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Thoughts on Banking and Finance

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Bangladesh Bank Training Academy
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Editorial Note

BBTA journal, from its inception, has succesfully covered the research articles based upon Central Banking, Finance, Economics, and related other important areas. The current volume of the BBTA journal:Thoughts on Banking and Finance includes a broad spectrum of macroeconomic and financial issues that are most substantial to the policy makers as well as researchers and academicians.

Topics dealt in this issue are: An Analysis of the Impacts of Inflation, Trade Openness and Exchange Rate on Foreign Direct Investment in Bangladesh and Some Selected Emerging Countries; A Markov-Switching Model of GDP Growth in Bangladesh; Purchasing Power Parity (PPP) with Structural Break and Mean Reversion in Real Exchange Rate: The Case of Bangladesh Taka and US Dollar; Determinants of Bank Deposit in Bangladesh: An ARDL Co-integration Approach; Examining the Efficacy of the Monetary Transmission Mechanism Channels of Bangladesh: A Vector Autoregression Approach; Determinants of Bank Profitability in Bangladesh; Does Investment Stimulate Economic Growth in Bangladesh? An Empirical Analysis; Employee Job Satisfaction of State-Owned Commercial Banks in Bangladesh: An Empirical Study.

Empirical examination on above-mentioned issues is expected to provide valuable insights into the way policy makers think and make decisions. This issue also opens new avenues for scientific discourses and offers a concrete look at how these insights apply to development policy.

The first paper investigates the impacts of inflation, trade openness and exchange rate on foreign direct investment (FDI) in Bangladesh, Colombia, India, Indonesia, Mexico, Philippines, and Turkey. Johansen-Juselius (1988) procedure is applied to test the cointegration relationship among the variables followed by the Vector Error Correction model. The empirical results trace a long-run equilibrium relationship in the variables and explores that the challenge before the central banks of these emerging countries including Bangladesh is to maintain a stable exchange rate that will boost domestic production, increase FDI and maintain internal and external balance. The study suggests that trade policy vis-a-vis monetary and fiscal policies should be made proactive considering the global perspectives.

The second paper examines the turning points of business cycle in Bangladesh using univariate Markov regime-switching approach to annual GDP of Bangladesh spanning 1974-2013. Estimation shows that real GDP growth in Bangladesh follows a second order autoregressive process, AR (2) where mean GDP growth switches between high growth and low growth regimes. The study also finds that both high and low growth regimes are significant and persistent implying that the high growth regime that began in 1991 is likely to continue in the subsequent years given the data generating process.

The third paper delve into the validity of purchasing power parity (PPP) both in absolute and relative terms with reference to the long run behavior of the real exchange rate of Bangladesh Taka relative to USA dollar. The paper verifies the long run relationship on co-integration and VAR framework. The paper finds support for both absolute and relative PPP, with an evidence of structural change (Quandt -Andrew test and CUSUM test) for only monthly data. Unit root test indicates that the real exchange rate, i.e., I (1) is not stationary.

The fourth paper examines the determinants of banks' time deposit especially for Bangladesh economy using autoregressive distributed lag (ARDL) model with co-integration techniques and error correction term. The results indicate that the growth of banks' time deposit in Bangladesh is positively influenced by the changes of per capita income, level of financial deepening (measured by domestic credit/gross domestic product) and remittance inflow in long run and if the long run relation is deviated somehow, it will take about 2.18 years to converge to the original integration.

The fifth paper has examined the effectiveness of monetary transmission channels in Bangladesh for the sample period from 2003.m6 to 2015.m6 using five variable Unrestricted Vector Auto Regression (VAR) techniques. The empirical results derived from VAR show that money supply (M2) have significant impacts on output (GDP) and the price level (Inflation) in Bangladesh implying that monetary transmission channels are effective in influencing real variables through banks portfolio.

The sixth paper specifically focuses on the performance measures, and their determinants of the banks operating in Bangladesh. By using bank specific panel data over the period 2005-2014, the paper estimates the impact of bank specific and macroeconomic factors on bank profitability, represented by return on equity (ROE). It is found that non-performing loans (NPL), foreign loans (FL) and capital adequacy ratio (CAR) have statistically significant negative impact on bank profitability while non-traditional activities (NTA) has significant positive impact on bank profitability with a very high magnitude.

The seventh paper examines the significant role of investment in the economic growth process of Bangladesh. The study applies Ordinary Least Square (OLS) method. The key findings of the study depict that there is a positive relationship between investment and economic growth in Bangladesh. It also reveals that there is a gap of investment to achieve a targeted level of growth in Bangladesh and suggests to increase investment gradually to the desired level.

The eighth paper has made an attempt to understand and explain the job satisfaction, which is influenced by utilitarian reasons. The results indicate a weak positive correlation between variables. The overall result of the study shows that the employees of State-Owned Commercial Banks in Bangladesh are satisfied enough.

Finally, I would like to convey my heart-felt thanks and sincere gratitude to the authors, reviewers, Editorial Advisory Board and the members of the Editorial Board of BBTA journal. Our efforts will be fruitful provided the articles published in this issue prove to be useful to the readers. We appreciate constructive criticism and thoughtful feedback for further improvement of the journal.

Md. Mostafizur Rahman Sarder
General Manager
Executive Editor
BBTA Journal: Thoughts on Banking and Finance

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An Analysis of the Impacts of Inflation, Trade Openness and Exchange Rate on Foreign Direct Investment in Bangladesh and Some Selected Emerging Countries

Dr. Sayera Younus[1]
Ehsanur Rauf Prince[2]

Abstract

This paper investigates the impacts of inflation, trade openness and exchange rate on foreign direct investment (FDI) in Bangladesh, Colombia, India, Indonesia, Mexico, Philippines, and Turkey. Johansen-Juselius (1988) procedure is applied to test the cointegration relationship among the variables followed by the Vector Error Correction model. The empirical results trace a long-run equilibrium relationship in the variables. Among the three independent variables, inflation and exchange rate are found as important factors in explaining the changes in FDI inflows in both short-run and long-run.Therefore, the challenge before the central banks of these emerging countries including Bangladesh is to maintain a stable exchange rate that will boost domestic production, increase FDI and maintain internal and external balance. In order to protect external competitiveness, one of the possible ways is to intervene in the domestic foreign exchange market by the concerned central banks. As trade openness is a means of the market-related economic determinant regarding attracting FDI inflow in the host country, so trade policy vis-a-vis monetary and fiscal policies should be made proactive considering the global perspectives.

Keywords: Foreign Direct Investment, Inflation, Exchange Rate, Trade Openness.

JEL Classification: O190, O110, E31, F31 and F21.

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Views expressed in this article are the authors' own and do not necessarily reflect the views of Bangladesh Bank.

Introduction

Foreign direct investment (FDI) has been receiving greater attention to policymakers of developing countries for accelerating the pace of economic growth and development since the mid- 1990s as these countries have embarked upon a process of reform and liberalization and placing FDI as an important policy priority in their development agenda. A number of studies find FDI that inflows have strong and positive effect on economic growth (see, for example, Lean and Tan 2011, Seila 2011, Thilakaweera 2011 Bjorvatn et al. 2002). FDI brings new capital for investment, contributing to the balance of payments, adding to the country's capital stock, and future economic growth and development. FDI can also help to bring technology and fill 'idea gaps' and 'object gaps'.

In the context of the new theory of economic growth, FDI is considered as an engine of growth of mainstream economics and accounts for more than half of the private capital flows between countries in the world (Thilakaweera, 2011). According to Shaari, Hong & Shukeri (2012), FDI can enhance economic growth. FDI in any country not only represent the investment of foreign nation but also transfers the better and current technological innovations, enhanced human resource and administrative ideas, well-trained labor force and managerial skills (Tabassum & Ahmed, 2014). FDI has the potentiality to enhance economic growth of developing countries like Bangladesh. Bangladesh became an independent country in the year 1971 and IDA provided more than US$ 16 billion support for policy reforms and investment projects since 1972 (Tabassum and Ahmed, 2014).

FDI flows to emerging markets countries (EMCs) increased rapidly during the 1990s and have become by far the single largest component of their net capital inflows. The surge in FDI to EMCs was led largely by mergers and acquisitions, reflecting the extensive privatization of state-owned assets in a number of countries in Latin America and Eastern Europe and the sale of distressed banking and corporate assets in several Asian Economies following the crisis. Furthermore, in contrast to traditional forms of FDI associated with either extractive activity or labor intensive manufacturing for exports, the 1990s witnessed a significant shift towards market-seeking FDI in a number of countries notably into the service sector. Therefore, we attempt to analyze the impacts of inflation, trade openness, and the exchange rate on FDI net inflows in Bangladesh and selected six emerging countries.

This study is divided into eight sections. After an introduction in section I, Section II presents objectives of the study while Section III reviews relevant literature. Data description and methodology is presented in Section IV. Empirical results are discussed in

the Section V. Finally, Section VI dicusses conclusion and policy recommendations. Tables and figures of the study are presented in Section VII.

Literature Review

Foreign Direct Investment (FDI) can be defined as investment in which a firm acquires a substantial controlling interest in a foreign firm or set up a subsidiary in a foreign country (Chen, 2000). According to IMF BOP Manual (1993), a foreign direct investment enterprise is an incorporated or unincorporated enterprise in which direct investor own 10 percent or more of the ordinary shares or voting power for an incorporated enterprise or the equivalent for an unincorporated enterprise.

Impacts of Macroeconomic variables on FDI have been studied by many researchers all over the world. Mottaleb and Kalirajan (2010) did a study on the determinants of foreign direct investment in developing countries. Using panel data from 68 low-income and lower-middle income developing countries, they attempted to identify the factors that determine FDI inflow to the developing countries. Based on a comparative discussion focusing on why some countries are successful in attracting FDI while others are not, their paper demonstrated that countries with larger GDP and high GDP growth rate, ahigher proportion of international trade and with the more business-friendly environment are more successful in attracting FDI.

Adhikary (2012) investigated the impact of foreign direct investment (FDI), trade openness, domestic demand, and exchange rate on the export performance of Bangladesh over the period of 1980-2009 using vector error correction (VEC) model. The Johansen-Juselius procedure was applied to test the Cointegration relationship between variables followed by the VEC regression model. The empirical results traced a long-run equilibrium relationship in the variables. FDI was found to be an important factor in explaining the changes in exports both in the short-run and long-run. However, the study did not trace any significant causal relationship for the cases of trade openness, domestic demand, and exchange rate. The study concluded that Bangladesh should formulate FDI-led polices to enhance its exports.

Enu, Havi and Attah-Obeng (2013) examined the determinants of foreign direct investment inflows to Ghana. The main objective of their study was to find out the major macroeconomic determinants of foreign direct investment in Ghana between the periods 1980 to 2012. All the variables considered were integrated at first order, as a result, the Johansen's Cointegration approach was used and the result showed that the variables were

not Cointegrated. Therefore, the vector autoregressive model was estimated. Results showed that the first past year of foreign direct investment, the last two years of theexchange rate and trade openness were statistically significant.

Tabassum and Ahmed (2014) examined the relationship between foreign direct investments and economic growth of Bangladesh during the period 1972-2011. These studies evaluated the association between FDI and economic growth using multiple regression methods by considering the relationship between real gross domestic product, foreign direct investment, domestic investment and openness of the trade policy regime. Results of their study indicated that domestic investments exerted a positive influence on economic growth whereas foreign direct investments, the openness of trade were less significant.

Lean and Tan (2011) examined the effect of Foreign Direct Investment (FDI) and Domestic Investment (DI) on economic growth in Malaysia using yearly data for the period of 1970 to 2009. Authors applied Augmented Dicky Fuller (ADF) test, Phillips-Perron test, Johansen's Cointegration approach etc. to establish a long-run relationship among the variables. The paper found that FDI, DI, and economic growth are cointegrated in the longrun while FDI had a positive impact on economic growth and was crowding in domestic investment. On the other hand, the paper found a one-way causal relationship from economic growth to FDI in short run applying granger causality.

Seila (2011) analyzed the impact of FDI on the economic growth, domestic investment and productivity of Cambodia, Vietnam, and Thailand for the period from 1987 to 2008. The author applied fixed effect estimation method to carry out the objectives. In the study, FDI was found not to have deteriorated growth in Cambodia, Vietnam, and Thailand. Though the study found a neutral crowding-in effect of FDI on domestic investment for Cambodia, the effect was significant for Vietnam and Thailand. The author found a positive effect of FDI on productivity in all three countries but at different extent.

Thilakaweera (2011) investigated the long-run relationship and causality among real per capita GDP, foreign direct investment (FDI) and the level of the infrastructure in Sri Lanka for annual time series of 1980 to 2011. The author applied ADF test, Johansen's Full Information Maximum Likelihood (FIML) approach and granger causality test to examine the relationship. The analysis of the paper concluded that there was a long-run relationship among real per capita GDP, FDI and the level of infrastructure when unidirectional causality from the level of the infrastructure to FDI was found.

Bjorvatn et al. (2002) reviewed the determinants of FDI and its role in economic development through analyzing the experience of five countries: South Korea, Malaysia, Mozambique, Philippines and South Africa for various point of time in between 1960 to 1999. The paper concluded that though FDI was not necessary to achieve economic development, the entry of foreign firms might play a vital role in adding technology and competition to the host economies acknowledging the scope of loss in market shares and consequent profit loss by local firms from the entry of foreign firms.

Ibrahim and Muthusamy (2014) examined the necessity of foreign direct investment in Indian economy for the period following the economic reform and analyzed the role played by the FDI in the economic development of thecountry. Authors covered the period of 2003-04 to 2012-13 and applied growth rates, regression, correlation etc. statistical measures to do the analysis. The study found significant improvement in FDI in India accompanying with thedevelopment of the economy.

An Overview of FDI

1. Bangladesh

Foreign Direct Investment in Bangladesh increased by 1833.87 USD Million in 2015 fiscal year. while the stock of Foreign Direct Investment in Bangladesh stood at USD 12,501 Million in 2015.

Table 1: FDI inflow from Top Ten Countries in 2015

	Country	% of FDI to Total FDI inflow (Stock)
1	U.S.A	24.10
2	U.K.	10.88
3	South Korea	7.48
4	Australia	7.06
5	Netherlands	5.35
6	Malaysia	5.30
7	Hong Kong	5.16
8	Singapore	3.36
9	Japan	2.58
10	India	2.53

Source: Bangladesh Bank.

Bangladesh received FDI $1495.50 million in FY 14 compared to $1730.63 million in FY13 and $1194.88 million in FY12. Annual average FDI inflows in Bangladesh during the last five years are $1222.61 million. FDI in Bangladesh constitutes a low share in GDP which varies between 0.89 percent in FY97 to 1.5 percent in FY14. Equity capital, reinvested earnings, and intra-company loans are the components of FDI. Despite attractive investment incentives and regulations, the flow of FDI to Bangladesh is very poor mainly due to political instability, inadequate infrastructure, bureaucratic complexities and higher cost of doing business.

FDI inflow in the manufacturing sector is the highest which is (35%) of total FDI followed by the power, gas and petroleum sector (32%) and trade and commerce sector (18%). However, the total FDI inflow in Bangladesh is still very low compared with other emerging countries.

Facilities and Incentives for a foreign investor [3]

In order to increase FDI, Bangladesh government adopted a number of supportive policies. Among them, the following measures are noteworthy: tax exemption on royalties, technical know-how and technical assistance fees and facilities for their repatriation, interests on foreign loans, capital gains from transfer of shares by the investing company.

No restrictions on issuance of work permit to project related foreign nationals and employees, facilities for repatriation of invested capital, profits and dividends provision of transfer of shares held by foreign share holders to local investors, reinvestment of remittable dividends would be treated as new investment, foreign-owned companies duly registered in Bangladesh will be on the same footing as locally owned ones.

100% foreign equity is allowed. In addition, facilities such as unrestricted exit policy, citizenship by investing a minimum of US$5,00,000, and permanent resident permits on investing US$75,000 were allowed. An investor can wind up investment either through a decision of the AGM or EGM. He or she can repatriate the sales proceeds after securing proper authorization from the central bank.

Fiscal and Financial incentives

Corporate tax holiday of 5 to 7 years for selected sectors, reduced tariff on import of rawmaterials capital machinery, bonded warehousing, accelerated depreciation on cost of machinery is admissible for new industrial undertaking (50% in the first year of commercial production,30% in the second year, and 20% in the third year). Tax exemption on capital gains from the transfer of shares of public limited companies listed on a stock exchange, reduced Corporate Tax for 5 to 7 years in lieu of tax holding and agricultural deprecation. Cash incentives and export subsidies ranging from 5% to 20% granted on the FOB value of the selected products, 90% loans against letters of credit (bybanks), permission for domestic market sales of up to 20% of export-oriented companies outside EPZ (relevant duties apply)

[3] Abdin MJ(2015) Foreign Direct Investment(FDI) in Bangladesh: Trends,Challenges and Recommendations. Int J Econ Manag Sci4:276. doi:10.4172/21626359.1000276

2. Colombia

Foreign Direct Investment in Colombia increased by 2843.60 USD Million in the fourth quarter of 2015. Foreign Direct Investment in Colombia averaged 1868.31 USD Million from 1996 until 2015. The two main destinations of FDI are the hydrocarbon (the oil sector accounted for 30% of FDI in 2014) and mining sectors (10% of FDI in 2014), but an increasing degree of diversification has been observed in recent years, in particular in telecommunications and tourism. In Colombia, FDI stock accounted for 37 of GDP in 2014 which was 31% in 2012.

In Colombia, FDI benefits from a very attractive legislative framework. The country ranks 54th out of 189 economies in the Doing Business 2016 classification established by the World Bank, thanks to major improvements in property registration and access to credit. The ratification of a bilateral free trade agreement with the U.S. in October 2011 and the establishment of special regulations in the free trade zones have contributed to improving the country's attractiveness. Moreover, the richness of its natural resources and a significant domestic market are Colombia's main assets.

3. India

FDI in India is the major financial source for economic development. Foreign companies invest directly in fast-growing private Indian businesses to take benefits of cheaper wages and changing business environment of India. Economic liberalization started in India in the wake of the 1991 economic crisis and since then FDI has steadily increased in India. According to the Financial Times, in 2015 India overtook China and the US as the top destination for the Foreign Direct Investment. In the first half of 2015, India attracted investment of $31 billion compared to $28 billion and $27 billion of China and the US respectively.

The Government of India has amended FDI policy to increase FDI inflow. In 2014, the government increased the foreign investment upper limit from 26% to 49% in theinsurance sector. It also launched Make in India initiative in September 2014 under which FDI policy for 25 sectors was liberalized further. As of April 2015, FDI inflow in India increased by 48% since the launch of "Make in India" initiative. India was ranking 15th in the world in 2013 in terms of FDI inflow, it rose up to 9th position in 2014 while in 2015 India became atop destination for foreign direct investment.

During 2014-15, India received most of its FDI from Mauritius, Singapore, Netherlands, Japan and the US. On 25 September 2014, Government of India launched Make in India[4] initiative in which policy statement on 25 sectors was released with relaxed norms on each sector. Following are some of themajor sectors for Foreign Direct Investment. Infrastructure, Automotive, Pharmaceuticals, Service, Railways, Chemicals, Textile. Make in India is an initiative launched by the Government of India to encourage multi-national, as well as national companies to manufacture their products in India. It was launched by Prime Minister Narendra Modi on 25 September 2014.

4. Indonesia

Foreign direct investment in Indonesia rose 17.1 percent year-on-year to an IDR96.1 trillion in the first quarter of 2016, slowing from a 26 percent growth in the preceding quarter, data from the Investment Coordinating Board showed. Foreign Direct Investment in Indonesia averaged IDR 58909.09 Billion from 2010 until 2015.

FDI flows into Indonesia have been experiencing growth and their base has been expanding. Indonesia has allowed foreign investment in the service industries, such as port management. According to the UNCTAD 2015 World Investment Report, in 2014, Indonesia lost its place among the three most attractive destinations for multinational companies, although it stayed among the top 20 at 14th place and 4th among the East-Asian countries, after China, Hong Kong, and Singapore. More than 20% of FDI inflows come from Singapore, one of its three most important trade partners. In Indonesia, FDI stock accounted for 29 of GDP in 2014 which was 23% in 2012. In Indonesia, the main invested sectors are mining (16.4%), food industry (11.0%), transport, storage and communications (10.5%),

5. Philippines

Foreign Direct Investment in the Philippines increased by PHP 138618 million in the fourth quarter of 2015. Foreign Direct Investment in the Philippines averaged PHP 41129.66 million from 2000 until 2015, reaching an all-time high of PHP 230215 million in the fourth quarter of 2012 and a record low of PHP 3959 Million in the first quarter of 2009.

[4] Make in India is an initiative launched by the Government of India to encourage multi-national, as well as national companies to manufacture their products in India. It was launched by Prime Minister Narendra Modi on 25 September 2014. India would emerge, after initiation of the programme(and if succesful) in 2015, as the top destination globally for foreign direct investment, surpassing the United States of America as well as China .India received US$63 billion in FDI in 2015

Foreign direct investment (FDI) has been rising steadily in recent years. In 2014, FDI inflows reached USD 6.2 billion, which represents a more than 65% increase compared to 2013. However, FDI inflow into the Philippines remains relatively weak, considering the country's comparative advantages, such as an English speaking and well-skilled workforce, a strong cultural proximity to the U.S. and a geographical location in a dynamic region. This can be partially explained by the fact that the country is evolving into a service society with low capital strength, which means that it needs only minimal equipment. In addition, the Government favors subcontracting agreements between foreign companies and local enterprises rather than FDI in the strict sense of the term. Lastly, corruption, instability, inadequate infrastructure and lack of juridical security discourages investment.

6. Turkey Foreign Direct Investment

Foreign Direct Investment in Turkey increased to USD 16800 million in 2015. Foreign Direct Investment in Turkey averaged USD 12750.62 million from 2003 until 2015, reaching an all-time high of USD 22046 Million in 2007 and a record low of USD 1800 million in 2003. Foreign Direct Investment in Turkey is reported by the Investment Support and Promotion Agency (ISPAT).

According to the UNCTAD 2015 World Investment Report , Turkey has become the largest recipient of FDI in West Asia, ahead of the United Arab Emirates. The country has adopted a series of legislative reforms to facilitate the reception of foreign investment, such as the creation of Investment Support and Promotion Agency of Turkey (ISPAT), a showcase effort undertaken to attract foreign operators. FDI inflows improved in light of the development of public-private partnerships for major infrastructure projects, the measures to streamline administrative procedures and strengthen intellectual property protection, the end of FDI screening and the structural reforms carried out with a view to the future accession into the EU. In 2014, Turkey announced a major national infrastructure development plan that should attract major foreign investment.

After reaching a record high (USD 22 billion) in 2007, FDI flows to Turkey have decreased, now stagnating around USD 12.5 billion. The factors hindering FDI development include the weak currency, inflation, and proximity to the Middle East conflict.

The countries of the European Union, the Gulf States, and the United States are among the main investors in Turkey. In Turkey, FDI stock accounted for 20.9% of GDP in 2014 which was 24.1% in 2012.

7. Mexico

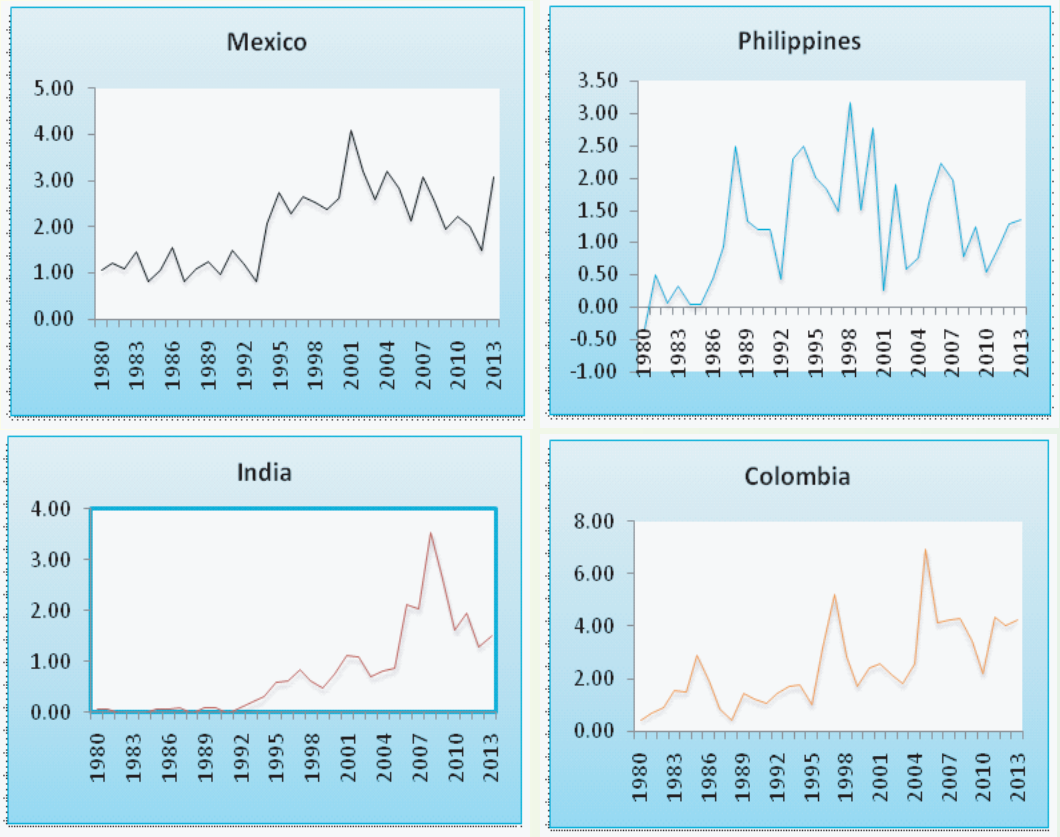
Foreign Direct Investment in Mexico increased by USD 4.891 billion in the fourth quarter of 2015. Foreign Direct Investment in Mexico averaged USD 2.289 billion from 1960 until 2015, reaching an all-time high of USD 20.995 billion in the second quarter of 2013.

Mexico is one of the emerging countries most open to foreign direct investment. According to 2015.World Investment Report published by UNCTAD, Mexico is the world's tenth largest FDI recipient. FDI inflows peaked in 2013 and dropped sharply in 2014, largely due to the arrival and departure of large international groups. The next year, FDI inflows grew considerably, ultimately reaching USD 21.5 billion. Investments in the aerospace sector were particularly substantial that year and were primarily carried out in the State of Queretaro.

A wave of reforms initiated in 2014 may help improve the regulatory situation in Mexico: the energy, telecommunications, labor, financial and education sectors have undergone sweeping reforms aimed at improving the country's competitiveness. Since 2014, the Government has also been planning to create new industrial centers (located in Guerrero, Oaxaca, and Chiapas), which could encourage FDI. Substantial infrastructure development, especially focused on airports, is planned to attract foreign investors. The business climate in Mexico has improved and the country ranked 38th in the 2016 Doing Business report of the World Bank.

Foreign investments are mostly concentrated in the border towns with the United States (where many assembly factories are located), as well as in the capital. Sectors receiving significant foreign investment are financed, the automobile industry and the electronics and energy sectors. Thanks to its robust tourism industry, the Yucatan Peninsula also receives substantial foreign investment (largely from the U.S. and Spanish banking sector). In Mexico, FDI stock accounted for 26.3% of GDP in 2014.

Figure 1: FDI Inflow of Bangladesh, Colombia, India, Indonesia, Mexico, Philippines and Turkey



Data Description and Methodology

Theoretical Model

The identified model is a four variable model which hypothesize that FDI as a function of inflation, trade openness, and exchange rate.

$$FDI_t = F(INFLA_{t,}TRADEOP_t, EXCHANGE_t)$$

Where FDI represents annual FDI inflow as a percentage of GDP, INFLA represents Inflation measured by GDP deflator (annual %), TRADEOP represents the sum of import and export as apercentage of GDP and EXCHANGE represents official exchange rate (local currency unit per US$). In the Equation t-sign represents time trend. In this study, seven countries were taken into consideration- Bangladesh, Colombia, Indonesia, India,

Indonesia, Mexico, Philippines, and Turkey. Emerging countries were selected on the basis of IMF's (2012) emerging country list. Data were collected from World Development Indicators (WDI) of the World Bank. Numbers of periods used in the study varied between 33-44 years depending on the countries. Data of trade openness and exchange rate are converted into the log-log equation for time series processing.Thus, the coefficients can be interpreted as elasticity.

Stationarity Test

Stationarity of a series is an important phenomenon because it can influence its behavior. If x and y series are a non-stationary random process (integrated), then modeling the x and y relationship as a simple OLS relationship as in equation below will only generate a spurious regression.

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

Time series stationarity is the statistical characteristics of a series such as mean and variance over time. If both are constant over time, then the series is said to be a stationary process (i.e. it is not a random walk/has no unit root), otherwise, the series is described as being a non-stationary process (i.e. a random walk/has unit root). If a series is stationary without any differencing it is designated as I(0) , or integrated of order 0. On the other hand, a series that has stationary first differences is designated I(I) or integrated of order one (1). Augmented Dickey Fuller test (Dickey and Fuller, 1979), Phillips-Perron test (Phillips and Perron,1988), ADF-GLS test (Graham ,Thomas & James, 1996) and KPSS (Kwiatkowski , Phillips, Schmidt & Shin, (1992) test have been used to test the stationarity of the variables.

Johansen and Juselius Cointegration Test

Following Johansen and Juselius (1988) two tests are used to determine the number of cointegration vectors: the Maximum Eigenvalue test and the Trace test. The maximum Eigenvalue statistic tests the null hypothesis of r cointegrating relations against the alternative of r+1 no cointegrating relations for r=0,1,2..n-1. This test statistics are computed as :

$$LR_{max}\left(\frac{r}{n+1}\right) = -T * \log\left(1 - \hat{\lambda}\right)$$

Where λ is the Maximum Eigenvalue and T is the sample size . Trace statistics investigate the null hypotheis of r cointegrating relations against the alternative of n cointegrating relations, where n is the number of variables in the system for r= 0,1,2…n-1. Its equation is computed according to the formula:

$$LR_{tr}\left(\frac{r}{n+1}\right) = -T * \sum_{i=r+1}^{n} \log\left(1 - \hat{\lambda}_i\right)$$

In some cases, Trace and Maximum Eigenvalue statistics may yield different results and (Alexander,2001) indicates that in this case the results of trace test should be preferred.

