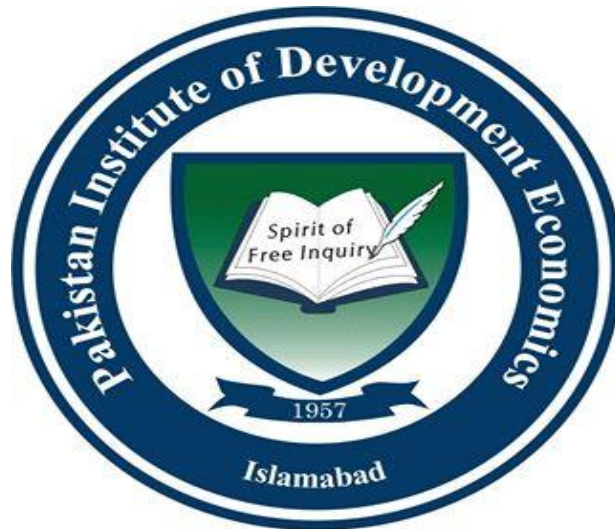**The Effect of International Financial Integration on Financial Contagion: A Case Study of Pakistan**

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Registration No. PIDE2016FMPHILEAF36

MPhil Economics and Finance

A Dissertation Submitted to the Pakistan Institute of Development Economics, Islamabad, in partial fulfillment of the requirements of the Degree of Master of Philosophy in Economics and Finance

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CERTIFICATE

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"And be patient; verily, Allah loses not the reward of the good-doers."

(Quran 11:115)

DECLARATION

*I, **Jamshed Ahmed**, solemnly declare that this dissertation entitled **"the effect of international financial integration on financial contagion: a case study of Pakistan"** submitted by me for the partial fulfillment of Master of Philosophy in Economics and Finance department, is my own effort under the complete supervision of my respected supervisor. Furthermore, this thesis has not been presented elsewhere for valuation or submitted simultaneously to any other university for any other degree.*

*
Jamshed Ahmed*

DEDICATION

To my family, who brought me here where I am today. Their love, affection, devotion, prayers, moral and financial support, especially when I was facing the peaks and valleys of my life, have been driving force for me to do something extraordinary.

ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Autoregressive Distributed Lag
ECM	Error Correction Model
FC	Financial Contagion
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
IFI	International Financial Integration
IMF	International Monetary Fund
MENA	Middle East and North Africa
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Square
RESET	Regression Equation Specification Equation Test
SBP	State Bank of Pakistan
SC	Schwarz Information Criteria
WDI	World Development Indicators

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ACKNOWLEDGEMENT

I express my greatest thanks to Almighty ALLAH, who has given me not only the opportunity but also the strength and courage to do this research work. My humble respect goes to the Holy Prophet Muhammad (PBUH), who is mercy to the whole universe.

First of all, I owe my deepest and sincere gratitude to my one of the most favorite teacher and respected supervisor Dr. Saud Ahmad Khan for his politeness, immense knowledge, guidance, motivation and patience which enabled me to complete this thesis.

I would like to thank my honorable teachers at Pakistan Institute of Development Economics (PIDE), especially, Dr. Asad Zaman, Dr. Arshad Hassan, Dr. Ahsan ul Haq, Dr. Ahmad Fraz, Dr. Hassan M. Mohsin, Dr. Abdul Jalil, Dr. Farhat Mahmood and Dr. Muhammad Jamil for their guidance, transfer of knowledge and consistent support during my period of study at PIDE.

Apart from my respected supervisor and teachers, I am thankful to my all family members for not only providing me the financial support but moral support as well. You have had always been very concerned in my studying. I will leave no stone unturned to make you feel proud of myself one day Insha Allah.

At last but not least, I am thankful to my friends and fellows, especially Ahsan Ijaz, Ameer Hamza Burki, and Shehryar Khan, with whom I have shared a very good time and who have been very motivational in the accomplishment of this dissertation.

ABSTRACT

International financial integration is perceived to strengthen the domestic financial system through accumulation of capital and advancement in information technology. However, international financial integration may also propagate the financial contagion through transmission of financial shocks. The study examines the impact of international financial integration on financial contagion in Pakistan using annual data from 1973 to 2017. It employs ARDL model framework that captures both the short run and the long run relationship through bound testing approach and error correction mechanism. Findings reveal that international financial integration has the negative and significant long run relationship with volatility of real effective exchange rate in Pakistan which is in line with the theory. The results also indicate that international financial integration has the positive and significant long run relationship with volatility of domestic credit which may pose threat of financial contagion in Pakistan. However, international financial integration has no relationship with volatility of inflation rate and volatility of real interest rate. The study suggests that Pakistan needs to enhance the international financial integration through deeper international portfolio diversification. In addition to that flexible exchange rate is also important to get potential benefits of international financial integration.

Keywords: International Financial Integration, Financial Contagion, ARDL

CHAPTER 1

Introduction

This study contributes to the literature on international financial integration and financial contagion or the global transmission of shocks. Effect of international financial integration is examined using data of foreign assets and liabilities for Pakistan. External liabilities divided into five main categories: foreign direct investment (FDI), portfolio debt investment, portfolio equity investment, derivatives and other investments, whereas assets are categorized into six parts: the same five as liabilities and official reserves. Hence, these data describe the total holdings by the domestic residents of financial claims on rest of the world, and nonresidents' claims on the domestic economy.

The process of international financial integration experienced a significant increase in 1970s in the developed countries and later on adopted by the developing economies during the 1980s and 1990s. After the mid-1990s, there has been a significant increase in the cross-border financial positions: the stocks of foreign assets and foreign liabilities have increased to around 172-189 percent of world GDP by 2016 whereas this ratio was between 74-77 percent in 1995 and the composition of international balance sheets has evolved substantially, Lane and Milesi-Ferretti (2017). Prior to the global financial crisis, the share of portfolio investments and banking sector positions expanded, however the portion of foreign direct investments (FDIs) in total financing of countries decreased.

Higher cross-border financial flows delivered many economic benefits, such as cheaper funding, more efficient allocation of capital for many countries, access to new markets and

risk sharing. However, at the same time, it led to greater external vulnerabilities in the economies that disproportionately relied on foreign inflows as a source for growth. The composition and size of the international financial positions can matter for the external adjustment and shock transmission. Countries with greater external vulnerabilities would be facing more pressure for adjustment during a shock. The financial interconnectedness and balance sheet information gives significant transmission mechanism by which international shocks can affect the value of total (foreign and domestic) financial assets and liabilities, through shift in international funding and liquidity, Lane (2015).

Mckinnon (1973) and Shaw (1973) underpin the theoretical bases by advocating that the market forces should decide the allocation of credit rather than control and intervention in the financial markets. The decrease in the investment and growth particularly in developing economies is caused by financial hurdles such as interest rate ceiling, higher reserve requirements and constraints in credit allocations.

The constrained and repressed financial markets lead to inefficient allocation of resources, lower savings, discourage investment, higher margin of financial intermediation and last but not least more segmentation in the financial markets. Hence, they provided a rational for the international financial integration to enhance return and mitigate the risk by diversification.

The increased international financial integration has been proceeded by greater private capital flows to the developing economies. Foreign direct investment and portfolio flows (i.e. bonds, equities and certificates) to emerging economies started increasing in the 1980s but accelerated after the 1990s. The diversification of risk internationally and opportunities

of higher returns have been the main reasons of increased international financial integration. Numerous economies encouraged capital inflows through dismantled restrictions, deregulated financial market, introduced reforms pertaining to the financial markets and improved domestic economic environment. This process, however, led to the financial volatilities and currency crisis during the second half of 1990s.

In many countries, Latin America, East Asia, and Eastern Europe, capital inflows are being encouraged through deregulation of domestic financial markets, dismantlement of controls and restrictions on capital outflows, improvements in their economic environment, and liberalization of the restrictions on foreign direct investment. In addition, demand of risk diversification and higher rate of returns by investors has increased the inflows of capital towards most attractive developing countries Agenor (2003). More importantly, higher number of financial institutions have been established in the developing nations, which has also been of great significance in the integration of financial markets of the developing nations with international financial markets.

Economic theory refers that financial integration helps to share risk across the countries, cross country efficient allocation of capital and hence increased investment. A stable, resilient, and sound financial system that can offset the financial shocks is result of deeper financial integration Devereux and Yetman (2010). Therefore, it is expected that deeper financial integration may not only facilitate the significant welfare and economic benefits but also promote the financial stability. However, financial crisis have indicated that deeper financial integration propagate the transmission of contagion risk to integrated markets.

The access to the world capital markets does not only allow the nations to get smooth consumption at the time of adverse shocks but also to maximize potential welfare benefits and growth from such international risk sharing. However, it is believed that reversal of capital flows and volatility risk can be a significant cost in case of highly opened capital account Obstfeld (1992). Concerns related to such reversals were increased after series of financial crisis including Mexican crisis in 1994, Asian crisis rooted by Thai baht's collapse in 1997, Russian crisis in 1998, Brazilian crisis in 1999 and financial crisis of 2007-8 triggered by the collapse of lehman brothers.

Williamson and Mahar (1998) document that both international and domestic financial integration are expected to be linked with costly financial crisis. Although all of the above crisis were triggered by some kind of misalignment, they managed to get attention to inherent risks of cross border transactions and contagion of financial markets for the economies with comparatively fragile financial system and weak supervision and regulatory mechanism. Hence, the main problem has been the identification of policy pre-requisites which can enable economies to exploit higher gains with minimum risks linked to financial integration.

