allows the economy to absorb the volatility shock more efficiently⁶. Second, the developed financial sector may also increase diversification at microeconomic and macroeconomic level,

⁵ The correlation is termed as ‘contemporaneous correlation’ because the growth indicators and financial development indicators are examined over the same period (King and Levine 1993).

⁶ See for detail Aghion et al (1999), Aghion et al (2000) and Acemoglu and Zilibotti (1997).

which reduces the risk and volatility⁷. Third, the financial development is also a source of information asymmetries which may cause the volatility⁸.

These linkages provide the theoretical motivation for the current study. The existing literature suggests that volatility should be reduced in the presence of increased financial development. To model our hypothesis we follow the Denizer et al (2002), the relationship between macroeconomic volatility and financial development is specified as follows:

$$Vot_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 X_t + U_t \quad (1)$$

where Vot_t is the standard deviation of real per capita consumption $VotC_t$, investment $VotI_t$ or GDP $VotY_t$. FD_t is a measure of financial development, X_t includes the additional controls variables and U_t is the disturbance term.

The control variable X_t includes ratio to export plus imports to GDP which is, denoted by TR_t in the model to control the effects of real external shocks on the domestic economies. Finally, we include the real interest rates in the model, that is R_t . The theoretical justification is obvious that the real interest directly affects consumption through its role of intertemporal substitution for agents with access to credit markets.

To materialize the hypothesis, this study adopts two different strategies. First, following Campbell and Mankiw (1989), we estimate the time varying fraction of credit-constrained agents and try to link the financial development with growth volatility. Second, we establish a long run relationship between macroeconomic volatility and financial development.

4.1 Time Varying Liquidity Constrained Agents

The hypothesis of the study, the reduced macroeconomic volatility is related with the increased financial development, can be shown in a direct connection.

$$\uparrow FD_t \Rightarrow \downarrow Vot_t \quad (2)$$

Here, we follow the argument of Cecchetti, Flores-Lagunes and Krause (2006) that increased FD_t will smoothen the consumption and investment by relieving the liquidity constraints the agents. This will lead to a smaller fluctuation in consumption and investment pattern and then will reduce the GDP volatility. That is,

$$\uparrow FD_t \Rightarrow \downarrow \lambda_t \Rightarrow \downarrow VotC_t \Rightarrow \downarrow VotY_t \quad (3)$$

Where λ representing the fraction of consumers who are liquidity constrained. To analyze the mechanism that is presented in equation (3) we have to estimate λ . To accomplish the task, this research follows Campbell and Mankiw (1989) model.

$$GroC_t = \alpha + \lambda GroY_t + \phi R_t \quad (4)$$

⁷ See for detail Bernanke and Gertler (1989,1990) Greenwald and Stiglitz (1993), Kyotaki and Moore (1997), Fazzari et al (1998), Gertler and Gilchrist (1994) and Kashyap and Stein (1995, 2000)

⁸ See For example, Dewatripoint and Maskin (1995) and Diamond(1984)

λ is marginal propensity to consume (MPC). Theory suggests that the value of λ should be between 0 and 1. The closer to unity value will show a higher proportion of liquidity constrained agents.

The next step is to analyze the relationship between financial depth and fraction of agents who are liquidity constrained. To get the time varying estimates of $\hat{\lambda}$, we perform the rolling regressions of equation (4). So, we proceed to estimate the following equation.

$$\hat{\lambda}_t = \beta_1 + \beta_2 FD_t + \beta_3 R_t + \varepsilon_t \quad (5)$$

This equation is estimated through ordinary least square (OLS) method. We are expecting negative sign of β_2 , as the deeper the financial development reduces the liquidity restriction. The sign of β_3 , coefficient of control variable, is expect to be positive, implied that higher the rate of interest will limit the agent to access the liquidity.

4.2 Long Run Relationship Using Auto Regressive Distributed Lag (ARDL) Model

The variables $\hat{\lambda}_t$, FD_t and R_t are the time series variables. It is possible that they are non-stationary at level. Then we will estimate the difference form of equation (5) to get rid of any spurious relation. But use of difference form of equation removes the long run information from the data set. It provides only the partial information or short run information. To overcome such problem, as time series literature suggests, one must test to determine whether long run relationship exists among the variables in the model or not.

The time series literature suggests a number of techniques to test the long run relationship among the time series variables for example Engel and Granger (1987) test and maximum likelihood based Johansen (1988, 1991) and Johansen and Juselius (1990) tests. However, with the passage of time researchers, Kremers et al (1992) and Hakkio and Rush (1991) find some drawbacks in above mentioned tests.

Keeping in view these drawbacks a relatively new approach is used to avoid these problems, that is popularized by Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran et al (2001). This technique is named as Autoregressive Distributed Lag model (ARDL), which is based on the general to specific modeling technique (see Charemza and Deadman 1992) The ARDL has several advantages to the other techniques of cointegration test. One of the main advantages of this technique is that it can be applied irrespective of whether the variables are $I(0)$, $I(1)$ or fractionally cointegrated (Pesaran and Pesaran 1997). The other advantage is that the model takes sufficient number of lags to capture the data generating process general to specific modeling framework (Lauranceson and Chai 2003). Furthermore the error correction model (ECM) can be derived from ARDL through a simple linear transformation (Banerjee et al 1993). The ECM integrates the short run adjustments with long run equilibrium without losing long run information. Moreover, small sample properties of ARDL approach is far superior than that of Johansen and Juselius's cointegration approach (Pesaran and Shin 1999).

Furthermore, as long as the ARDL model is free of residual correlation, endogeneity is less of a problem. Pesaran and Shin (1999) demonstrated that the appropriate lags in the ARDL model corrected for both serial correlation and endogeneity problems. The ARDL method can distinguish between dependent and explanatory variables. Indeed, one of the important advantages of ARDL procedure was that the estimation is possible even when the explanatory variables are endogenous (Pesaran and Pesaran, 1999; Pesaran et al., 2001). This is important in the present context as investment, GDP or financial development, in our setting, may be an endogenous variable.