Vector Error Correction Model (VECM)

According to Adhikary (2012) in the presence of one or more cointegrating vectors, VEC model will be applied in the study as outlined in Granger (1988).

$$\Delta FDI_t = \alpha + \lambda e_{t-1} + \sum_{i=1}^{n} bi\, \Delta FDI_{t-i} + \sum_{i=1}^{m} ci\, \Delta INFLA_{t-i} + \sum_{i=1}^{p} di\, \Delta TRADEOP_{t-i} + \sum_{i=1}^{p} ei\, \Delta EXCHANGE_{t-i} + \varepsilon_t \quad \ldots\ldots(1)$$

Notably, in this specification, the parameter (λ) of the lagged error correction term (e_{t-1})) indicates the long run relationship in the variables being studied, and also the speed of adjustment from the short run to long run equilibrium state. The appropriate lag length of the variables has been selected through different information criteria such as FPE, AIC, HQIC and SBIC (Akaike,1969; Brooks, 2008). Notably, the parameter of the error correction term needs to be negative and statistically significant in terms of its associated t value to confirm long -run equilibrium relationship in the variables. Changes in inflation, trade openness and exchange rate cause changes in FDI when ci's, di's, ei's are significant in terms of F test (Bahmani-Oskooee & Payeshteh, 1993) . Impulse Response Analysis has been performed by giving a shock of one standard deviation (+-2 S.E innovations) to inflation, trade openness and exchange rate to visualize the duration of their effects on the FDI of Bangladesh and six emerging countries. Finally, a forecast model is used to forecast FDI, trade openness, inflation and exchange rate of Bangladesh and six emerging countries for the next seven years.

Empirical Results and Discussion

Descriptive Statistics

Jarque-Bera test was conducted to see whether the series were normally distributed.The hypothesis of Jarque-Bera test under the null Hypothesis H0: Residuals are normally distributed against the alternative hypothesis HI: Residuals are not normally distributed. From the Tables (Appendix 1), it is found that Jarque-Bera test statistics fails to reject the null hypothesis of the normal distribution of most of the variables (for most of the variable value of Prob>chi2 is greater than .05).

Stationarity Results

Four unit root tests namely Augmented Dickey-Fuller test (ADF), Phillips-Perron (PP) test, ADF-GLS test and KPSS test are used in the study. From the above-mentioned tests it is found that all the four variables used in the model have unit root (absolute value of test statistics is less than critical values at 5% level) at levels while at the first differencing, these variables are found stationary.

The same procedure was followed for testing stationarity of the variables for remaining six emerging countries and it was found that all the variables have a unit root. All the series confirmed non-stationarity but stationary at the first difference.Thus, it is concluded that they depict the same order of integration, that is, I(I) behavior. As a result ,the study employs the Johansen-Juselius cointegration test on the level series to detect the cointegration relationship in the variables.

Table 2: Results of Unit-Root Tests

Variables		**With Trend**	
Bangladesh	**ADF**	**PP**	**KPSS**
FDI	-2.067	-1.700	0.285
Infla	-4.506	-33.037	0.153
tradeop	-1.971	-1.205	0.198
exchange	-4.206	-5.051	0.30
D(FDI)	-4.182**	-36.190***	0.0392
D(Infla)	-9.319***	-49.703***	0.0377
D(tradeop)	-6.278***	-45.668***	0.054
D(exchange)	-5.777***	-25.685***	0.0481
Colombia			
FDI	-4.851***	-8.590	0.0533
Infla	-2.361	-14.372**	0.399***
tradeop	-2.856	-5.139	0.0679
exchange	-0.377	0.087	0.242***
D(FDI)	-4.879***	-8.590	0.0533
D(Infla)	-10.72**	-62.283***	0.036
D(tradeop)	-9.982***	-67.781***	0.0551
D(exchange)	-3.846**	-23.481**	0.29***

Variables	With Trend		
	ADF	PP	KPSS
India			
FDI	-2.565	-4.383	0.163*
Infla	-4.598***	-32.890***	0.0973
tradeop	-2.324	0.909	0.319***
exchange	-1.912	-6.207	0.19 #
D(FDI)	-7.034***	-43.619***	0.0522
D(Infla)	-4.970***	-32.890***	0.0973
D(tradeop)	-6.479***	-45.572***	0.0622
D(exchange)	-4.884***	-34.094***	0.111
Indonesia			
FDI	-1.70	9.85	0.10
Infla	-3.15	-38.25	0.12
tradeop	-1.98	-9.02	0.30
exchange	-2.59	-14.43	0.11
D(FDI)	-4.84***	-27.83***	0.05***
D(Infla)	-10.80***	-62.00***	0.03***
D(tradeop)	-12. 21***	-70.56***	0.05***
D(exchange)	-7.48***	-46.47***	0.06***
Mexico			
FDI	-2.85	-5.19	0.13
Infla	-2.59	-10.33	0.30
tradeop	-3.81	-0.13	0.16
exchange	-1.71	-4.09	0.22
Phillippines			
FDI	-2.58	-23.55	0.16
Infla	-4.75	-34.11	0.22
tradeop	-1.04	-4.46	0.17
exchange	-1.94	-7.43	0.22
D(FDI)	-5.25***	-60.97***	0.03***
D(Infla)	8.57***	-50.29 ***	0.03***
D(tradeop)	-6.53***	-44.17***	0.12***
D(exchange)	-5.35***	-49.04***	0.06***

Variables	With Trend		
	ADF	PP	KPSS
Turkey			
FDI	-3.60	-6.45	0.12
Infla	-1.88	-8.06	0.33
tradeop	-3.36	-3.83	0.18
exchange	-1.93	-4.91	0.29
D(FDI)	-5.42***	-28.78***	0.03***
D(Infla)	-8.12***	-48.98***	0.05***
D(tradeop)	-3.36	-42.45	0.03***
D(exchange)	-3.10	-15.67	0.32

Note: Critical values for ADF Tests are -4.25,-3.54 and -3.20 respectively at 1%, 5% and 10% significance levels. Critical values for Phillip Perron Test are -18.28, -13.01 and -10.52 respectively at 1%, 5% and 10% significance levels. Critical Values for KPSS tests are 0.216, 0.146 and 0.119 respectively at 1%, 5% and 10% significance levels

Cointegration Tests

The trace test and the maximum eigenvalue test yield one cointegrating equation at the 5% level of significance. Thus, it is concluded that the series are cointegrated, and a long run equilibrium relationship exists among them. As a result, the study proceeds to run the vector error correction model as outlined as outlined in (1).

Table 3: Johansen's Co-integration Tests

Null hypothesis	Alternative hypothesis		Trace Test
Bangladesh		**Statistic**	**95% Critical value**
r=0	r=1	63.78***	47.21
r ≤1	r=2	25.06	29.68
r ≤2	R=3	10.51	15.41
r ≤3	R=4	0.66	3.76
Colombia			
r=0	r=1	59.06***	47.21
r ≤1	r=2	27.59	29.68
r ≤2	R=3	12.69	15.41
r ≤3	R=4	5.66	3.76
India			
r=0	r=1	57.6934***	47.21
r ≤1	r=2	22.40	29.68
r ≤2	R=3	6.16	15.41
r ≤3	R=4	1.61	3.76

Null hypothesis	Alternative hypothesis	Statistic	Trace Test 95% Critical value
Indonesia		Statistic	95% Critical value
r=0	r=1	75.36***	47.21
r≤1	r=2	17.88	29.68
r≤2	R=3	7.03	15.41
r≤3	R=4	1.79	3.76
Mexico			
r=0	r=1	81.34***	47.21
r≤1	r=2	24.93	29.68
r≤2	R=3	7.70	15.41
r≤3	R=4	2.30	3.76
Philippines			
r=0	r=1	62.93***	47.21
r≤1	r=2	19.96	29.68
r≤2	R=3	6.31	15.41
r≤3	R=4	2.35	3.76
Turkey			
r=0	r=1	87.97***	47.21
r≤1	r=2	21.23	29.68
r≤2	R=3	7.94	15.41
r≤3	R=4	2.45	3.76

Table 4 : Normalized Co-integrating Coefficient

LogFDI	infla	Logtradeop	Logexchange	C
Bangladesh 1.00	-0.42*** (0.000)	-0.68*** (0.004)	-0.40*** (0.006)	4.235
Colombia 1.00	0.04** (0.089)	5.42** (0.020)	-0.84*** (0.000)	-16.46
India 1.00	-0.19*** (0.000)	-0.33 (0.494)	-1.27*** (0.001)	5.99
Indonesia 1.00	0.28*** (0.000)	-3.63 (0.11)	-0.39 (0.24)	11.83
Mexico 1.00	-0.29*** (0.00)	2.92 (0.55)	-0.37 (0.65)	-15.69
Philippines 1.00	-0.28*** (0.000)	-1.11 (0.17)	-1.44*** (0.001)	10.41
Turkey 1.00	-0.01** (0.06)	-0.33 (0.17)	-0.10*** (0.00)	0.75

Vector Error Correction Model

Seven vector error correction models have been run for Bangladesh, Colombia, India, Indonesia, Mexico, Philippines and Turkey using appropriate lag length selected by FPE, AIC, HQIC and SBIC criteria.Results of VECM reveals that a long-run equilibrium relationship exists among the variables. This has been observed by the parameter (λ) of the error correction term e_{t-1} , which is negative as expected. From the tables and using speed of adjustment formula [*Speed of adjustment*=ln(0.5)/ln(1+λ), it is found that equilibrium will be restored for Bangladesh, Colombia, India, Indonesia, Mexico, Philippines in 8.22, 0.58, 4.38, 1.88, 114.82 and 1.78 years. For the countries like Philippines and Indonesia, Inflation has significant (p value less than .05) short run impact on FDI. Regarding Exchange rate, India and Colombia has significant(p value less than .05) short run impact on FDI.

From the results, it is also found that for all the countries except Colombia, inflation has significant(p-value less than .05) long run impact. Regarding trade openness, Bangladesh and Colombia have significant(p-value less than .05) long run impact whereas exchange rate has significant (p-value less than .05) long run impact on FDI for Bangladesh, Colombia, India, Indonesia, Philippines, and Turkey.

For most of the countries relationship between FDI and inflation is found negative which means if inflation increases, then FDI inflow decreases. According to Romer (1990), inflation distorts tax system and investors are uncomfortable with it because of money illusion. The level of inflation is positively correlated with its volatility. Greater inflation volatility is consistent with higher inflation rates and hence increase uncertainty and discourages long-term investment. However, this study has found asignificant positive relationship between FDI and inflation for some countries like Indonesia and Mexico. Domination of other factors such as political stability, market size and low level of corruption can generate such type of relationship.

According to Ahmed and Tanin (2010), trade Openness generally positively influences the export-oriented FDI inflow into an economy. Overall, the empirical literature reveals that one of the important factors for attracting FDI is trade policy reform in the host country. Investors generally want big markets and like to invest in countries which have regional trade integration, and also in countries where there are greater investment provisions in their trade agreements. However, this study has found a significant negative relationship between FDI and trade openness for some countries like Bangladesh. According to Seim

(2009), trade openness can have a negative impact on the countries in transition. This may be an explanation why for Bangladesh relationship between trade openness and FDI is found negative.

According to Benassy-Quere et al. (2001) on the study of the impacts of exchange rate on foreign direct investment flows, the impact of exchange rate on foreign direct investment flows depends on the type of investment (horizontal foreign direct investment or vertical foreign direct investment). In the case of horizontal foreign direct investment, a depreciation of the host country's exchange rate will have a positive impact on the flows it receives through reduced cost of capital; and the appreciation of the local currency will also increase the flows of foreign direct investment because the local consumers will have a higher purchasing power. In the case of vertical foreign direct investment, an appreciation of a local currency has a negative effect on foreign direct investment inflows because items produced locally are becoming expensive abroad. The depreciation of a local currency, on the other hand, has a positive effect on foreign direct investment inflows because the products are less expensive.

Vector Error Correction Model (VECM) (P> | Z | Value is given in the parenthesis)

Bangladesh

$$\Delta lnFDI_t = 0.14 + 0.07\Delta lnFDI_{t-1} - 0.01\Delta infla_{t-1} - 0.10\Delta lntradeop_{t-1} - 0.67\Delta lnexchange_{t-1} - 0.16\Delta EC_{t-1}$$

(0.033) (0.705) (0.063) (0.680) (0.129) (0.016)

Colombia

$$\Delta lnFDI_t = 0.62 + 0.16\Delta lnFDI_{t-1} + 0.01\Delta infla_{t-1} + 2.84\Delta lntradeop_{t-1} - 3.99\Delta lnexchange_{t-1} - 0.90\Delta EC_{t-1}$$

(0.003) (0.310) (0.734) (0.231) (0.003) (0.000)

India

$$\Delta lnFDI_t = 0.28 - 0.02\Delta lnFDI_{t-1} - 0.01\Delta infla_{t-1} - 0.84\Delta lntradeop_{t-1} - 3.12\Delta lnexchange_{t-1} - 0.27\Delta EC_{t-1}$$

(0.016) (0.915) (0.528) (0.511) (0.004) (0.020)

Indonesia

$$\Delta lnFDI_t = -0.27 + 0.41\Delta lnFDI_{t-1} - 0.14\Delta infla_{t-1} - 1.77\Delta lntradeop_{t-1} - 2.80\Delta lnexchange_{t-1} - 0.51\Delta EC_{t-1}$$

(0.32) (0.01) (0.00) (0.40) (0.09) (0.00)

Mexico

$$\Delta lnFDI_t = 0.62 - 0.53\Delta lnFDI_{t-1} - 0.001\Delta infla_{t-1} + 0.17\Delta lntradeop_{t-1} - 0.09\Delta lnexchange_{t-1} - 0.01\Delta EC_{t-1}$$

(0.003) (0.00) (0.83) (0.87) (0.90) (0.68)

Philippines

$$\Delta lnFDI_t = -0.000 - 0.25\Delta lnFDI_{t-1} - 0.12\Delta infla_{t-1} - 2.96\Delta lntradeop_{t-1} - 2.77\Delta lnexchange_{t-1} - 0.53\Delta EC_{t-1}$$

(0.99) (0.15) (0.00) (0.05) (0.06) (0.00)

Turkey

$$\Delta lnFDI_t = 0.28 - 0.66\Delta lnFDI_{t-1} - 0.01\Delta infla_{t-1} - 0.64\Delta lntradeop_{t-1} - 0.89\Delta lnexchange_{t-1} - 1.13\Delta EC_{t-1}$$

(0.016) (0.00) (0.01) (0.18) (0.05) (0.00)

Autocorrelation Test

The results from autocorrelation tests depict no autocorrelation for the models used in the study (p-value greater than .05) at the lag order for all the seven countries.

Impulse Response Functions

In the case of Bangladesh, it is observed that for an initial shock in the inflation, FDI trend will be upward up to the second year. After that, it will start to decline. For the initial shock in trade openness, FDI will have a sharp increase, then a sharp decline and lastly a sharp increase. After that, the FDI will start to stabilize. For initial shock in exchange rate Bangladesh will have a sharp decline and gradually it become stable. Interpretation for the other six countries will follow the same procedure.

Regarding Colombia, it is observed that after initial shock in inflation there will be a sharp decline in FDI and in the 5th period it will become relatively stabilized. As regard shock in trade openness, there will be a sharp decline of FDI up to period 3. After that, FDI will go

up and become stabilized after 5th period. If there is a shock in the exchange rate, there FDI will decline sharply up to the1st period and then an upward sloping trend of FDI will be noticed.

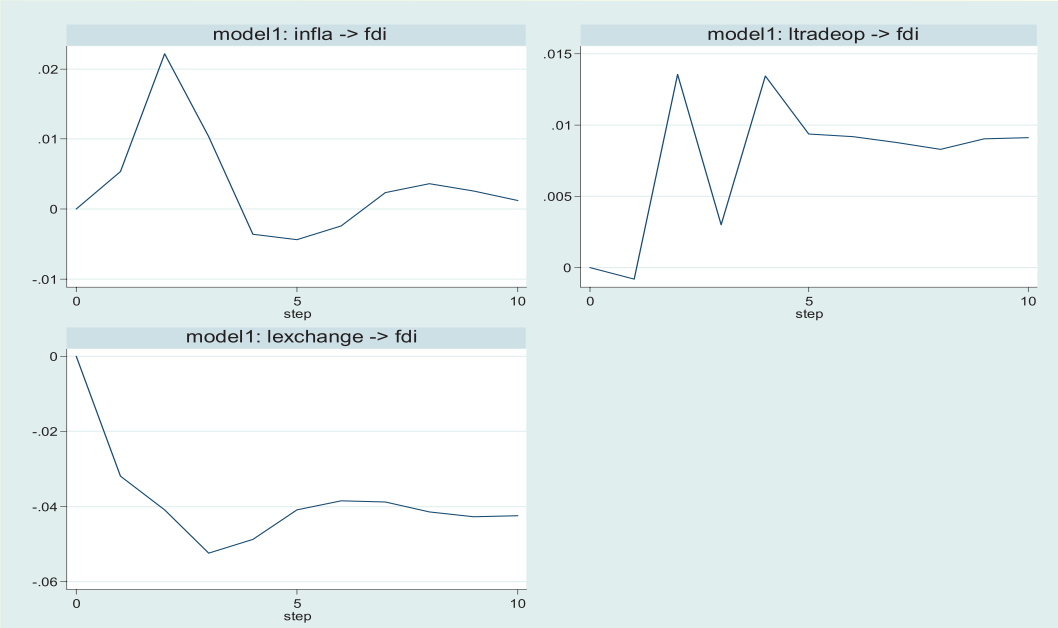
Regarding India, if there is a shock in inflation then there will be a sharp increase in FDI and after 5th or 6th period, it will become stable. If there is a shock in trade openness then initially there will be a sharp decline in FDI. After 2nd period FDI will go up and after a 5th period it will become stabilized. If there is a shock in theexchange rate, then initially there is a sharp decline but after 3rd or 4thyear, it will become stabilized.

As regard to Indonesia, if there is a shock in inflation then initially FDI will go down and after some fluctuations, it will be stabilized. If there is a shock in trade openness, then FDI will increase. At a5th year it will reach its peak level and after that, some decline will be noticed. As regard exchange rate, if there is a shock in exchange rate then FDI will decline sharply. After that, it will go up and will reach its peak at the7th time period.The impulse response of Mexico exhibits a very interesting relationship. In all cases of shocks such as inflation, trade openness, and exchange rate, FDI shows volatility in responses.

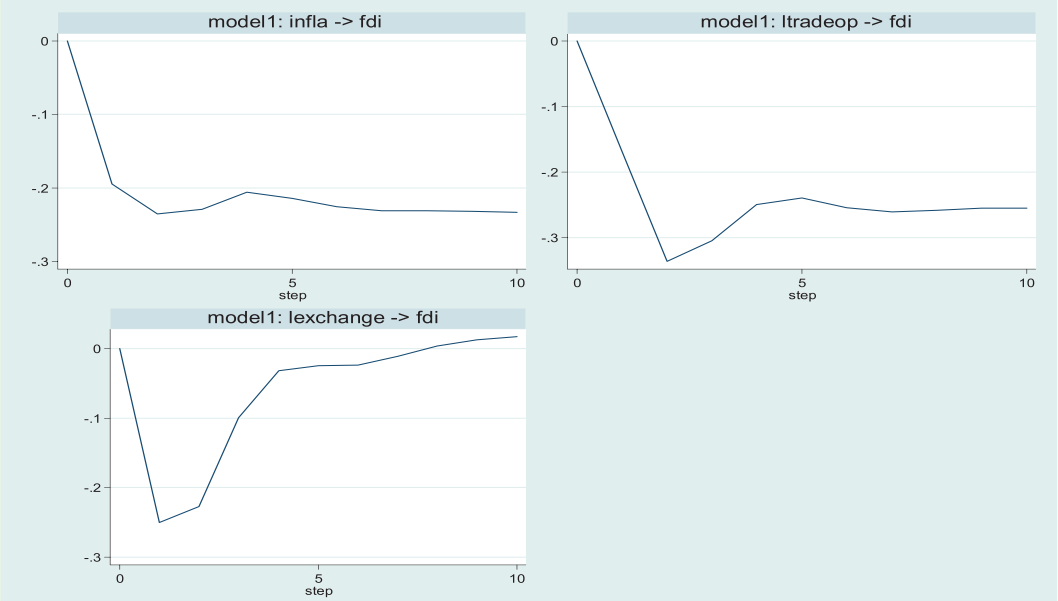
For Turkey, when there is an initial shock in inflation and trade openness, FDI will have avolatile response. As regard exchange rate, if there is an initial shock then there will be aslight decline in FDI. After that, FDI will go up and reach its peak at the5th time period. After that, it starts to decline.