International financial integration is believed to improve the domestic financial markets, through innovative technology and accumulation of capital, and hence fosters the economic growth. However, deeper financial integration causes risk of financial contagion which poses risk of instability in domestic financial system. Financial contagion refers to "the transmission of shocks or the spread of market disturbances, mostly on the downside, from one economy or region to another economy or region, a process recognized through

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co-movements in the exchange rates, sovereign spreads, capital flows and stock prices"
Dornbusch, Park and Claessens (2000).

Therefore, this study is carried out to examine the relationship of international financial integration and financial contagion in Pakistan so that transmission of shocks (if there is any) can be mitigated and maximum benefits of international financial integration can be attained through diversification in the global markets. It is important to ensure the stability in domestic financial system and identify the way forward.

1.1 Research Gap

It is obvious from the extensive literature that international financial integration has been studied for many years. There exist numerous studies that examine the relationship of stock markets, bond markets, portfolio investments, foreign direct investment (FDIs) and capital inflows on the financial contagion or transmission of financial shocks for example Fei (2009), Mollah et al. (2014), Luchtenberg and Vu (2015) etc. Further, most of the studies take single dimension to measure the financial contagion (i.e. inflation rate or domestic credit) which can lead to incomplete information.

In this study, foreign assets plus liabilities as percentage of GDP is taken as international financial integration which combines equity portfolio, debt portfolio, FDI, and capital inflows and financial contagion is measured through different macroeconomic variables i.e. real interest rate, inflation rate, domestic credit and real effective exchange rate. There is no single study in case of Pakistan that explores this phenomena. So, it is pertinent to carry out research work on this topic to get policy implications for stability of financial system as international financial integration does not only accelerate the financial

development and prosperity but also propagates the transmission of shocks Rejeb and Boughrara (2015).

1.2 Problem Statement

International financial integration is a two edge sword; it fosters the financial development because of openness to international competition which necessitate to espouse the international standards of financial regulations and reporting system but also transmits the financial contagion or financial shocks. Therefore, the study of financial contagion is imperative to avoid the instability in domestic financial system as a result of financial integration and take the complete benefit of international financial integration.

1.3 Objectives of the Study

The study has following research objectives:

➢ To examine the effect of international financial integration on financial contagion in Pakistan so that transmission of shocks, if any, can be mitigated.

➢ To identify the channels through which the financial contagion transmits in the domestic financial system due to international financial integration, e.g. whether international financial integration causes the volatility of inflation or domestic credit etc.

➢ The rationale behind this study is to provide impetus to the fiscal and monetary policies for the avoidance of contagion risk and way forward to take the potential benefits of international financial integration.

1.4 Research Questions

The objective of the study leads to the following research questions:

1. Does international financial integration cause financial contagion or transmission of financial shocks in case of Pakistan?
2. Hence, identify the channels (if there is any) which transmits the financial contagion in Pakistan as result of international financial integration?

1.5 Significance of the study

International financial integration can be used as a mechanism to transfer the contagion risk to other financially integrated countries at the time of crisis and achieve the financial stability through mitigation of systematic risk Devereux and Yetman (2010). After the global financial crisis 2008, Financial contagion has been critical topic for many studies because it is perceived as a real problem. This study examines that whether international financial integration of Pakistan has any effect on financial contagion or transmission of shocks and to examine the channels which may transmit risk to the economy. Four different macroeconomic variables are used to examine the transmission of shocks and identify the contagious channel that includes real interest rate, inflation rate, domestic credit and real effective exchange rate.

Hence, the study will help the authorities to design prudent monetary and fiscal policies to curb the contagious effect, if there is any, and stabilize the financial system and way forward for the international financial integration in Pakistan. In order to determine the effect of international financial integration on the financial contagion or risk, we drive the measures of financial contagion using standard deviation from several macroeconomic variables and then apply Autoregressive Distributed lags (ARDL) cointegration technique.

1.6 Organization of the Study

The study contains five chapters. First chapter gives introduction of the topic, research gap, objective, significance and organization of study. Second chapter consists of literature review, in which we discuss international financial integration and financial contagion then literature review of measures of financial contagion followed by Pakistan's review. In third chapter, we explain the econometric methodology as well as detailed descriptions of the variables. In chapter four, empirical results and analysis are given. In chapter five, we discuss the findings, policy suggestions and future directions.

CHAPTER 2

Literature Review

2.1 Introduction

The literature has been divided into distinct parts, first it discusses the international financial integration and financial contagion then financial integration and individual measures of financial contagion, i.e. interest rate, exchange rate, domestic credit and inflation rate. In the end, literature review of Pakistan in the context of international financial integration is discussed.

2.2 International Financial Integration and Financial Contagion

Lane and Milesi-Ferretti (2018) use dataset on external assets and liabilities for 212 nations for the period 1970 to 2015 to evaluate the international financial integration after financial crisis of 2007. Study identifies that growth in cross border position as percentage of GDP has decreased due to lower capital flows from and to developed economies, growth in the weight of developing countries in global GDP as these countries have lower value of external assets and liabilities than developed countries, and decrease in the cross country banking. However, FDI level has continued to increase unlike portfolio investment and other investments.

Korniyenko et al. (2018) study the linkage of global financial system and it vulnerability to financial shocks. Study Applies the novel multilayer network framework and links the debt and equity exposures across economies. This approach does not only help to identify the channels of transmission but also their higher order effects, which usually aggregate all

the claims and underestimate the extent and effect of financial contagion. It is argued that financial network is highly vulnerable to shocks from central countries that have relatively large financial system while role of Asian countries particularly China and Hong Kong SAR economies has also been increased.

Fei (2009) analyze the evolution of financial integration and contagion in the bond markets and international stocks. By focusing on the portfolio level integration, they conclude that small portfolios are less integrated with world than large portfolios. They are of the view that increased level of integration and conditional variance are best determinants for the identification of crisis period.

Devereux and Sutherland (2011) develop two-country model that credit market distortions in countries can lead to financial liberalization across the countries. Financial shocks and productivity shocks can bring macro risks in the countries. They examine three different level of international financial integrations between countries and established that both welfare and macroeconomic is subject to the type of financial integration. Results suggest that financial integration of both equity and bond markets creates significant positive co-movement across economies but welfare improvement is not confirmed, whereas financial integration of bond markets is expected to reduce welfare with higher consumption volatility at aggregate level.

Financial contagion is a systematic effect of one country's speculative activity in financial markets on the likelihood of similar activity in another country's financial markets. Financial integration has both advantages and disadvantages, since it enhances the financial stability and propagates financial crisis as well. Policies should be based on

developing institutions, establishment of market practices and rules, and development of financial markets at a multilateral level, Chiwira and Tadu (2013).

Financial contagion is result of financial shocks or instability, of the capital market. Using a spillover index, they find which shocks lead to contagion and their persistence, countries which are vulnerable, and moments of crowd effect in the investment sectors. Shock spreads may get fuel from the investor's reaction to shock, their behavior, and information asymmetry. According to this study, contagion issue is extremely important because it can propagate through numerous regions. It proves that Contagion risk is underestimated by the financial markets, which is generated by the linkages between countries Armeanu and Cioaca (2014).

Mollah et al. (2014) explore the financial market's contagion using vector error correction and DCC-GARCH models. Results validate the occurrence of contagion in financial markets during financial crisis. They also suggest that the crisis was commenced in the US market and its effects expanded to the other markets. Further, during period of crisis benefits from the diversification decreased among countries.

A wavelet-based approach is proposed by Gallegati (2012) to examine contagion during the US subprime crisis of 2007. After the separate identification of interdependence and contagion through wavelet, they assessed the occurrence of contagion in crisis and non-crisis periods. Results indicate that US subprime crisis had affected all the markets and Japan and Brazil were the only countries to be affected by contagion at all scales.

Luchtenberg and Vu (2015) aim in their study to analyze contagion effects and its determinants worldwide at the time of financial crisis of 2008. Increase in the cross market

linkages among financial markets was observed by controlling the crisis related volatility. Developed countries' financial markets received and transmit contagion, whereas emerging markets were not influenced by contagion effects during the global financial crisis, in contrast to precious crisis, of 2008. Results also show that country markets are greatly influenced by other country markets than regional markets.

Financial integration increases the probability of balance sheet crisis through higher global leverage for any country. Hence, significantly increases the level of contagion across the countries. Further, internationally integrated financial markets tend to have less severe crisis than that nonintegrated financial markets, Devereux and Yu (2014).

Financial integration can bring the global financial imbalances due to difference in the financial markets' development across the borders. Countries with greater financial markets' development tend to accumulate foreign liabilities in long lasting and gradual process. There is increase of risky assets and debt in the United States' net foreign asset position after 1980, mainly due to gradual international financial integration, Mendoza, Quadrini and Rios-Rull (2009).

Fratzscher (2012) argue that common shocks affected the capital flows significantly both in crisis as well as in the recovery phase, using factor model for portfolio capital flows of 50 countries. However, these effects have shown heterogeneous results for different countries. The reasons of heterogeneous effects are difference in the advancement of local financial institutions, macroeconomics strengths and country risks. Overall comparison indicated that usual factors or "push" factors were the main forces of capital flow in the

times of crisis, whereas country related determinants or "pull" factors have been main sources of global capital flows after crisis period.

Devereux and Yetman (2010) develop a specific model of international transmission of shocks as a result of cross portfolio holdings among leverage constrained investors. They are of the opinion that if there is no leverage constraint on investment, financial integration may have no effect on the international macro co-movement. However, with leverage constraint, a significant financial transmission channel which leads to a positive co-movement of production is evident. Further, type of financial integration is important for global co-movement in case of leverage constraint. Co-movement of the shocks is negative if trade is allowed only in bonds, not in equities, otherwise it reverses sign shocks.