So keeping in view, all the above mentioned points, we also use ARDL approach for cointegration analysis and the resulting ECM.

ARDL representation of equation (1) is as follows

$$\Delta Vot_t = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta Vot_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{3i} \Delta X_{t-i} + \delta_1 Vot_{t-1} + \delta_2 FD_{t-1} + \delta_3 X_{t-1} + U_t \quad (6)$$

Where α_0 is drift component and U_t white noise. Furthermore the term with summation sign represented the error correction dynamics. While the second part of the equation with δ_i corresponds to long run relationship.

The ARDL model testing procedure starts with bound test. The first step, in the ARDL bounds test approach, is to estimate equation (2) by ordinary least square (OLS) method. The F -test is conducted to test the existing of long run relationship among the variables.

The null hypothesis in the equation is $H_0 : \delta_1 = \delta_2 = \delta_3 = 0$. This means that the long run relationship does not exist. While the alternative is $H_1 : \delta_1 \neq \delta_2 \neq \delta_3 \neq 0$. The calculated F -statistics value is compared with two sets of critical values are given by the Pesaran et al (2001). One set assumes that all variables are $I(0)$ and other assumes they are $I(1)$. If the calculated F -State exceeds the upper critical value, then null hypothesis of no cointegration will be rejected irrespective of whether the variable are $I(0)$ or $I(1)$. If it is below the lower value then the null hypothesis of no cointegration can not be rejected. If it falls, inside the critical value band, the test is inconclusive. At this stage of estimation process, the researchers may have to carry out the unit root tests on variables entered into the model (Pesaran and Pesaran 1997).

In order to choose optimal lag length for each variable, the ARDL method estimate $(p+1)^k$ number of regressions. Where p is the maximum number of lags and k is the number of variable in the equation. The model can be selected on the basis Schwarz-Bayesian Criteria (SBC) and Akaike's Information Criteria (AIC)⁹. In the second step, the researchers estimate the long run relationship using the selected ARDL model through AIC or SBC. When the long run relationship exists among the variable, then there is error correction representation. So, the following error correction model is estimated is the third step.

$$\Delta Vot_t = \alpha_0 + \sum_{i=1}^p \alpha_{0i} \Delta Vot_{t-i} + \sum_{i=1}^p \alpha_{1i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta X_{t-i} + \gamma EC_{t-1} + U_t \quad (7)$$

The error correction model result indicates the speed of adjustment back to long run equilibrium after a short run shock. As we mentioned above that we are using three

⁹ The SBC is known as parsimonious model, as selecting the smallest possible lag length. While AIC is known for selecting maximum relevant lag length.

different measures for the volatility, so we have to estimate three different models. These models are presented in the appendix.

To ensure the goodness of fit of model, the diagnostic and stability tests are also conducted, the diagnostic test examine the serial correlation, functional form, normality and heteroscedasticity associated with selected model. Pesaran and Pesaran (1997) suggest using Brown et al. (1975) stability test. This technique is also known as cumulative (CUSUM) and cumulative sum of squares (CUSUMSQ). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the breaks points. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bounds of five percent level of significance, the null hypothesis of all coefficients is the given regression are stable can not be rejected.

5 Empirical Results

The main focus is on the relationship between financial development and macroeconomic volatility. For this purpose we divide our analysis into two parts. First, we estimate the relationship between frictions of liquidity constrained agents and financial development. Second, focus on the long run relationship between financial development and macroeconomic volatility. To accomplish task, we are using the ARDL technique for cointegration test. That requires the following key steps. 1) we have to check stationarity to avoid the spurious relationship 2) establish the long run relationship among the variable through F -statistics. 3) then find the long run and short run coefficients 4) Lastly, the model's stability will be checked through Brown et al (1975) technique of CUSUM and CUSUMSQ.

5.1 Financial Development and Time Varying Frictions of Liquidity Constrained Agents

The equation (4) is estimated to get the fraction of liquidity constrained consumer and the results are shown in Table 02. The coefficient of ' λ ' is between 0 and 1 for both countries and significant at one percent. The coefficient ' λ ' is much larger in the case of Pakistan than China that indicates a higher proportion of liquidity constrained agents in Pakistan. The low value of ' λ ' in the case of China is also interesting to discuss, but we are more interested to study the time varying behavior of ' λ '. More particularly, we want to give a link this time varying ' λ ' with the development of financial sector.

To show the relationship between financial depth and fraction of agents who are liquidity constrained, we have to estimate the equation (5). To accomplish this task, in the first step, we performed 30 rolling regressions for both countries to get $\hat{\lambda}$. In the second step the equation (5) is estimated for both countries. Following the standard practice, as $\hat{\lambda}$ and financial development indicators carry the time series characteristics, we check the stationarity through ADF test and results are presented in Table 02. As evident from the table that $\hat{\lambda}$ and the financial development indicators, FD (LC) are non stationary at level and stationary at first difference. So, we estimate the equation (5) in difference form. Table 02 carries the result of this step.

As mentioned above that a negative sign for β_2 and positive sign for β_3 is expected. This means that the friction of liquidity constrained agents will be reduced or access to credit market will be increased by the increase in financial development. It is evident from

Table 02, β_2 is negative and β_3 is positive for the both countries. Importantly, β_2 is statistically significant in both cases. However, β_3 is statistically insignificant in both cases. Additionally, the both models pass through the diagnostic test, that is, serial correlation, functional forms and heteroscedasticity.

5.2 Unit Root Test

Ouattara (2004) argues that, in the presence of $I(2)$ variables the computes F -statistics provided by Pasaran et al (2001) are not valid. So, initially we have to investigate the order of integration. This is to ensure that the variable are not $I(2)$ stationary to avoid spurious results. Because the bound test is based on the assumption that variables are $I(0)$ or $I(1)$. Therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variable is $I(2)$ or beyond.