Bangladesh

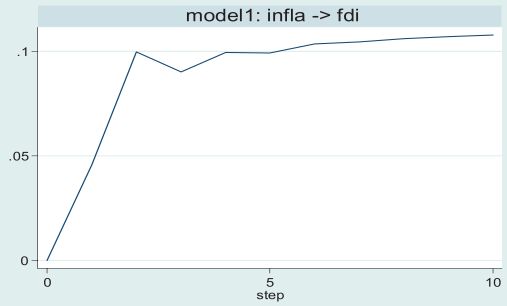
FIGURE 2: IMPULSE RESPONSE FUNCTIONS

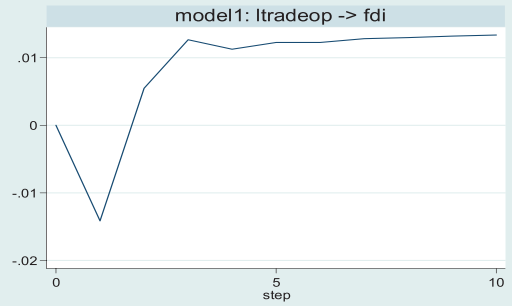


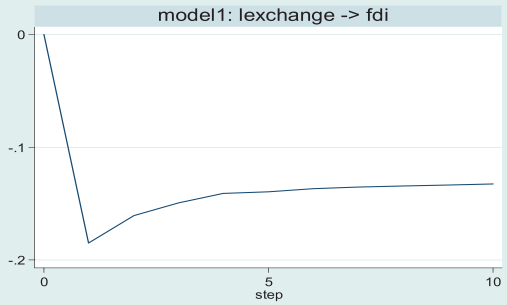
Colombia



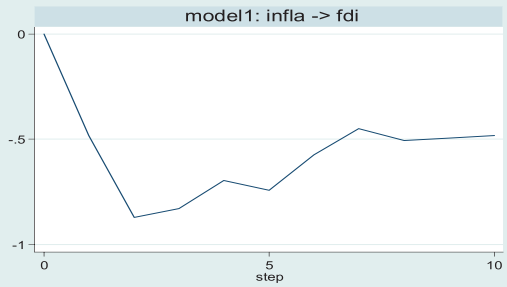
India

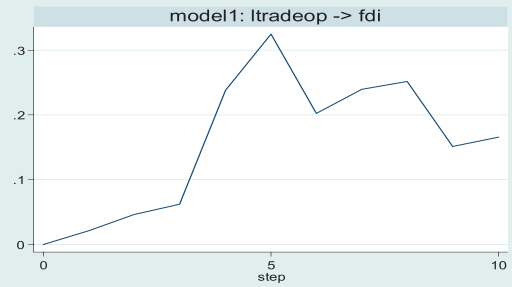


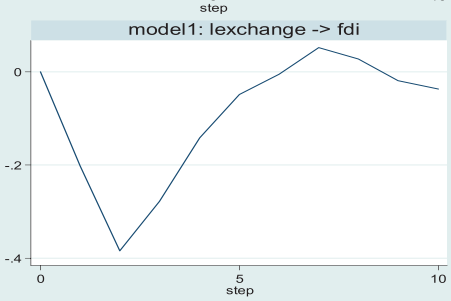




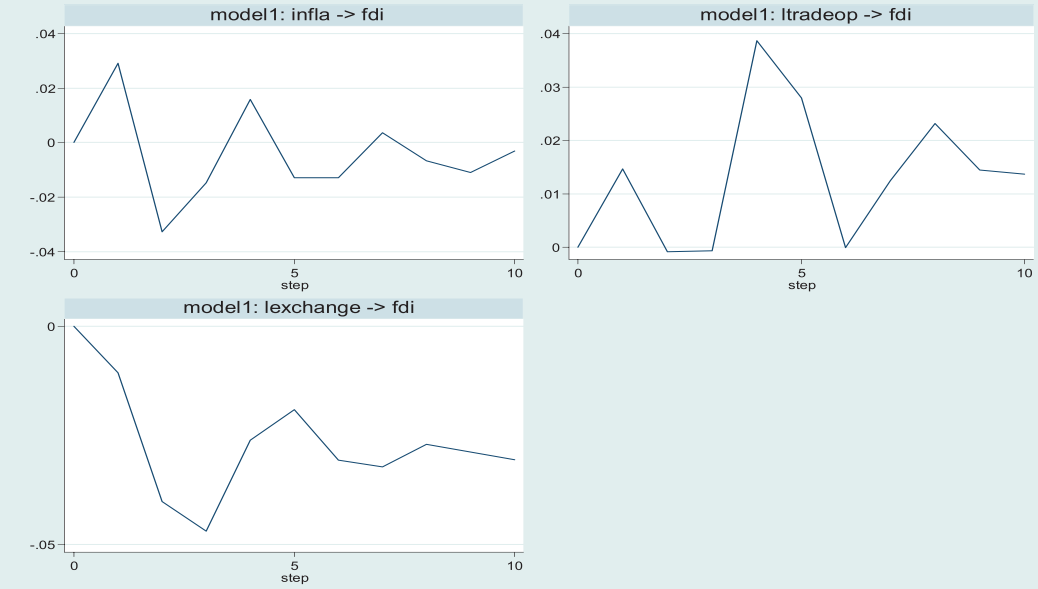
Indonesia



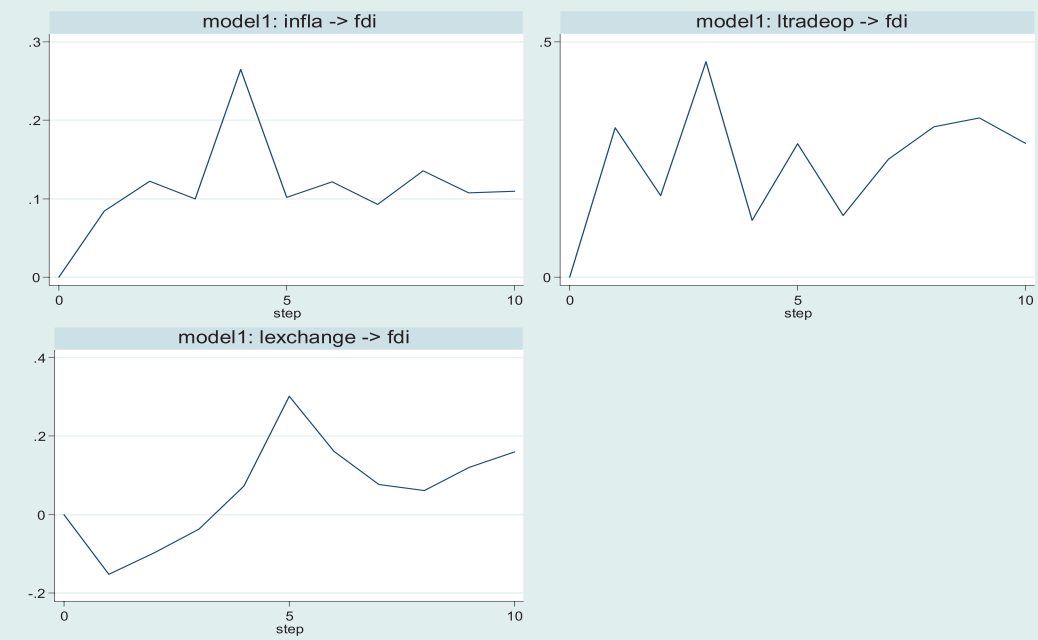




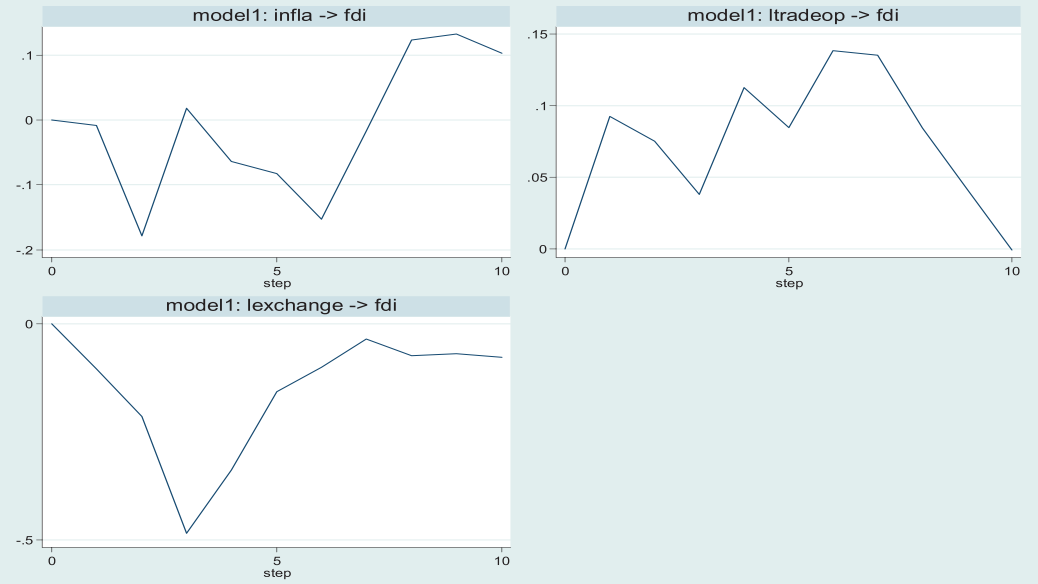
Mexico



Philippines



Turkey

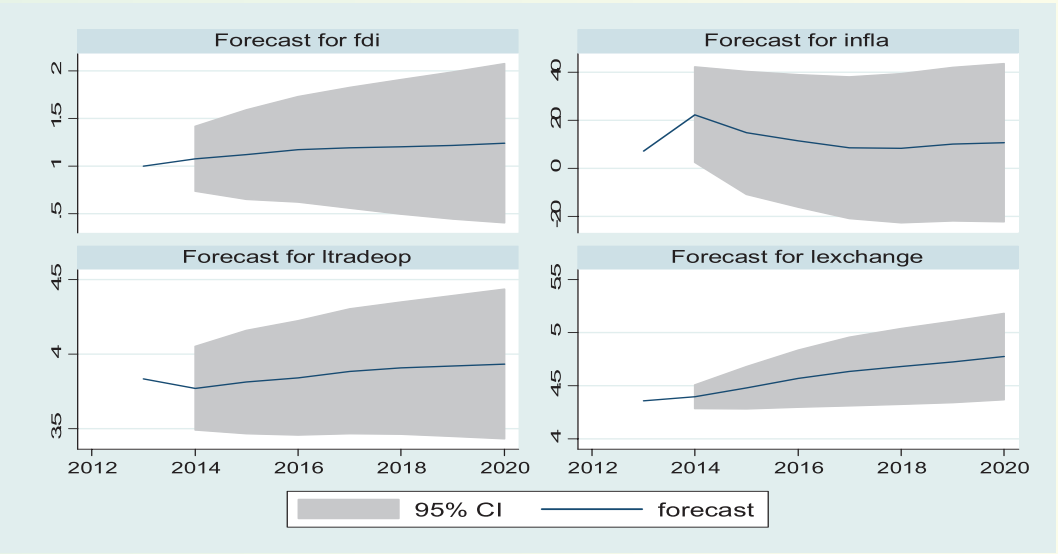


Forecasting

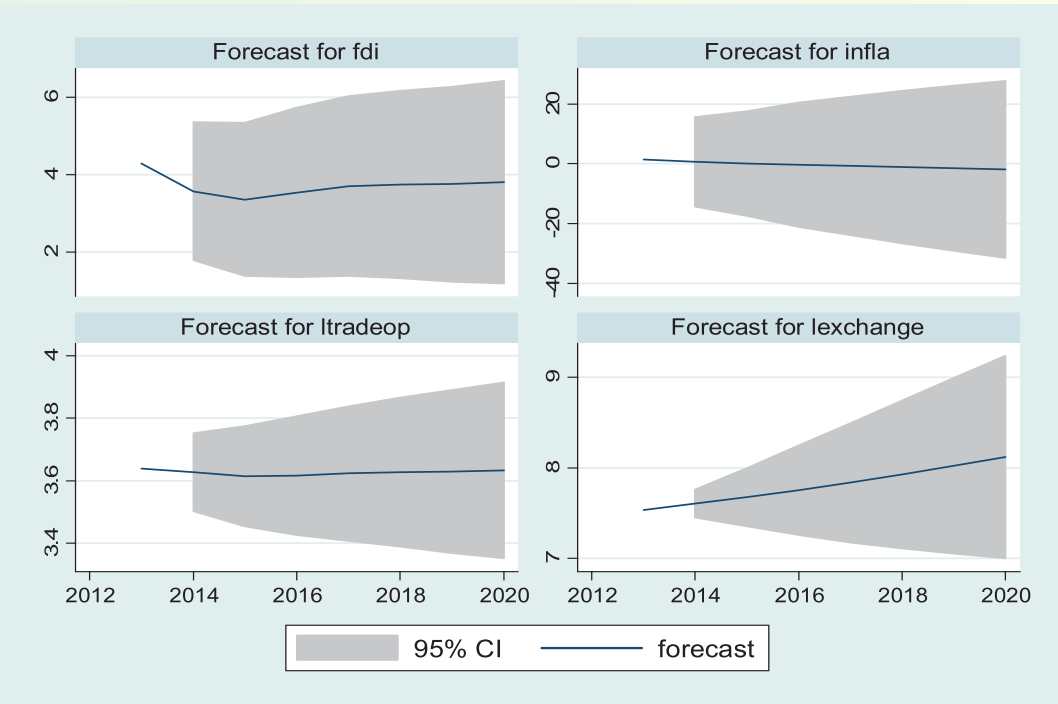
This study also tries to forecast FDI for Bangladesh and selected six emerging countries for the next seven years. From the Figures, it is observed that countries such as Bangladesh and India will have anupward trend in FDI inflows in the coming years. Indonesia will have an almost stable FDI. For countries like Colombia, Mexico, Philippines and Turkey FDI will have a bit fluctuating trend.

FIGURE 3: FDI FORECASTING

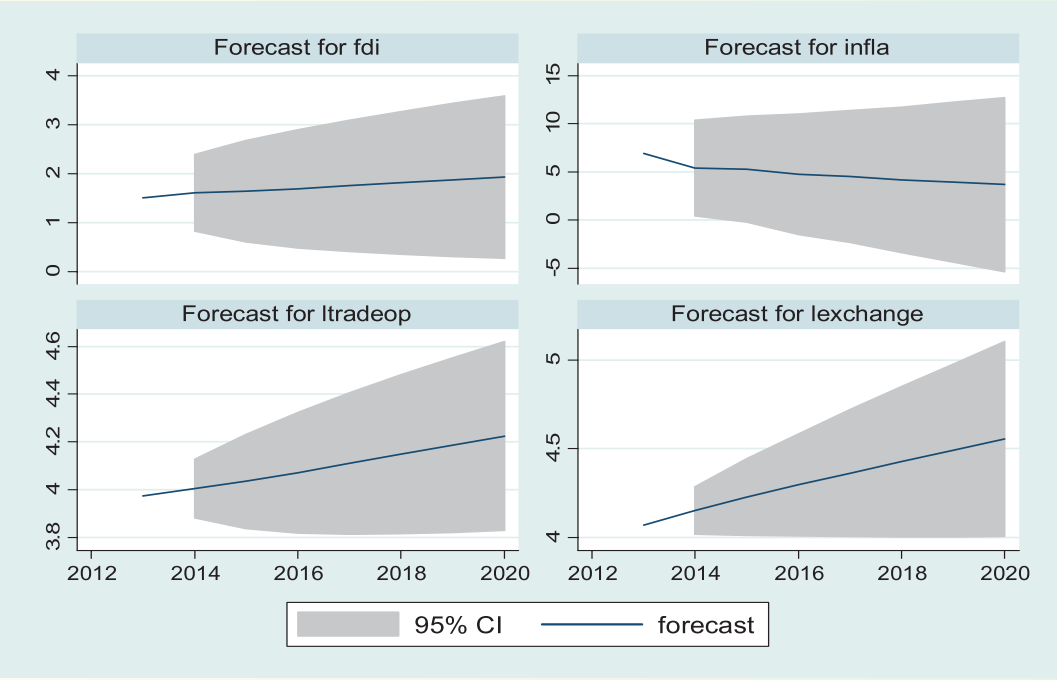
Bangladesh



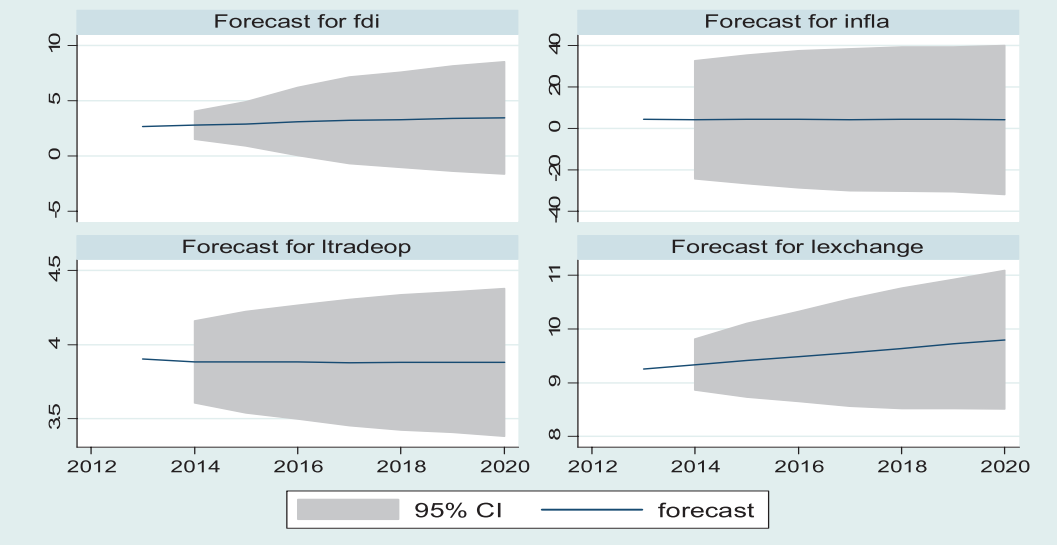
Colombia



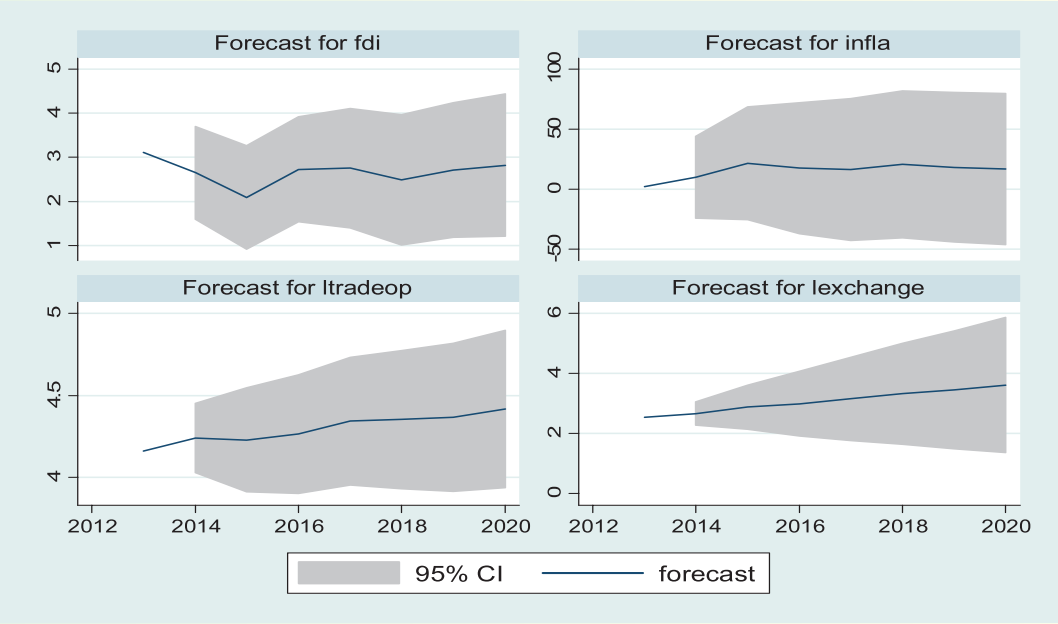
India



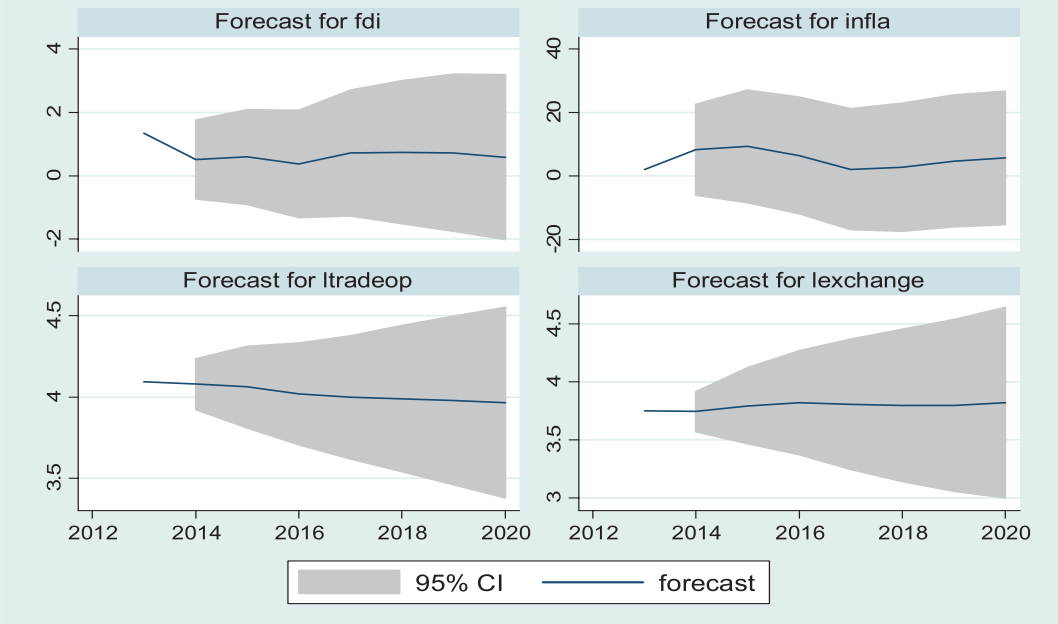
Indonesia



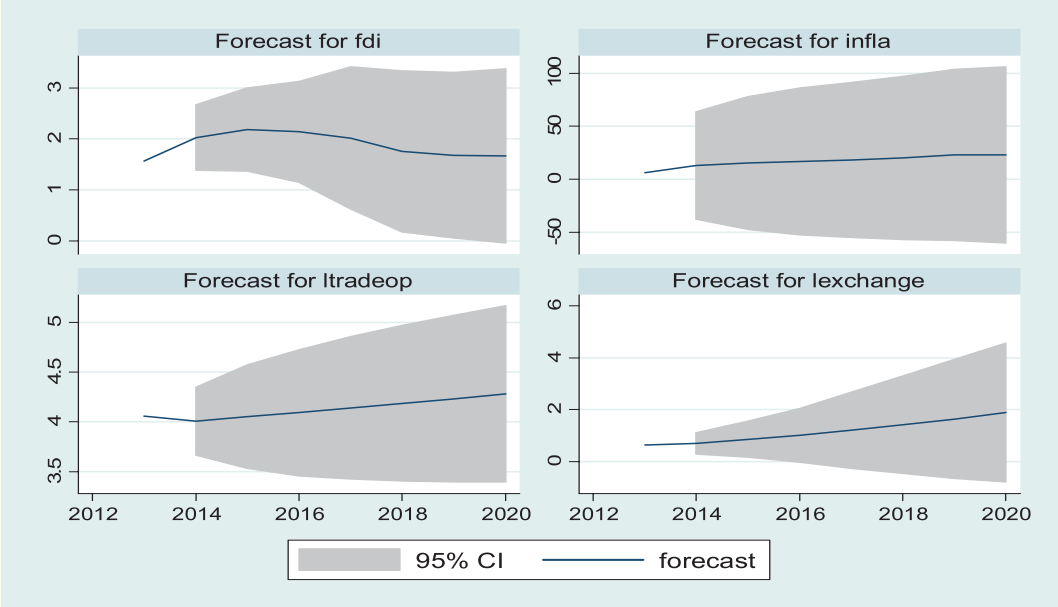
Mexico



Philippines



Turkey



Conclusion and Recommendations

This study investigated the impacts of inflation, trade openness and exchange rate on the FDI inflows in Bangladesh and six other emerging countries (Colombia, India, Indonesia, Mexico, Philippines and Turkey) under study by applying a vector error correction model. Results of the unit root tests such as ADF, ADG-GLS, PP and KPSS indicated that all variables in the study were integrated into order one. The test statistics (trace and eignvalue) of the Johansen Co-integration test indicated the presence of a co-integration relationship among the variables. In addition, a negative parameter of the error correction term confirmed that a long-run equilibrium relationship exist among the variables. The study has found that among three independent variables of the study,inflation and exchange rate are important factors to explain the changes in FDI inflows in both short run and long-run for Bangladesh and six other emerging countries. However, this study has found the impact of trade openness as not so dominant factor for FDI inflow in the countries under study.

Therefore based on the results this study provides following recommendation:

As FDI depends on price stability of host country to a great extent, monetary and fiscal stances of the country should be designed in a prudent manner to maintain price stability and to keep inflation at a low level in order to attract more FDI inflows. In this context, it is imperative to make effective co-ordination between monetary and fiscal policy to maintain price stability.

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Annex-1

Bangladesh

Lag Selection

Selection-order criteria
Sample: 1977 - 2013 Number of obs = 37

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-17.4483				.000037	1.15937	1.22076	1.33352*
1	-1.67942	31.538	16	0.011	.000038	1.17186	1.47885	2.04263
2	23.7472	50.853	16	0.000	.000024*	.662315	1.21489*	2.22969
3	34.8498	22.205	16	0.137	.000034	.927038	1.7252	3.19103
4	59.8879	50.076*	16	0.000	.000025	.438493*	1.48224	3.3991

Endogenous: diffdi difinfla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	13.3711	16	0.64546
2	23.3622	16	0.10439

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	2.895	2	0.23513
D_infla	7.807	2	0.02017
D_ltradeop	0.474	2	0.78901
D_lexchange	0.290	2	0.86484
ALL	11.467	8	0.17662

Colombia

Lag Selection

Selection-order criteria
Sample: 1974 - 2013 Number of obs = 40

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-228.946				1.34426	11.6473	11.7084	11.8162
1	-84.6523	288.59	16	0.000	.002212	5.23261	5.53794*	6.07705*
2	-66.3374	36.63*	16	0.002	.002023*	5.11687*	5.66645	6.63686
3	-56.2282	20.218	16	0.211	.002902	5.41141	6.20525	7.60696
4	-45.1636	22.129	16	0.139	.00424	5.65818	6.69628	8.52928

Endogenous: fdi infla ltradeop lexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	14.9312	16	0.52969
2	17.1603	16	0.37530

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	17.337	2	0.00017
D_infla	4.817	2	0.08995
D_ltradeop	0.440	2	0.80256
D_lexchange	7.282	2	0.02623
ALL	29.876	8	0.00022

India

Lag Selection

Selection-order criteria
Sample: 1980 - 2013 Number of obs = 34

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-9.85595				.000027	.815056	.876295	.994628*
1	15.3911	50.494	16	0.000	.000016	.271111	.577306*	1.16897
2	34.8906	38.999	16	0.001	.000013*	.065258*	.61641	1.6814
3	42.2893	14.797	16	0.540	.000025	.571218	1.36733	2.90565
4	59.9889	35.399*	16	0.004	.000028	.47124	1.51231	3.52396

Endogenous: diffdi infla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	15.7528	16	0.47034
2	15.1154	16	0.51620

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	12.429	2	0.00200
D_infla	32.048	2	0.00000
D_ltradeop	0.279	2	0.86977
D_lexchange	2.274	2	0.32073
ALL	47.031	8	0.00000

Indonesia

Lag Selection

Selection-order criteria
Sample: 1986 - 2013 Number of obs = 28

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-100.957				.021185	7.49692	7.5551	7.68723
1	-73.8818	54.15	16	0.000	.009753	6.70584	6.99675*	7.65742*
2	-55.3101	37.143	16	0.002	.008784*	6.52215*	7.04578	8.23499
3	-40.7737	29.073*	16	0.023	.01207	6.62669	7.38305	9.10079
4	-28.0524	25.443	16	0.062	.024412	6.86089	7.84997	10.0962

Endogenous: diffdi difinfla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	11.4534	16	0.78067
2	14.2968	16	0.57661

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	11.765	2	0.00279
D_infla	6.268	2	0.04354
D_ltradeop	0.488	2	0.78362
D_lexchange	0.662	2	0.71834
ALL	19.182	8	0.01391

Mexico

Lag Selection

Selection-order criteria
Sample: 1975 - 2013 Number of obs = 39

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-171.049				.093054	8.97689	9.03811	9.14751*
1	-148.629	44.84	16	0.000	.067328	8.64766	8.95375*	9.50077
2	-129.088	39.083*	16	0.001	.057751*	8.46604*	9.017	10.0016
3	-118.69	20.795	16	0.187	.082723	8.75333	9.54916	10.9714
4	-108.581	20.218	16	0.211	.12925	9.05544	10.0961	11.956

Endogenous: diffdi difinfla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	9.6753	16	0.88303
2	11.5045	16	0.77733

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	10.815	2	0.00448
D_infla	3.779	2	0.15112
D_ltradeop	21.858	2	0.00002
D_lexchange	6.986	2	0.03040
ALL	43.439	8	0.00000

Philippines

Lag Selection

Selection-order criteria
Sample: 1974 - 2013 Number of obs = 40

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-115.867				.00471	5.99334	6.05441	6.16223*
1	-95.4433	40.847	16	0.001	.003795	5.77216	6.07749	6.6166
2	-72.3473	46.192	16	0.000	.002732*	5.41737*	5.96695*	6.93736
3	-60.5598	23.575	16	0.099	.003604	5.62799	6.42183	7.82353
4	-40.4495	40.22*	16	0.001	.00335	5.42248	6.46057	8.29357

Endogenous: fdi difinfla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	16.5486	16	0.41537
2	14.6517	16	0.55028

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	0.324	2	0.85042
D_infla	16.948	2	0.00021
D_ltradeop	2.628	2	0.26872
D_lexchange	5.803	2	0.05493
ALL	25.703	8	0.00118

Turkey

Lag Selection

Selection-order criteria
Sample: 1979 - 2013 Number of obs = 35

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-171.378				.264521	10.0216	10.083*	10.1994*
1	-151.26	40.237	16	0.001	.210691*	9.78627*	10.0931	10.675
2	-138.056	26.408	16	0.049	.257116	9.94605	10.4983	11.5458
3	-124.558	26.995	16	0.042	.328489	10.0891	10.8867	12.3999
4	-106.126	36.864*	16	0.002	.352163	9.95007	10.9932	12.9719

Endogenous: diffdi difinfla diftradeop difexchange
Exogenous: _cons

Test for Autocorrelation

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	16.4553	16	0.42166
2	26.8295	16	0.04342

H0: no autocorrelation at lag order

Test for Normality

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_fdi	0.321	2	0.85180
D_infla	3.484	2	0.17515
D_ltradeop	34.274	2	0.00000
D_lexchange	0.593	2	0.74347
ALL	38.672	8	0.00001

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A Markov-Switching Model of GDP Growth in Bangladesh

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Abstract

This paper examines the turning points of business cycle in Bangladesh using a Markov regime-switching approach to annual GDP of Bangladesh spanning 1974-2013. In particular, it applies the univariate Markov-switching model proposed by Hamilton (1989) which models GDP series with stochastic trend and a stationary cyclical component in order to identify turning points in business cycles observed in Bangladesh. Estimation shows that real GDP growth in Bangladesh follows a second order autoregressive process, AR(2) where mean GDP growth switches between high growth and low growth regimes. In addition, switching time coincides with the year 1991 when the financial sector reform program (FSRP) started after privatization and trade liberalization in the previous decade. The study also finds that both high and low growth regimes are significant and persistent implying that the high growth regime that began in 1991 is likely to continue in the subsequent years given the data generating process. Identification of turning points in business cycles may be useful to economic agents and policymakers in decision making process.

Keywords: Markov-switching regression, autoregressive process, Business cycle, Regime changes, Bangladesh.

JEL Classification: C22, E32, O53.

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Introduction:

The real GDP growth of Bangladesh has undergone discernible changes in response to shifts of economic policy regimes since her independence through a liberation war in 1971. Bangladesh economy suffered severe output loss owing to devastation loss of physical and human capital in the aftermath of the war. In addition, high dependence on agriculture, low level of industrialization, nationalization of industries, weak international trade and restrained financial sector inhibited the real GDP to stagnate in the years following independence till economic liberalization that were kicked in the early 80's and culminated in financial sector reforms in the early 1990s. It is interesting to examine how the changes in economic policy regimes have impacted the trajectory of real GDP growth of Bangladesh.

Surprisingly, the author could not find in the existing literatureany instance of modeling regime shifts in the real GDP growth rate of Bangladesh. Undoubtedly, the information on regime shifts will provide valuable information to policy makers as the country aspires to sustain high and stable GDP growth rates to attain the status of highermiddle income countries in the near future.

Therefore, the aim of this paper is to fill in this gap in literature using a Markov-switching model of real GDP growth in Bangladesh. Following the methodology used by Hamilton (1989) and Kim and Nelson (1999)for analyzing US business cycles, the paper examines the dynamics of business cycles in Bangladesh using annual GDP growth rate for the period 1974-2013. Specifically, the goal of the paper is to identify the nature of structural break in Bangladesh real GDP towards more stable growth trajectory in the post liberation war period. Economic agents and policy makers may find it useful to consider information on turning points of business cycles in their decision making process.

The remainder of the paper is organized as follows: the next sections review literature, describes data, model and methods, presents empirical results, respectively. The final section summarizes the findings and concludes the paper.

Literature Review

Regime-switching models have been widely applied in identifying the phases of business cycles in many countries via changes in regimes of real GDP (Hamilton (1989), Goodwin (1992), Chauvet (1998), Kim and Nelson (1999), Clemens and Krolzig (2003) and Billio, Ferrera, Gueegan and Mazzi (2013), to mention a few) and other important

macroeconomic variables such as consumption, industrial production, inflation, stock returns and so on. This brief literature review will mostly cover existing literature regarding real GDP.

Goldfeld and Quandt (1973), and Hamilton (1989) were among the pioneers in econometric applications of Markov-switching models. However, the first prominent study on business cycles is due to Hamilton (1989), who examined the post-war US real GNP to identify turning points in the US business cycles using a two-state Markov-switching model and found that typical recession in the US were associated with a 3% permanent fall in the level of real GNP in the US.

Filardo, (1994) sought to investigate if expansionary and contractionary phases of the business cycle differ by applying Markov-switching model to monthly series of industrial production. Unlike Hamilton (1989) who used time-invariant transition probabilities in estimating a two-state Markov-switching model, Filardo (1989) used time-varying transitionprobabilities between the regimes. Results of the latter study showed that there was a high correlation between estimated probabilities from the model and traditional reference cycles.

Chauvet (1998) proposed a dynamic factor model with a two-state Markov-switching that facilitates drawing inference about unobserved nonlinear factor and latent Markov state. Using an MSAR specification of switching factors coincident index for the quarterly series 1952.04-1993.03 and the monthly series 1952.2-1931, the author was able to optimally date the turning points in the US business cycle which was strongly correlated with NBER dating of business cycles.

Many studies on business cycles also attempted to identify asymmetry in real GNP. Potter (1995) estimated a nonlinear threshold autoregressive model for US GNP which was found to outperform standard linear models. Estimates of Potter (1995) showed that the US economy turned more stable in the post-1945 period than it was in the pre-1945 period which evidenced the existence of asymmetric effects of shocks on US business cycles.

Kim and Nelson (1999) extended Hamilton's (1989) taking a Bayesian approach to Markov-switching model with regime heterogeneity. The authors attempted to identify the existence, timing and nature of business cycles in the US using quarterly real GNP. The study found evidence in favor of a structural break in US business cycle around the first quarter of 1984 towards more stable real GDP growth as reflected in lower difference in real GDP growth between recessions and expansions.

Clemens and Krolzig (2003) examined asymmetries of business cycles and applied two and three state Markov-switching models to detect turning points in US business cycles using real GDP of the US together with models examining consumption and investment growth in the US. The author found that asymmetries in the mean of these series which did not depend on regime-heteroscedasticity if they are incorporated in the Markov-switching model whereas non-parametric tests produced the mean of these series which were subject to regime heteroscedasticity.

Kim et al. (2005) modeled US real GNP using endogenously estimated unobservable Markov-switching regimes in order to see whether US business cycles show asymmetric effects of shocks. The study found that predicted dating of business cycle turning points matched those of NBER. The estimated non-linear Markov-switching model was found statistically significant but permanent effects of recession were small.

Empirical study of business cycles using Markov-switching models extended to cross-country experience as well. For instance, Goodwin (1992) studied business cycles of eight developed market economies using Hamilton's (1989) Markov-switching model and stated that improvements in forecasting were marginal and prediction of turning points were no different than those from traditional methods.

Ocal and Osborn (2000) developed and examined non-linear smooth transition autoregressive (STAR) models to understand the nature of UK business cycle using real consumption expenditure and industrial production. The study found a two regimes (recession and expansion) in consumption but three regimes (recession, normal growth and high growth) in industrial production and transitions from recovery were similar for the two macroeconomic variables.

Billio et al. (2013) attempted to evaluate whether Markov-switching as well as threshold models can identify the turning points in business cycles of the Euro Area. They found that Markov-switching models could generate more robust estimators in detecting turning points of business cycles.

In general, Markov-switching models performed well in modeling non-linearity and discrete nature of regime changes, as well as detecting turning points and asymmetric nature of business cycle turning points compared to linear and threshold models. It appears that application of Markov switching models to real GDP may reveal important information about regime shifts in real GDP of Bangladesh that may be useful in policy decisions about economic growth and stability.

Data, Model and Methodology

The study uses annual GDP growth rate for the period 1974-2013 calculated from the real GDP series collected from the International Financial Statistics (2014) CD-ROM. The sample period starts from 1974 recognizing the fact that real GDP growth in the immediate post-liberation period was highly volatile and constitutes outliers in the sample (Appendix-1).

In this paper, a combination of two-state Markov-switching Autoregressive model (MSAR) of Hamilton (1989) and Kim and Nelson's (1999) regime-heteroscedasticityis used to analyze the nature of business cycles as measured in real GDP growth of the post-1971 Bangladesh. Hamilton (1989) specifies a two-state Markov switching model where the mean growth rate of GNP in the USA switches between two regimes under the assumption that the error terms exhibit a regime-invariant AR(4) process. On the other hand, unlike the regime-invariant error variances in MSAR model of Hamilton (1989), Kim and Nelson (1999) allows regime-specific error variances in their MSAR model. While the paper keeps the two-state nature of regime switching of Hamilton (1989), it incorporates regime-heteroscedasticity in the model it estimates.