Lane and Milesi-Ferretti (2003) aim to investigate the empirical characteristics of increase in international financial integration or international cross holdings of foreign assets and liabilities. They identify that increase in capitalization of stock market and goods trade are the two main covariates of increase in the level of international balance sheets.

You, Liu and Du (2014) provide evidence about the existence of financial contagion in the China by applying dynamic conditional correlation model. Volatility spillovers are effective throughout the financial markets and geographical proximity has great impact on increasing the volatility transmission. According to the results, financial openness contributes towards the higher transmission of international volatility and greater risk of contagion Rejeb and Boughrara (2015).

2.3 Financial Integration and Interest rate:

Financial integration has spillover effect through financial markets and evidence implies greater spillover in the OECD and European countries. These markets tend to affect the Interest rates as same as higher public debt affect it through crowding out effects Claeys et al. (2012).

Carvalho and Fidora (2015) depict that higher international holdings of the euro area bonds in the mid-2000s reduces the euro area long run interest rate by almost 1.55 percentage, as there were large capital flows into euro area during that period. These results are consistent with previous studies that report same effects of international bond buying on the US treasury yields.

By applying two country overlapping generation model, Von Hagen and Zhang (2014) argue that two financial frictions, i.e., incomplete markets and limited commitment, affect the stability of interest rate similarly under international financial autarky. Furthermore, complete capital mobility assists in mitigating these distortions.

Haynes (1988) Examine the data from Canada and US from 1960s, which supports the conventional argument that difference in the interest rate among countries lead to capital movements and simultaneous reduction of interest rate differentials is difficult to understand empirically. The study believes that these demonstrations can be feasible if the dynamics of adjustment are specified through simultaneous model. Further, monthly data supports the argument whereas quarterly data indicate no significant relationship between capital flows and interest rate.

Warnock (2009) are of the view that foreign capital inflows in the shape of purchases of US government bonds may have significant and economically huge effect on the long run interest rate. Further, it reduces the inflation expectations and volatility of interest rates in the long term. According to their results, in case of zero foreign inflows into the bonds of US government, long term rates would be 80 basis points higher.

The net effect of international financial integration has been the enhancement of the monetary policy effectiveness in the emerging and advanced economies Georgiadis and Mehl (2015). They suggest that output effects of strict monetary policy were stronger, around 40%, due to financial integration. Further, exchange rate flexibility is prerequisite for valuation effects in an economy.

2.4 Financial Integration and Exchange Rates:

Identification of fluctuations in the real exchange rate does not only measure the outcomes of economics polices but also guide the policy makers to moderate the harmful movements of real exchange rate Amor and Sarkar (2008). They suggest that real exchange rate is reduced by openness but international financial integration support to the volatility in real exchange rate. They encourage the improvement of flexibility in the exchange system of the South East Asia and South countries in order to pursue the sequential integration policy.

Obstfled (2004) claim that institutional deficiencies, such as liability dollarization and restrictions on the foreign currency borrowing, are the main reasons behind the limited gains of financial integration in the emerging countries. Moreover, fixed exchange rate causes the risk of crisis whereas more flexible regime has its own problems. As for as the floating exchange rate, some of the emerging countries successfully used the floating to

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relieve the market pressure while others exhibited fear of floating as the tradeoff risks currency crisis against excessive volatility.

Financial integration drives the real exchange rate in the long term in transition economies. Further, in the long run, financial integration depreciates the real exchange rate of transition economies, whereas under valuation in the MENA and overvaluation takes place in most of Asian and Latin America countries in the form of real exchange rate misalignment Caporale et al. (2009). Using a sample of 48 industrial countries and applying panel cointegration relationship, Ricci et al. (2008), establish that higher foreign assets can lead to real appreciation of exchange rates.

Brooks et al. (2004) study the impact of foreign direct investment and portfolio investment on the movements of yen and euro against dollar. Fluctuations in the euro against dollar are believed to be associated with net portfolio investment, whilst net foreign direct investments appear less important in tracking fluctuations in euro-dollar rate. Fluctuations in yen against dollar rate are rather tied to the conventional variables current account and interest differential instead of FDI and portfolio investment.

Combes et al. (2011) analyse the effects of private capital inflows on real effective exchange rate and assess the capability of flexible exchange rate to moderate the real appreciation of exchange rate. The results of panel cointegration indicate that private and public inflows tend to cause the real appreciation of exchange rate. Portfolio investment shows highest effect on the appreciation of real exchange rate among foreign direct investment and bank loans. During period of economic slowdowns, private transfers can help economies to deal with depreciation of real exchange rates. Since capital inflows tend

to appreciate real effective exchange rate, countries use policies for the reduction of loss of competitiveness. They find that flexibility in exchange rate can moderate the real appreciation of exchange rate and thus helps to mitigate the destabilizing effects.

Milesi-Ferretti and Lane (2004) Focus on the significance of exchange rate accustoming valuation channel: rates of returns on the stocks of foreign liabilities and assets are influenced by currency fluctuations, in addition to the traditional trade balance channel. According to their results, it raises many questions about optimal external capital structure and the benefits of valuation channel for adjustment.

Tille (2008) indicate that financial integration could lead to distinction welfare across the economies as a result of shock and how numerous characteristics may impact the result. According to their results, international financial openness affects the welfare differentials instead of trade openness. They emphasize that same composition of equity and bonds holdings across the borders matters as do the level of substitutability of goods produced in different countries and effect is sensitive to the level of exchange rate pass through.

Grilli and Roubini (1989) argue that the equilibrium of exchange rate relies on the amount of money employed for asset transactions. Second, under uncertainty, liquidity effect leads to the higher volatility of nominal as well as real exchange rate. Third, capital control through tax on foreign assets' acquisitions may lead to the higher exchange rate. Fourth, the equilibrium level of exchange rate is also effected from maturity structure of the public debt.

2.5 Financial Integration and Domestic Credit:

Lane and Mcquade (2013) investigate the inter-association of international capital flows and domestic credit growth over the period of 1993-2008. According to their results, domestic credit growth of European countries has no relationship with net equity inflows whereas strong relationship with net debt inflows. Further, current account balance is not a reliable indicator in measuring the relation between domestic credit and international capital flows. Results remain same when they extend sample to other advanced and emerging countries.

Bianchi (2011) claim that financial development is pre-requisite to address the credit constraint and generate welfare gains by diversifying the risk through international finance. Their results suggest that if the financial system is not developed then it may be like "throwing sand in the wheels of international finance".

To predict the banking crises, Alessi and Detken (2018) propose a system that warns before any crisis by gauging the aggregate leverage and excessive credit growth. By applying a latest classification tree ensemble technique, "Random Forest", they conclude that since all credit growths are not harmful for stability of financial system, all other conditioning variables are important.

Borio and Disyatat (2011) argue that main factor behind the financial crisis was not the more saving but the higher volatility of international financial and monetary system. Further, the monetary and financial regimes led to the asset price booms and unsustainable credit. Credit creation, an important character of monetary economy, plays pivotal role in this story.

2.6 Financial Integration and Inflation:

Ogbuagu and Ewubare (2015) analyze the impact of exchange rate stability and financial integration on inflation. Their results refer that exchange rate significantly and positively affects the inflation volatility, whereas financial integration has significant negative effect on the inflation and used to mitigate the inflation volatility.

Garali and Othmani (2015) identify the determinants of international financial integration in the MENA countries, and their results suggested that inflation rate has no impact on the financial integration.

Financial openness may lead to adverse macroeconomic shocks because of inflationary pressure emanating from the effect of higher capital inflows on domestic spending, Agenor (2001). Belke and Keil (2016) apply cointegration vector autoregression model to measure the impact of financial integration on various macroeconomic variables. According to their results, financial integration drives the commodity prices and the difference between prices of commodities and financial flows is met through global liquidity injection by central bank.

Brown et al., (2015) argue that credit dollarization is less influenced in the countries where banking sector integration is weaker. Lending structure of the banks of these regions was adjusted by inflation driven variations in currency composition of deposit inflows. Integrated banks can reallocate foreign exchange in the region where demand is higher. It can reduce the offloading of currency risks on unhedged firms and households, and provide them with choice of rebalancing the currency composition.

2.7 Pakistan's Review:

Ali and Afzal (2012) study the effects of the 2008 global financial crisis on the stock markets of the India and Pakistan. According to the results, financial crisis increased the volatility of Indian and Pakistani stock markets and had slight impact on the stock returns.

Effects of the economic growth, government consumption expenditure, financial and economic integration on the aggregate financial stability index measured by Nasreen and Anwar (2015). Using the pooled mean group and fully modified OLS estimator techniques, they conclude that economic integration and financial integration does not increase the financial stability of financial markets in the South Asian countries.

Rashid and Husain (2013) identify the effects of capital inflows on prices of the domestic commodities, exchange rate volatility and monetary expansion. They apply linear and nonlinear cointegration and granger causality tests in not only bivariate but in multivariate framework as well. According to their results, capital inflows have significant inflationary effect. Hence, suggest that capital inflows may be managed such that they should not make inflationary pressure.

Conclusion and Literature Gap

In this section, literature pertaining to the international financial integration and financial contagion is reviewed in detail. Overall, there are mixed results regarding the relationship of international financial integration with financial contagion. Some evidences show that financial integration improves the domestic financial system through higher capital inflows, technology transfer, information sharing and risk sharing, however, there are also evidences of risk of financial contagion or downward financial spillovers from developed

economies to developing countries which poses threat to the local financial system of developing economies.