We apply ADF test of stationary hypothesis for all series under consideration. It is evident from the test statistics that $VotY_t, VolI_t, VolC_t, TR, LC$ and LD are both level non stationary and stationary at first difference for both countries. While the R for the both countries is level stationary (Table 3). The ambiguities in the order of integration of the series give a support to the use of ARDL bounds approach rather than one of the alternative cointegration tests.

5.3 Conitegration Test

After establishing that none of the selected series is $I(2)$ or beyond, we can test for the presence of the long run relationship. To accomplish this task, we have to estimate the equation (6) through OLS procedure and compute the F statistics for the joint significance of lagged levels of variables. We have to estimate this model for each dependent variable for each country. So we estimate the equations A.2, B.2 and C.2, presented in appendix, using the methodology of OLS to get the F statistics. The computed F statistics for each order of lags are given in Table (4). It is evident from the table that computed F -values are much higher than the above critical bounds values for the both countries for each proxy of financial development. So, there is a strong evidence of existence of long run relationship among the variables of equation (1).

5.4 Long Run and Short Run Results of ARDL Model

Twelve models are estimated to compare Pakistan and China. In each model for one country, we consider the alternative measure of volatility and alternative measure of financial development. The SBC based models are preferred to AIC on the basis of lower mean prediction error. ARDL order for each model is presented in Table 05 and Table 06.

It is evident that from Table 05 that the sign of the coefficient of LC is negative, according to the priori expectations, and significant except for $VotC_t$ in the case of Pakistan¹⁰. However, the positive sign is statistically insignificant. The negative signs indicate that higher the level of credit will reduce the macroeconomic volatility. Similarly, in the case of Pakistan, the signs with TR are negative and significant implying that the higher total trade will reduce the macroeconomic volatility. However,

¹⁰ We show t-values in the parenthesis of table 05, 06, 07 and 08.

surprisingly, in the case of China, this coefficient becomes positive but insignificant¹¹. All six models presented in the Table 05 pass through the diagnostic test.

Table 06 presents the result of other six models with an alternative measure of financial development, that is, LD . In the case of China, the sign of financial depth is negative in all three models and statistically highly significant. Same is true for Pakistan except the case of consumption. Here again TR shows a negative and significant, in the case of Pakistan. Most of the time, in all twelve models, interest rate R shows negative relationship with dependent variable in the case of Pakistan and positive in the case of China. We let the discussion on the results for the next section. All six models presented in the Table 06 pass through the diagnostic test.

Table 07 and 08 present the short run results of the model. ΔLC shows the negative and significant coefficient in the most of the cases. It implies that increase in credit can reduce the fluctuation in both countries. On the other hand ΔLD shows a mix of negative and positive coefficient. Importantly, ΔTR is negative and significant in the case of Pakistan. The coefficient EC_{t-1} is correct in sign for all the twelve cases, that is, negative. The magnitude of this coefficient, which varies from -0.18 to -0.60, shows the speed of adjustment process. For example, if it is 0.187 in the first model of Pakistan. This implies that, nearly 19 percent of the disequilibrium in the volatility of the previous year's shock adjusts back to the long run equilibrium in the current year. The coefficient EC_{t-1} is fairly large in almost all the cases. R^2 , DW statistics and F statistics are presented in the lower panel of Table 07 and 08 to show the goodness of fit of the models.

To check the stability, we apply CUSUM and CUSUMQ techniques. Keeping brevity in mind, we are not presenting the graphs here but both statistics CUSUM and CUSUMSQ are within the critical bounds, indicating that all coefficients in ARDL error correction model are stable¹².

5.5 Discussion

We started, in the section 5.1, with hypothesis that the improvement in financial development will increase the access to credit market. The higher access to the credit market will reduce the volatility in consumption, which in turn reduce in the GDP growth. This means that consumption smoothening has a core element in our analysis. Our results show that access to credit market, in both countries, has a significant association with higher financial development.

However, our results provide suggestive evidence. There are clearly other elements, like financial institution, financial instruments, arrangement between banks and customer and income distribution etc, that enable an economy to smoothen its consumption. For example, according to the descriptive and chart analysis, China has more developed financial sector. So there should be a higher consumption due to higher access to the credit market. But, there is a trend of continuous decline in the share of household consumption in GNP. That has fallen to below 40 percent in 2005, due to the borrowing constrained, despite the remarkable pace of sustained high economic growth and financial development¹³ (Aziz and Cui 2007).

¹¹ However, TR has a positive and significant impact on the growth of China. The results are available on request.

¹² The graphs of CUSUM and CUSUMQ stability test are available on request.

¹³ So we can expect a lower volatility in consumption due to a lower base.

However, as our results suggest, the higher financial development clearly reduce the macro volatility in both country. Only $VotC_t$, in case of Pakistan, shows a positive relationship with financial development but it is statistically insignificant¹⁴. It implies that both countries, generally the developing countries, need a sound financial system for a sustainable economic growth.

Positively, the financial sector of both countries is doing a far better job after the reforms. But there is still a lot of work has to be done, especially by China. Pakistan is, successfully, pursuing the privatization policy for its state owned bank, realizing the distortion of socio-economic objectives of the nationalization policy of 1970s. On the other hand, China's major portion of banking sector is still revolving around four largest state owned banks (SOBs) which allocate a major chunk of credit to the state owned enterprise under the government's management. The government of China uses the credit to achieve regional equality (Park and Shert 2001), instead of investing in market based activities.

Besides that, it is a well known fact that China's banking sector is running with high non-performing loans (NPLs) that is an indicator of misallocation of credit. Allen et al (2005) mentioned that NPLs within the SOBs are 12.6 percent of total loans and 15.2 percent of total GDP, which is significantly higher than in other countries. For example the NPLs of all banks in Pakistan are only 3.1 percent to net loans (State Bank of Pakistan 2005). This suggests that the major chunk of the credit is not issued for the productive use in China. However, it should be noted that the NPLs are continuously decreasing since 2003, which is an encouraging sign for the future of the China's financial sector (He 2007).