The two-step MSAR(2) model, we estimate in this paper, may be posed as the following

$$y_t - \mu_{s_t} = \emptyset_1(y_{t-1} - \mu_{s_t-1}) + \emptyset_2(y_{t-2} - \mu_{s_{t-2}}) + \sigma\varepsilon_t,\ \varepsilon_t \sim N(0,1) \ldots\ldots(1)$$

$$\mu_{s_t} = \alpha_1 + \alpha_2 s_t, \ldots..(2)$$

$s_{t=1} = 1$if the economy is in high growth state, 0 otherwise

$$P(s_t = 1 | s_{t-1} = 1) = p_{11} \ldots\ldots(3)$$

$$P(s_t = 1 | s_{t-1} = 2) = p_{12}$$

$$P(s_t = 2 | s_{t-1} = 1) = p_{21}$$

$$P(s_t = 2 | s_{t-1} = 2) = p_{22}$$

Equation (1) refers to MSAR(2) process while equation (2) defines how the mean growth rate evolves. Equation (3) describes the Markov transition matrix whichcontains the probabilities of making transition from one state to the other. These three equations constitute theMSAR(2) model to be estimated in this paper. There are seven parameters, namely, $\alpha_1, \alpha_2, \sigma, p_{11}, p_{22}, \emptyset_1, \emptyset_2$ that defines this two-stateMSAR(2) model of real GDP.

Empirical Results

Table 1 reports the estimated parameters of Markov-switching regression. It can be seen that except the coefficient on AR(1) term, all coefficients appear significant at either 1%

or 5% level of significance. The estimates of the study satisfy diagnostic tests including inverted AR root, autocorrelation, and normality tests (Appendices). Therefore, the real GDP growth of Bangladesh may be characterized as a second order autoregressive process, MS-AR(2) in which the mean GDP growth switches between high growth and low growth regimes.

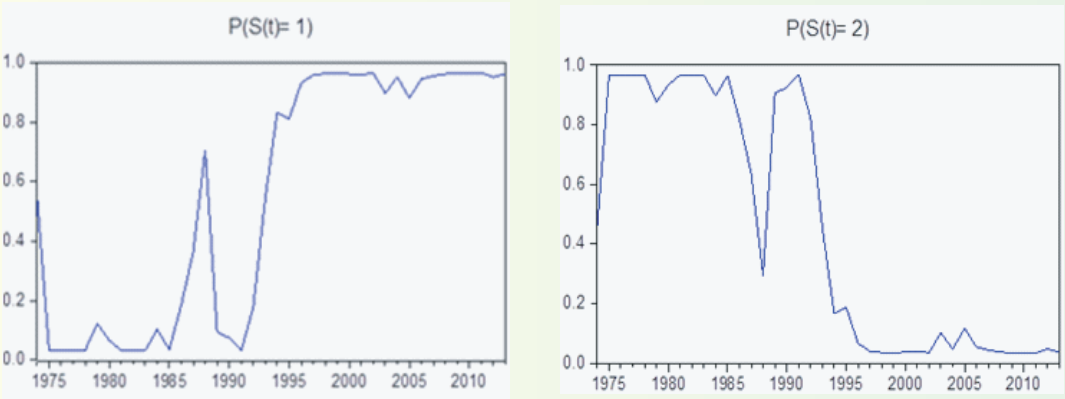
Table 1: Maximum Likelihood Estimates of Hamilton-MSAR(2) Model

	Regime Means		Regime-Specific Standard Errors		Transition Matrix Parameters		Parameters to AR Terms	
	α_1	α_2	σ_1	σ_2	p_{11}	p_{22}	$\emptyset_{1,}$	$\emptyset_{2,}$
Coefficient	0.058**	0.070**	-5.181**	-3.503**	3.554*	-3.389*	0.212	0.484*
Standard Error	0.005	0.010	0.174	0.205	1.425	1.531	0.1425	0.122

*Significant at 5% level,**Significant at 1% level

Figure 1 exhibits predicted regime probabilities together with the timing of regime switching. It turns out that the change from low growth to high growth state is observed to occur around 1991.

Figure 1: One-step Ahead Predicted Regime Probabilities



The year 1991 is characterized by a number of events that might have shaped the real GDP growth trajectory of Bangladesh. First, this is a year when the financial sector reform program (FSRP) began in a sequel to liberalization, particularly, the deregulation and privatization of nationalized industries initiated in the preceding decade. Second, 1991 marks the end of authoritarian regime and the beginning of a democratic regime. Third, internal resource mobilization through introduction of value added tax kicked in since 1991 and

dependence on external aid started to diminish as well. Therefore, we may surmise that the influence of all these positive changes set real GDP growth on a higher trajectory since 1991.

Table 2: Estimated Transition Probabilities and Expected Duration of Regimes

	State 1	State 2
State 1	$p_{11} = 0.972$	$p_{12} = 0.029$
State 2	$p_{21} = 0.033$	$p_{22} = 0.967$
Expected Duration	35.95	30.64

The predicted regime probabilities (Table 2) reveal high persistence of both regimes. The probability of the low growth regime (1974-1990) to persist is 0.972 with an expected duration of 35.95 periods while the probability of the high regime (1991-2013) to persist in 0.967 with an expected duration of 30.64 periods.

Summary and Conclusion

Given their non-linear nature, business cycles modelling by traditional linear models often fails to identify turning points in business cycles which are often subject to unobserved regime shifts. Therefore, the study attempts to examine business cycle dynamics using annual real GDP growth of Bangladesh using Markov-switching auto-regression (MSAR) that assumes that real GDP growth rate switches between two states with regime specific standard errors. Estimation reveals that real GDP growth of Bangladesh may be characterized as a second order autoregressive process, MS-AR(2) in which the mean GDP growth switches between high growth and low growth regimes. In addition, it may be noted that real GDP of Bangladesh switches from low growth to high growth regime around the year 1991 when implementation of financial sector reform program (FSRP) began together with internal resource mobilization through valued-added tax and diminishing dependence on external aid.

Evidently, the turning points identified by the Markov-switching model indicates that there has been a structural break in Bangladesh real GDP growth toward more stabilization since 1991. Particularly, post-1991 period is marked by lower volatility in GDP growth rate and a stable growth trajectory that made Bangladesh's transition to lower middle income status in 2014. If the notably stable economic growth that Bangladesh attained in recent two decades can be sustained and accelerated, it appears that Bangladesh has the potential to makethe transition to higher middle-income country status with right set of institutions and economic policy regimes.

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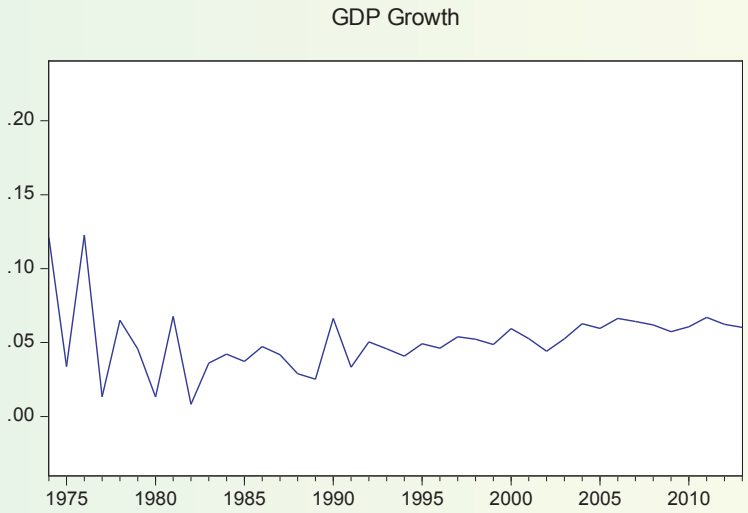
Appendices

Appendix 1: Plot of Real GDP Growth over the Sample Period 1974-2013



Appendix 2: ARMA Structure

Inverse Roots of AR/MA Polynomial(s)
Specification: GDP_GROWTH C AR(1) AR(2)
Date: 08/31/15 Time: 09:58
Sample: 1974 -2013
Included observations: 38

AR Root(s)	Modulus	Cycle
0.809809	0.809809	
-0.598220	0.598220	

No root lies outside the unit circle.
ARMA model is stationary.

Appendix 3: Residual Diagnostics

3.1: Correlogram of Standard Residuals

Sample: 1974-2013
Included observations: 40
Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.182	-0.182	1.4205	
. | . |	. | . |	2	0.038	0.005	1.4836	
. | . |	. | . |	3	-0.030	-0.023	1.5236	0.217
.*| . |	.*| . |	4	-0.148	-0.163	2.5422	0.281
. |*. |	. | . |	5	0.122	0.072	3.2572	0.354
.*| . |	. | . |	6	-0.081	-0.045	3.5778	0.466
. |*. |	. |*. |	7	0.122	0.092	4.3378	0.502
. | . |	. | . |	8	0.003	0.028	4.3384	0.631
.*| . |	.*| . |	9	-0.119	-0.101	5.1051	0.647
. | . |	. | . |	10	0.025	-0.029	5.1413	0.742
. |*. |	. |*. |	11	0.102	0.159	5.7466	0.765
.*| . |	.*| . |	12	-0.086	-0.079	6.1852	0.799
. | . |	.*| . |	13	-0.032	-0.095	6.2481	0.856
. | . |	. | . |	14	0.002	0.010	6.2482	0.903
.*| . |	.*| . |	15	-0.128	-0.123	7.3512	0.883
. | . |	. | . |	16	0.061	-0.004	7.6146	0.908
. | . |	. | . |	17	-0.035	-0.002	7.7035	0.935
.*| . |	**| . |	18	-0.123	-0.215	8.8495	0.919
. | . |	. | . |	19	0.070	0.006	9.2380	0.932
.*| . |	. | . |	20	-0.117	-0.024	10.395	0.918

*Probabilities may not be valid for this equation specification.

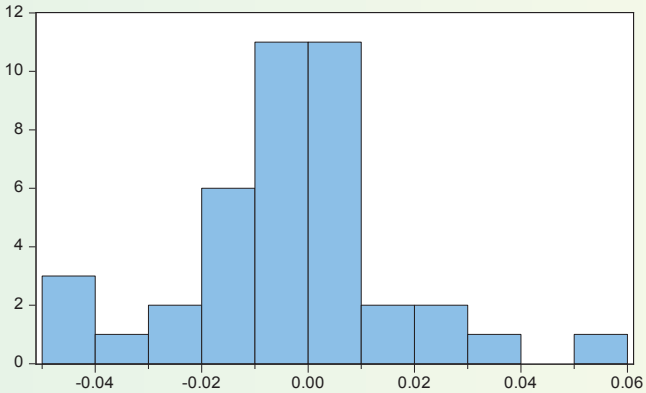
3.2: Correlogram of Standard Residuals Squared

Sample: 1974-2013
Included observations: 40

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.026	0.026	0.0280	0.867
. | . |	. | . |	2	0.024	0.023	0.0537	0.974
. | . |	. | . |	3	0.038	0.037	0.1205	0.989
. | . |	. | . |	4	-0.026	-0.028	0.1511	0.997
. | . |	. | . |	5	-0.027	-0.028	0.1872	0.999
. | . |	. | . |	6	0.058	0.060	0.3550	0.999
. | . |	. | . |	7	-0.019	-0.019	0.3737	1.000
. | . |	. | . |	8	0.006	0.005	0.3755	1.000
. | . |	. | . |	9	-0.031	-0.036	0.4259	1.000
. | . |	. | . |	10	-0.028	-0.022	0.4686	1.000
. | . |	. | . |	11	-0.029	-0.024	0.5159	1.000
. | . |	. | . |	12	-0.026	-0.025	0.5563	1.000
. | . |	. | . |	13	-0.030	-0.025	0.6109	1.000
. |*. |	. |*. |	14	0.149	0.151	2.0419	1.000
. | . |	. | . |	15	-0.019	-0.024	2.0669	1.000
. | . |	. | . |	16	0.007	0.002	2.0702	1.000
. | . |	. | . |	17	-0.032	-0.044	2.1431	1.000
. | . |	. | . |	18	-0.039	-0.029	2.2612	1.000
. | . |	. | . |	19	-0.041	-0.030	2.3954	1.000
. | . |	. | . |	20	0.019	0.005	2.4268	1.000

*Probabilities may not be valid for this equation specification.

3.3: Normality Test



Series: Residuals
Sample 1974 2013
Observations 40

Mean	-0.003656
Median	-0.001224
Maximum	0.057497
Minimum	-0.049879
Std. Dev.	0.020421
Skewness	0.091331
Kurtosis	4.692244
Jarque-Bera	4.828424
Probability	0.089438

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Purchasing Power Parity (PPP) with Structural Break and Mean Reversion in Real Exchange Rate: The Case of Bangladesh Taka and US Dollar

Javed Bin Kamal [1]

Abstract

This paper aims at examining the validity of purchasing power parity (PPP) both in absolute and relative terms with reference to the long run behavior of the real exchange rate of Bangladesh Taka relative to USA dollar. In doing so, the paper tests the presence of mean-reversion in the real exchange rate by using the unit root test approach i.e. Augmented Dickey-Fuller, DF-GLS, Zivot-Andrews tests. The paper verifies the long run relationship on co-integration and VAR framework. Using monthly data (01/2007-06/2013) and annual data (1986-2014), the paper finds support for both absolute and relative PPP, with an evidence of structural change (Quandt -Andrew test and CUSUM test) for only monthly data. VECM has been applied on monthly data, as there exists co-integrating equations for only monthly data (by using Johansen test). Unit root test indicates that the real exchange rate, that is the I (1) is not stationary.

Keywords: Purchasing power parity, exchange rate, structural break, international trade.

JEL Classification: F31.

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Introduction:

Regarding determination of the exchange rate of the two countries' currencies, the theory refers to the equilibrium rate as determined by the demand and supply of one country's currency relative to the other. However, in contrast to the theory, determining the factors that affect demand and supply of a currency is clearly subject to some challenges. Knowledge on these factors helps to understand future movements of exchange rate, which enable us to benefit from the export opportunities, foreign investments and trade, price competitiveness of foreign goods. Lothian and McCarthy (2001) find that purchasing power parity (PPP[2]) provides a good description of actual exchange rate behavior over a long run period. Furthermore, Hakkio finds that PPP explains the US Dollar's value in the market.

However, PPP validity has long been debated on the ground that empirical studies find mixed results. Some of the previous studies such as Kurihara (2009) use nonlinear unit root tests and find support for PPP for the EU countries. Meanwhile, some studies, such as, Ocal (2013) uses Zivot-Andrews unit root approach and find no evidence of PPP in Romania. According to Caglayan and Sacild (2010), unit root test such as KPSS test provides some evidence in favor of PPP for most of the OECD countries, compared to ADF and PP tests. Such deviations in results of the PPP studies are due to mainly different measurements scales used for price levels (see Terra and Abreau (2005), transportation costs, and trade restrictions (Kurihara (2009) between countries, data intervals (yearly, monthly), traditional unit root approaches.

One of the recent studies on Bangladesh has been carried out by Zaman et al (1999), Ahmed (2005), Anwar & Ahmed (2006), Hoque & Banarjee (2012, 2014), Chowdhury. This study is complementary to existing studies in the Bangladesh context with a wider range ofeconometric tools applied to probe the validity of purchasing power parity.

PPP is based on the law of one price and implies that exchange rates should equalize with the national price levels of different countries in terms of a common currency. Validity of PPP, is significant to policymakers for two reasons. First, PPP can be used to forecast exchange rate to conclude whether a currency is overvalued or undervalued. This is important for developing countries, along with countries experiencing large differences between domestic and foreign inflation rates. Second, PPP is used as the foundation for

[2] PPP is abbreviation of Purchasing power parity. PPP will be used in place of full form in this paper.

numerous theories of exchange rate determination. Therefore, the validity is important to those policymakers in developing countries who base their adjustment of exchange rate determination on the concept of PPP (Chang et al., 2010). Furthermore, estimates of PPP exchange rates are important for some practical purposes, including measuring nominal exchange rate misalignment, determining exchange rate parities, and comparing the national incomes of different countries.

Monetary authority controls interest rate, and money supply to stabilize inflation, increase output, and economic growth. Along with this, monetary authority also looks for stabilized currency, often intervenes the currency market, which is also known as managed floating.Bangladesh has adopted floating exchange rate regime since 2003, by abandoning adjustable peg system, so that market forces (supply and demand) determine the exchange rate. Exchange rate regimes affect both price levels and PPP. Under fixed exchange rate regime, the inflation rate of the foreign country to which local currency is pegged has direct effect on the local economy. Meanwhile, in a floating exchange rate regime, inflation is effected by the exchange rate fluctuations.

This paper focuses on exchange rate of Bangladesh Taka (BDT) to US Dollar (USD), because United States of America is a major trading partner of Bangladesh. According to USTR (United States Trade Representative), U.S.A. exports to Bangladesh in 2013 were $712 million, up 41.9% from 2012. Main items of exports were Machineries, Cotton, Yarn, and Fabrics, Electrical Machineries, Iron, and Steel, agricultural products. Meanwhile, U.S.A imports from Bangladesh totaled $5.4 billion in 2013, a 9.0% increase from 2012. Main categories were Woven Apparel, Knit Apparel, Miscellaneous Textile Products, Fish, Seafood (Shrimp and Prawn) and Tobacco. Apart from trade relationship, Bangladeshi migrants in U.S.A send remittances amounting over $2 billion, in fiscal year of 2013-14, chasing top remittance sending destination of Saudi Arabia and U.A.E (source: Bangladesh Bank, Statistical Table). Furthermore, US FDI (U.S. foreign direct investment in Bangladesh (stock) was $368 million in 2012, source: USTR) stimulated local production and employment. Bangladeshi people buy retail goods and services (including educational expenses) in USD. Considering, this facts, the impact of USD in the economy of Bangladesh is enormous.

Despite different methods applied to check the validity, the central idea is to test whether the behavior of real exchange rate is random walk (mean reverting) in the long run. Nominal exchange rate of Bangladeshi Taka against USD was on average of 77.72 in 2013-14 with an appreciation in value of 2.8% from 2012-12 (the rate was 79.93) (source:

Bangladesh Bank, Statistical Table). If exchange rate follows random walk, then the exchange rate in 2016 is not predictable. By random walk, it is understood that future forecast is independent of the past movements. As a result, the future exchange rate is not predictable. Meanwhile, mean reversion is the tendency of the exchange rate moves towards long term average rate. Any deviations will revert to the mean in the long run; any shock is not permanent and dies out in the long run. The paper aims to examine whether real exchange rate of Bangladeshi currency i.e. Taka is random walk and mean reverting in the long run. In addition, co-integration techniques has been employed to examine some equilibrium results at least in the long run, structural break, and non-linearity test to check the robustness of the model also applied.

Objective of the Study:

International finance theory reflects two puzzles (Rogoff,1996) about PPP validity; there is no consensus on obtaining similar conclusions about PPP in the long run (the first puzzle), and the real exchange rate has a higher volatility in the short term compared with a slower mean reversion in the long run (the second puzzle) (Nicholae Ghiba,2011).

- In this respect, the specific of objectives of the study are:
- To solve the first PPP puzzle, that is the PPP is valid in the long run. In that case, both absolute and relative PPP to be examined.

To solve the second PPP puzzle. Use the modern econometric tool to test the empirical behavior of the exchange rate, including mean reverting behavior to reach long run equilibrium.

There is always some short run fluctuation in the exchange rate, which is difficult to forecast. This study does not focus on such fluctuations in exchange rate. The investor's psychology effected by many factors such as political conditions, form expectation on future exchange rate movements. In addition, Bandwagon effect, herd of investors moving in the same directions, can cause short run fluctuations. This have no link with macroeconomics, rather linked with microeconomic aspects such as investment in individual firms.

The Theory:

According to the theory of Purchasing Power Parity (Cassel, 1918), in the absence of transaction cost and export barriers, identical goods will have the same price in different

markets when the prices are expressed in the same currency. This can be expressed as below:

$$E\left(\frac{BDT}{Us\$}\right) = P_{BD}/p_{Us} \quad (1)$$

The absolute version of the theory asserts that under these conditions, the same basket of goods and services should cost the same when expressed in terms of the same currency. Relative version of the theory asserts that the percentage change in the exchange rate between the two countries should be equal in percentage change in the national price level.

$$E = c(\frac{p}{p*}) \quad (2)$$

Absolute PPP is as follows:

$$\ln E = C + \ln P - \ln P^* \quad (3)$$

Relative PPP is as follows:

$$\Delta \ln E = \Delta \ln p - \Delta \ln p^* \quad (4)$$

According to The law of one price (LOOP), identical goods sold atthe same price in different countries if expressed in the same currency.Due to arbitrage, price differencesfor tradable goods result in international trade, until any such price differences exist, eventually dies out and equilibrium is reached at least in the long run. Based on holding of LOOP for individual commodity, PPP holds true automatically. Since the reference basket is different across countries, while considering PPP holding is true. As a result, for PPP validity, LOOP does not require to hold.

Few Previous Literatures:

Tons of previous literatures (See for example Papell & Prodan; Chortareas & Kapetanios, 2008; Pelagatti& Colombo) can be found on the empirical test of PPP hypotheses. We can find that many studieshave attempted to test the stationary or random walktest to verify the holding of PPP theory. The empirical validation of the purchasing power parity (PPP) theory is generally based on real exchange rates using consumer price indexes (CPI). The empirical evidence fails to provide clear support to the theory, resulting in the purchasing power parity puzzle. Even if the law of one price holds for all the goods traded in two countries, real exchange rates based on CPI are not mean-reverting, and therefore, statistical tests based on them should reject the PPP hypothesis. Meanwhile, test for the consistency of the PPP hypothesis in emerging economies is an obstacle mainly due to the frequent variation in the exchange rate arrangement, which results in long periods of fixed

exchange rates. Furthermore, the same specification of the PPP hypothesis is not applicable to countries adopting different exchange rate regime. However, PPP validity tests are successful for hyperinflation economies and panel data setting.However, Ikhifa-Aigbokhan (2015) find that PPP is not valid in both hyperinflation and low inflation countries.

Many previous studies using different time series and econometric techniques, found mixed results. Although numerous studies support the existence of PPP, some of them find very little or no evidence for PPP. One explanation for this unexpected result is the use of a small data set with standard unit root tests. There is no consensus on appropriate unit root testing procedure (John et al). In the current literatures, long run PPP has been tested in most cases, and has supportedthe use of unit root test such as ADF, DF-GLS, and PP (Ghiba, 2011). Meanwhile, Yin Wong Cheung et al find that modified Dicky Fuller test exhibits better result for the PPP support. Ng and Perron (Econometrica, 2001), find better result than ADF tests due to its power and size problems.

Conversely, conventional univariate unit root tests fail to support PPP (Alba and Park). They also find evidence of non-linear mean reversion in real exchange rates. This implies that PPP holds in one threshold regime but not in any other situation.Pelagatti and Colombo prove that such real exchange rates are neither stationary nor integrated, and so both unit-root and stationarity tests should reject the null hypothesis according to their power properties. Sarno and Valente provide strong evidence that long-run PPP is valid.

There are many papers that look into stationarity of real exchange rate of Bangladesh. For example Zaman et al (1999), by using the co-integration technique, assures a long term relationship among PPP and exchange rate. Ahmed (2005) findssome empirical support only for the relative version of PPP as a theory of price determination in Pakistan. His paper also discusses potential reasons for empirical failure of PPP in developing countries. Anwar & Ahmed (2006) use Engle-Granger co-integrating relationship, on a data set of 1984 to 2002 of India, Pakistan, Bangladesh, Sri Lanka. They find that PPP holds in weaker form with respect to Pakistan, India, and Sri Lanka; meanwhile they find strong indication of lack of PPP for Bangladesh. However, Hoque & Banarjee(2012) use unit root tests with structural change for the same four countries on a 55 year data set, find that real exchange rate is not constant and no support for PPP to hold in the long run. Chowdhury applies nonlinear econometric technique on data from 1994 to 2002 in the Bangladesh context, finds strong evidence for highly nonlinear mean reversion towards a stable long run equilibrium.

There are some non-conventional approaches to measure PPP validity. Coe and Serletis (2002), use bounds testing approach, and find long run relationship without the assumption of stationarity and conintegration. Aylar (2013) adopts bootstrap stationary test, which provides high power and controlling size, finds less evidence on PPP than other asymptotic tests. Kasmanetalin the EU context employs Lagrange Multiplier based unit root test with structural breaks and fail to support PPP. Pittis et al (2008) show that when robust procedures are applied, the evidence favors the PPP hypothesis.

Methodology:

In order to investigate the validity of PPP, unit root testing has become a very popular approach. If the real exchange rate includes a unit root, the shocks should have permanent effects and the variable will never return to its long run equilibrium. On the other hand, if the real exchange rate is stationary, shocks tend to die out in the long run and the equilibrium is achieved some time after the shock has occurred (Cuestas and Regis, 2008). Previous studies also examine existence of co-integrating relationships among price levels and exchange rate series. If there any co-integrating relationships exists, then VECM model is applied to see the short run and long run adjustments. Meanwhile, issues such as non-linearity, structural breaks, stability to regime changes and macroeconomic shocks attract the attention to find the stylized facts of the exchange rate behavior and to minimize forecasting errors.

The Model:

The relationship between the nominal and real exchange rates and their relationship with the concept ofpurchasing power parity can be understood from the following equation:

$$q_t = e_t - p_{BD,t} + p_{FOR,t} \quad (5)$$

Where q_t is the log real exchange rate, e_t is the log nominal exchange rate that is the domestic currency price of a unit of the foreign currency, and $P_{BD,\,t}$ and $P_{FOR,\,t}$ is the log Bangladesh and foreign price levels, respectively. If purchasing power parity holds perfectly, t would be equal to a constant, call it q, and we can rewrite (1) as

$$P_{FOR,t}) + e_t = q_t + P_{BD,t} \quad (6)$$

Absolute and Relative PPP test:

An empirical test includes the examination of the following relationship

for absolute PPP test:

Nominal Exchange Rate $t = \beta_0 + \beta_1 P t + \beta_2 P t * + u t$ (7)

For relative PPP test, examines the following relationships

ΔNominal exchange rate $t = \beta_0 + \beta_1 \Delta p_t + \beta_2 \Delta p_t^* + ut$ (8)

Coefficient restrictions are imposed as, $\beta_1=1$, $\beta_2= -1$, β_o .For absolute PPP test , $\beta_1=0$, $\beta_2=1$, with price level used , whereas for relative version , $\beta_2=1$ is enough with price indices used.

Unit root test:

Although there is no relationship between the two series, the regression results may suggest that there is a strong relationship. The R-square provides misleading results for time series with trends, also known as unit root processes or I(1). Such regression results are called spurious regression.

We assume that real exchange rate qt is a time series with intercept and trend

$$qt = \rho q_{t-1} + \alpha + \beta t + \varepsilon t$$

By subtracting q_{t-1} from both sides, we get:

$$\Delta qt = (\rho - 1) q_{t-1} + \alpha + \beta t + \varepsilon t \quad (9)$$

In the above equation of *p* =1, then we conclude that there is unit root in the times series of real exchange rate and thus non stationary.

Testing real exchange rate stationarity through the augmented Dickey Fuller unit root test, entails three assumptions: the intercept presence, the presence of an intercept, and a time trend, and finally, the absence any deterministic element. For each supposition, we construct three different relationships:

A. Both a drift and a linear time trend

$$\Delta qt = \alpha_0 + \gamma q_{t-1} + \alpha_1 t + \varepsilon t \quad (10)$$

B. Random walk with a drift

$$\Delta qt = \alpha_0 + \gamma q_{t-1} + \varepsilon t \quad (11)$$

C. Pure random walk

$$\Delta qt = \gamma q_{t-1} + \varepsilon t \quad (12)$$

If γ equals zero, than the real exchange rate sequence contains a unit root (the series is nonstationary).

Co-integration:

The concept of Co-integration has been widely applied in time series analysis as time series often have either deterministic or stochastic trends. Granger and Newbold (1974) suggest the idea for co-integration between two or more I(1) series. For example, time series $y_{1,t}$ and y2,t are I(1). I(1) variables tend to diverge as t?? because their unconditional variances are proportional to t. Thus I(1) can never be expected to obey any sort of the long run equilibrium relationship. The two series with I(1) trends can be co-integrated only if there is a genuine relationship between the two, as a result there exists a co-integrating vector of coefficients , which form linear combination of variables which is I(0) or stationary. Engle and Granger (1987), followed by Johansen (1988), Johansen and Juselius (1992) use co-integration to find relationship among variables.

Purchasing power parity (PPP) implies co-integration between the nominal exchange rate and foreign and domestic prices. Price levels to be co-integrated, it is required that each price series is integrated of the same order. To demonstrate this, we have conducted augmented Dickey-Fuller and DF-GLS test. For example, the Fisher equation implies co-integration between nominal interest rates and inflation.Engle and Granger (1987) test the cointegration between a set of integrated variables of the first order: l (1). If e_t, p_t* and $P_t$refers to natural logarithms of real exchange rate, foreign price level and domestic price level respectively. Long run PPP requires that $e_t + p_t$*-$P_t$be stationary. According to Engle and Granger, if the pt and pt* are cointegrated, PPP holds in the long-run under the following conditions (Enders, 2009).

- $e t + p t^* = \beta 0 + \beta 1 p t + \mu$ between of the form exists a linear combination.
- Residua ls (u_t) are stationary.
- Variables have the same integration order.

Stability Test:

OLS based inferences are biased if time series data are non-stationary (includes unit root). If there is a structural break (one or more) in times series, which reduce the ability to reject a false unit root null hypotheses. As a result, existence of structural break results in biased estimation. Though ADF (1979, 1981) is widely used to check existence of stationarity, Perron (1988, 1994, 1997, 2005), Zivot Andrews (1992) address the issue of structural break in stationarity checking process. Bai-perron (1997, 2003a) implement regression with multiple breaks. Meanwhile, CUSUM (Page, 1954) is used to monitor change detection.