Further, literature supports the theory that international financial integration depreciates the real exchange rate in the long term to correct the short term current account deficit and helps to mitigate the external pressure. While financial integration may lead to the financial contagion through volatility in the domestic private credit. It also has mixed results about the influence on inflation and interest rate.

Comprehensive review of literature shows that many studies have examine this phenomenon in other countries but most of them have incorporated single dimension, means study the effect of financial integration on one proxy that does not give the complete information and hence misguides. As for as Pakistan is concerned, there is no single study which discusses the impact of international financial integration on financial contagion. Therefore, it is pertinent to examine this effect to get policy implication for the financial integration and stability in the domestic financial system.

CHAPTER 3

Model Specification, Econometric Methodology and Data Analysis

3.1 Introduction

This section describes the econometric methodology to examine the effect of international financial integration on the financial contagion (i.e. volatility of inflation rate, volatility of domestic credit, volatility of real interest rate and volatility of real effective exchange rate). Also a brief introduction of the different sources, along with the description and nature of the variables is discussed in this section.

3.2 Econometric Model

In order to examine the effects of international financial integration on the financial contagion or risk, study drives the measures of financial contagion by calculating volatilities using the three-period moving average standard deviation from several macroeconomic variables which are usually used as single-dimension measures of financial contagion. Since single dimensionality does not incorporate the other dimensions, it can be a disadvantage and hence, gives the limited information. However, in this endeavor of measuring financial contagion, we strive to mitigate this limitation by using several proxies such as volatility of inflation rate, real interest rate, domestic credit and real effective exchange rate. The study then proceeds to examine the effect of international financial integration on financial contagion by employing Autoregressive Distributed lags (ARDL) cointegration technique.

So, our econometric model is as following:

$$FC_t = \alpha_0 + \alpha_1 IFI_t + \varepsilon_t \qquad (3.1)$$

In above model, FC_t refers to the financial contagion (i.e. volatilities of inflation rate, , real interest rate, domestic credit and real effective exchange rate) in each model at current time period whereas right hand side's IFI_t denotes the international financial integration. In addition to that, coefficient of international financial integration, α_1, can be positive or negative based on the estimations.

3.3 Estimation Procedure

Time series properties of the data are analyzed by applying order of integration or unit root test. In order to examine the unit root test, we apply Augmented Dickey-Fuller (ADF) test. For co-integration or long run relationship, we apply ARDL Bound testing approach. Details of these tests and procedures are as below.

3.4 Financial Contagion

We derive the measures of financial contagion by calculating volatilities using the three-period moving average standard deviation from several macroeconomic variables following Motelle and Biekpe (2015):

$$S.D_t = [1/m \sum_{i=1}^{m} (X_{t+i-1} - X_{t+i-2})^2]^{1/2} \qquad (3.2)$$

Where $m = 3$ and X denotes the underlying proxy for financial contagion.

3.5 Augmented Dickey-Fuller (ADF) Test for Stationarity

Since time series data are usually non-stationary at level or I(1), applying OLS (Ordinary Least Squares) gives us spurious relationship as coefficients become biased. Therefore, it is necessary to apply a stationarity test on data before estimations. To identify if there is unit root in the time series variable or not, a test was introduced by Dickey-Fuller (1979) on the below equation.

$$Y_t = \gamma Y_{t-1} + \varepsilon_t \qquad (3.3)$$

$$Y_t = \alpha_1 + \gamma Y_{t-1} + \varepsilon_t \qquad (3.4)$$

$$Y_t = \alpha_1 + \beta_t t + \gamma Y_{t-1} + \varepsilon_t \qquad (3.5)$$

Above mentioned three equations refer that Y_t is time series variable, ε_t is random error term and time trend is being referred by t. If the means, variance and covariance of any series are time-invariant, it is said to be stationary. Contrary, if it varies over the time then the series is not stationary or there is unit root problem. Dickey-Fuller test implies the null hypothesis that the series is non stationary or in the case, $H0: \gamma = 0$, whereas the alternative hypothesis is that there is no unit root in the series or $H1: \gamma < 0$. Furthermore, the series is believed to be explosive when $\gamma > 0$.

Dickey-Fuller test has an assumption of serially uncorrelated error term or residual. Therefore, if the residual is serially correlated then we need to go for Augmented Dickey-Fuller test proposed by Dickey-Fuller (1981) that is augmented version of Dickey-Fuller test and has same null and alternative hypothesis. Augmented Dickey-Fuller test includes the lagged-difference of the dependent variable (ΔY_{t-i}) on the right side of equation.

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Moreover, ADF test is better than simple Dickey-Fuller to handle the complex and larger time series model. The ADF is written as below:

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \qquad (3.6)$$

$$\Delta Y_t = \gamma Y_{t-1} + \alpha T + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \qquad (3.7)$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \qquad (3.8)$$

$$\Delta Y_t = \alpha_0 + \alpha T + \gamma Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \qquad (3.9)$$

Where $\Delta Y_t = Y_t - Y_{t-1}$, $\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$ and ε_t is purely white noise error and T is component of trend.

Deterministic trend can also be used in ADF coefficient test which is shown in equation (3.7) and (3.9). Traditionally trend component is dealt by detrending the data through OLS and then applying unit root to detrended series.

3.6 Cointegration

Cointegration keeps the long run information intact while modeling the time series. It examines how time series variables, which may be individually not stationary and drift away from equilibrium, can be paired such that equilibrium forces do not let them go far apart. There are numerous tests that can be applied to check the cointegration such as Engle & Granger (1987), Johansen & Juselius (1990), and Autoregressive Distributed Lags (ARDL) cointegration technique. However, the former two tests of cointegration can be

applied only when all the variables are I(1) or stationary at first difference, whereas the third one (i.e., ARDL) may be applied even if variables are stationary at first difference or I(0), or combination of both. In this study some variable are stationary at level and other are I(1), so we apply ARDL cointegration technique. Further, to validate the existence of long run relationship, we use the ARDL Bound Testing Approach.

3.7 ARDL Bound Test

To evaluate the long run equilibrium relationship, Pesaran & Shin (1995), Pesaran et al (1995), and most importantly Pesaran et al (2001) gave detailed idea of the ARDL bound testing approach. It has numerous merits over other cointegration techniques. First, there is no need to check the order of integration as time series variables most of the time are integrated of either order one or I(0). Second, ARDL catches the data forming process from general to specific modeling context by incorporating the enough number of lags. Third, ARDL helps to acquire the Error Correction Model (ECM) through linear transformation which shows the adjustment or speed of convergence of any short run shocks toward the long run equilibrium. Since ARDL is estimated on a single equation setup, it estimates and draws results more clearly and easily. It is more suitable cointegration technique in case of small sample than those of others. It does not consider the residual correlation, so endogeneity is not an issue at all in ARDL technique.

Our model can be written in ARDL framework as below:

$$\Delta FC_t = \alpha + \sum_{i=1}^{n1} \beta_i \Delta FC_{t-i} + \sum_{i=0}^{n2} \gamma_i \Delta IFI_{t-i} + \delta_1 FC_{t-1} + \delta_2 IFI_{t-1} + \varepsilon_t \qquad (3.10)$$

Both short and long run relationship effect is displayed simultaneously in the equation (3.10). The estimated slope coefficients of the first differenced variables (i.e., β_i, γ_i) show the short run effects. For instance, estimated value of γ_i will capture the short run effect of international financial integration on the financial contagion or risk. Likewise, long run effect is captured by δ_2, normalized on δ_1.

ARDL estimation process has two steps. First, appropriate lags of all the variables are selected, through lag selection criteria, to calculate the parameters of short and long run dynamics. Second, bound test is applied to validate the presence of long run equilibrium relationship among the variables. ARDL bound cointegration technique does not require to check the unit root before its applications as most of the macroeconomics variables are either stationary at level or I(0). However, we can apply unit root test to make sure that no variables is I(2) or higher order because if any or all of the variables are stationary at I(2) or higher order, bound cointegration technique cannot be applied. Bound testing is applied by using the F-statistics.

The null hypothesis of non-existence of long run relationship can be defined as:

H0: $\boldsymbol{\delta_1 = \delta_2 = 0}$ (null i.e. there is no long run relationship)

Whereas, the alternative hypothesis of bound cointegration technique can be defined as:

H1: $\boldsymbol{\delta_1 \neq \delta_2 \neq 0}$ (Alternative i.e. there is long run relationship)

If the bound testing approach of cointegration verifies the existence of cointegration then error series or residual is obtained by estimating the static long run model. The lag of residual term estimates the short run dynamics and speed of convergence or adjustment, and it is also called the error correction mechanism. Error Correction Model should be

highly significant and negative for the long run convergence after short run shocks. At last, some diagnostic tests such as stability test, normality test, autocorrelation and heteroscedasticity tests are applied.

3.8 Error Correction Model (ECM)

Error Correction model estimates the speed of convergence. It simply explains how much disequilibrium is being adjusted in single period. For convergence or adjustment, coefficient of ECM must be negative and highly significant. Let's assume that ECM is -0.92, it means 92 percent convergence is being taken place in one year.

Below is ECM model of ARDL technique. ECT_{t-1} is referred as error correction term, it shows the pace of adjustment towards long run equilibrium in the model or it can be said that it measures how much disequilibrium is being adjusted in single period towards the long run equilibrium following the short term shocks.