The negative and statistically significant coefficient of interest rate is, in the case of Pakistan, which implies a negative relationship between fluctuation and interest rate. According to the repressonist school of McKinnon (1973) and Shaw (1973), R is positively correlated with savings in developing countries because the positive substitution effect dominates the negative income effect. That in turn increases the investment and then output. Hence a positive real interest may reduce the volatility in the macroeconomic variables and increase the pace of growth. In this case the negative income effect dominates. On the other hand, the results of China show, most of the time if no all, the positive sign but statistically insignificant.

The Table 1 provides another interesting insight. The contemporaneous correlation between R and LD is negative and very low in the case of China and Pakistan respectively. Moreover, R remained stagnant in the case of China and fluctuated, mostly, on the negative side in the case of Pakistan if we plot the interest rate in a graph. This suggests that there are fewer or riskier investment opportunities other than banks deposits. Therefore, people prefer to keep their savings in the deposit instead of any other instrument despite of the very low or even negative interest rates.

6 Summary and Policy Implications

The main objective of the present study is to analyze the finance-fluctuation nexus hypothesis in the case of Pakistan and China. We presented data description and chart analysis to create a motivation. We then tried to empirically test the hypothesis that financial development reduces fluctuation in the macro-economy. Our estimation strategy

¹⁴ In the case of Pakistan our result follows Kose et al (2003); but statistically insignificant, that higher financial development is associated with higher volatility in consumption.

consists of two parts. First we utilize the Campbell and Mankiw (1989) model to estimate the time varying friction of liquidity constrained agents (λ) and then estimate a relationship between λ and financial development indicators. Second we utilize ARDL framework by using the *LD* and *LC* as indicators of financial development. In both cases we find that increases in financial development reduce the macroeconomic fluctuation in both countries. However, in the case of Pakistan the result also follows Kose et al (2003); but statistically insignificant, that higher financial development is associated with higher volatility in consumption.

In a nutshell, on the basis of the above empirical evidences some interesting policy implication can be derived for both countries, specifically Pakistan and China, as well as for developing countries, in general. As noted, financial development reduces macroeconomic volatility in both countries. Therefore, a sound financial sector is important for both countries to mitigate the macroeconomic fluctuations. As we mentioned above that China's banking sector is providing a major chunk of its credit to SOBs and credit allocation of the China's SOBs is not very efficient. Furthermore, the higher rate of NPLs has prevented financial development from contributing to economic growth. If China carries on with the same unproductive loan expansion, then the growth of China's economy will be hampered.

Empirically, it is tested that financial controls tend to slow down the future financial development (Bekaert et al 2002). The control of interest rates and credit allocation by the government (as is happening in China), can create the problem of adverse selection and moral hazards. This may hamper the banks from taking into account credit risk and developing their institutional capacity to assess and manage risks. This in turn increases the risk of a financial crisis. Hence, it is essential that further institutional reforms should be introduced for more efficient allocation resources. The same is true for Pakistan. For a sound competition and profitable banking, it is essential to open the doors for private parties, local as well as foreign investors.

The moderate increase in *LD* in Pakistan suggests that the government of a developing country should maintain a liberal and positive real interest rate to enhance savings and investment. The importance of factors like trade, also reinforce the argument for a more liberal rate of interest. Importantly, the increase in deposits with low and negative interest suggests that there is a need for other financial instruments and a more developed stock market. Hence, developing countries should diversify their investment opportunities.

In addition, the main source of deposits of Chinese banks (*LD*) is the savings of its people (Aziz and Cui 2006). But the interest rates on the deposits are very low or even negative real interest in the presence of higher inflation. So, the share of interest earnings has declined over the years. This is leading, partially, towards the lower consumption in China. This reinforces the point that both countries should introduce liberal interest rate for the betterment of financial sector if they are really interested to compete in the WTO regime.

Appendix

Models for the Different Dependent Variables

A: Denizer et al (2002) Model for GDP Volatility as a dependent variable.

$$VotY_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 X_t + U_t \quad \text{A.1}$$

ARDL framework of the general model

$$\Delta VotY_t = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta VotY_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{3i} \Delta X_{t-i} + \delta_1 VotY_{t-1} + \delta_2 FD_{t-1} + \delta_3 X_{t-1} + U_t \quad \text{A.2}$$

Error Correction Representation

$$\Delta VotY_t = \alpha_0 + \sum_{i=1}^p \alpha_{0i} \Delta VotY_{t-i} + \sum_{i=1}^p \alpha_{1i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta X_{t-i} + \gamma EC_{t-1} + U_t \quad \text{A.3}$$

B: Denizer et al (2002) Model for GDP Volatility as a dependent variable.

$$VotI_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 X_t + U_t \quad \text{B.1}$$

ARDL framework of the general model

$$\Delta VotI_t = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta VotI_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{3i} \Delta X_{t-i} + \delta_1 VotI_{t-1} + \delta_2 FD_{t-1} + \delta_3 X_{t-1} + U_t \quad \text{B.2}$$

Error Correction Representation

$$\Delta VotI_t = \alpha_0 + \sum_{i=1}^p \alpha_{0i} \Delta VotI_{t-i} + \sum_{i=1}^p \alpha_{1i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta X_{t-i} + \gamma EC_{t-1} + U_t \quad \text{B.3}$$

C: Denizer et al (2002) Model for GDP Volatility as a dependent variable.

$$VotC_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 X_t + U_t \quad \text{C.1}$$

ARDL framework of the general model

$$\Delta VotC_t = \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta VotC_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{3i} \Delta X_{t-i} + \delta_1 VotC_{t-1} + \delta_2 FD_{t-1} + \delta_3 X_{t-1} + U_t \quad \text{C.2}$$