VAR and VECM:

A VAR(1) in two variables (domestics and foreign price level) can be written in matrix form as:

$$\begin{bmatrix} p1,t \\ p2,t \end{bmatrix} = \begin{bmatrix} c1 \\ c2 \end{bmatrix} + \begin{bmatrix} A1,1 & A1,2 \\ A2,1 & A2,2 \end{bmatrix} \begin{bmatrix} p1,t-1 \\ p2,t-1 \end{bmatrix} + \begin{bmatrix} e1,t \\ e2,t \end{bmatrix} \quad (13)$$

Equivalently, as the following system of two equations

p1,t=C1+A1,1 p1,t-1+A1,2 p2,t-1+e1,t

p2,t=C2+A2,1 p1t-1+A2,2P2,t-1+e2,t

For applying VAR, all variables need to be of the same order of integration (I(0) or stationary). If variables are non-stationary, they should be co-integrated. In that case, the error correction term is added in the VAR. The model becomes a Vector Error Correction Model (VECM) which can be interpreted as a restricted VAR.

Bivariate VEC , with one lagged difference can be written as :

$$\Delta p,1t = C1 + A1,1\Delta p1,t-1 + A1,2\Delta p2,t-1 + \gamma\,(p1,t-1-\alpha 0-\alpha 1\,p2,t-1) + e1,t \quad (14)$$

$$\Delta p,2t = C2 + A2,1\Delta p1,t-1 + A2,2\Delta p2,t-1 + \gamma\,(p2,t-1-\alpha 0-\alpha 1\,p2,t-1) + e1,t \quad (15)$$

Impulse Response Function:

Impulse response is reaction of a dynamic system to an external change. We have applied impulse response function for examining regime change or any other shocks on PPP.

Data:

The frequency and measurement type of price levels used in the study of PPP validity and its impact results. In measuring price levels, a number of yardsticks are available. Consumer Price Index (CPI) includes consumer goods (larger portion of urban consumer goods), used to calculate inflation and represents living standards, being published monthly. The disadvantage is that there are some non- tradable items included in CPI, with variations in baskets of goods among countries. Wholesale Price Index represents wide ranges of tradable items consumed by mainly industrial units, with an advantage of being published weekly. Meanwhile, GDP deflator includes no tradable items. Export value index may include larger portion of tradable items that may not match between two countries. In addition, Big Mac index may represent set (basket) of goods, which may match most among countries. The consideration of base year does not possess any significance in price level measurements.

For testing PPP, we need frequent data (such as daily, weekly) for price levels to cope with high frequency data of exchange rate. For robust results, common basket of goods considered in calculation of price levels matter as well, even better would be to include the most tradable items. Considering this, the paper uses CPI as measurements of price levels on yearly basis (base year 2010=100) from 1986 to 2014, 28 years, collected from the World Bank database. The US CPI for monthly basis has been collected from the U.S. Department of Labor Statistics and Bangladesh CPI from the Bangladesh Bank and Bureau of Statistics, (from January , 2007-June 2013, months), here (US base = 1982, BD old base=1995, new base= 2005). Due to inaccessibility to the monthly data prior to 2007 in the case of Bangladesh, the paper does not study the case of pre and post regime change period for monthly data series. The data are collected from the World Bank database, Bangladesh Bank database (BD CPI and Exchange rate), Bangladesh Bureau of Statistics (BD CPI monthly) and US Bureau of Labor statistics (US CPI monthly).

Empirical Results:

Insert table1 here

The descriptive statistics table shows data series are normal (insignificant Jarque Bera statistics), except for Bangladeshi CPI (monthly) data. The standard deviation is high for the yearly data set, comparing to that of the monthly set. Both skewness and kurtosis are positive for all series. Figures 1 and 2 present both monthly and yearly data of real and nominal exchange rates. For both the data series, there are deviations between real and nominal exchange rate. For monthly data series, in 2012, both real and nominal exchange rate intersects. However, for yearly data series, the intersection point is 2011.

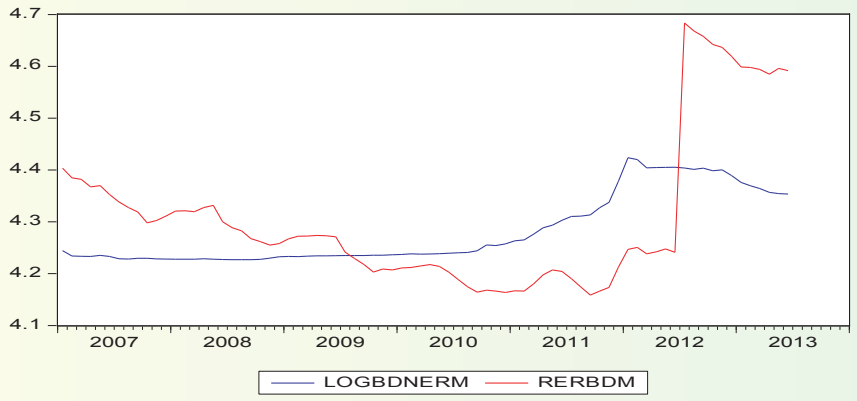


Figure-1: Monthly nominal and real exchange rate

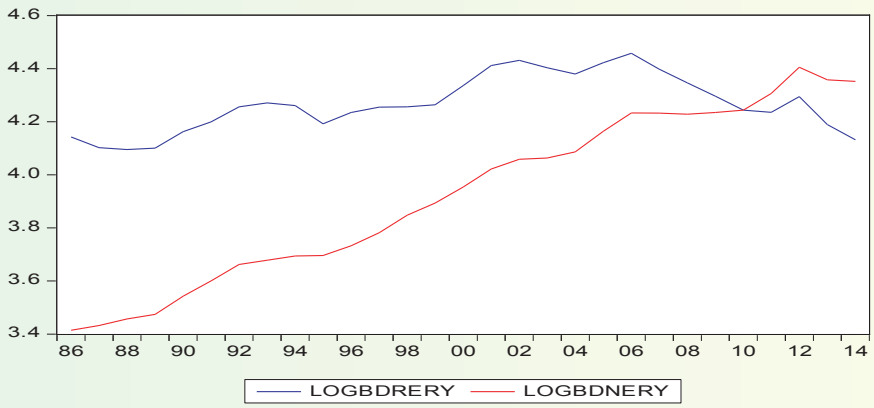


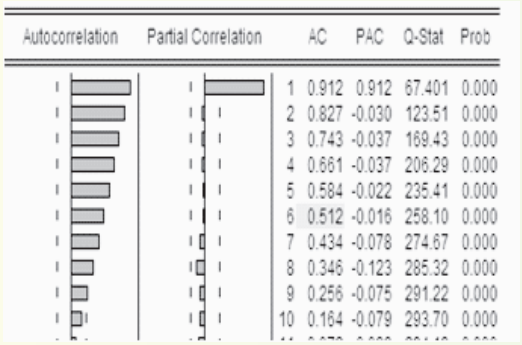
Figure-2: Yearly nominal and real exchange rate

Insert table 2 here

This paper usesADF, DF-GLS and Zivot-Andrews test (considers structural breaks) to identify order of integration of the data series. Unit root tests are conducted on both levelsand in 1st differences of data series. All the data series, nominal exchange rate, real exchange rate, Bangladeshi CPI, and the US CPI are integrated to order one (I (1) series). For monthly data series, Zivot-Andrews test reveals that all the series contains structural break and hence I(0) (Stationary at the level). For yearly data series, due singular matrix, results cannot be derived for Zivot-Andrews test.

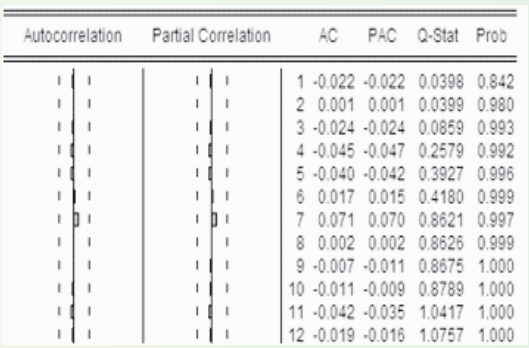
Figures 3 and 4 represent Autocorrelation and Partial Autocorrelation Function for the monthly data series of real exchange rate both in levels and in 1st differences respectively. It shows that real exchange rate is non-stationary. Meanwhile, for the yearly data series (figure 5 and 6), both Autocorrelation and Partial Autocorrelation Functions results are the same, the real exchange rate is non-stationary.

Figures 7-10 represent structural break test (by using CUSUM test), for both monthly and yearly data series, while estimating both absolute and relative PPP. It shows that for the monthly data series, there is structural break. However, for the yearly data, there is no structural break. Due to the existence of structural break in the monthly data series, estimation of absolute and relative PPP is not accurate.



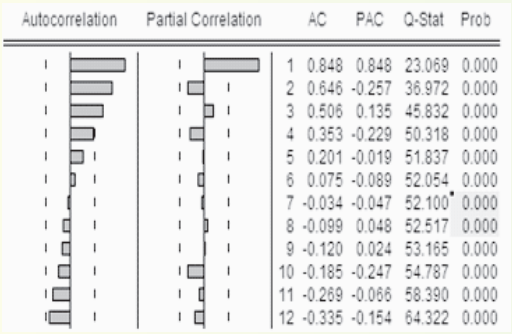
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.912	0.912	67.401	0.000
		2	0.827	-0.030	123.51	0.000
		3	0.743	-0.037	169.43	0.000
		4	0.661	-0.037	206.29	0.000
		5	0.584	-0.022	235.41	0.000
		6	0.512	-0.016	258.10	0.000
		7	0.434	-0.078	274.67	0.000
		8	0.346	-0.123	285.32	0.000
		9	0.256	-0.075	291.22	0.000
		10	0.164	-0.079	293.70	0.000

Figure-3 : Autocorrelation and Partial Autocorrelation Function (monthly level data)



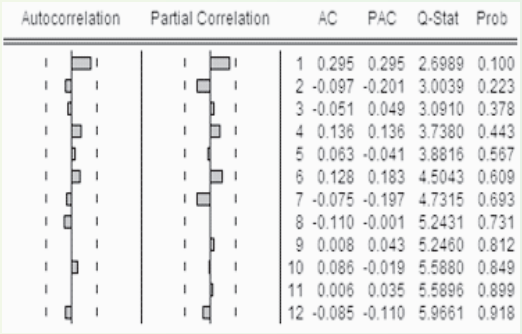
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.022	-0.022	0.0398	0.842
		2	0.001	0.001	0.0399	0.980
		3	-0.024	-0.024	0.0859	0.993
		4	-0.045	-0.047	0.2579	0.992
		5	-0.040	-0.042	0.3927	0.996
		6	0.017	0.015	0.4180	0.999
		7	0.071	0.070	0.8621	0.997
		8	0.002	0.002	0.8626	0.999
		9	-0.007	-0.011	0.8675	1.000
		10	-0.011	-0.009	0.8789	1.000
		11	-0.042	-0.035	1.0417	1.000
		12	-0.019	-0.016	1.0757	1.000

Figure-4: Autocorrelation and Partial Autocorrelation Function (monthly 1st difference data



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.848	0.848	23.069	0.000
		2	0.646	-0.257	36.972	0.000
		3	0.506	0.135	45.832	0.000
		4	0.353	-0.229	50.318	0.000
		5	0.201	-0.019	51.837	0.000
		6	0.075	-0.089	52.054	0.000
		7	-0.034	-0.047	52.100	0.000
		8	-0.099	0.048	52.517	0.000
		9	-0.120	0.024	53.165	0.000
		10	-0.185	-0.247	54.787	0.000
		11	-0.269	-0.066	58.390	0.000
		12	-0.335	-0.154	64.322	0.000

Figure-5: Autocorrelation and Partial Autocorrelation Function (yearly level data)



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.295	0.295	2.6989	0.100
		2	-0.097	-0.201	3.0039	0.223
		3	-0.051	0.049	3.0910	0.378
		4	0.136	0.136	3.7380	0.443
		5	0.063	-0.041	3.8816	0.567
		6	0.128	0.183	4.5043	0.609
		7	-0.075	-0.197	4.7315	0.693
		8	-0.110	-0.001	5.2431	0.731
		9	0.008	0.043	5.2460	0.812
		10	0.086	-0.019	5.5880	0.849
		11	0.006	0.035	5.5896	0.899
		12	-0.085	-0.110	5.9661	0.918

Figure-6: Autocorrelation and Partial Autocorrelation Function (yearly 1st difference data)

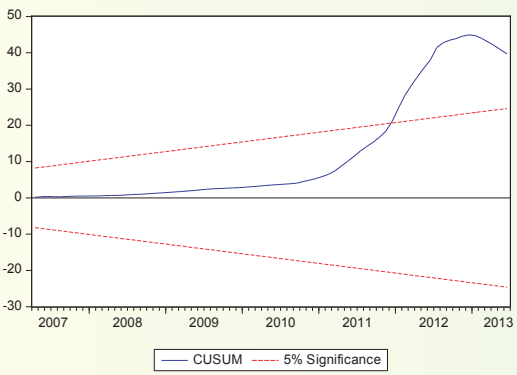


Figure-7 : CUSUM test (structural break test for absolute PPP, monthly data)

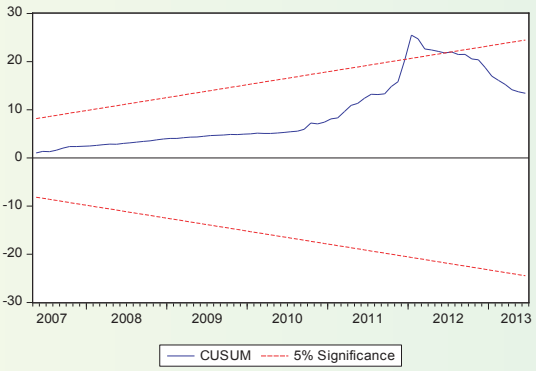


Figure-8 : CUSUM test (structural break test for relative PPP, monthly data)

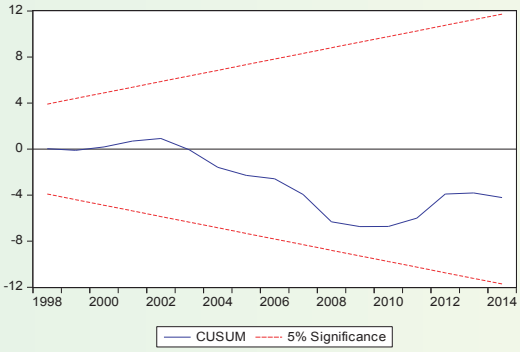


Figure-9 : CUSUM test (structural break test for absolute PPP, yearly data)

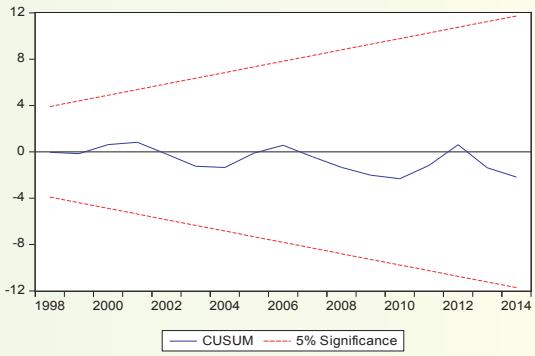


Figure-10 : CUSUM test (structural break test forrelative PPP, yearly data)

Insert Table 3 here

Both absolute and relative PPP are supported by joint coefficient test and individual coefficient test. There is the evidence of structural break forthe monthly data series (for both absolute and relative PPP). Besides, there is one (01) cointegrating equation for only the monthly data series, using Johansen test.

Insert Table 4 here

According to Johansen test, BD CPI (monthly) adjusts 65% in the short run, whereas USCPI and nominal exchange rate adjust 0.78% and 0.65% respectively.

Insert Table 5 here

Table 5 presents the results of vector error correction model, Quandt Andrews test (structural break test), Johansen test (cointegration test), Bai-Perron test (estimation with structural break. Due to one (01) cointegrating equation, VECM can only be applied to the monthly data series. Estimation of PPP with Bai-Perron (if there is structural break) is possible with monthly data.

Figure 11 presents impulse response functions. Here, Cholesky type restrictions are imposed. Nominal exchange rate responses positively to a unit shock in Bangladeshi CPI, with neutral response to USCPI. Meanwhile, Bangladeshi CPI responses positively to a unit shock in nominal exchange rate, which dies away over time. However, such responses to the US CPI are upward and stable for Bangladeshi CPI. On the other hand, theUS CPI responses positively to nominal exchange rate and negatively to the Bangladesh CPI shocks respectively.

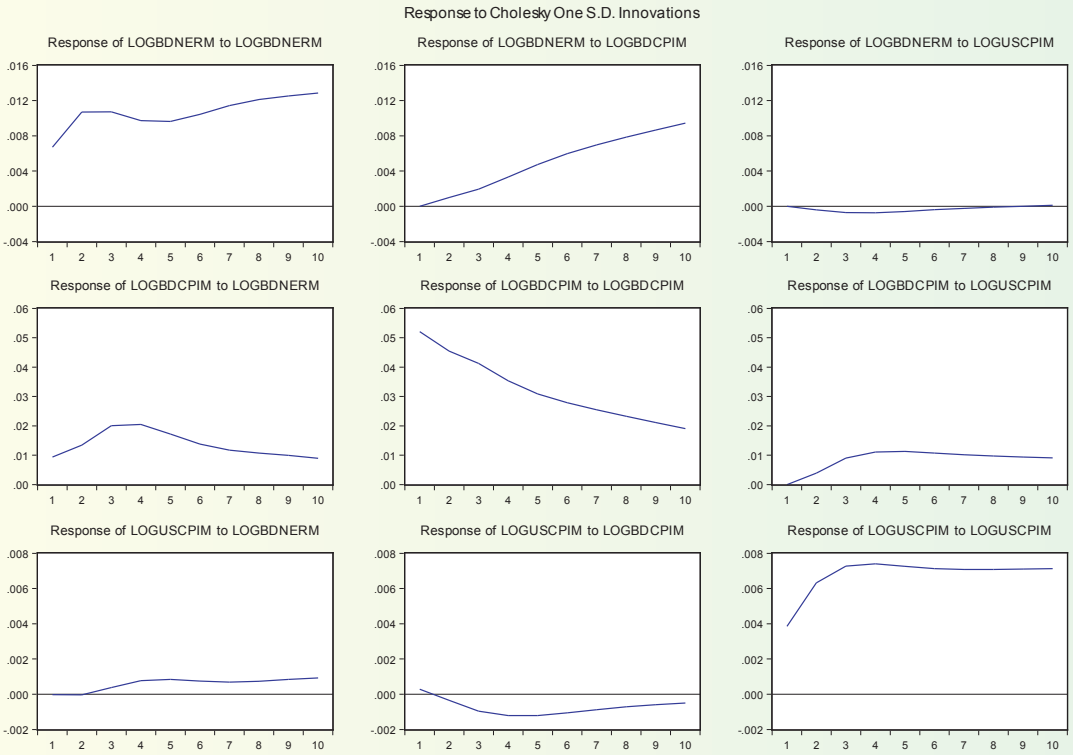


Figure-11: Impulse response functions for monthly data (after applying VECM.

Insert Table 6 here

Table 6 represents result of VECM for nominal exchange rate. Result shows that cointegrating equation is significant, which is known as error correction term, represents deviations from long run equilibrium are corrected gradually through short run adjustments.

Conclusions

In this paper, we examined the validity of PPP in the Bangladesh-USA context, using monthly data (01/2007-06/2013) and annual data (1986-2014). Despite evidence of PPP validity (in absolute and relative terms) found for both data sets, there are structural breaks with the monthly data, producing doubt about the inferences. As real exchange rate is integrated of order one, on the basis of unit root tests and autocorrelation function, it is a random walk and not mean reverting in the long run. Meanwhile, cointegration and VAR framework provide long term equilibrium results for only the monthly data set. VECM results suggest significant short term adjustments to correct long term deviations. These results are important to forecast exchange rate and adjust any deviations between nominal and real exchange rates between the currencies in question.

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Appendices

Table 1–Descriptive Statistics

	Yearly data 1986-2014			Monthly data 01/2007-06/2013		
	BDNERY	BDCPIY	USCPIY	BDNERM	BDCPIM	USCPIM
Mean	53.16	62.26	79.74	72.52	215.41	219.37
Median	52.14	53.90	78.97	69.29	207.64	218.25
Maximum	81.86	135.28	108.56	83.41	270.81	233.50
Minimum	30.40	24.28	50.26	68.52	172.65	202.40
Std. Dev.	16.34	31.76	17.67	5.04	30.03	8.21
Skewness	0.16	0.85	0.02	0.97	0.45	0.04
Kurtosis	1.66	2.64	1.84	2.31	2.01	1.98
Jarque-Bera	2.27	3.66	1.60	13.99	5.88	3.38
Probability	0.31	0.16	0.44	0.00	0.052	0.18

Note: For yearly data, there are 29 observations. For monthly data, there are 78 observations

Table 2 –Unit root tests

		ADF	DF -GLS	Zivot - Andrews (with structural change)
yt	NomEx (Y)	A.-1.61 B.-.97 C. 3.09	A. -1.44 B. -.34	
	RealEx (Y)	A.-.38 B.-1.05 C. -.56	A. -1.26 B. -.71	
	BDCPI (Y)	A.-.68 B.1.48 C. 12.39	A. -1.22 B. -.46	
	USCPI (Y)	A.-1.50 B.-1.18 C. 10.84	A. -1.82 B. -.24 C	
	Nom Ex (M)	A. -2.07 B.-1.17 C. .64	A. -1.81 B. -1.01	A. -3.37 B. -3.5*
	Real Ex (M)	A.-1.49 B.-1.02 C. .37	A. -1.26 B. -1.10	A.-5.34* B. -6.49*
	BDCPI (M)	A.-1.41 B.-1.82 C.-.13	A. -1.40 B. -1.29	A. -6.30* B.-7.36*
	USCPI(M)	A.-3.75* B.-.76 C. 1.85	A. -3.31* B. .83	A.-7.14* B.-5.70*

Δyt	NomEx (Y)	A. -4.02* B.-4.08 C.-.54	A.-4.23* B.-4.17*	
	RealEx (Y)	A. -3.57* B. - 3.18* C.-3.22*	A. -3.80* B.-3.27*	
	BDCPI (Y)	A. -3.64* B. -3.35* C.-.04	A.-3.83* B.-1.92	
	USCPI (Y)	A. -4.02* B. -3.95* C. -.82	A.-4.33* B.-4.02*	
	NomEx (M)	A. -2.45 B.-2.55 C.-2.44*	A.-2.11 B.-1.54	A.-3.37* B.-3.50*
	RealEx (M)	A.-8.98* B.-8.80* C.-8.83*	A.-9.08* B.-8.39*	A.-5.34* B.-6.49*
	BDCPI (M)	A.-8.96* B.-8.80* C.-8.86*	A.-9.07* B.-8.67*	A.-6.30* B.-7.36*
	USCPI(M)	A.-4.97* B.-5.03* C. -4.61*	A.-4.79* B.-4.26*	A.-7.14* B.-5.70*

Note: * indicates 5% significance level. AIC applied to find the lag. T-stat is given. For applying DF-GLS, with trend and drift, test statistics are calculated for 50 observations and may not be accurate for a sample of 20. A B C refers to model with (drift, linear trend) and (drift) and pure random walk model. For yearly data, Zivot-Andrews test could not be conducted due to singular matrix issue.

Table3-Absolute and Relative PPP tests

	Full period (1986-2014, yearly)	(01/2007-06/2013, monthly)	PPP support	Structural change	Co-integrating Eqn. (long term relation)
Equation test $NER_t = \beta_0 + \beta_1 P_t + \beta_2 P_t^* + u_t$				For Monthly data ,there is structural change	Yes for monthly data only
Combined restricted test $\beta_0=0$, $\beta_1=1$, $\beta_2=-1$					
Absolute ppp	F= 84500*	F=378404*	Yes		
Relative ppp	F= 12.63*	F=929*	Yes		
Individual restricted test $\beta_0=0$, $\beta_1=1$, $\beta_2=-1$					
Absolute ppp	F ($\beta_1=1$)=83* F ($\beta_2=-1$)=102*	F ($\beta_1=1$)=1100* F ($\beta_2=-1$)=501*	Yes		
Relative ppp	F ($\beta_1=1$)= 28* F ($\beta_2=-1$)=11*	F ($\beta_1=1$)=2766* F ($\beta_2=-1$)=16*	Yes		

Note: * refers 1% significance level. ** refers 5% significance level. F stat are round ed up.

Table 4- Adjustment coefficients (Johansen test)

Adjustment coefficients (standard error in parentheses)	
D(LOGBDCPIM)	-0.65 (0.073)
D(LOGUSCPIM)	-0.0052 (0.0078)
D(LOGBDNERM)	0.0065 (0.013)

Table 5- VEC, Quandt Andrews test, Bai-Perron

	VECM	Cointegration Test Johansen test	Quandt Andrews structural break test	Bai –Perron Structural change estimation
Yearly data (1986 - 2014)	VECM can not be applied as no Co - integrating Eqn.	No cointegrating equation	Singular matrix issue	Not applicable due to singular matrix issue
Monthly (01/2007 - 06/2013)	VECM can be applied as CI exists	Eigen value=.11 Test statistics=9.41 *	Wald F= 234* For relative version Wald F= 10*	Applicable

Table 6- VECM model for nominal exchange rate

D(LOGBDNERM) = C(1)* (LOGBDNERM (-1) + 2.77* LOGBDCPIM (-1) - 2.40 *LOGUSCPIM (- 1) - 6.23) + C(2)*D (LOGBDNERM (-1)) + C(3)*D(LOGBDNERM(-2)) + C(4)*D(LOGBDCPIM(-1)) + C(5)*D(LOGBDCPIM (-2)) + C(6)*D(LOGUSCPIM(-1)) + C(7)*D(LOGUSCPIM(-2)) + C(8)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1) *	0.008859	0.002718	3.259533	0.0018
C(2) *	0.556705	0.114707	4.853277	0.0000
C(3) *	-0.365175	0.116256	-3.141140	0.0025
C(4)	-0.005079	0.015266	-0.332681	0.7404
C(5)	-0.015752	0.015408	-1.022323	0.3103
C(6)	-0.081392	0.205011	-0.397013	0.6926
C(7)	0.044092	0.205757	0.214291	0.8310
C(8)	0.001339	0.000877	1.526444	0.1316

Note: * indicates 5% significance.

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Determinants of Bank Deposit in Bangladesh: An ARDL Cointegration Approach

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Abstract

Bank deposit, as a proxy of saving, is usually influenced by disposable income (Y). Besides disposable income, interest rate and other economic and noneconomic factors can play an imperative role on deposit movement. However, the nature of deposit mobilization may change in different regions due to political, social and cultural variation. This study examines the determinants of banks' time deposit especially for Bangladesh economy using autoregressive distributed lag (ARDL) model with cointegration techniques and error correction term. The results indicate that the growth of banks' time deposit in Bangladesh is positively influenced by the changes of per capita income, level of financial deepening (measured by domestic credit/gross domestic product) and remittance inflow in long run and if the long run relation is deviated somehow, it will take about 2.18 years to converge to the original integration.

Keywords : bank deposit, income, remittance

JEL Classification : E21, E23, F24.

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[1] The Authors are officials of Bangladesh Bank. Views expressed in this paper are authors' own and not necessarily that of Bangladesh Bank. The authors are thankful to K. M. Jamshed uz Zaman, Biru Paksha Paul and Dr. Akhtaruzzaman for their valuable comments and suggestions that helped to improve the earlier versions of this work. Contact email: bayazid.sarker@bb.org.bd

1. Introduction

Saving, as ultimate contributor to investment, is an important device for economic growth and development especially for developing economy. According to Keynesian theory, saving (S) is the residual part of income (Y) or expected income that is not to be spent on consumption(C). Mathematically, S=Y- C. Higher saving-GDP ratio facilitates to boost up growth and development. The opposite of increasing saving-GDP (S/Y) ratio reflected the decreasing of consumption-GDP (C/Y) ratio. Hence, increasing S/Y and decreasing C/Y implicitly contributes in increasing per capita income as well as improvement of living standard. In the early 1990s, consumption to saving ratio was about 87:13 and it reshaped at 78:22 by the end of 2015 (BB, 2016a). It indicates that economy's expenditure pattern gradually moves towards more saving. As a final point, the reshaping of consumption-saving ratio is positively pursuing to higher growth regime for Bangladesh. Thus, saving growth pattern needs to be gauged for policy analysis.

In Bangladesh, commercial banks collect their funds through three types of interest bearing deposit accounts. These are current account, saving account and term deposit account and all of them are in fact fully transformed into investment through various financial intermediation. In ground reality, current account is mostly non-interest bearing and saving accounts covers a very little portion in the total bank deposit of Bangladesh. Around 90% of total bank deposit appears to be time deposit making it eligible to be a better substitute for estimating saving determinants in Bangladesh as well as the best depiction of total bank deposit in Bangladesh.

The human saving behavior is largely explained by the life-cycle hypothesis (Modigliani and Brumberg, 1954), the permanent-income hypothesis (Friedman, 1957); and the more recent buffer-stock theory (Deaton, 1991 and Carroll, 1992). However, an individual is not the only contributor of saving or deposit, firms and public corporate institutions maintain significant amount of deposit in banks. In short, bank deposit, as a part of saving is mostly an income phenomenon which can be additionally determined by some other factors including densely distributed bank outlet, export led growth etc.

The main objective of the paper is to examine the long run and short run relationship between the bank deposit and its explanatory variables i.e., per capita income, financial deepening and remittance inflow in an ARDL bound test approach of cointegration technique.

The remainder of the paper is organized as in the following segments:

Section-2 covers survey of related studies and identifying gap, section-3 describe the methodology, model selection and result analysis, section-4 contains diagnostic and stability of the model and finally, a conclusion is given in section-5.

2. Survey of Studies and Identifying Gap

According to Keynesian theory, income, specifically tax adjusted income is the main determinant of saving. In case of bank deposit, other than the main factors, interest rate and other economic & noneconomic factors can play significant role on deposit growth. However, it may be different for different economies. The survey of related studies is selected from the similar developing economies like Bangladesh. Sudin et al (2006) conducted a study using cointegration techniques and vector error correction model (VECM) and found significant result for profit rate (Shariah based banking) base lending rate, KL composite index, money supply and GDP as determinants of total deposit in Malaysia. However, they have not found significant relation with interest on deposit and inflation.