ECT equation is derived as following:

$$\varepsilon_t = FC_t - \alpha_0 - \alpha_1 IFI_t \qquad (3.11)$$

Lagging ε_t in above equation will be as following:

$$\varepsilon_{t-1} = FC_{t-1} - \alpha_0 - \alpha_1 IFI_{t-1} \qquad (3.12)$$

Now the first linear lagged variables in equation (3.10) is replaced by ε_{t-1} which yields the ECM as follows:

$$\Delta FC_t = \alpha + \sum_{i=1}^{n1} \beta_i \Delta FC_{t-i} + \sum_{i=0}^{n2} \gamma_i \Delta IFI_{t-i} + \delta ECT_{1-1} + \varepsilon_t \qquad (3.13)$$

Hence, in order to make the convergence towards the long run equilibrium, in above equation error correction term's coefficient (i.e. δ) should be negative and highly significant.

3.9 Diagnostic Tests

Diagnostic tests are applied to check whether estimated models are valid or not. Diagnostic tests we apply in this study to validate the models are Ramsey test, serial correlation test, and ARCH-LM test. Serial correlation of error term or residual is validated through Brush-Godfrey (1981) Langrange Multiplier (LM) test with null hypothesis of non-existence of serial correlation.

Moreover, we apply Engle (1982) ARCH test to check the Autoregressive Conditional Heteroscedasticity in the residual term.

3.10 Data Sources

This study examines the annual data collected from State Bank of Pakistan, World Bank's data base world development indicators (WDI), and international monetary fund (IMF). The data will cover a period spanning 1973 to 2017 with an annual frequency. The brief overview of the data is discussed below:

3.11 Description and Construction of the Variables

This section briefly gives an idea about the description and construction of variables which are being used in this study. Furthermore, the data collection sources are also explained.

3.11.1 International Financial Integration

To measure international financial integration of Pakistan, study uses sum of foreign assets and liabilities as a percentage of GDP, following the Lane and Milesi-Ferretti (2007) and Lane and Milesi-Ferretti (2018).

$$\text{IFI} = \frac{FASSETS + FLIABILITIES}{GDP}$$

The data presentation follows the standard decomposition of assets and liabilities according to the Balance of Payments Statistics Manual 6. Assets and liabilities are divided in the following categories: foreign direct investment; portfolio equity; portfolio debt; other investment; and financial derivatives; plus foreign exchange reserves on the asset side. Existing evidence indicates that this measure is more close to the concept of international financial integration as it includes both the ability of domestic agents to invest and borrow from the foreign countries and foreigners to lend and invest into the domestic country Brezigar-Masten et al. (2008) and Brezigar-Masten et al. (2011).

Furthermore, this is the most robust and aggregated measure of financial integration than others such as gross capital formation, foreign direct investment, portfolio investment etc. The data of international financial integration has been taken from the State Bank of Pakistan and Lane and Milesi-Ferretti (2018).

Figure 3. 1 Time Series Plot of International Financial Integration
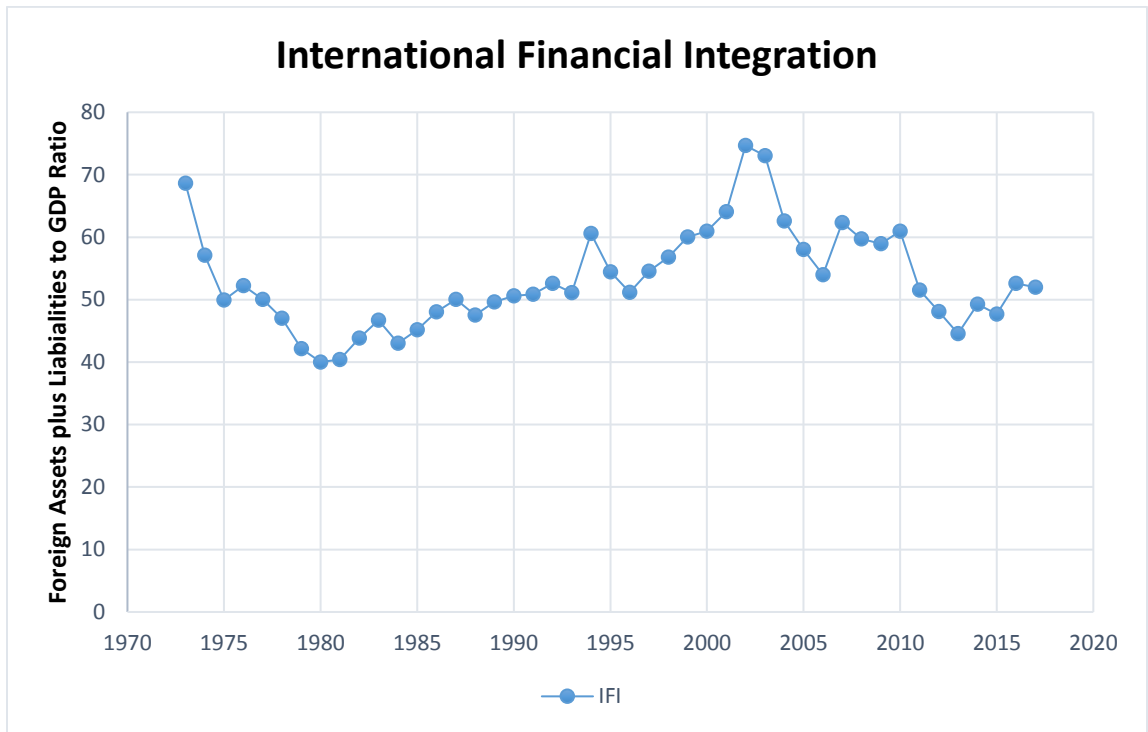
Figure 3.1 shows the international financial integration of Pakistan for the period of 1973 to 2017. The international financial integration is close to the 70% of its GDP in 1973 but then there is significant declining trend until 1980, where it is about 40%. Upward trend can be observed from 1981 to 2002, where it is around 75% (highest of all times). However, again there is downward trend after 2002.

3.11.2 Inflation Rate

The data for inflation rate has been extracted from the World Bank's data base, world development indicators (WDI). Since the inflation rate is believed to be linked with the high interest rate, it may adversely affect the banking and economic system through macroeconomic mismanagement. We use the volatility of inflation rate to determine the macroeconomic risk following the Motelle and Biekpe (2015).

Figure 3. 2 Plot of Volatility in Inflation Rate
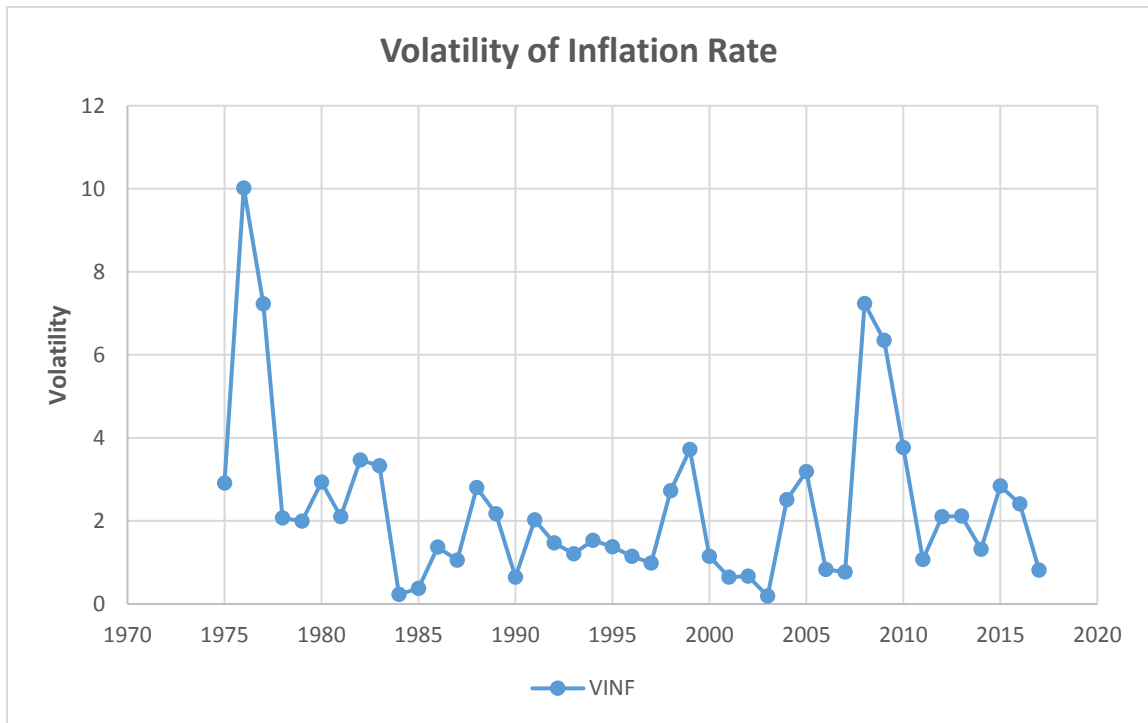
Figure 3.2 displays the time series plot of volatility in inflation rate from 1975 to 2017 for Pakistan. There is normal trend in the volatility of inflation rate except 1975, 1976 and 2008 where a higher volatility in inflation rate is observed. Higher volatility in inflation rate in 2008 is due financial crisis.

3.11.3 Domestic Credit

High domestic credit is considered as the primitive determinant of fragility in the banking system. It has been observed that ratio of domestic credit usually rises in the initial stage of banking crisis. In the later stage, central bank starts injecting money to the banks to manage the financial situation as the crisis becomes obvious. The data for Domestic credit to private sector has been collected from the World Bank's data base, world development indicators (WDI). Volatility of domestic credit is used to measure the macroeconomic risk following the Motelle and Biekpe (2015).