Error Correction Representation

$$\Delta VotC_t = \alpha_0 + \sum_{i=1}^p \alpha_{0i} \Delta VotC_{t-i} + \sum_{i=1}^p \alpha_{1i} \Delta FD_{t-i} + \sum_{i=1}^p \alpha_{2i} \Delta X_{t-i} + \gamma EC_{t-1} + U_t \quad \text{C.3}$$

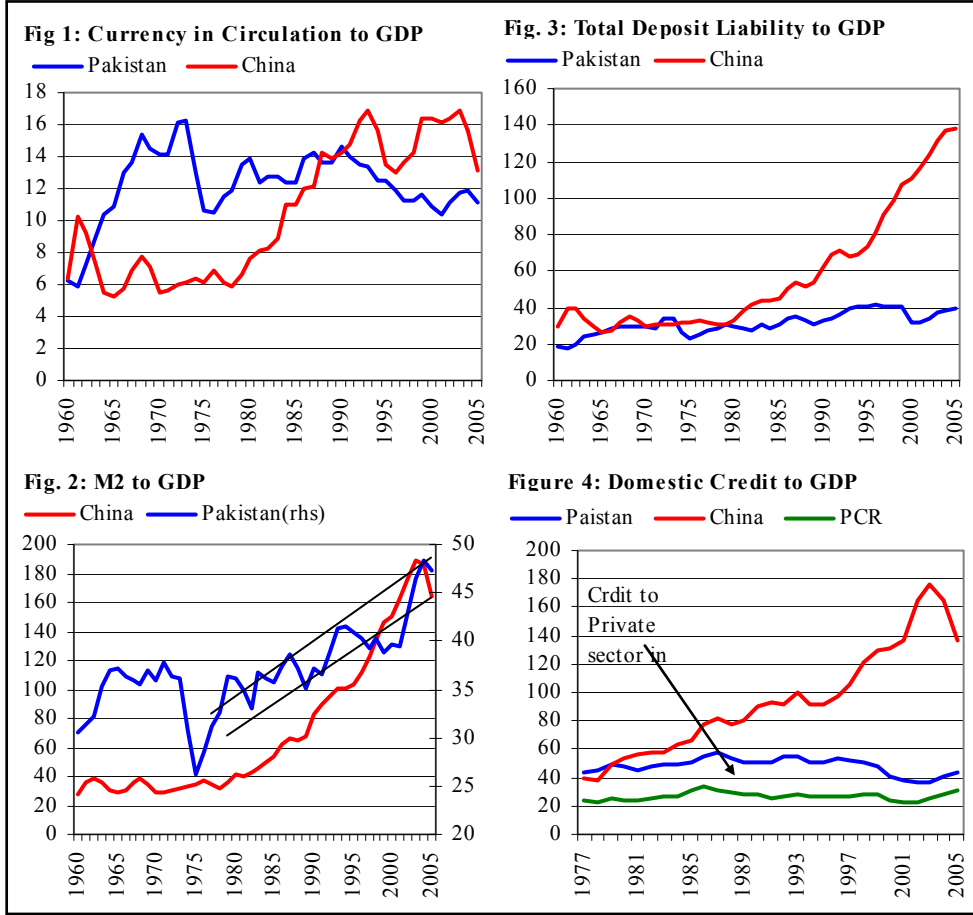


Figure 5: Volatility in Real percapita GDP

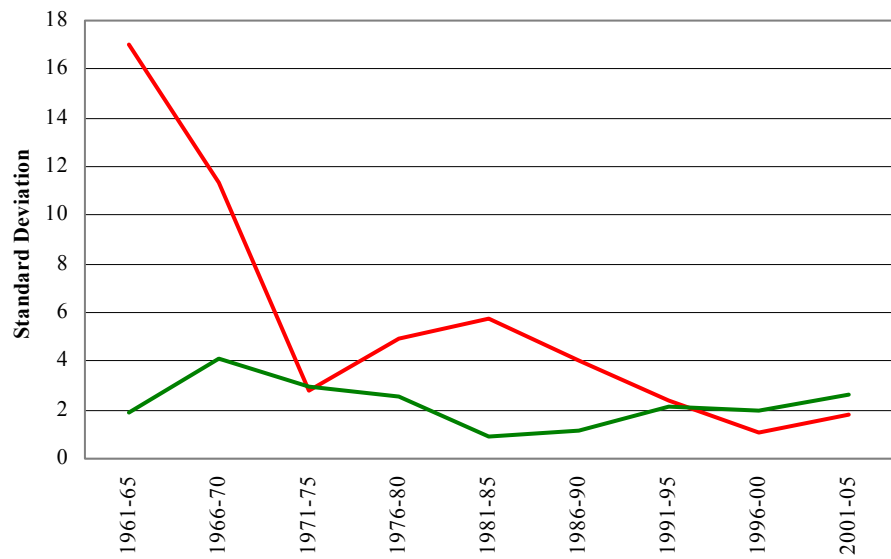


Figure 6: Volatility in Real percapita Investment

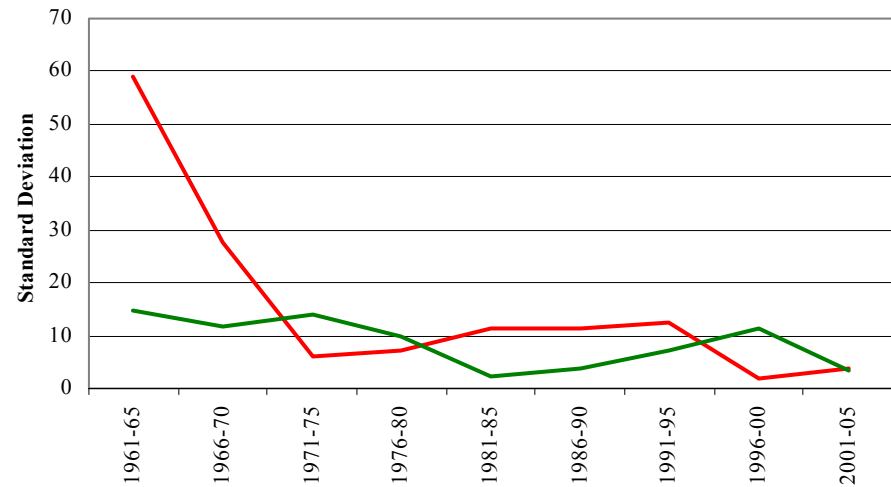


Figure 7: Volatility in Real percapita Consumption

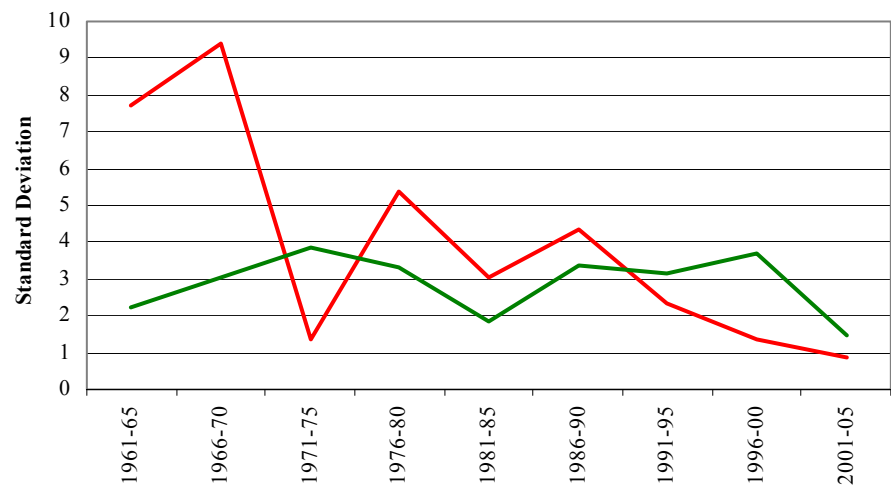


Table 1: Descriptive Statistics and Correlation Matrix

	Panel a		Pakistan			Correlation	
	Mean	Median	Maximum	Minimum	Std. Dev.	LD	LC
<i>Log of per capita real GDP</i>	9.841	9.850	10.400	9.300	0.326	0.811	0.518
<i>Log of per capita real Consumption</i>	14.221	14.299	15.262	13.151	0.638	0.794	0.496
<i>Growth of per capita real consumption</i>	0.050	0.046	0.171	-0.015	0.035	0.013	0.113
<i>Log of per capita real capital</i>	10.371	10.369	11.008	9.471	0.439	0.829	0.516
<i>Growth of per capita real GDP</i>	2.378	2.300	10.000	-2.700	2.452	-0.135	0.065
<i>Growth of per capita real capital</i>	3.496	3.547	9.812	-0.688	2.177	-0.527	-0.324
<i>Growth of real Investment</i>	6.323	4.587	43.318	-14.626	10.667	-0.464	-0.440
<i>VotY_t</i>	1.642	1.278	8.770	0.054	1.711	0.018	0.027
<i>VotC_t</i>	0.026	0.024	0.084	0.002	0.019	0.159	0.238
<i>VotI_t</i>	6.058	5.283	19.403	0.021	5.266	-0.407	-0.427