On the other hand, Eriemo, N. O. (2010) found positive relation with interest rate, bank investment and importantly number of bank branches for bank deposit in Nigeria. Recently Boadi and Lartey (2015) used an ordinary least square technique and showed that Treasury bill rate and interest rate liberalization (dummy) have significant impact on bank deposit of Ghana. Other than developing economy, Monokrousos and Thomakos (2011) tested determinants of private deposit in Greece using cointegration techniques & VECM and their study established a found positive relationship with private sector credit and level of GDP.

After assessing the mentioned studies in the area of bank deposit a strong relation between bank deposit and GDP appears to quite intense. Other variables such as private sector credit, lending rate, capital market index and number of bank branches also draw significant results as determinants of deposit in different studies. Until now, no study has found to get the long run relation of determinants of deposit in Bangladesh.

Therefore, conducting study for testing determinants of bank deposit in Bangladesh can aid to consider as policy options for the policy makers in Bangladesh. In addition, remittance is the new area, first time to be tested as an explanatory variable of bank deposit in the area of economic research.

3. Methodology, Model Specification, and Result

3.1 Data

Fiscal year (FY) data sets used in this study, are taken from Bangladesh Bank Time Series Data, published in the Monthly Economic Trend covering FY 1972 to FY 2015. Prior to FY 1976, there were abrupt movements in the time series data set. In addition to that, proliberalization changes started to take motion in the market economy during the fiscal year of 1976. Subsequently this has rationalized selecting our data set from FY 1976 to FY 2015. As no authority estimates quarterly gross domestic product (GDP) of Bangladesh, the study has limited options to use other than yearly data. GDP data are 1995/96 based, and time deposit is the stock data. Though GDP data is taken from Monthly Economic Trend of Bangladesh Bank, the ultimate data source is Bangladesh Bureau of Statistics (BBS). Population data is taken from World Development Indicators (WDI).

3.2. Assumption and Limitation of the Model

We assumed that time deposit is the best representative of total bank deposit in Bangladesh (As mentioned earlier that 90 percent bank deposit is time deposit). Only the best fit model is reported in the paper. For example, theoretically deposit interest rate should have an influence on banks' time deposit. However, for developing economies, we have found very few cases where interest rate has long run association with their bank deposit. In some cases, consumer price index (CPI) is associated with bank deposit. In case of Bangladesh, both CPI and deposit interest have no long run association with growth of deposit.

3.3 Methodology and Model Selection

The initial step of the empirical study is to select the variables and method based on theoretical background, unit root testing and variables' of best fit to the model. The projected model is

$$TD=f(PCG,DC\_GDP,REM)$$

Here, TD is the time deposit of all banks

PCG is the per capita income (nominal GDP/population)

DC_GDP is the domestic credit to gross domestic product (GDP) used as a proxy of financial deepening REM is the workers' remittance inflow

Before fitting the econometric model, we take natural logarithm of all the variables. The prefix "L" before a variable name indicates natural logarithm of that variable.

3.3.1 Unit Root Test

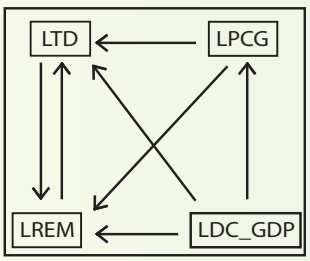
All variables (in log form except interest rate) are tested by applying three popular unit root tests, namely, Augmented Dickey-Fuller (ADF) test, Philips-Perron (PP) test, and Kwiatkowski-Philips-Schmidt-Shin (KPSS) test. The order of integration, suggested by different tests, is summarized in the Table-1 below. Based on the test, we get mix results. According to the test results, variables of time deposit LTD, LPCG, and LDC_GDP are I(1), however, LREM is stationary i.e., I(0).

Table-1: Summary of Unit Root Test Result

H0 :Variable has a unit root *(for ADF & PP)*
H0 :Variable is stationary *(for KPSS)*

Variables	Natural Log Level						Decision
	Intercept			Intercept & Trend			
	ADF	PP	KPSS	ADF	PP	KPSS	
Time Deposit (*LTD*)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Per-capita GDP (*LPCG*)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)
Remittance Inflow *(LREM)*	I(0)	I(0)	I(0)	I(1)	I(0)	I(0)	I(0)
Financial Deepening (*LDC-GDP*)	I(1)	I(1)	I(1)	I(1)	I(1)	I(0)	I(1)

In addition to that, all variables transform into I(0) in first difference, implies that no variable in I(2). Correlation among the variables has been calculated to check the relationship and found strong correlation. Besides, pair wise Granger Causality tests are also performed to see the direction of the causality presented in the Table-A1 in Appendix and a summery is shown in the diagram below.



3.3.2 Model Development

Since the order of integration is noticeable with the variables of both I(1) and I(0) and no variable with I(2), the situation is allowed to use ARDL bound test approach of

cointegration techniques (Pesaran and Shin, 1999 and Pesaran et al., 2001). This methodology is quite friendly to estimate long run relationship among the variables with small sample data. Therefore, the ARDL regression model is finally selected as:

$$LTD_t = \alpha + \sum_{i=1}^{p} \beta_i LTD_{t-i} + \sum_{i=0}^{q_1} \beta_i LPCG_{t-i} + \sum_{i=0}^{q_2} \beta_i LDC\_GDP_{t-i} + \sum_{i=0}^{q_3} \beta_i LREM_{t-i} + \varepsilon_t \quad \ldots\ldots (1)$$

Here, LTD denotes log level of time deposit, LPCG denotes log level of per capita nominal GDP, LDC_GDP is the log level of financial deepening measured by total domestic credit/GDP and LREM represents the log level of remittance inflow to Bangladesh. α stands for intercept term, βi (i=1…4) signifies the coefficients on respective variables, and ε_t denotes for error terms.

The model is modified for bound test cointegration as follows:

$$\Delta LTD_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta LTD_{t-i} + \sum_{i=0}^{q_1} \gamma_i \Delta LPCG_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta LDC\_GDP_{t-i} + \sum_{i=0}^{q_3} \mu_i \Delta LREM_{t-i} + \theta_0 LTD_{t-1} + \theta_1 LPCG_{t-1} + \theta_2 LDC\_GDP_{t-1} + \theta_3 LREM_{t-1} + \varepsilon_t \quad \ldots\ldots(2)$$

Here, Δ denotes the first difference of respective variables. θ_i (i =1…3) signifies the coefficients on respective lagged level and? $\beta_i, \gamma_i, \delta_i, \mu_i (i = 1 \ldots q)$ denotes coefficient on respective lagged variables. ε_t stands for error terms where coefficients are unrestricted and p denotes the maximum lag length selected by the user. In this model, lag length is selected according to the Akaike Information Criteria (AIC), commonly used to select the order of ARDL model. To check the existence of long-run relationship bound test provides F statistics of checking joint significance hypothesized as coefficients on lagged level are zero.

H_0: $\theta_1 = \theta_2 = \theta_3 = 0$

3.3.3 ARDL and Error Correction Estimation

After variable selection and their required granger causality test along with unit root test, we conduct an ARDL bound test. Theoretically we know, if computed F-statistic is below the lower bound, the variables are I (0), so no cointegration is possible. If the F-statistic exceeds the upper bound, it indicates to have a cointegration. If the F-statistic falls between the bounds, the test is inconclusive. Accordingly we have compared F-test value with the bounds critical value tables provided by Narayan (2005) since the study used relatively smaller sample size. The results are summarized in Table 2 & 3.

Table 2: Result of ARDL Bound Testing (Joint significance test)

Variables	F-Statistic	Result
LTD (LPCG, LDC_GDP, LREM)	13.602***	Cointegration

*** significant at 1% level

Table-3: Critical Values of Bound Test from Pesaran and Narayan

	Pesaran		Narayan	
Significance Level	Lower Bound I(0)	Upper Bound I(1)	Lower Bound I(0)	Upper Bound I(1)
1%	5.17	6.36	6.380	7.730
5%	4.01	5.07	4.568	5.795
10%	3.47	4.45	3.800	4.888

k=3, number of independent variables.

From the above result of bound test provides the F-Statistic calculated value 13.602 much higher than the critical value (Table-2 & 3). Thus, the null hypothesis of no cointegration can be rejected. It implies there is a long run relationship among the variable of the model.

In addition, if we check the t-statistic of $LTD_{(t-1)}$ with the critical value from Pesaran, Shin and Smith table (p304), the calculated value -6.656 for k=3 is far ahead from the tabulated value (-3.96,-4.73) for I(0) and I(1) bound respectively at 1% significance level. Therefore, t-statistic is also in favor of long run relationship among the variables of the model.

For estimating short run dynamics, model is transformed again containing coefficient of error correction term (ECT) as follows:

$$\Delta LTD_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta LTD_{t-i} + \sum_{i=0}^{q_1} \gamma_i \Delta LPCG_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta LDC_{GDP\,t-i} + \sum_{i=0}^{q_3} \mu_i \Delta LREM_{t-i} + \sigma ECT_{t-1} + \varepsilon_t \quad \text{.....(3)}$$

3.4 Estimated Output

Long run Relation:

Results of long run coefficients are estimated by using ARDL approach, shown below:

$$\widehat{\Delta LTD} = 5.55 + 0.51\ LPCG + 1.62\ LDC\_GDP + 0.29\ LREM$$

t-statistics	4.883	4.653	6.638	4.046
Probability ()	(0.000)	(0.000)	(0.000)	(0.001)

According to the estimated output from selected ARDL (3, 2, 4, 4) model, all coefficients are statistically significant even at 1% level. It also indicates that per capita income, financial deepening and remittance inflow have positive impacts on banks' time deposit in long run.

Short run Relation:

In short run dynamics, ordinary least square (OLS) equation is estimated by using the selected ARDL (3, 2, 4, 4) model. The estimation output gives a negative coefficient (σ = -0.4585) for lagged error correction term (ECT) and it is statistically significant at 1% level. It implies having a strong speed of adjustment to equilibrium (Table A2).

3.5 Result Interpretation:

According to the equation (3) and corresponding Table-A2, the negative coefficient value of lagged ECT indicates the short-run dynamics is in integration with long-run relationships. As the coefficient is statistically significant at 1% level, entails that the dependent variables (*per capita income, level of financial deepening and remittance inflow*) cause growth of banks' time deposit in long run. The value of the Table-A2 also signifies that the causal long-run relations are positive for each independent variable at 1% to 5% significance level. The coefficient value of -0.4585 implies strong and relatively faster speed of adjustment to equilibrium. It means, if long run equation is distorted, it will take about 2.18 years to converge to the original relation.

4. Diagnostic and Stability of the Model

4.1 Residual Diagnostic

The selected ARDL (3, 2, 4, 4) model is checked following standard econometric tests. Based on Q-Statistics (Correlogram of Residuals) and Correlogram Squared Residual tests result, the model has no auto-correlation or partial auto-correlation among the residuals. The Breusch-Godfrey Serial Correlation LM test result indicates that model has no serial correlation and Breusch-Pagan-Godfrey Heteroskedasticity test results indicate that the model has no serial correlation and no hetroskedasticy among the residuals (Table 4). Normality (Jarque-Bera) test result signifies that residuals are normally distributed (Table 4). Finally, we can conclude that residuals of the model are white-noise.

Table A4: Model Diagnostic Test Results

Test	χ^2	Probability
Breusch-Godfrey Serial Correlation LM test	0.017	0.115
Breusch-Pagan-Godfrey Heteroskedasticity test	0.351	0.397
Jarque-Bera	1.677	0.43

4.2 Coefficient Diagnostic:

Wald Test for coefficients of all independent variable signifies that per capita income, financial deepening and remittance inflow have short run influence over the banks' time deposit (Table 5). Bound test result has already revealed a long run relationship among the variables in this ARDL model (Table 3).

Table 5 Wald Test Results

Independent Variables	χ^2	Probability
LPCG	0.017	0.039
LDC_GDP	39.56	0.000
LREM	62.76	0.000

4.3 Stability of the Model:

Goodness of fit of the model is examined through the Actual/Fitted/Residual plot of the unrestricted error correction mechanism (ECM) shows that the model is fitted well. Ramsey RESET test output implies the model is fitted well (Table 6).

Table 6: Ramsey RESET Test (ARDL 3, 2, 4, 4)

t-statistic	F-statistic	Probability
0.3244	0.1052	0.7494

The robustness of the estimated results is also tested through the cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals of squares (CUSUMQ). Both CUSUM and CUSUMQ remain within the 5 percent critical bound. It implies that model is stable with no systemic change and all coefficients of variables are significant at 5 percent level over the study period (Figure 1 & 2).

Figure 1: Plot of CUSUM Tests

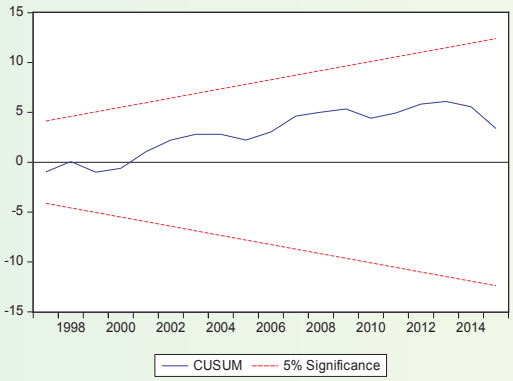
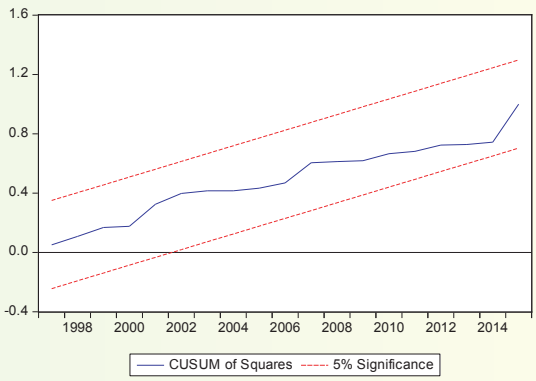


Figure 2: Plot of CUSUM of Square Tests



5. Conclusion and Policy Option

The study empirically establishes the long-run relationship between time deposit and its explanatory variables: domestic credit to GDP ratio as a proxy of financial deepening, per capita GDP, and remittance inflow to Bangladesh. It also explores the short-run stability and speed of convergence to reach the long-run equilibrium. In short, the study results indicate that the level of financial deepening i.e. credit to GDP ratio has a significant role to deposit growth. In addition to that, per capita GDP and remittance, as external parts of income, play irrefutable role to deposit growth in long-run. The result signifies that time deposit, as a proxy of saving is the ultimate income phenomenon. However, for developing economy like Bangladesh, remittance and peoples' financial integration (domestic credit to GDP ratio) play the key role in deposit mobilization. Any shock takes about 2 years to get back its original position to attain the long-run equilibrium. Hence, for any disruption in bank deposit, government or central bank can think about their policy support considering 2 years to rebalance.

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Appendix

Table A1: Pair wise Granger Causality Tests

	Dependent Variable				Causal Direction
	LTD	LDC_GDP	LPCG	LREM	
LTD	-	1.592 (0.215)	0.030 (0.862)	7.274 (0.10)	LTDLREM
LDC_GDP	7.366 (0.0.10)	-	4.731 ((0.036)	20.264 (0.000)	LDC_GDPLTD, LPCG, LREM
LPCG	15.263 (0.000)	3.731 (0.0.61)	-	15.1955 (0.000)	LPCGLTD, LREM
LREM	4.356 (0.044)	3.225 (0.081)	3.332 (0.076)	-	LREMLTD

Value of t-statistics with corresponding probability in ()

Table A2: Estimate Results from Error Correction Mechanism

Variables	Coefficient	t-Statistic	Probability
D(LTD(-1))	-0.160525	-1.237758	0.2309
D(LTD(-2))	-0.213989	-1.523110	0.1442
D(LPCG)	0.182639	0.896394	0.3813
D(LPCG(-1))	-0.468918 **	-2.261445	0.0357
D(LDC_GDP)	0.293436 **	2.686926	0.0146
D(LDC_GDP(-1))	-0.110572	-0.881323	0.3892
D(LDC_GDP(-2))	-0.028329	-0.247232	0.8074
D(LDC_GDP(-3))	-0.362352 ***	-3.885854	0.0010
D(LREM)	-0.024823	-0.553371	0.5865
D(LREM(-1))	0.061628	1.433379	0.1680
D(LREM(-2))	-0.117707 **	-2.568715	0.0188
D(LREM(-3))	0.044678	1.347479	0.1937
CointEq(-1)	-0.458535 ***	-6.656537	0.0000

***, ** and *denotes statistical significance at 1%, 5% and 10 % levels respectively

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Examining the Efficacy of the Monetary Transmission Mechanism Channels of Bangladesh: A Vector Autoregression Approach

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Abstract

This paper examines the efficacy of the monetary transmission channels in Bangladesh using a five variable unrestricted vector auto-regression (VAR) technique for the sample period from June 2003 to June 2015. Several monetary transmission channels, i.e., interest rate channel, bank lending channel or credit channel, and the exchange rate channel, have been analyzed to investigate the efficacy of policy reforms undertaken in the arena of monetary and exchange rates since 2002. Results from estimated VAR show that money supply (M2) have significant impacts on output (GDP) and the price level (Inflation) in Bangladesh implying that the monetary policy transmission channels are effective in influencing real variables through banks portfolio. Although all the monetary transmission channels work in Bangladesh, the bank lending channel has relatively more impact than that of interest rate or exchange rate channel in Bangladesh. Conversely, this study finds that the policy rate responds to inflation implying that the transmission channels work from inflation to policy rate as the central bank responds to higher inflation by raising policy rate in Bangladesh.

Keywords: impulse response functions, open economy, monetary policy transmission channel, VAR models, intermediate channels.

JEL Classification: C32, E52, E58, F41.

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I. Introduction

The purpose of this study is to examine the relative effectiveness of the monetary transmission channels in Bangladesh because it is important to understand the channels through which monetary policy transmits to the economy so that monetary authority achieve can the targets through adjustments of appropriate tools and instruments. The monetary policy transmission mechanism, or what is commonly referred to as the 'Black Box', describes how monetary policy actions are transmitted to the economy via various intermediate channels such as monetary aggregates, interest rates, credit, asset prices and exchange rates. There are some studies examining the monetary transmission mechanism in Bangladesh. For example, Alam (2015) using Structural Vector Auto Regression Model (SVAR) and quarterly data from 1995 to 2011 examines the effectiveness of monetary policy in Bangladesh. Younus (2004) also using SVAR model examines the impact of monetary policy on the output and the price level in Bangladesh using quarterly data from 1973:1 to 2000:4. Ahmed and Islam (2006) using Unrestricted VAR examines the monetary transmission channel through bank lending channel and the exchange rate channel in Bangladesh. Younus (2009) examines the impact of changes in monetary policy in Bangladesh. Specifically, the study examines the impact of domestic and foreign monetary shocks on Bangladesh's major economic aggregates using near vector autoregressive (NVAR) model.

However, this study differs significantly with the other study in that this study includes the sample period when Bangladesh adopted various reform policies, i.e., there was a significant change in the policy level in Bangladesh. For example, at the end of May 2003, Bangladesh entered into the flexible exchange rate regime. Repurchase Agreement (Repo) (July 2002) and Reverse Repo (April 2003) were introduced for banks and financial institutions as an indirect monetary policy tool for day-to-day liquidity management in response to temporary and unexpected disturbances in the supply of and demand for money. Various government treasury bills have been used to conduct open market operation to keep money to its desired level.

II. Monetary Policy in Bangladesh

Bangladesh Bank was established with the aims of maintaining stability in the price level, promoting a high level of output and real income and sustained economic growth, the stability of the exchange rate and the overall financial system.[2] During the early 1990s,

[2] Bangladesh Bank (BB), the Central Bank of Bangladesh was established by the Bangladesh Bank Order of 1972 (Presidential Order No. 127 of 1972) which became effective from 16th December of 1971.

initiatives were taken to bring significant changes in the financial system of Bangladesh. Under Financial Sector Reform Program (FSRP),initial restrictions were withdrawn from interest rates alongwith other conducive policies to liberalize financial sector. All of these developments help the monetary authority to formulate monetary policies based on the market requirement to bring effective changes in some macroeconomic variables to achieve goals and objectives of monetary policies.

Monetary policy framework followed by the Bangladesh Bank is now mostly market based that is influencing the target variables through supply and demand framework. The monetary authorities estimate the required level of money growth to facilitate required level of credit growth to the private sector to achieve sustained economic growth. It determines both reserve money and broad money (M2) growth so as to facilitate continued economic growth along with stability in the price level. This implies that monetary policies focus more on achieving target economic growth while keeping the inflationary pressure low. Focuses are also given to the development of effective credit and debt markets as the authority believe that efficient transmission of monetary policies depended on better functioning credit and debt markets.

BB uses net domestic assets as its key operating target and imposes a ceiling on it to influence reserve money and thus broad money. Broad money is the intermediate target of BB to achieve its goals and objectives of sustained economic growth, external sector stability, and to keep the inflation as anticipated. Before formulating its monetary policy, BB takes into account of the domestic macroeconomic perspectives along with global context.

The monetary authority in Bangladesh takes into consideration of the recent macro-variables to formulate monetary policy decisions. BB does influence its intermediate target (broad money M2) of its monetary policy through operating target of net domestic assets and reserve money. However, it cannot directly affect broad money or money supply rather it indirectly affects money supply through various direct and indirect policy instruments. These policy instruments immediately affect operating target that is net domestic assets and thus reserve money.

The study has been organized as follows. After an introduction in section-I, Section II deals with the details of monetary policy framework and practices in Bangladesh. Section III provides the theoretical background followed by the relevant literature review in Section IV. In Section V provides methodology followed by the empirical examination in Section VI. Finally, conclusions and recommendations presented in Section VII.

III. Theoretical Review: The channels of monetary policy transmission.

Monetary authorities handle managing the money supply and interest rates in most countries. Policies adopted and used by monetary authorities to maintain the growth of money supply and interest rates to affect some desired economic variables. Banks for International Settlements (1998) in its policy paper has identified at least four channels of monetary policy in the modern financial system. The first is through the direct interest rate effects. Interest rate affects not only the cost of credit but also the cash flows of debtors and creditors. Changes in interest rates alter the marginal cost of borrowing, leading to changes in investment and saving and thus in aggregate demand.

The second channel is through the impact of monetary policy on domestic asset prices - including bond, the stock market, and real estate prices. The third channel is through the exchange rate. Credit availability is the fourth major channel. However, in countries with either poorly developed or tightly controlled financial systems, the interest rate may not move to clear the market. The quantity of credit often influences aggregate demand rather than its price. An increasing body of research has found that the financial condition of households, firms, and financial institutions can play a critical role in the propagation of monetary policy actions (Kamin, Turner, and Van'tdack- 1998)[3]. However, the function of this channel in a given economy depends on its financial structure and the macroeconomic environment.

III.1 Direct interest rate channel: cost of credit and cash flow

In the most conventional model of monetary transmission, a shift in policy leads to a change in the money supply that, for a given money demand, leads to a change in market interest rate. Changes in policy and interbank rates lead, in turn, to change in bank loan rates for borrowers, which may consequently affect investment decisions, and in deposit rates, which may influence the choice between consuming now or later. The Keynesian view of how monetary tightening is transmitted to the real economy can be characterized with the following schematic diagram[4]:

$$\mathbf{M}\downarrow \Rightarrow i \uparrow \Rightarrow \mathbf{I}\downarrow \Rightarrow \mathrm{Y}\downarrow$$

Where M↓ indicates a contractionary monetary policy leading to rising interest rates ($i\uparrow$), which in turn raise the cost of capital, thereby causing a decline in investment spending (I↓), thus leading to a decline in aggregate demand and a fall in output (Y↓).

[3] Kamin, S, Turner, P and Van'tdack, "The Transmission Mechanism of Monetary Policy in Emerging Market Economies: An overview" Bank for International Settlement, Basle, January 1998.

[4] Frederic S. Mishkin "Symposium on the monetary transmission mechanism", Journal of Economic Perspective, Volume - 9, No. 4 fall - 1995 p. 3 - 10.

Although domestic interest rates have become a major channel of monetary transmission, they are mostly influenced by foreign interest rates in industrial countries. Even in the developing economies, with financial liberalization, the household and corporate sectors enjoying a higher degree of leverage, therefore, the interest rate channel is likely to become a more important channel of the transmission mechanism.

III.2 Exchange rates channel

In many developing countries, particularly those with only rudimentary markets for bonds, equities, and real estate, the exchange rate is probably the most significant asset price affected by monetary policy. When the exchange rate fixed or heavily managed the effectiveness of monetary policy is reduced but not eliminated. Often relatively wide margin exists within which the exchange rate can fluctuate. Moreover, if domestic and foreign assets are only imperfectly substitutable, there is some scope for domestic interest rates to deviate from international level. Therefore, even if the nominal exchange rate is fixed, monetary policy may be able to affect the real exchange rate by acting on the price level. In this manner, monetary policy retains its ability to affect net exports. Hence, Taylor, J. B (1995)[5] and Obstfeld, M & Rogoff, K (1995)[6] have identified the exchange rate as the key variable in the monetary policy transmission mechanism.

When the exchange rate is floating, a tightening of monetary policy increases the interest rates, raises the demand for domestic assets and hence leads to an appreciation of the nominal and, at least initially, the real exchange rate.Therefore, the higher value of the domestic currency (appreciation of the domestic currency, denoted by E ↑) makes domestic goods, more expensive thereby causing a fall in net export (NX↓) and hence in aggregate output (Y↓). Mishkin (1995) has expressed this transmission mechanism with the following schematic diagram:

$$\mathbf{M} \downarrow \Rightarrow \mathbf{i} \uparrow \Rightarrow \mathbf{E} \uparrow \Rightarrow \mathbf{NX} \downarrow \Rightarrow \mathbf{Y} \downarrow$$

However, where domestic and financial assets are close to perfect substitute (as in Argentina or Hong Kong) or where there is a long tradition of dollarisation (e.g. in Argentina and Peru), the scope for monetary policy with exchange rate channel is severely limited. Nonetheless, in small open economies with flexible exchange rates, the exchange rate channel is likely to be particularly important because, in contrast to another channel,

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[5] John B. Taylor "The Monetary Transmission Mechanism: An Empirical Framework", Journal of Economic Perspectives, Vol. 9, No. 4, Fall- 1995, pp. 11- 26.

[6] Maurice Obstfeld and Kenneth Rogoff "The mirage of Fixed Exchange Rates", ibid.

it affects not only aggregate demand but also aggregate supply. Therefore, a loosening of monetary policy, for example, may lead to a depreciation of the exchange rate, an increase in domestic currency import costs, and hence induce firms to raise their price even in the absence of any expansion of aggregate demand. Because exchange rate changes are viewed as a signal of future price movements in many countries, especially those with a history of high and variable inflation.

III.3. Credit Channel

The bank lending channel is based on the view that banks play a special role in the financial system because they are especially well suited to deal with thecertain type of borrowers, particularly small firms where the problem of asymmetric information can be especially pronounced. After all, large firms can directly access the credit market through stock and bond markets without going through banks. Thus, acontractionary monetary policy that decreases bank reserves and bank deposits will have an impact through its effect on these borrowers. Schematically, the monetary policy effect is:

$$M\downarrow \Rightarrow \textit{Bank Deposits}\downarrow \Rightarrow \textit{Bank Loans}\downarrow \Rightarrow I\downarrow \Rightarrow Y\downarrow.$$

In countries where private markets for credit either are poorly developed or are prevented by government regulation from operating freely, monetary policy is likely to affect aggregate demand more by altering the quantity or availability of credit than through the direct or indirect effects of changes in the price of credit. Binding ceiling on interest rates or direct government involvement in the loan market, either through state owned commercial bank or fiscal subsidies of commercial bank loan, will have a non-price rationing effects in the credit market. The liberalization of the financial market does not necessarily eliminate availability credit effects. In the liberalised system, several central banks like in India, Indonesia, Israel, Malaysia, Peru, Thailand, and Venezuela explicitly monitor credit growth in evaluating the stance of monetary policy (Kamin, Turner and Van'tdack- 1998).

A tightening of monetary policy leads to a greater cut back in lending by small banks than by large banks, thereby supporting the existence of a credit channel for monetary policy. To the extent that certain firms depend on heavily or exclusively on bank financing, shifts in loanable resources from banks to other markets may exert an impact on aggregate demand that goes beyond the effects of increased interest rate alone.[7]

[7] Bank of Korea, "Korea's experience of the monetary transmission mechanism": A paper submitted to BIS, Basle, in January 1998, seminar..

Monetary policy may affect the availability of credit more directly through effects on the value of assets of both borrowers and lenders. As changes in monetary conditions lead to a change in asset prices, the value of collateral for bank loans may be affected, and changes in the access of borrowers to credit could be induced. Also, where a large proportion of bank assets is invested in equities or real estate, the decline in asset prices, by lowering capital/ asset ratios, could force the bank to tighten the supply of credit.

Ben S. Bernanke and Mark Gertler[8] has suggested two channels to explain the link between monetary policy actions and the external finance premium: the balance sheet channel (sometimes called the net worth channel) and the bank lending channel. According to them, monetary policy affects not only the general level of interest rates but also the size of the external finance premium.

The credit view contends that two channels of monetary transmission arise due to informational asymmetries between borrowers and lenders in the financial market. The bank lending channel emphasizes the special role of bank loans, particularly for "bank-dependent" borrowers (e.g. small firms), while the balance sheet channel operates through the balance-sheet position of the business firm.

III.3.1 Bank Lending Channel

The bank-lending channel rests on the idea that small firms, facing informational frictions in financial markets, must rely primarily on bank loans for external finance because it is prohibitively expensive for these borrowers to issue securities in the open market. When bank loans are of special importance for bank-dependent small firms, the effects of a monetary contraction may be amplified through the following two channels beyond those working through the interest rate channel: the direct channel operates through the reduced willingness of banks to lend at the going market interest rates owing to institutional factors such as regulatory action and moral suasion to restrain bank lending directly.