Figure 3. 3 Plot of Volatility in Domestic Credit
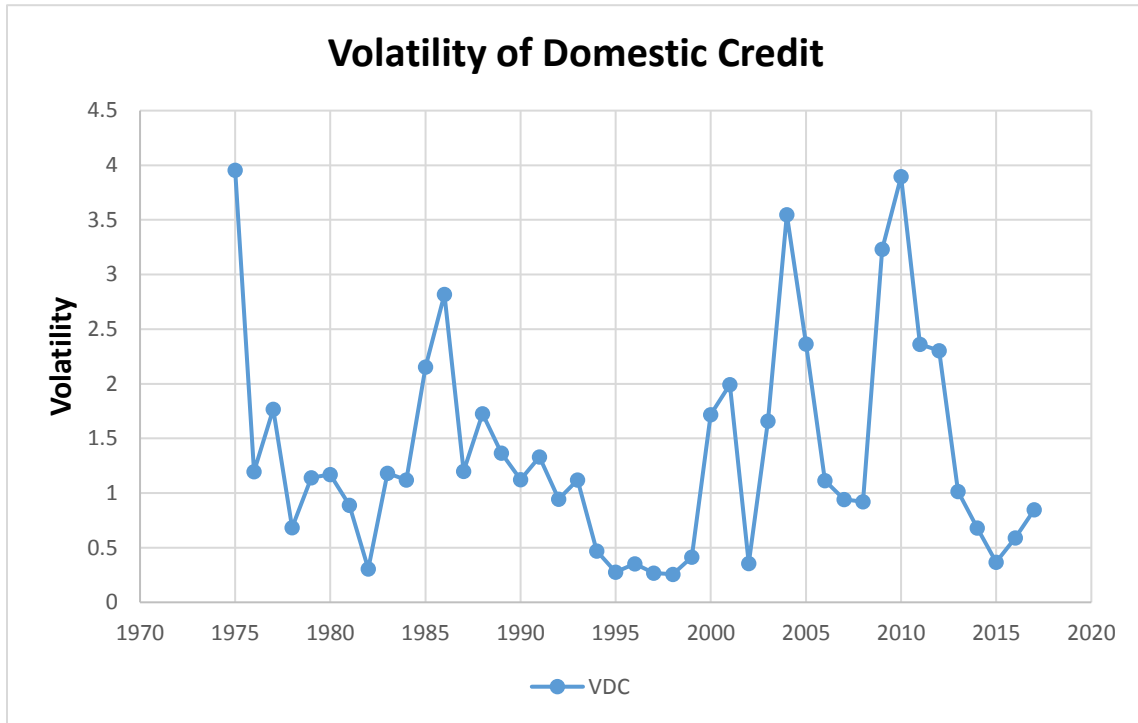
Figure 3.3 shows the time series plot of volatility in the domestic credit to private sector for the period of 1975 to 2017 for Pakistan. Domestic credit shows higher volatilities, e.g. in 1986, 2004 and 2010 etc.

3.11.4 Real Effective Exchange Rate

Real effective exchange rate refers to the value of domestic currency against the weighted average of currencies of the major trading partners, where weight is determined based on the total trade (imports plus exports) with particular country, which is adjusted to the inflation effect. It is generally considered as the measure of international competitiveness. It is a proxy for under or over valuation. Overvalued real effective exchange rate tend to provide impetus to the financial crisis. Hence, volatility of effective real exchange rate is measured to determine the risk of loss of export competitiveness or reversal in capital flows. Data for the real effective exchange rate has been collected from the State Bank of

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Pakistan. Volatility of real effective exchange rate is used to measure the financial contagion following the Amor and Sarkar (2008), Calderon (2004b) and Corporale et al. (2009).

Figure 3. 4 Plot of Volatility in the Real Effective Exchange Rate
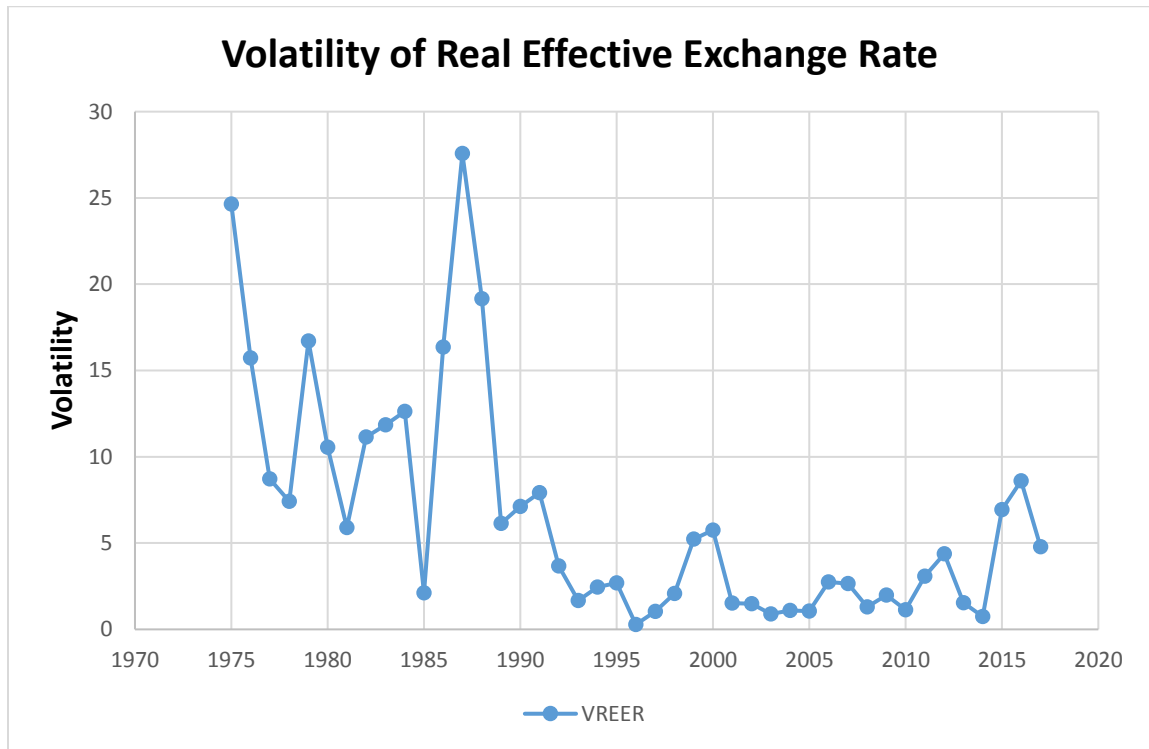
Figure 3.4 displays the time series plot of volatility in the real effective exchange rate from 1975 to 2017 for Pakistan. Pakistan's exchange rate was shifted from the fixed or pegged exchange rate to managed floating exchange rate in the year 1982. Then it shifted from managed floating to floating rate in 2000. There is decreasing trend in the volatility of real effective exchange rate as it more volatile in the initial years. However, there is a considerable increase in the volatility in the 2015 and 2016.

3.11.5 Real Interest Rate

Real interest rate is measured as nominal interest rate minus inflation. It is expected to be the proxy financial liberalization. High real interest rate indicates the liquidity crunch or has been enhanced to fend off a speculative attack. Hence, volatility of real interest rate is measured to evaluate the probability of default risk following Motelle and Biekpe (2015). The data for the real interest has been taken from the State Bank of Pakistan.

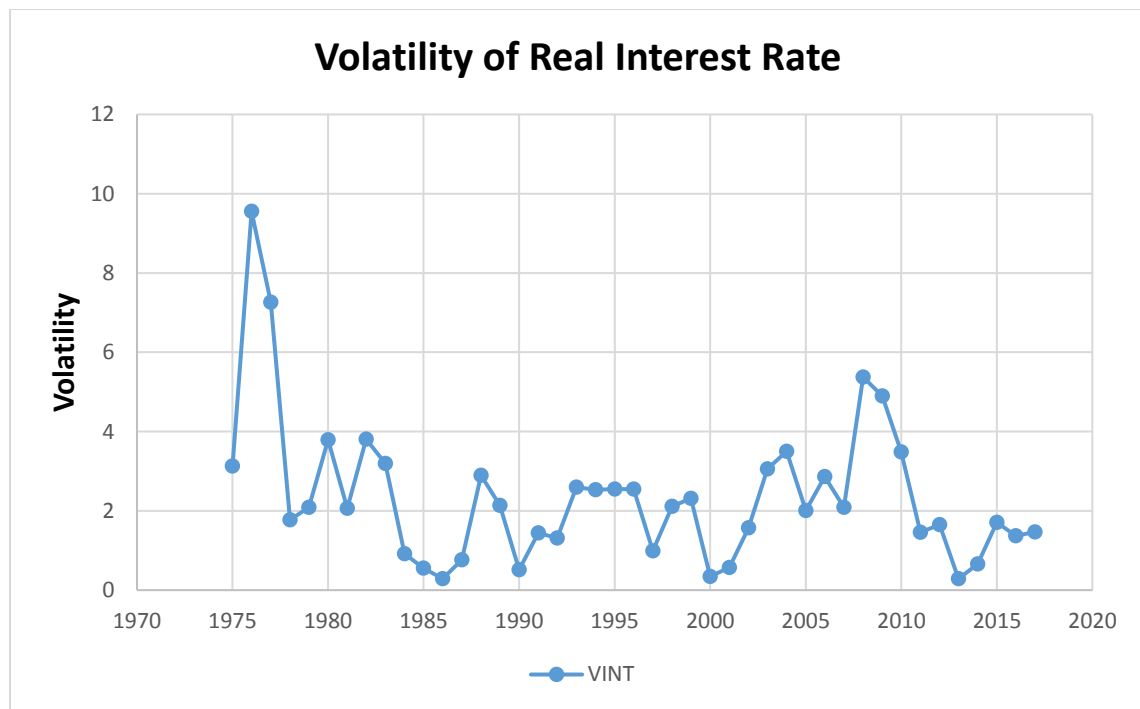**Figure 3. 5 Plot of Volatility in the Real Interest Rate**

Figure 3.5 displays the plot of volatility in the real interest rate from 1975 to 2017 for Pakistan. Just like inflation rate, real interest rate has also more or less same volatility through the history except 1976, 1977 and 2008 where higher volatility is observed.