<i>R</i>	-2.639	-2.068	4.446	-26.035	5.559	0.266	0.378
<i>TR</i>	0.245	0.249	0.312	0.113	0.045	0.461	0.156
<i>BSC</i>	0.468	0.481	0.574	0.356	0.060		
<i>CPS</i>	0.251	0.257	0.335	0.112	0.044		
<i>M2GDP</i>	0.370	0.367	0.484	0.262	0.044		
<i>DLR</i>	0.313	0.306	0.414	0.180	0.060		
	Panel b		China			Correlation	
	Mean	Median	Maximum	Minimum	Std. Dev.	LD	LC
<i>Log of per capita real GDP</i>	7.657	7.450	9.200	6.400	0.855	0.953	0.970
<i>Log of per capita real Consumption</i>	7.819	7.753	8.996	6.693	0.715	0.947	0.973
<i>Growth of per capita real consumption</i>	0.086	0.084	0.208	-0.004	0.042	0.199	0.119
<i>Log of per capita real capital</i>	8.537	8.341	10.347	7.508	0.894	0.973	0.964
<i>Growth of per capita real GDP</i>	5.902	7.600	16.600	-26.400	7.415	0.168	-0.004
<i>Growth of per capita real capital</i>	6.486	6.320	12.428	-2.916	3.878	0.073	0.072
<i>Growth of real Investment</i>	10.829	10.746	72.949	-62.844	21.243	0.011	0.221
<i>VotY_t</i>	2.392	1.709	6.541	0.026	1.754	-0.470	-0.597
<i>VotC_t</i>	0.031	0.020	0.116	0.000	0.030	-0.044	-0.006
<i>VotI_t</i>	5.755	3.996	17.544	0.063	5.327	-0.348	-0.422
<i>R</i>	1.313	2.793	11.360	-13.120	4.652	-0.251	-0.007
<i>TR</i>	0.218	0.150	0.610	0.050	0.159	0.959	0.920
<i>BSC</i>	0.888	0.882	1.471	0.505	0.289		
<i>M2GDP</i>	0.719	0.442	1.885	0.271	0.499		
<i>DLR</i>	0.573	0.425	1.380	0.270	0.337		

Table 2: Income Weighted Time Varying Fraction of Liquidity Constrained Agents (λ)