This channel is direct because it does not depend on the extent to which market interest rates rise. The indirect channel becomes operative when the increase in market interest rates following a monetary contraction raises loan rates enough both to cover the increase in lenders' cost of thefund as a result of the higher interest rates and to compensate them for the default risk. Banks also tend to tighten other non-price terms of lending, such as

[8] Ben S. Bernanke and Mark Gertler, " Inside the black box: The credit channel of Monetary Policy Transmission" Journal of Economic Perspectives, Vol. 9, N0. 4, Fall, 1995.

collateral requirements and the maturity of loans (Morgan-1992).[9] When either of these two bank lending channels operates, the banks are forced to reduced their total lending, and in most cases small firms that rely primarily on banks for credit must curtail their spending on investment.

Kasyap and Stein (1993)[10] argue that banking firms may be subject to thesame sort of capital market imperfections as their non-financial counterparts. According to their view, if a bank-lending channel is effective, a monetary contraction should have a disproportionately large impact on the lending behavior of small banks. Which are more likely to experience difficulties offsetting a loss of reserves by expanding non-deposit sources of external finance. Consequently, they wish to cut loan supply by relatively more than do large banks.

However, Allan, H. Meltzer (1995)[11] has rejected the lending channel as a separate hypothesis of monetary transmission mechanism because his study on the US Economy in the Great Depression did not support this channel. He argued, "If the lending channel is a separate transmission mechanism affecting small firms differently, bank loan should have fallen during the Great Depression more rapidly than open market commercial paper and banker's acceptances." He worked on U S with available monthly data of credit instruments. He produced his finding as "Both bank and open market lending first rise and then fall during the Great Depression. The initial relative decline in bank loans, following the August 1929 peak, occurred before the first wave of bank failures, so it does not support the non-monetary transmission process. …… In this period, open market lending declined at twice the rate of bank lending."[12] Moreover, Haubrich study (1990)[13] on Canada casts doubt on the importance of the bank lending as a separate channel of themonetary transmission mechanism. In contrast, according to Bernanke (1983)[14], "disruption of thelending channel during the Great Depression supplemented the effects of

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9 Morgan, Donald P. "Are bank loans a force in monetary policy?" Economic Review, Federal Reserve Bank, 1992, pp. 31- 41.

10 Kashyap, Anil K. , Jeremy C. Stein and David W. Wilcox, "Monetary Policy and Credit Conditions: Evidence from the composition of external finance". American Economic Review, Vol. 83, No. 1, !993, pp.78- 98. They found when the Federal Reserve tightens monetary policy, commercial paper issuance rises sharply, even while bank loans are falling. Thus bank lending channel may not be so effective if commercial paper can be substitutable for bank loan.

11 Allan, H. Meltzer, "Monetary, Credit and (Other) Transmission Process: A monetarist Perspective" Journal of Economic Perspectives, Vol. 9. No. $, Fall-1995, pp. 49- 72.

12 Ibid, p.67

13 Haubrich, Joseph G., "Non-monetary effects of Financial crises: Lesson from Great Depression in Canada", Journal of Monetary Economics, March 1990.

14 Bernanke, Ben S., "Nonmonetary Effects of the financial crisis in the propagation of the Great Depression," American Economic Review, June 1983.

a decline in money stock by reducing the quality of financial services." On the other hand, the monetarist hypothesis recognizes that bank failures or commercial and industrial failures may have disrupted financial relations or encouraged banks to screen loans more carefully during the depression.

III.3.2 The balance sheet channel

The balance sheet channel of monetary policy transmission arises because rising interest rates, following the adoption of a tight monetary policy, directly increase the interest expenses of those firms that rely heavily on short- term debt to finance inventories and working capital.Which causes to reduce their net cash flows and consequently weaken their financial position. Furthermore, rising interest rates are always associated with falling asset prices, which indirectly erode the value of the firms' collateral. These effects lead to a reduction in the firms' net worth, thereby raising the premium for external finance.Small businessesare most likely to face a proportionately larger premium for external finance. One possible reason for this is that smallbusinesses have proportionately lesscollateralizable net worth. Therefore, small companies that have relatively poor access to short-term credit markets respond to the deteriorated balance-sheet positions by drawing down inventories and cutting investment spending more than big business do. However, some research suggests that in a high inflation economy balance sheet mechanism loses strength because long-term debt disappears (Lopes-1997).[15]

III.4. Factors influencing the transmission of monetary policy

Two aspects are important in evaluating how fast monetary policy affects the real economy. The first is the transmission from the instruments directly under the central bank's control. Short-term interest rates or reserve requirements most directly influence the non-financial sector through loan rates, deposit rates, asset prices and exchange rate. The linkage is determined primarily by the structure of the financial system. The second aspect of the monetary transmission process is the link between financial condition and the spending decision of household and firms. In this regard, the initial financial position of household, firms and banks play a crucial role, including denomination of assets and liabilities and degree of dependence upon external sources of finance. Both aspects of the monetary transmission channel are likely to have been affected by the process of financial liberalization. The reduced role of the government has lessened the importance of the credit availability channel of monetary policy compared with the interest rate channel.

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15 Fransisco L. Lopes "The monetary transmission mechanism of monetary policy in a stabilising economy: notes on the case of Brazil", a paper submitted at BIS seminer, January 1997.

IV. Literature Review

In the literature, themonetary transmission mechanism is studied extensively by academicians, policy makers researchers due to its importance in policymaking. Monetary policies are expected to find their effects on economic output and prices through various channels known as monetary transmission channels. Romer and Romer (1989), Bernanke and Blinder (1992), Christiano, Eichenbaum and Evans (1994a, b) reconfirmed an empirical research findings of Friedman and Schwartz (1963) by empirically showing that movement in real output respond to change in monetary policy stances for two years or more (Bernanke and Gertler, 1995).

Eichenbaum and Evans (1995) conduct a study to investigate the U.S. monetary policy shocks on the exchange rates using VAR approach for the period from 1974:1 to 1990:4. They consider three measures of the monetary policy: The Federal fund rates, the ratio of non-borrowed to total reserves and change in the Romer and Romer index. The empirical results from all three measures show that due to a contractionary monetary policy shocks lead to a persistent and significant appreciation in the nominal exchange rate and the real exchange rate as well.

Koray and McMillin (1999) investigate the responses of the exchange rate and the trade balance to monetary policy innovations in the U.S. economy during the period from 1973:1 to 1993:12. Vector autoregression models (VAR) are employed to derived impulse response functions (IRFs) and variance decompositions (VDCs).

Koray and McMillin (1999) used the Federal fund rates and Non-borrowed Reserve (NBR) as monetary policy variables. The empirical results show that after an adverse shock to NBR, output and price level decline and exchange rate appreciates.

Fung et al. (1997) tried to identify the uncertainty about the monetary transmission mechanism for the six G-7 countries. A VAR model is used to identify the monetary policy shock on the key macroeconomic variables such as money, the interest rate, prices and output. Fung et al. (1997) try to determine whether the effects of monetary policy shocks are common across the countries. Fung et al. (1997) identified monetary shocks by the assumption that due to a permanent change in the nominal stock, theprice level increases proportionately with no long-run real economic effect. Empirical results of the paper show that initial responses to the monetary stock differ

across countries. However, interest rate responses follow a similar pattern for all the countries.

Perera, A. (2013), unanticipated increase in the short-term interest rate (a restrictive monetary policy shock) causes reductions in real GDP and consumer price levels via interest rates, credit, exchange rates and asset prices.The interest rate channel remains the most important transmission channel in Sri Lanka though other channels also help to propagate monetary policy shocks. From the CBSL's perspective, these results provide implications, which are consistent with the Bank's move towards a monetary policy framework focusing on indirect instruments of monetary policy.As the reaction of target variables has been substantially enhanced, i.e. prices are more responsive to interest rate shocks, it provides a strong justification for moving towards an inflation targeting framework, which is considered as an appropriate monetary policy framework for emerging market economies.

Perera and Jayawickrema (2014) empirically estimated the monetary policy reaction function of the Central Bank of Sri Lanka over the period from 1996Q1 to 2013Q2 using OLS and GMM method. The estimates provide evidence of a change in the coefficients for the inflation gap and the output gap during the period of analysis, in particular with a stronger response of monetary policy to the inflation gap and the output gap being observed since 2007. There is also evidence of a greater weight being placed on output stabilization, which could reflect both the preference of the central bank and structural issues relating to the slower transmission of monetary policy. A relatively strong response to the output gap maybe attributed to a lower sensitivity of output to the interest rate. However, there appears to be a shift in monetary policy from greater responsiveness to the output gap to more focus on inflation. Their study, however, does not provide any evidence that monetary policy is responsive to the exchange rate.

Alam (2015) using quarterly data from 1995 to 2011 examine the effectiveness of monetary policy on the price level, output and the exchange rate in Bangladesh. The model variables employed in this model are reserve money, broad money (M2), 3-month Treasury bill rate, industrial production index, consumer price index and nominal and real exchange rate. The empirical results derived from Structural Vector Auto Regression model show that either T-bill rate or the reserve money or broad money does not have any impact on the output, price level and exchange rate in Bangladesh.The author argued that may be

excessive government borrowing, or the existence of microcredit may have contributed to the ineffectiveness of monetary policy in Bangladesh.

Younus (2009) examines the impact of changes in monetary policy in Bangladesh. Specifically, the study examines the impact of domestic and foreign monetary shocks on Bangladesh's major economic aggregates using near vector autoregressive (NVAR) model.

Ahmed and Islam (2006) conducted a study to examine whether bank lending and exchange rate channels exist in Bangladesh as the monetary transmission mechanism. The study attempted to identify the existence of bank lending channels for two sample periods, one is full sample period of July-September 1979 to April-June 2005, and the other is a sub-sample period January-March 1990 to April-June 2005.The model variables used for both full sample and sub-sample periods are reserve money (RM), total deposits, private sector advance, consumer price index (CPI) and Real GDP (RGDP) for bank lending channel while the model variable for exchange rate channel are reserve money, CPI, nominal exchange rate, export, import and real GDP. VDCs for Bank lending channel shows that Reserve money has no explanatory power over the other variables' movement while private Sector advance has some impact to explain total deposits' and CPI's. The result indicates that the Bank lending channel weekly exists as monetary transmission mechanism in Bangladesh. Impulse Response Function's also explain that reserve money has no explanatory power to explain the changes or movements of other variables in the model implying that RM's shock does not generate any significant response to other variables in the model.CPI can explain forecast error variances of the nominal exchange rate (NER) over the time horizon 12th& 16th quarter.

Younus (2004) examined the transmission channel through bank portfolio (credit or deposits). Quarterly data on six variables from the period of 1975:1 to 2000:4 were used to examine the dynamism of the relationship between monetary policy and bank portfolio and subsequently on the economy. The variables used here are all in log scaled and seasonally adjusted except for lending rate.The methodology used are structural VAR (SVAR) technique and Cholesky decompositions to construct VDC. Structural VAR is also applied for developing IRF's. These models are used to see the impact of monetary policy on the bank portfolios in Bangladesh and to determine whether money and credit

channel as monetary transmission mechanism exist in Bangladesh.SVAR estimation shows that monetary base does not explain forecast error variances of bank portfolios, price level, interest rate and output at optimal lag length 3. However, monetary base describes interest rate to some extent at lag length 8 and 12 and output at lag length 8 for time horizon 16 & 20.

Mala et al. (2012) conducted an in-depth investigation analyzing the Malaysian monetary policy using Structural Vector Autoregression (SVAR) model. The sample period covers only the post (Malaysian) liberalization period 1980:01 to December 2007:12, which also includes the 1997 Asian financial crisis. Given the changes in the financial environment and the choice of policy regimes, the sample period of study is divided into the pre-crisis period (1980:01 to 1997:06) and the post-crisis period (1999:01 to 2007:12). The overall results suggest that the crisis and the subsequentsignificantshift in the exchange rate regime have significantly affected the Malaysian 'Black Box.' In the pre-crisis period, domestic variables appear to be more vulnerable to foreign monetary shocks. Further, the exchange rate played a significant role in transmitting the interest rate shocks, whereas credit and asset prices helped to propagate the money shock. In the post-crisis period. However, asset prices play a more domineering role in intensifying the effects of both interest rate and money.

Kapur and Behera (2012) examined the monetary transmission mechanism in India. The study was based on a small model known as New Keynesian Model (NKM) to examine the monetary transmission mechanism in India. Developing three key equations of NKM, the IS curve, Philips curve and monetary reaction function using forward-looking approach this study found that interest rate channel is the most efficient in Indian monetary transmission process. That is interest rate channel plays a significant role inaffecting the monetary policy on the economy of India. On the other hand, Bhattacharya et al. (2011) found that most effective transmission channel in India is the exchange rate channel. Interest rate channel is weak. It has been argued that interest rate channel has no direct impact on inflation rather it is the exchange rate channel through which interest rate affect the inflation.

Disyatat and Vongsinsirikul (2003) conducted study to examine monetary transmission mechanism in Thailand. The objective was to examine interest rate, credit, exchange rate channel, and other asset price channel so as to find out the monetary transmission

channel(s) in Thailand. The model variables used are real output or GDP, CPI and 14-day repurchase rate for interest rate channel using quarterly data from 1993Q1 to 2001Q4 using seasonally adjusted data. VAR model was developed based on recursive Cholesky decomposition. The study first examined the impact of monetary policy on the GDP and price level using VDC and IRFs. It was found that GDP's response to interest rate was negative and quite persistent for long time horizon, but price puzzle was found for short time horizon as IRFs showed thepositiveresponse of price to repo rate but after quarter six this becomes significant.

Kim (1999) conducted a study to discern whether credit channel works as the key monetary transmission channel in Korea. The model variables used to identify the impact of monetary policy on output through bank lending, or credit channel are monetary base, total reserves maintained, M1, MCT (M2+CD), bank loans, movements in the short-term interest rate and the difference between target & actual growth rate of M1 and MCT. The empirical result showsthat credit channel is found to play asubstantial role in affecting output after a crisis that is it played arole in transmitting the tight monetary policy on real economic output following thecrisis. The bottom line of this study is that interest rate and credit shocks playasignificant role in affecting economic activity and price level.

V. Model variables, Methodology and Model Specifications

Monthly data for the sample period of 2004: m1 to 2015:m1 have been used to examine the monetary transmission channel through interest rate channel, banklending, and exchange rate channel. Reserve Money or monetary base (RM)[16] and Broad Money (M2)[17] are used as aproxy for the monetary policy. Use of M2as aproxy for monetary shocks or money supply instead of RMis influenced by the work of Friedman and Schwartz (1963) as their findings show that on an average monetary base was stable during great depression 1929-1933 while money supply, as measured by M1, declined continuously. That is even if monetary base remains the same money supply could vary significantly due to changes in the money multiplier. Over time, money multiplier could change dramatically causing unstable money supply that should affect economic price level and output. Therefore, M2 is used to have agreater impact of monetary shocks on

[16] Monetary Base= Currency + Reserve Money

[17] M2= M1+Term Deposits, Money supply M1 has been strictly defined as currency outside bank plus demand deposit

the economy and at the same time, M2 is the intermediate target of Bangladesh Bank's monetary policy.

Consumer Price Index (CPI) has been considered as the proxy for theprice level. It also affects purchasing power of consumers, and the nominal cost of capital thus affects both demand for real money balance and real cost of capital subsequently changing consumption and investment two components of GDP or economic output. Log of CPI is employed as aproxy for price level during the period of interest.

The final variable, for all channels that are expected to be affected by monetary shocks, is aneconomic activity or aggregate output. The proxy for economic output (Y) has been the GDP (Log real value) in this report. GDP measures the value of goods and services produced in the economy during a specified period. Again for aproxy of theeconomic activity log value of real GDP has been employed.

V.1 Data Analysis

All the variables in this study have been collected in the form of nominal value. Real values of all variables have been employed. Using CPI all the nominal variables have been transformed into a real variable. Real value= {Nominal Value/ (CPI/100)}.

Seasonal adjustment: As these variables are now in quarterly frequency there remains thechance that theses all-time series do contain seasonality. That is time series may have a pattern that repeats each year. These seasonal pattern needs to be adjusted to have smooth time series for all the variables to better fit the linear regression, model. Seasonality might make the regression results biased and so to have better outcomes from regression model seasonal effects are to be removed. In this report using Census X11 technique all the time series variables have been adjusted for seasonal effect. These deseasonalized time series of all the variables have been employed in this study to have better results from the analysis.

Use of a Logarithmic form of Time Series Variables: In this report the relevant time series variables except interest rate (both lending and deposit interest rate) have been used taking thenatural log of them. The rationale for using the logarithm of each time series variable is that logarithmic transformation makes the residuals of a time series variables more homoscedastic that is logarithm makes them more random rather than being in a particular pattern. Use of raw data in anordinary least squares (OLS) method in

regression analysis better fits when the time series variable trends linearly but for nonlinear or curvilinear raw data use in regression analysis may result is biased output. Time series variables need to be smoothed to fit better OLS method so that robust result can be obtained from theregression analysis. In this report, log-log model has been applied. Log-log model means theuse ofa logarithmic form of both dependent and independent variables. The econometric model in this report uses all the variables as both dependent and independent variables in turn. So to have better forecast response of a variable to impulses/shocks from another variable logarithmic form for all variables have been used which tend to smooth the trend of the variables and make them more normally distributed.

That is to comply with two fundamental assumptions that residuals are homoscedastic & random and usually distributed of regression analysis log form of time series variables is used in this report as the variables do not show alinear trend in their raw form. For example, agraphical representation of both raw data and log form time series for GDP has been produced below.

V. 2 Econometric Methodology

If we assume the dynamics of $Z_t = \begin{bmatrix} m_t \\ DR_t \\ PSC_t \\ p_t \\ y_t \end{bmatrix}$ is a Pth order Gaussian vector auto-regression process,

we could write

$$Z_t = c + \Phi_1 Z_{t-1} + \Phi_2 Z_{t-2} + \ldots\ldots\ldots\ldots\ldots\ldots \Phi_p Z_{t-p} + \varepsilon_t;$$

$$\varepsilon_t \sim \text{iid}, N(0,\Omega).$$

Here, Φ i is a 5x5 coefficients matrix; A vector autoregressive (VAR) model is an appropriate econometric technique when we are interested in dynamic relationships among variables in the presence of possible feedback among the variables and ambiguity about the exogeneity of the right hand side variables (Sims, 1980 and Enders, 1995). Vector autoregression has become quite popular as noted by Keating (1992, page 37) because of the inability of macroeconomists to agree on the correct structural model of the economy.As noted by Fackler and McMillin (1989), among others, "A VAR technique is well suited to an examination of the channels through which a variable operates since few

restrictions are imposed on the way the variables interact." (Fackler and McMillin, 1989, page 995). This study uses a VAR model to derived IRFs. The IRFs show the dynamic response of each variable in the system to shocks from each variable in the system.[18] IRFs calculated using VAR approach helps to discern the dynamic response of a variable in the linear equation to the lagged innovations of all system variables in the model (Enders, 1995). IRFs graphically show the response or movement of a variable to shocks in the all other variables in a particular channel to understand the dynamic relationship between the variables in a channel. Hafer and Sheehan(1991) argued that VAR results could be very sensitive to the choice of lag length. Therefore, Akaike's Information Criterion (AIC), is used to select the lag length for the VAR model. Lag orders of one through eight are used.[19] A lag order of 4 produces the minimum AIC. Q-statistics are used to see if VAR residuals of each equation are white noise at this minimum AIC, and it turns out that Q-statistics show white noise residuals for each equation at lag order four. Therefore, a lag of four is used to estimate a five-variable VAR, model.

To estimate IRFs, orthogonalization of the VAR residuals is required. Cholesky decomposition is used to orthogonalize the residuals. Cholesky ordering requires the variables to order in a particular way where variables placed higher in the ordering have contemporaneous impacts on the variables lower in the ordering, but the variables lower in the ordering do not have a contemporaneous effect on the variable higher in the ordering.Therefore, Sims correctly stated, "in the Cholesky ordering, …due to the cross-equation residual correlation when a variable higher in the ordering changes all the variables lower in the ordering are assumed to change."Therefore, it is important to decide proper ordering of the variables.Because this study is mainly interested in examining the impact of monetary policy on the macroeconomic variables, domestic money (M2) is placed first followed by the bank deposits, banks credits, interest rates, the price level, and output.[20]

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[18] A VAR model is a reduced form model. Therefore, there are several drawbacks in using a VAR model. As noted by Cooley and LeRoy (1985), an estimated shock in VAR is not a structural shock, but linear combinations of structural disturbances. In that case IRFs and VDCs derived by using Cholesky ordering are difficult to interpret because these IRFs and VDCs represent a complicated function of all the structural disturbances. Besides, Cholesky ordering in a VAR imposes a recursivecontemporaneous structure on the variables but most of the theories do not imply recursive structure on system.

[19] The Maximum lag length of eight is used to preserve degrees of freedom.

[20] Switching the ordering between the price level and the exchange rate are also attempted. However, policy conclusions remain the same for both the orderings.

Placing the domestic monetary policy variable first in the ordering allows the policy variable to affect other model variables contemporaneously. However,policy variable respond to the lag effect of other variables, because it is reasonable to assume that information of other variables is not readily available to the decision makers. The first variable implies that innovation to domestic money supply is contemporaneously exogenous. It has a contemporaneous effect on the rest of the model variables, but none of the model variables has a contemporaneous impact on the first variable). Placing the banks' deposits after domestic money supply implies that innovation to domestic money has a contemporaneous effect on the deposits, but banks deposits rate does not have any contemporaneous impact on the domestic money. The third variable is the private sector credit variable, followed by the price level and income. The third variable implies that domestic money supply and the deposits have contemporaneous impacts on the private sector credit; however, private sector credit does not have any contemporaneous effects on the domestic money or the deposits and so on.

VI. Empirical Results:

VI.1. Efficacy of Monetary Transmission Mechanism: Money Supply (M2)

The IRFs shows the response of each variable in the system due to a shock from each variable in the system. A two-standard-deviation confidence interval is reported for each IRF. A confidence interval containing zero indicates a lack of significance. The confidence interval for each IRF is computed from one thousand Monte-Carlo simulations. The IRFs showing the response of the deposits, credit, interest rate, price level, and output due to innovations (shocks) to domestic money are shown in Figure-1.

IRF of deposits rate in Figure-1 indicates that a positiveshock to domestic monetary policyproduces a statistically significant positive impact on the banks deposits, credit and GDP,which are expected implying that due to an expansionary monetary policy bank deposits, credit and output increased significantly.However, on the other hand, interest rate increased due to shock to M2,which is contradictory to the expectations. Theoretically, due to an expansionary monetary policy shock interest rate should decrease.

Figure-1: Interest Rate Channel: Responses of lending interest rate, private sector credit and the GDP to monetary policy shock (M2)

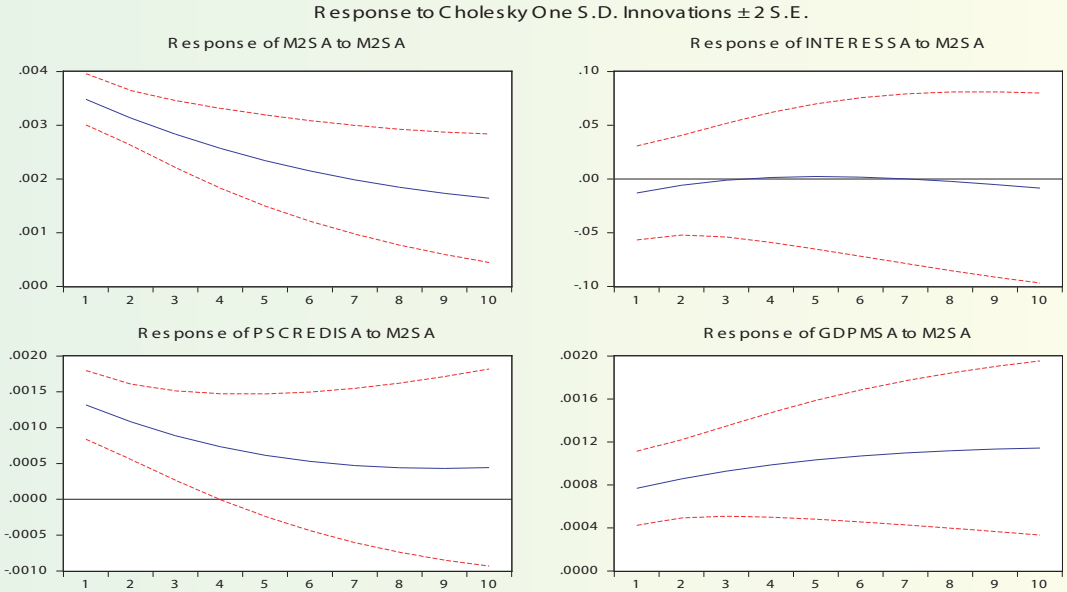
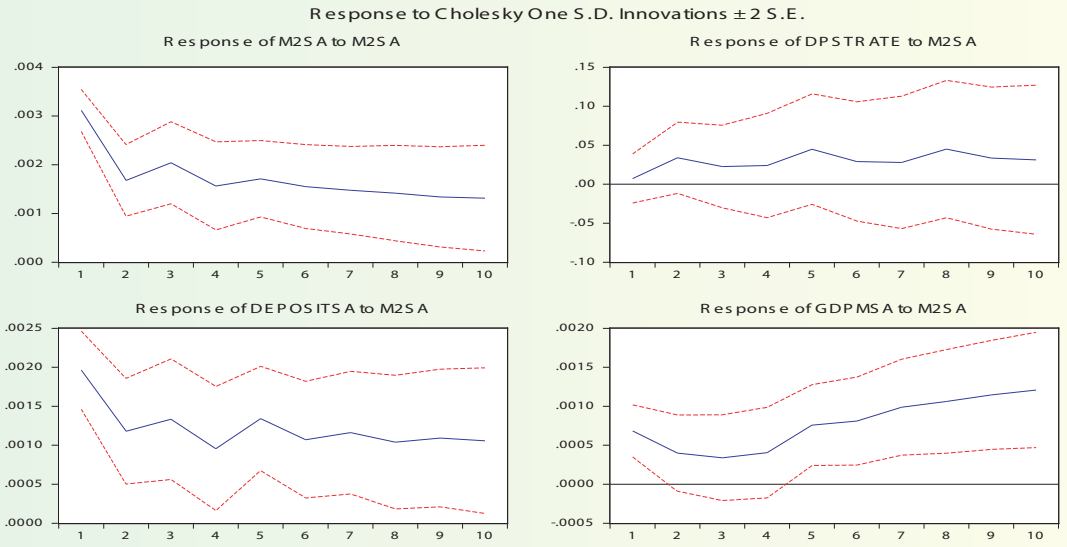


Figure-2: Interest Rate Channel: Responses of deposit interest rate, bank deposits and the GDP to Monetary Policy Shock (M2)



The above Figure-1 and 2 implies that although interest rate does not decrease due to monetary policy shock money supply has an impact on bank deposits and credit, which in turn increase output or GDP growth in Bangladesh.

In Figure-3, IRFs showing the response of the deposits, credit, price level, and output due to innovations (shocks) to M2 . The IRFs of deposits indicates that a positive shock to domestic monetary policy shock produces a statistically significant positive impact on banks deposits, credit and GDP, which are expected implying that due to an expansionary monetary policy bank deposits, credit and output increased significantly.The IRFs of the price level in Figure-3, show that domestic money supply (M2) initially produces an insignificant impact on the price level (since the confidence band contain the zero line), which became significant and positive at time horizon 7th and remained significant for the rest of the period implying that the response of the price level is permanent and no turning back to the initial position. This is consistent with the theory.