CHAPTER 4

Empirical Results and Discussion

4.1 Introduction

In this section we discuss the empirical results of our study titled "the effect of international financial integration on financial contagion: a case study of Pakistan" over the period of 1973 to 2017. In order to avoid the spurious result, we start with the examination of stationarity of all variables through ADF unit root test. Since the ARDL cointegration technique is very sensitive to the lags selection, different lag selection criterions are used to select the optimal lags such as Akaike information criterion (AIC), Schwarz information criterion (SC) etc. Once the optimal lags are selected, ARDL bound cointegration technique is applied which does not only obtain the long run relationship but also the short run relationship along with error correction term that indicates the possibility of convergence towards the long run equilibrium in the aftermath of short run shocks. In the last, we discuss some diagnostic tests such as tests of autocorrelation and heteroscedasticity.

4.2 Unit Root Test

Unit root test or checking the stationarity of the variables is pre-requisite before applying any cointegration test as it may provide spurious results without analyzing the order of integration of estimating model. There are numerous tests of unit root examination such as Phillip-Parron (PP), KPSS (1992) and ADF test. In this study we use Augmented Dickey

Fuller (1981) test as it has been frequently used in the empirical literature and considered more reliable.

While applying the ADF test, we include the constant and trend or constant if they both or only constant is significant. The results of ADF tests are given in the table (4.1). According to the results, international financial integration (**IFI)** becomes stationary after the first difference or I(1) at 1 percent significant level and constant is significant. Inflation rate volatility (**VINF**) is stationary at level or integrated of order zero at 1 percent significance level and with constant significant. Interest rate Volatility (**VINT**) is also stationary at I(0) at 1 percent significance level and it has significant constant value. Real effective exchange rate volatility (**VREER**) is stationary at level or I(0) at 1 percent significance level. Domestic credit volatility (**VDC**) is integrated of order zero or I(0) at 1 percent significance level along with significant value of constant.

Table 4. 1 Stationarity Test of the Variables

Variables	Constant/Trend	I(0)	I(1)	Order of Integration
IFI	C	-1.962	-6.254***	I(1)
VINF	C	-6.182***		I(0)
VINT	C	-3.616***		I(0)
VREER		-2.969***		I(0)
VDC	C	-4.413***		I(0)

Note: T=trend, C=constant, * refers to the significance at 10 percent, ** significance at 5 %, and * significance at 1 %.**

Above results indicate that all dependent variables are stationary at level or I(0), whereas independent variable, (i.e. international financial integration (IFI)), becomes stationary after first difference or I(0). Moreover, no variable is stationary at I(2) or greater level. Hence, it becomes evident that pre-requisite of the ARDL bound cointegration technique has been fulfilled as there is no variable which is integrated of 2 or higher order. Therefore, we can apply ARDL bound cointegration technique to get both the long run and short run analysis along with error correction term.

4.3 Auto Regressive Distributed Lag (ARDL) Approach

Since the ARDL cointegration technique is very sensitive to the lags selection, different lag selection criterions are used to select the optimal lags such as Akaike information criterion (AIC), Schwarz information criterion (SC) etc. The results of lag selection are

given in the table (4.2). We have four models in which independent variable or IFI (international financial integration) is same for all the models, whereas dependent variables vary in each model that are; VINF (inflation rate volatility) in the first model, VINT (real interest rate volatility) in second model, VEER (real effective exchange rate volatility) in third model, VDC (domestic credit volatility) in fourth and last model. Based on the different lag selection criterions, we select 3, 1, 1 and 1 lag for first, second, third and fourth model respectively.

Table 4. 2 Selection of Optimal Lags Length

Model	Endogenous Variable	Exogenous Variable	Optimum Lags
1	VINF	IFI	3 Lags
2	VINT	IFI	1 Lags
3	VREER	IFI	1 Lags
4	VDC	IFI	1 Lags

Now ARDL bound cointegration technique can be applied to fulfil our main objective of validating the effect international financial integration on financial contagion in case of Pakistan.

4.4 ARDL Bound Testing Approach

In order to apply the ARDL technique, first we need to examine long run relationship. Since we have four dependent variables (i.e. Inflation rate Volatility, Real Interest Rate Volatility, Real Effective Exchange Rate Volatility and Domestic Credit Volatility) and

one independent variable (i.e. International Financial Integration), we will apply four models of bound test to check the pair-wise long run relationships among variables.

This approach is used to examine the long run relationship among different variables. It has two bounds, the upper bound which considers that variables are integrated of order one or I(1) and the lower bound which considers that variables are integrated of order zero or I(0). This approach may be applied to test the null-hypothesis of no cointegration H0: $\sigma_i = 0$, against the alternative hypothesis of existence of long run relationship or cointegration H1: $\sigma_1 \neq 0$, where i=1,2,3,.. If the calculated F-statistics is above the upper bound, it indicates the existence of cointegration or long run relationship. On the other hand, if the value of calculated F-statistics is below the lower bound value it indicates that there is no cointegration or long run relationship among the variables. The values between the upper and lower bands are inconclusive.

Table 4. 3 ARDL Bounds Test for Co-Integration

Model	Dependent Variable	Independent Variable	Test Statistics	Value	K
1	VINF	IFI	F-statistics	1.891	1
2	VINT	IFI	F-statistics	2.512	1
3	VREER	IFI	F-statistics	**6.090**	1
4	VDC	IFI	F-statistics	**9.268**	1

Critical Value Bounds

Significance Level	I(0)	I(1)
10%	3.02	3.51
5%	3.62	4.16
2.5%	4.18	4.79
1%	4.94	5.58

The results in the table (**4.3**) indicate that the values of calculated F-statistics of model 1 and 2 are below the lower the bound, which implies that null hypothesis of no cointegration cannot be rejected in case of model 1 and 2. F-statistics of model 3 and 4 are above the upper bound even at 1% significance level and implies that null hypothesis of no cointegration is rejected. Therefore, on the basis of calculated F-statistics we may conclude that there exists cointegration in case of model 3 and 4 which means international financial integration has long run relationship with volatility of real effective exchange rate and volatility of domestic credit, whereas it has no cointegration with volatility of inflation rate

and volatility of real interest rate. The reason of no relationship in case of model 1 and 2 is lower level of international financial integration and most importantly the government interventions in the inflation and interest rate adjustments. Hence, we can estimate long run coefficients of model 3 and 4.

Table 4. 4 Long-Run Coefficients Estimated through ARDL models

Models	Dependent Variable	Independent Variable	Coefficients
3	VREER	IFI	-0.3524 (0.0585)
4	VDC	IFI	0.0441 (0.1032)

P-values are given in the parenthesis

Table 4.4 shows the long run coefficients of two models (i.e. model no. 3 and 4) as model 1 and 2 have no cointegration according to the ARDL bound test approach. The long-run coefficient of model 3 confirms the theoretical prediction (see Obstfeld, 1984, Gavin, 1992) in case of Pakistan that international financial integration has negative effect on the Volatility of real effective exchange rate and it has statistically significant value. This implies that 1% increase in international financial integration leads to long run 0.35% REER depreciation in Pakistan.

According to the theory, international financial integration must help the developing countries to reduce volatility but the empirical studies argue that developing countries could not manage to reach the potential benefits of a financial integration. Lower exchange rate volatility is deemed to be the determinant of economic welfare. Approach to international markets provides with better opportunities for the nations to share macroeconomic risks and hence reduce uncertainty. Theory suggests that to correct the short term current account deficit, long run negative impact of international financial integration on real effective exchange rate for REER depreciation is pre-requisite, therefore, Marshall-Lerner condition holds in emerging economies. This result is consistent with Hooper and Morton (1982), Obstfeld (1982), Corporale et al. (2009) and Gavin (1991).

As for as the long run coefficient of fourth model is concerned, it indicates that international financial integration has a positive and significant impact on the volatility of domestic credit at 10% of significant level. The theoretical effect of the international financial integration on the volatility of domestic credit depends on various factors, including the composition of financial integration, specialization, and quality of the economic structure, especially the financial system. For instance, if the international financial integration is associated with a less developed financial system, this could lead to a higher volatility.

The result implies that 1% increase in the international financial integration of Pakistan, increases the volatility of domestic credit to private sector by 0.04%. Therefore, this result indicates that since international financial integration affects the volatility of domestic credit positively, authorities should not undermine the importance of effective credit policies to curb the expected fragility of banking sector due to international financial

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integration. It favors the idea that development of domestic financial system is pre-requisite for stable financial integration. This result is consistent with the finding of Motelle and Biekpe (2015), who argue that financial integration in the SADC leads to the credit volatility.