Pakistan							
Dependent Variable: $GroC_t$				Dependent Variable λ			
	Constant	(λ)	R		Constant	FD	R
Coefficient	-0.041	0.886	-0.182	Coefficient	0.247	-2.227	0.013
t-value	1.141	5.669	-1.908	t-value	1.778	-2.066	0.901
Diagnostic Test							
R^2			0.530	R^2			0.584
DW			1.900	DW			1.751
Serial Correlation CHSQ(1)			0.44391(.505)	Serial Correlation CHSQ(1)			0.63419(.426)
Functional Form CHSQ(1)			2.5604(.110)	Functional Form CHSQ(1)			.0072356(.932)
Heteroscedaticity CHSQ(1)			4.7776(0.29)	Heteroscedaticity CHSQ(1)			0.35961(.850)
China							
Dependent Variable $GroC_t$				Dependent Variable λ			
	Constant	(λ)	R		Constant	FD	R
Coefficient	4.667	0.642	-0.198	Coefficient	0.675	-6.270	0.036
t-value	4.303	6.415	-1.565	t-value	3.766	-1.712	0.540
Diagnostic Test							
R^2			0.535	R^2			0.725
DW			2.026	DW			2.145
Serial Correlation CHSQ(1)			1.9385(.164)	Serial Correlation CHSQ(1)			.24558(.620)
Functional Form CHSQ(1)			0.45188(0.501)	Functional Form CHSQ(1)			.80964(.368)
Heteroscedaticity CHSQ(1)			0.39398(0.843)	Heteroscedaticity CHSQ(1)			1.5703(.210)

Table 3: Unit Root Tests

	Pakistan		China			Pakistan		China	
	ADF	k	ADF	k		ADF	k	ADF	k
$VotY_t$	-1.69	0	-2.13	0	$\Delta VotY_t$	-4.57	0	-5.11	1
$VotC_t$	-2.88	0	-1.45	2	$\Delta VotC_t$	-4.27	0	-3.97	2
$VotI_t$	-1.88	0	-1.99	2	$\Delta VotI_t$	-5.45	0	-6.44	1
LD	-2.43	2	1.66	2	ΔLD	-5.83	1	-6.03	1
LC	0.11	2	-1.75	0	ΔLC	-5.24	1	-3.60	1
R	-3.84	1	-5.06	1					
TR	-2.44	2	1.78	0	ΔTR	-7.59	0	-5.53	0
λ	-2.11	2	-1.64	1	$\Delta \lambda$	-6.44	1	-4.67	0

Table No: 4 Bounds Tests for the Existence of a Long Relationship

Country	F-statistic		1 % Critical bounds	
Pakistan				
Dependent Variable	LC	LD		
<i>VotY_t</i>	6.739	8.313	4.29	5.61
<i>VotI_t</i>	7.698	5.987	4.29	5.61
<i>VotC_t</i>	7.854	8.114	4.29	5.61
China				
<i>VotY_t</i>	5.362	7.214	4.29	5.61
<i>VotI_t</i>	7.417	8.965	4.29	5.61
<i>VotC_t</i>	6.965	5.996	4.29	5.61

source of critical values: Pesaran et al(2001)

Table No:5 Long Run ARDL Estimates (LC as a measure of Financial Development)

Regressor	Pakistan			China		
	Dependent Variables:					
	<i>VotY_t</i>	<i>VotI_t</i>	<i>VotC_t</i>	<i>VotY_t</i>	<i>VotI_t</i>	<i>VotC_t</i>
LC	-6.427 (-1.694)	-39.051 (-2.729)	14.424 (0.953)	-6.283 (-1.682)	-10.891 (-2.663)	-6.795 (-1.611)
R	0.177 (0.877)	-0.051 (-0.373)	-0.418 (-1.200)	0.228 (0.931)	-0.219 (-2.395)	0.081 (2.557)
TR	-28.576 (-2.164)	-41.682 (-2.609)	-109.140 (-1.711)	8.879 (0.861)	9.661 (0.212)	19.793 (1.692)
Intercept	13.018 (1.794)	36.149 (4.201)	28.004 (1.933)	6.241 (4.259)	54.073 (1.884)	27.476 (1.736)
ARDL Order Selected on the Basis of SBC						
	(1,2,2,0)	((1,0,1,0)	(1,0,0,0)	(1,1,0,0)	(1,0,0,0)	(1,0,1,0)
Diagnostic Test Statistics						
Serial Correlation CHSQ (1)	0.6060	0.8510	0.2900	0.5750	0.2950	0.9010
Functional Form CHSQ(1)	0.8280	0.8110	0.1840	0.8860	0.6110	0.5050
Normality CHSQ(2)	0.2530	0.7210	0.3390	0.2710	0.6210	0.9440
Heteroscedaticity CHSQ(1)	0.991	0.3180	0.1730	0.814	0.1480	0.3470

Table No:6 Long Run ARDL Estimates (LD as a measure of Financial Development)

<i>Regressor</i>	Pakistan			China		
	Dependent Variable:					
	<i>VotY_t</i>	<i>VotI_t</i>	<i>VotC_t</i>	<i>VotY_t</i>	<i>VotI_t</i>	<i>VotC_t</i>
<i>LD</i>	-7.227 (-3.952)	-8.783 (-7.783)	0.839 (0.318)	-5.022 (-2.343)	-35.250 (-2.767)	-9.314 (-1.964)
<i>R</i>	-0.072 (-2.105)	-0.183 (-1.735)	-0.136 (-2.262)	0.055 (0.559)	0.745 (1.438)	1.561 (1.906)
<i>TR</i>	-34.618 (-5.753)	-6.097 (-5.180)	-38.707 (-2.191)	9.921 (1.720)	-48.979 (-1.982)	42.061 (1.968)
<i>Intercept</i>	-14.591 (-2.764)	38.416 (1.072)	6.208 (1.702)	21.096 (3.119)	-92.722 (-2.311)	30.813 (1.761)
	ARDL order Selected on the basis of SBC					
	(1,0,0,2)	((1,0,0,0)	(1,0,0,0)	(1,1,0,0)	(1,0,0,0)	(1,1,1,0)
	Diagnostic Test Statistics					
Serial Correlation CHSQ (1)	0.6380	0.5080	0.6460	0.5800	0.2950	0.4810
Functional Form CHSQ(1)	0.4530	0.6800	0.9050	0.1900	0.6110	0.3470
Normality CHSQ(2)	0.1870	0.2650	0.1530	0.1120	0.6210	0.6930
Heteroscedaticity CHSQ(1)	0.647	0.4810	0.3780	0.268	0.1480	0.1600