There may also exist short run relationship apart from the log run cointegration. Therefore, we apply error correction model to estimate the short run relationship among variables.

4.5 Error Correction Model (ECM)

The error correction model replaces the lags of error term by linear combination of all variables including dependent variable. The short run relationship is captured through first difference which is indicated by the sign **(D)** in ECM. Speed of adjustment or convergence towards the long run equilibrium after short run shocks is captured by **ECT (-1)**. For convergence or adjustment, the ECT (-1) term should be negative and highly significant.

Table 4. 5 Error Correction Mechanism Result

Model No. 3
Where **VREER** (volatility of real effective exchange rate) is dependent variable and **IFI** (international financial integration) is independent.

Variables	Coefficients	Standard Error	P-values
D(IFI)	-0.072161	0.155247	0.6447
ECT(-1)	**-0.497532**	**0.113992**	**0.0001**

Table 4.5 displays the short run relationship. The result indicates that international financial integration has negative but insignificant effect on the volatility of real effective exchange rate in the short term. Hence, it is stated that in the short term, IFI does not affect the VREER. Further, ECT (-1) is highly significant and negative which fulfils the requirement for long run convergence.

Table 4. 6 Error Correction Mechanism Result

Model No. 4

Where **VDC** (volatility of domestic credit) is dependent variable and **IFI** (international financial integration) is independent variable.

Variables	Coefficients	Standard Error	P-values
D(IFI)	-0.039836	0.026315	0.1383
ECT(-1)	**-0.616189**	**0.113894**	**0.0000**

Table 4.6 displays the short run relationship of model 4. The result indicates that short run coefficient of IFI is negative with statistical value slightly insignificant which implies that in the short run international financial integration has no significant effect on the volatility of domestic credit. Moreover, ECT (-1) is highly significant and negative which means that after any short run shocks, there will be long run convergence towards the equilibrium with the speed of 0.61%.

4.6 Diagnostic Tests

Finally, we apply some diagnostic tests to examine the validity of models. When the residual or dependent variable has correlation with its lag values, it refers to the problem

of serial correlation. The statistical values become unreliable in case of serial correlation issue. Whereas, heteroscedasticity refers to the non-constant variance of error term or residual over the time. When there is heteroscedasticity, ordinary least square is not efficient any longer however consistent. Further, Regression Equation Specification Error Test (RESET) is applied to validate whether our models are linear or not and also to examine whether the variables incorporated in the models should be log form or in level form. The Ramsey RESET test is employed under the null hypothesis that model is properly specified. The results of diagnostic tests like serial correlation test and heteroscedasticity test are given below.

Table 4. 7 Diagnostic Tests of First Model

Tests	F-statistics	P-values
Serial Correlation LM Test	0.2804	0.5998
Ramsey RESET Test	1.1368	0.2938
ARCH Test	0.1305	0.7200

Table 4. 8 Diagnostic Tests of Second Model

Tests	F-statistics	P-values
Serial Correlation LM Test	0.3592	0.5525
Ramsey RESET Test	0.0037	0.9517
ARCH Test	0.0135	0.9080

Table 4. 9 Diagnostic Tests of Third Model

Tests	F-statistics	P-values
Serial Correlation LM Test	0.9317	0.3405
Ramsey RESET Test	0.0012	0.9990
ARCH Test	1.6924	0.1973

Table 4. 10 Diagnostic Tests of Fourth Model

Tests	F-statistics	P-values
Serial Correlation LM Test	0.8130	0.3731
Ramsey RESET Test	1.4904	0.2299
ARCH Test	1.3501	0.2726

Above results of diagnostic tests of all the models show that all of these models are valid. The probability values of those tests in all the models are insignificant, implying non-rejection of the null hypothesis or H0. Therefore, it indicates that there is no serial correlation and heteroscedasticity problem in those models and models are properly specified. Hence, results of these models are reliable.

4.7 Conclusion

In this chapter, we started with the application of ADF test of stationarity to analyze the time series properties of all the variables. Optimal lags were selected for all the four models by applying lag selection criterions. Then, to estimate the effect of international financial integration on financial contagion, we applied ARDL bound testing approach which validated the existence of cointegration for model 3 and 4 whereas model 1 and 2 have no cointegration as their F-statistics values are below the lower bound value.

Further, we examined both the long run as well as short run relationships and applied the Error Correction Model (ECM) to validate the speed or possibility of adjustment or convergence towards the long run equilibrium after any short run shock. The results show that IFI has significant negative long run effect on the VREER whereas significant positive long run effect on the VDC. Coefficients for the short term are insignificant for both models (i.e. 3rd and 4th model), which implies IFI has no short run effect on the VREER and VDC. ECM depicts that estimated coefficients are negative and significant which implies that both the models have convergence towards the long run equilibrium. Finally, we applied some diagnostics tests like autocorrelation, heteroscedasticity and Ramsey-RSEST test to validate the models. Results of diagnostics tests depict that there is no issue of serial correlation or heteroscedasticity and all the models are properly specified.

CHAPTER 5

Conclusion and Policy Suggestions

5.1 Conclusion

This study explores the effect of international financial integration on financial contagion for Pakistan. The study examines data from 1973 to 2017 with annual frequency and applies ADF test of stationarity for time properties of the variables. Then, ARDL bound cointegration approach is applied which does not only capture the long run but also the short run relationship.

The study takes the sum of foreign assets and liabilities to GDP ratio as measure of international financial integration. Existing evidence indicates that this measure is more close to the concept of international financial integration as it emphasizes on both the ability of domestic agents to invest and borrow from abroad and foreigner to lend and invest in the local country. Furthermore, this is robust and aggregated measure of financial integration than others such as gross capital formation, foreign direct investment, portfolio investment etc. We drive the measures of financial contagion by calculating volatilities using three-period moving average standard deviation of inflation rate, real interest rate, real effective exchange rate and domestic credit, which are usually used as single-dimension measures of financial contagion.

In order to examine the effect of international financial integration on financial contagion, four models are employed. In each model independent variable remains same which is international financial integration (IFI) whereas dependent variables vary. In first model

we take inflation rate volatility, a proxy of financial contagion, as dependent variable, similarly model 2, 3 and 4 incorporate real interest rate volatility, real effective exchange rate volatility and domestic credit volatility as dependent variables respectively. Result of ARDL bound cointegration validates the existence of cointegration in case of model 3 and 4 as their F-statistic values are greater than the upper bound value. In case of model 1 and 2 there is no cointegration according to ARDL bound testing approach as their F-statistic values are below the lower bound value. Furthermore, error correction model ratifies the adjustment or convergence towards the long run equilibrium after any short run shock in both models (i.e. 3 and 4) which have cointegration or long run relationship.

The major findings of this study are as follows:

The long-run coefficient indicates that international financial integration has significant negative effect on the real effective exchange rate volatility in the long term in the context of Pakistan. This result is in line with theory which claims that international financial integration must help the developing countries to reduce volatility as approach to international markets provides with better opportunities for the nations to share macroeconomic risks and hence reduces uncertainty. To correct the short term current account deficit, long run negative impact of international financial integration on real effective exchange rate for REER depreciation is required. Hence, it depicts that international financial integration may prevent the adverse effect by depreciating the volatility of real effective exchange rate in case of Pakistan. However, in the short term, IFI has no significant impact on the real effective exchange rate volatility in Pakistan as short term coefficient is statistically insignificant.

In the long run, international financial integration has positive and statistically significant impact on the volatility of domestic private credit. It implies that since international financial integration increases the volatility of domestic credit, authorities should not undermine the importance of effective credit policies to curb the expected adverse impact of international financial integration in Pakistan. Moreover, international financial integration has no significant effect on the volatility of domestic credit in the short term.

Finally, after examining the models and their interpretations, we may conclude that international financial integration stabilizes the real effective exchange rate in Pakistan. However, IFI increases the volatility of domestic private credit which indicates that international financial integration can lead to financial contagion or risk through this channel (i.e. volatility of domestic credit). Hence, it becomes obvious that international financial integration not only stabilizes the real effective exchange rate but may also lead to the financial contagion through higher domestic credit volatility in Pakistan.

5.2 Policy Implications

On the basis of above detail discussion and after testing the relationship between international financial integration and financial contagion, study makes some points which may be useful for the policy perspective.

Theory suggests that reduction of exchange rate volatility is regarded as a determinant of economic welfare. Since international financial integration provides a great opportunity for Pakistan to reduce the volatility of real effective exchange rate, Pakistan may enhance the international financial integration through deeper international portfolio diversification and obtain better investment opportunities which may help in getting more advantage from external sector.

Floating exchange rate has not been successful to relieve the market pressure in the emerging countries. Pakistan may adopt flexible exchange rate to pursue the sequential integration policy and harvest the potential benefits of international financial integration. However, flexible regime has its own problems.

Moreover, international financial integration also poses threat of financial contagion in Pakistan as IFI has significant positive effect on the volatility of domestic private sector credit in the long run. It requires that authorities should not undermine the importance of credit policy in connection with the international financial integration and frame policies effectively to prevent the adverse shocks on domestic credit.

Theory suggests that the effect of international financial integration on domestic credit volatility can be reduced by higher financial development. Hence, it is suggested that

volatility of domestic credit may be curbed through higher financial development while pursuing the greater international financial integration.

5.4 Future Directions

In our study we have incorporated four macroeconomic variables to drive the measure of financial contagion, there are some other variables that may be used for this purpose such as liquidity, unemployment rate, public debt etc. Moreover, one may also explore the effect of economic integration (trade openness) on financial contagion so that it may provide further policy implications to completely curb the financial contagion in the country.

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