Table No:7 Short Run ARDL Estimates (LC as a measure of Financial Development)

Regressor	Pakistan			China		
	Dependent Variable					
	$VotY_t$	$VotI_t$	$VotC_t$	$VotY_t$	$VotI_t$	$VotC_t$
ΔLC	-2.971 (-1.916)	-16.215 (-2.077)	2.768 (2.238)	-2.052 (-1.830)	-3.130 (-2.607)	-2.666 (-1.099)
ΔLCI	10.803 (3.332)	NA NA	NA NA	NA NA	NA NA	NA NA
ΔR	-0.026 (-1.773)	-0.021 (-3.714)	-0.080 -3.6939	-0.0386 (-1.823)	-0.0631 (-2.396)	0.0317 (0.577)
ΔRI	-0.047 (-2.259)	NA NA	NA NA	NA NA	NA NA	NA NA
ΔTR	-5.344 (-2.481)	7.9641 (1.678)	-20.9408 (-5.473)	2.8991 (1.936)	2.7768 (2.207)	20.4494 (2.671)
$\Delta Intercept$	2.435 (2.152)	15.0105 (2.504)	-5.3732 (-1.262)	2.0379 (1.581)	15.5414 (1.777)	10.7782 (1.916)
$ecm(-1)$	-0.187 (-1.681)	-0.4152 (-3.3573)	-0.1919 (-1.9620)	-0.3265 (-1.8380)	-0.2874 (-1.8944)	-0.3923 (-1.6969)
Diagnostic Test Statistics						
R-Squared	0.590	0.2977	0.65906	0.3749	0.6493	0.6356
R-bar-Squared	0.480	0.1912	0.59513	0.2260	0.5789	0.5177
F	7.189	3.4962	10.3096	3.1484	7.2368	2.6513
DW	1.840	1.8104	2.1061	1.8569	1.6898	1.9549
For Pakistan						
$ecm = \text{Vot}Y_t - 0.17691 * R + 6.4269 * LC + 28.5756 * TR - 13.0178$						
$ecm = \text{Vot}I_t + 0.050711 * R + 41.6816 * TR + 39.0514 * LC - 36.1488$						
$ecm = \text{Vot}C_t + 0.41768 * R - 14.4242 * LC + 109.1395 * TR + 28.0041$						
For China						
$ecm = \text{Vot}Y_t - 0.22775 * R - 8.8785 * TR + 6.2829 * LC - 6.2410$						
$ecm = \text{Vot}I_t + 0.21943 * R - 9.661 * TR + 10.8911 * LC - 54.0727$						
$ecm = \text{Vot}C_t - 0.08083 * R - 19.7928 * TR + 6.7951 * LC - 27.476$						

Table No: 8 Short Run ARDL Estimate (LD as a measure of financial development)

Regressor	Pakistan			China		
	Dependent Variables					
	$VotY_t$	$VotI_t$	$VotC_t$	$VotY_t$	$VotI_t$	$VotC_t$
ΔLD	3.377 (5.552)	-2.0965 (-3.772)	0.3888 (1.325)	-3.0151 (-1.983)	14.0621 (2.2691)	-12.1260 (-2.5603)
ΔR	-0.034 (-1.650)	-0.0438 (-2.7131)	-0.0628 (-2.7837)	-0.0516 (-1.9907)	0.2971 (1.8482)	0.0354 (1.5794)
ΔTR	-6.012 (-2.250)	-1.4553 (-0.1737)	-17.9413 (-4.0247)	5.9564 (1.2621)	-19.5391 (-1.9256)	12.0198 (2.2259)
ΔTRI	10.056 (2.939)	NA NA	NA NA	NA NA	NA NA	NA NA
$\Delta Intercept$	-6.819 (-3.691)	9.1698 (1.9940)	2.8773 (1.6837)	12.6661 (2.3737)	-36.9895 (-2.0665)	8.8055 (1.6761)
$ecm(-1)$	-0.467 (-4.332)	-0.2387 (-2.3143)	-0.4635 (-2.9153)	-0.6004 (-4.1465)	-0.3989 (-3.8258)	-0.2858 (-2.8411)
Diagnostic Test Statistics						
R-Squared	0.6272	0.4480	0.50291	0.4635	0.4344	0.3806
R-bar- Squared	0.557	0.3478	0.42759	0.3641	0.3284	0.2525
F	10.769	3.4771	6.6772	5.8313	4.0962	4.4557
DW	1.829	1.7035	1.6546	1.8560	1.8777	1.7563

For Pakistan

$$ecm = \text{Vot}Y_t + 0.071690 * R + 7.2264 * LD + 34.6182 * TR + 14.5913$$

$$ecm = \text{Vot}I_t + 0.18349 * R + 8.7832 * LD + 6.0967 * TR - 38.4159$$

$$ecm = \text{Vot}C_t + 0.13555 * R - 0.83890 * LD + 38.7070 * TR - 6.2077$$

For China

$$ecm = \text{Vot}Y_t - 0.054659 * R - 9.9207 * TR + 5.0218 * LD - 21.0959$$

$$ecm = \text{Vot}I_t - 0.74471 * R + 48.9791 * TR + 35.2497 * LD + 92.7223$$

$$ecm = \text{Vot}C_t - 1.56102 * R - 42.40610 * TR + 9.3138 * LD - 308132$$

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