Figure-3: Bank Lending Channel: Responses of Deposits, Credit, Price level and GDP to Monetary Policy Shock

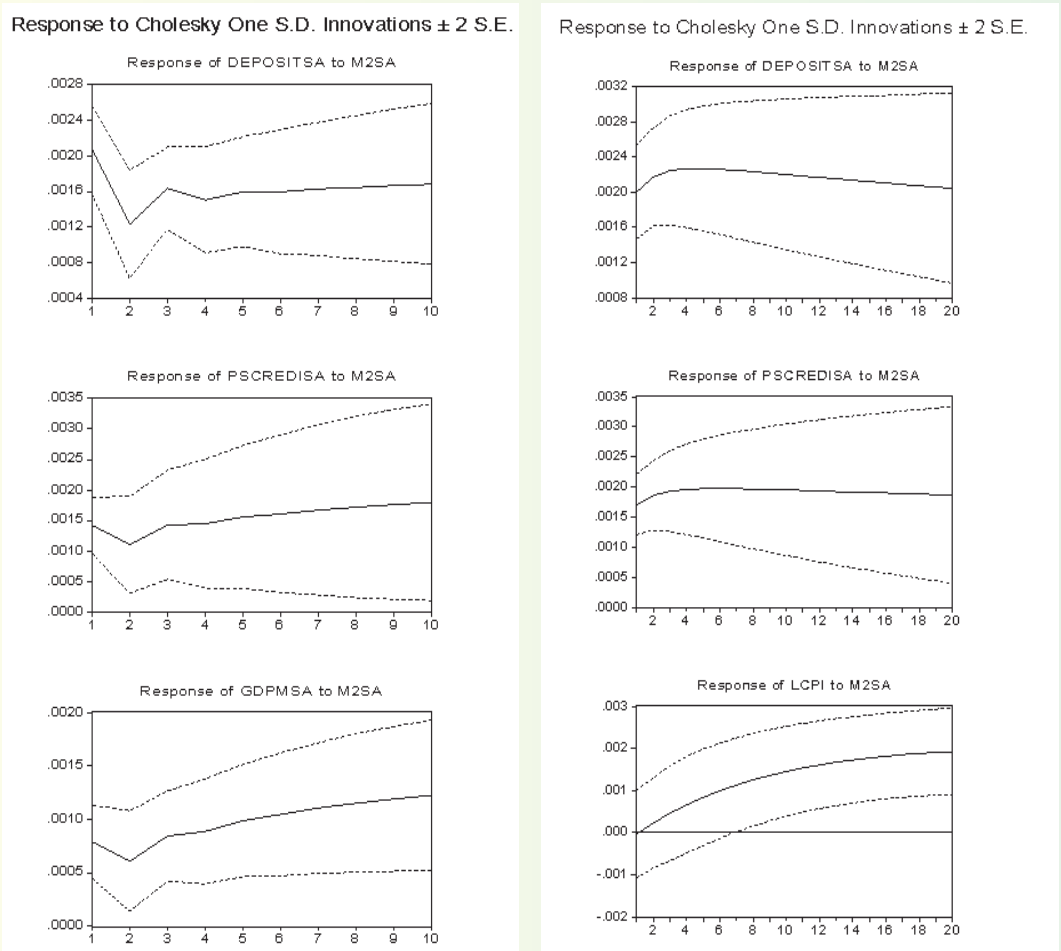
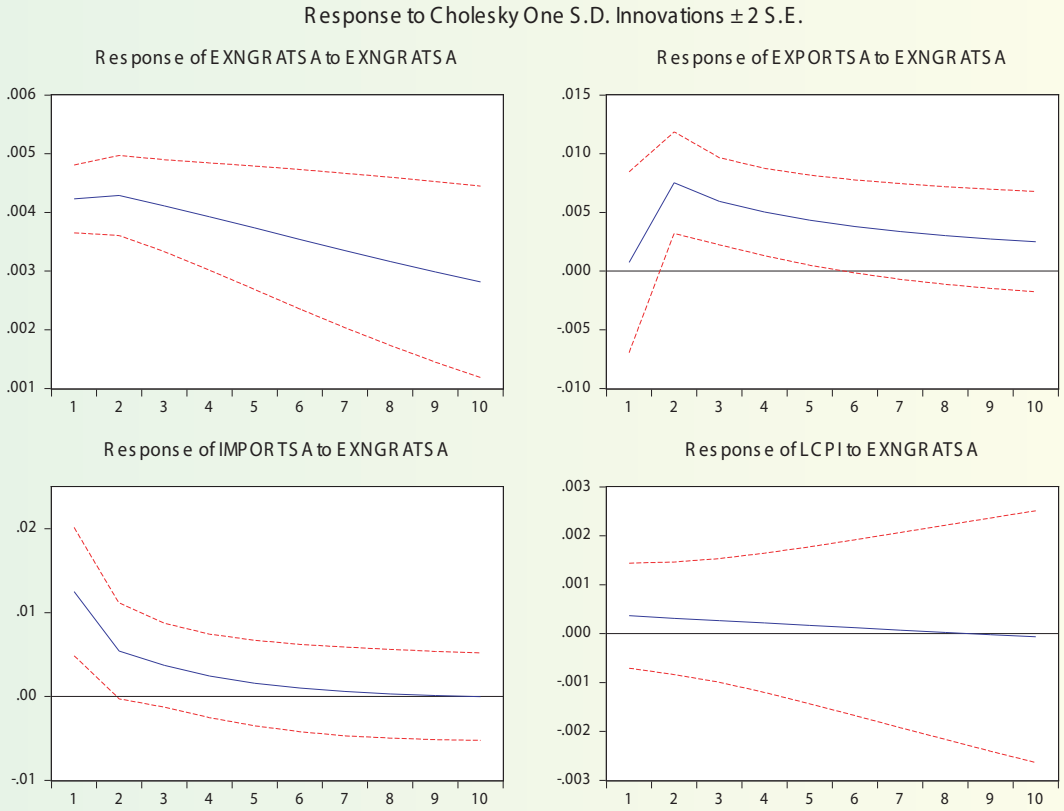


Figure-4: Exchange Rate Channel: Response of Export, Import and Price level to Exchange Rate shock



In Figur-4 the IRFs of the exports, imports, and the price level showed due to shock to the exchange rate exports and imports both became statistically significant and positive. The IRF of exports due to the shock to the exchange rate is insignificant initially which became significant and positive at time horizon 1st, and remain significant up to period 5th then becomes insignificantafter that.[22] The response of imports due to positive exchange rate shock is significant and positive also implying that if exchange rate depreciates that will increase exports and imports both because for exports we need raw materials that we import from rest of the world.The response of GDP and the price level due to shock to the exchange rate is insignificant. This is because GDP and the price level determined by some other factors rather than exchange rate itself.

[22] An attempt also been made to gauge the impact of expansionary monetary policy on the exchange and the interest rate. Both the variable appear to be insignificant due to shock to an expansionary monetary policy. However, M2 and exchange rate found to have independent impact on exports and imports.

It is evident from Figure-5 that money supply decrease to higher inflation that also cause the interest rate to rise. The increase in banks' lending rate causes banks private sector credit to decline and so is GDP rate. Figure 5 and 6 shows how money supply changes respond to changes in inflation.

Figure-5: Bank Lending Channel: Responses of Money Supply (M2), Lending Rate, Credit and GDP to Inflation Shock

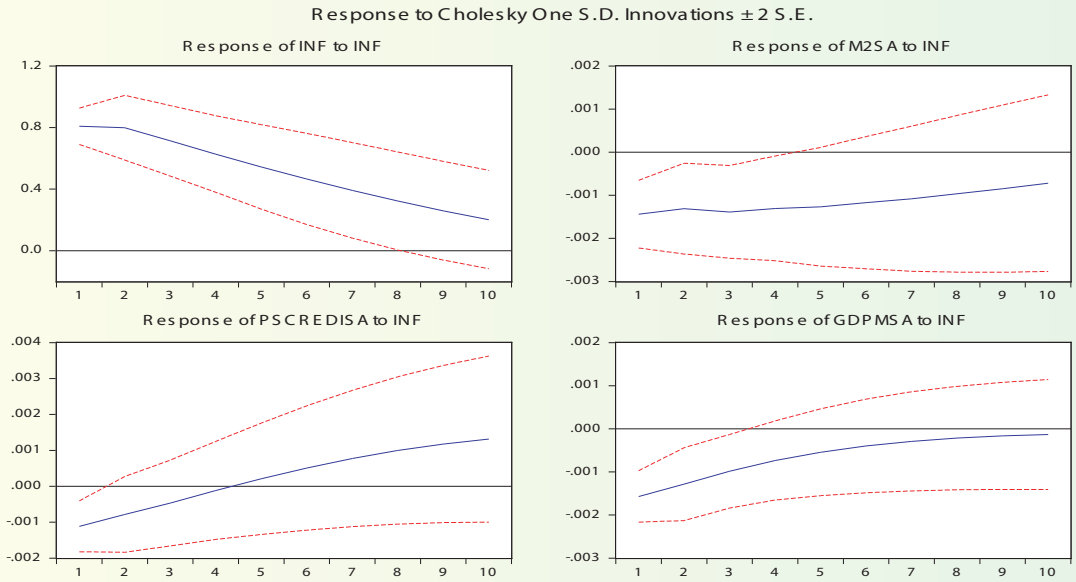
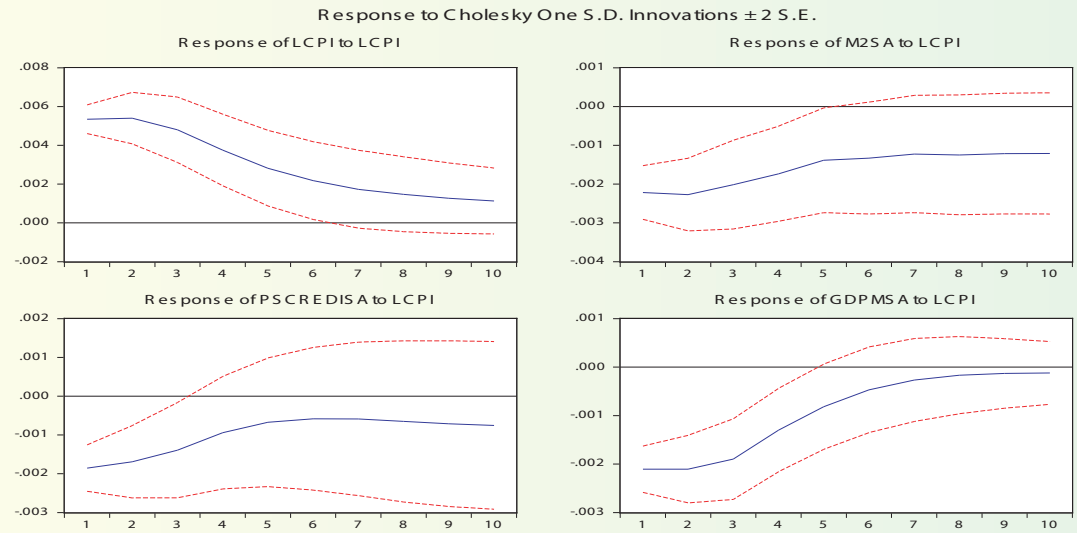


Figure-6: Bank Lending Channel: Responses of Money Supply, Lending Interest Rate, Credit and GDP to Price level shock

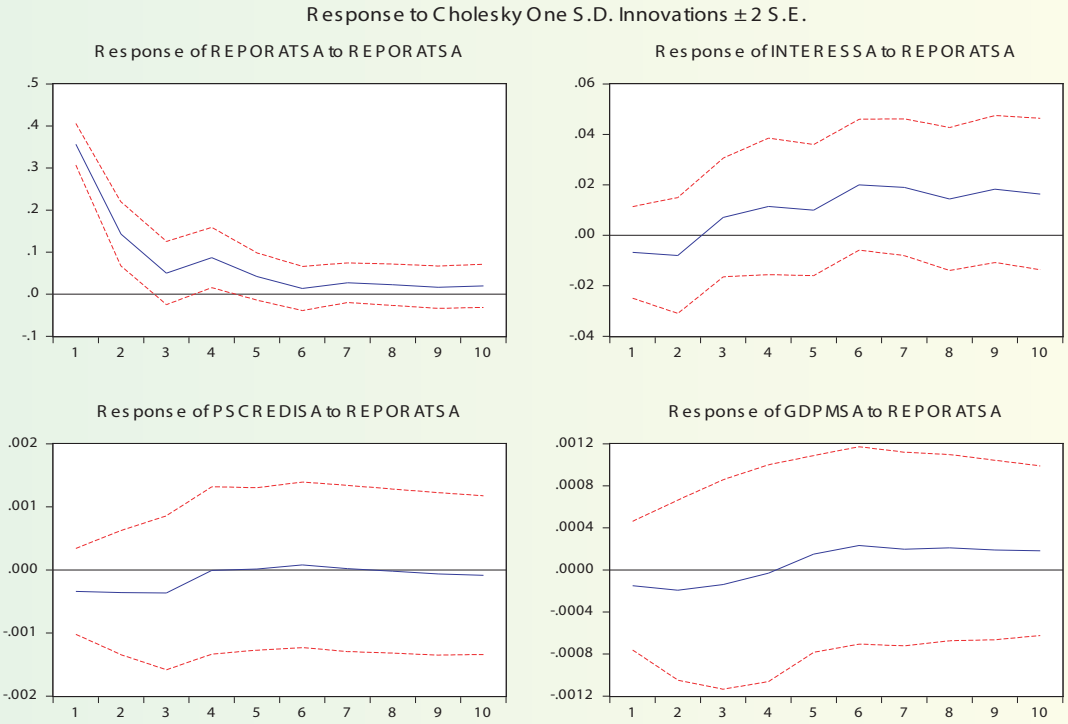


In Figure-6, shows the similiar impact of the price level. Money supply, private sector credit and GDP decreases dur to higher price level.

VI.2. Efficacy of Monetary Transmission Mechanism: Policy Rate

Bangladesh Bank uses Repo and Reverse Repo rates alongwith M2 as an indirect monetary policy tools since 2002 and 2003 respectively to control money supply or liquidity in the money market. Therefore, it is worthwhile to examine the efficacy of the monetary transmission channel of the policy rates. Pair-wise Granger causality test shows that there is a one-way causality from inflation to Repo Rate.

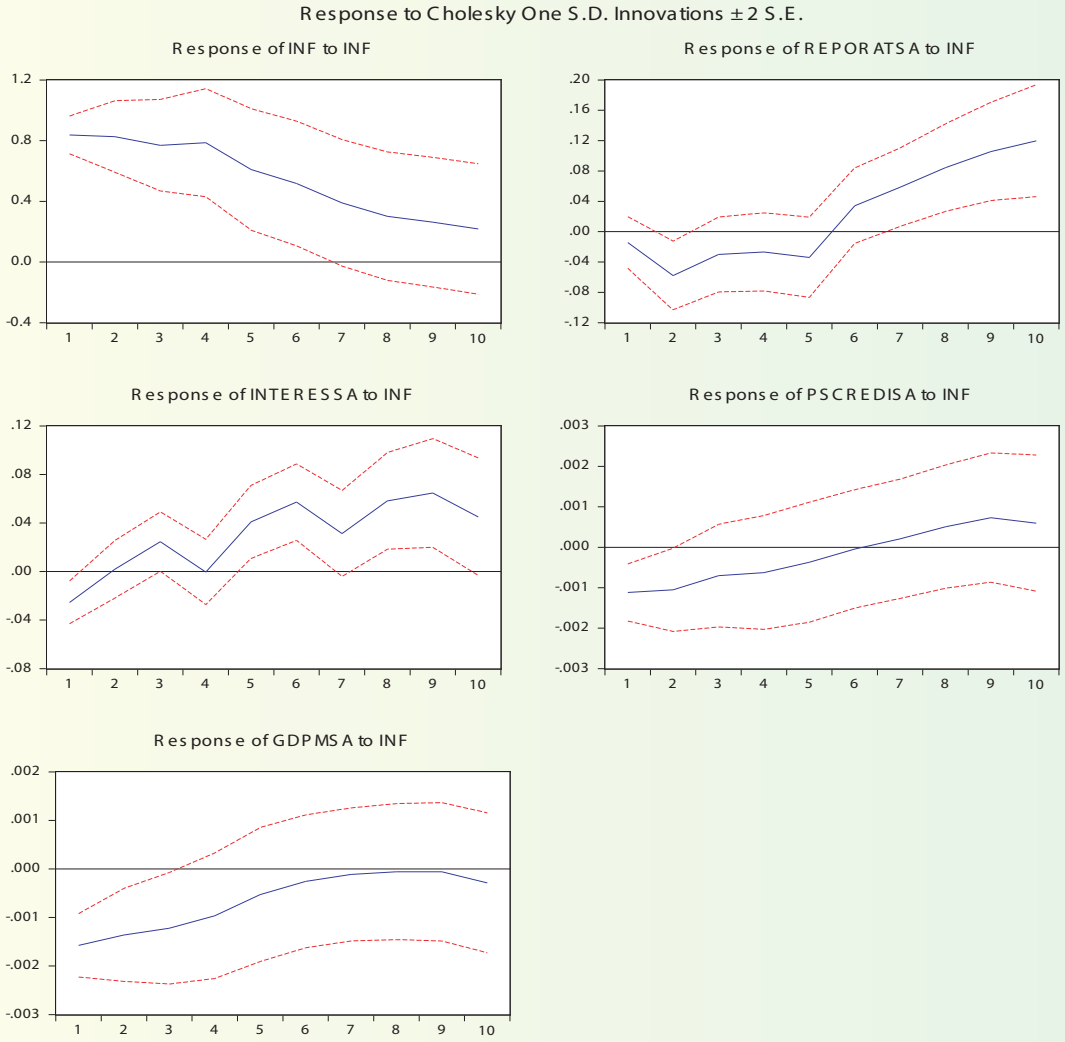
Figure-7: Bank Lending Channel: Responses of lending interest rate, credit, and GDP to Monetary Policy Shock (Policy rate)



In Figure-7 show the impact of policy rate on the interest rate, private sector credit and the GDP. Due to one S.D shock to policy rate (repo rate) the impact on the interest rate, private sector credit and GDP is insignificant . This is because the central bank do not use policy rate for increasing output. The policy rate is used to control money supply or liquidity in the market.?

The above Figure-7 show that Repo rates do not have any impact on GDP. However, in Figure-8, Repo rate responds to higher inflation. This implies that monetary authority responds to the rise in inflation by increasing repo rate, that causes bank lending rates to increase and decrease private sector credit and output.

Figure-8: Bank Lending Channel: Responses of Policy Rate, Lending Rate, Bank Credit and GDP to Inflation Shock



VII. Conclusion:

This study focuses on examining the transmission of monetary shocks onto the economy through different channels.Therefore, the dynamic relationship between the variables of each channel is to be examined to find out the impact of monetary shocks on to the final variable of each channel, the economic output, and the price level. If the responses of the core variable of each channel are significant to monetary shocks implying that monetary policy stance changes have a considerable impact on the economy through the respective channel/s. In this backdrop, a five variable Unrestricted Vector Auto Regression (VAR) techniques are used to examine the effectiveness of monetary transmission channels in Bangladesh. In this study, several monetary transmission channel has been analyzed. For example, interest rate channel, bank lending channel or credit channel, and the exchange rate channel. The IRFs derived from VAR show that money supply(M2) have significant impacts on output (GDP) and the price level (Inflation) in Bangladesh implying that monetary policy transmission channel is effective in influencing macroeconomic variables in Bangladesh. Also, the empirical results show that although the interest rate, lending, and exchange rate channels work efficiently to affect output and the price level. Bank deposits and credit channel work better as an intermediate channels to transmit monetary policy on output and the price level.

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Determinants of Bank Profitability in Bangladesh

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Abstract

This paper specifically focuses on the performance measures, and their determinants of the banks operating in Bangladesh. By using bank specific panel data over the period 2005-2014, the paper estimates the impacts of bank specific and macroeconomic factors on bank profitability, represented by return on equity (ROE). We find that non-performing loans (NPL), foreign loans (FL) and capital adequacy ratio (CAR) have statistically significant negative impact on bank profitability while non-traditional activities (NTA)[2] *have significant positive impact on bank profitability with a very high magnitude.*

Keywords: Profitability, ROE, NPL, CAR, NTA.

JEL Classification: E58, G21.

[1] Authors are officials of Bangladesh Bank. Views expressed in the paper are authors' own and not necessarily reflect the view of Bangladesh Bank.

[2] Non Traditional Activities incorporated in the model with the ratio of non interest income to total assets.

1. Introduction

Banks are the most important financial intermediaries in Bangladesh. Most of the operations in money and capital market are carried out by groups of SCBs, PCBs, FCBs and SBs. The banking industry generally proved its resilience during the Global Financial Crisis of 2007-2008. This development was achieved due to the implementation of stringent regulatory and supervisory standards within a stable, sound and more flexible macroeconomic management framework over the past decade. Measures have also been taken to improve transparency, and internal management of the banks. In this paper we specifically focus on the performance measures, and their determinants of the banks operating in Bangladesh. By using bank specific panel data over the period 2005-2014, the paper estimates the impacts of bank specific and macroeconomic factors on bank profitability, represented by ROE. The paper is organized in the following way. It starts with reviewing the existing literature analyzing the determinants of bank profitability in different countries. This is followed by section which discusses the measures of bank profitability and their determinants. Data, methodology and empirical results are described in the following section. The final section includes the conclusion.

2. Literature Review

The profitability analysis of the banking sector has received immense attention in recent years. Athanasoglou et al. (2006) examined the effect of bank-specific, industry-specific and macroeconomic determinants of bank profitability over the period 1985-2001, using an empirical framework that incorporates the traditional Structure-Conduct-Performance (SCP) hypothesis. To account for profit persistence, they apply a GMM technique to a panel of Greek banks. They find that capital is important in explaining bank profitability and that increased exposure to credit risk lowers profits. Additionally, labor productivity growth has a positive and significant impact on profitability, while operating expenses are negatively and strongly linked to it, showing that cost decisions of bank management are instrumental in influencing bank performance.

Molyneux & Thornton (1992) used two-stage least squares to simultaneously model the determinants of foreign bank profitability and commercial credit extension in the United States between 1987 and 1991. Their results indicate that supply-side factors; such as capital strength, commercial and industrial loan growth and assets composition were important factors in determining foreign banks' return-on-assets in the sample period.

Roman & Danuletiu (2013) investigated the factors that have an influence upon the profitability of 15 commercial banks that operate in Romania between 2003 and 2011. Their empirical results highlight the fact that the ratio of nonperforming loans, the

management quality and the ratio of liquid assets to total assets has a significant impact upon the banking profitability. Instead, other factors, respectively the ratio of total equity to total asset, the ratio of loans to total assets, funding costs and income diversification of bank did not have an important effect upon the profitability.

Flamini et al. (2009) uses a sample of 389 banks in 41 Sub-Saharan Africa (SSA) countries to study the determinants of bank profitability. To capture the tendency of profits to be persistent over time (due to market structure imperfections or high sensitivity to autocorrelated regional or macroeconomic factors), they adopt a dynamic specification of the model, with a lagged dependent variable among the regressors. They find that bank returns are affected by macroeconomic variables, suggesting that macroeconomic policies that promote low inflation and stable output growth boost credit expansion. The results also indicate moderate persistence in profitability.

Guisse (2012) examined the performance of the Malaysian's local banks and foreign banks, and compared their profitability in the financial sector. They conclude that profitability of commercial banks can be influenced by several factors, such as liquidity, credit, capital, operating expenses, and the size of the banks.

Sufian & Habibullah (2009a) seeks to examine the performance of 37 Bangladeshi commercial banks between 1997 and 2004. The empirical findings of their study suggest that bank specific characteristics, in particular loans intensity, credit risk, and cost have positive and significant impacts on bank performance, while non-interest income exhibits negative relationship with bank profitability. However, their study includes all the specialized banks that are not driven for profit motive, and have continuously experienced negative ROA and ROE. Moreover, their study does not incorporate foreign banks which contribute more than 5% of the assets and deposits of the banking industry. More surprisingly they include Bangladesh Bank in their study which is the central bank regulating the banking industry not a commercial bank. Given the above discussions on the literature, it seems that there is a space of more research to derive the determinants of bank profit profitability in Bangladesh.

3. Bank Profitability Measures and their Determinants

a. Bank Specific Determinants

- **Capital Risk:** To capture the capital risk we have used CAR which measures the impact of capital requirements on banks' profitablity.
- **Credit Risk:** Credit risk of the banks on profitabilty is incorporated in the model by NPL.

- **Liquidty Risk (LR):** Liquidity risk is measured by the ratio of toatal loans to total assets.
- **Management Quality (MQ):** Management quality is represented by operating expenditure to total assets ratio.
- **Non Traditional Activities:** Non Traditional Activities incorporated in the model with the ratio of non interest income to total assets.

b. Macroeconomic Determinants

- **Foreign Loans:** Forign loan inflows in the country is assumed to adversely affect the proftabilty of the domestic banking industry.
- **Economic Growth:** Measured by GDP growth (GROWTH_BD) is expected to influnce bank proftability positively because the default risk of bank loans is lower in economic upturns.

4. Data and Methodology

We have used a balanced panel data set[3] of 42 commercial banks (4 SCBs, 30 PCBs & 8 FCBs) over the period 2005-2014 on yearly basis which account for more than 90% of assets and deposits in the banking sector of Bangladesh in 2014. The banks lisened in 2012 are excluded for having a very short operation history. The specialized banks, concentrated to meet the special needs and demand for agricultural and industrial development, are also excluded as they are not driven by profit and their ROEs are almost negative for the whole sample period, seeming that they are the outliers. The variables: ROE, CAR, LR, NPL, MQ, NTA and FL are derived from both the income statements and the balance sheets of commercial banks published in the website, as well as from the Bangladesh Bank statements. GDP Growth is taken from World Development Indicators of World Bank.

Before estimation, we perform several transformations on our data. First, all the variables are transformed into their natural logarithm forms. As we have a panel data set, we proceed to estimation using fixed effects and random effects models. In the fixed effects model, the individual-specific effect is a random variable that is allowed to be correlated with the explanatory variables. The rationale behind random effects model is that, unlike the fixed effects model, the individual specific effect is a random variable that is uncorrelated with the independent variables included in the model. Panel least squares estimation output of ROE with explanatory variables is summarized in Table 1. We have used White period standard errors to correct for heteroscedasticity.

[3] Same observation is observed over time.

Table 1: Estimating the determinants of ROE

	Dependent Variable: ROE	
Regressors	Coefficient	Robust SE
Constant	0.236	0.456
Capital Adequacy Ratio	-0.087	0.081
Liquidity Risk	-0.083	0.148
Non Performing Loan	-0.929*	0.532
Management Quality	-0.432	1.519
Non Traditional Activities	3.074***	1.091
Foreign Loans	-0.034***	0.011
Economic Growth	0.042	0.122
N	418	
Number of groups	38	
R-squared	0.176	
Prob (F-statistic)	0.000	

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Table 1 shows the estimated parameters and their standard errors obtained from the application of panel least squares model, using ROE as the dependent variable. Non-performing loan is negatively related to ROE at 10% level of significance. This negative relationship shows that the loan defaults have significant negative impact on bank profitability. Non-traditional activities and foreign loans are found to be significantly affecting the profitability of banks at 1% level. As for the other bank-specific variables, namely capital adequacy ratio, liquidity risk, and management quality, they all show no statistically significant impact on bank profitability. Economic growth is not found to have a significant impact on banks' profitability. Fixed effect panel least squares estimation output of ROE with explanatory variables is summarized in Table 2.

Table 2: Estimating the determinants of ROE

	Dependent Variable: ROE	
Regressors	Coefficient	Robust SE
Constant	0.580**	0.226
Capital Adequacy Ratio	-0.360***	0.047
Liquidity Risk	-0.036	0.044
Non Performing Loan	-0.021	0.248

Management Quality	-0.203		2.388
Non Traditional Activities	1.173		1.840
Foreign Loans	-0.016*		0.009
Economic Growth	-0.065		0.055
N		418	
Number of groups		38	
R-squared		0.423	
Prob (F-statistic)		0.000	

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

The capital adequacy ratio now becomes significant at 1 % level while NPL and NTA become insignificant. An increase in capital adequacy ratio curtails bank's ROE as it leaves the bank with fewer funds for interest earning. FL remains significant at 10 % level but with a lower magnitude of the coefficient. To check the random effect we have used Hausman test. The Hausman test achieves a p-value of 1 which simply indicates that there is no evidence that the random effects estimates are invalid. The outputs of cross-section random effects are used here (Table 3). However, almost similar results are attained using period random effects and two way random effects.

Table 3: Estimating the determinants of ROE

	Dependent Variable: ROE	
Regressors	Coefficient	Robust SE
Constant	0.270	0.531
Capital Adequacy Ratio	-0.115	0.074
Liquidity Risk	-0.107	0.153
Non Performing Loan	-0.868*	0.515
Management Quality	-0.681	1.461
Non Traditional Activities	3.092***	1.013
Foreign Loans	-0.031***	0.010
Economic Growth	0.033	0.116
N	418	
Number of groups	38	
R-squared	0.146	
Prob (F-statistic)	0.000	

Note: *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

The random effect model results are almost similar to the results attained in panel least squares model. Non-performing loan is negatively related to ROE at 10% level of significance. This negative relationship shows that the loan defaults have significant negative impact on bank profitability. Non-traditional activities and foreign loans are found to be significantly affecting the profitability of banks at 1% level. As for the other bank-specific variables, namely capital adequacy ratio, liquidity risk, and management quality, they all show no statistically significant impact on bank profitability. Economic growth is not found to have a significant impact on banks' profitability. Fixed effect panel least squares estimation output of ROE with explanatory variables is summarized in Table 2.

5. Conclusions

Our study examines the determinants of the bank profitability in Bangladesh. Using panel data method (random effects model) for 42 commercial banks (4 SCBs, 30 PCBs & 8 FCBs) over the period 2005-2014 on yearly basis, we find that non performing loan, nontraditional activities, capital adequacy ratio and inflation has statistically significant impact on bank profitability. A bank's profitability is extensively dependent on its non performing loan, both ROA and ROE exhibits a decline at 1% level for an increase in nonperforming loan. On the other hand, non interest income of banks increases their ROA and ROE both, indicating that greater diversified banking activity positively influence returns. On the macroeconomic variables, only inflation is found to having positive effect on profitability, as measured by ROA. When inflation rises, return on assets of banks rises. The remaining bank-specific factors and macroeconomic factor do not have statistically significant effect on bank profitability.

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Appendix

A.1. Determinants of ROA (Panel Least Squares)

Dependent Variable: LROE
Method: Panel Least Squares
Date: 08/17/16 Time: 23:11
Sample: 2004 2014
Periods included: 11
Cross -sections included: 38
Total panel (balanced) observations: 418
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.236631	0.456207	0.518692	0.6043
LCAR	-0.087747	0.081886	-1.071580	0.2845
LNPL	-0.929389	0.532966	-1.743807	0.0819
LLR	-0.083130	0.148671	-0.559153	0.5764
LMQ	-0.432210	1.519597	-0.284424	0.7762
LNTA	3.074673	1.091309	2.817417	0.0051
LFL	-0.034452	0.011164	-3.086064	0.0022
LGDP_R	0.042281	0.122387	0.345471	0.7299

R-squared	0.176962	Mean dependent var	0.109191
Adjusted R -squared	0.162910	S.D. dependent var	0.251543
S.E. of regression	0.230143	Akaike info criterion	-0.081279
Sum squared resid	21.71597	Schwarz criterion	-0.004045
Log likelihood	24.98731	Hannan -Quinn criter.	-0.050747
F-statistic	12.59349	Durbin -Watson stat	1.184195
Prob(F -statistic)	0.000000		

A.2. Determinants of ROA (Fixed Effect Model)

Dependent Variable: LR OE
Method: Panel Least Squares
Date: 07/10/17 Time: 22:03
Sample: 2004 2014
Periods included: 11
Cross -sections included: 38
Total panel (balanced) observations: 418
White period standard errors & covariance (d.f. corrected)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.580055	0.226023	2.566350	0.0107
LCAR	-0.360467	0.047388	-7.606738	0.0000
LNPL	-0.021157	0.248550	-0.085123	0.932 2
LLR	-0.036181	0.044262	-0.817422	0.4142
LMQ	-0.203728	2.388855	-0.085283	0.9321
LNTA	1.173622	1.840952	0.637508	0.5242
LFL	-0.016600	0.009754	-1.701977	0.0896
LGDP_R	-0.065507	0.055373	-1.183004	0.2376

Effects Specification

Cross -section fixed (dummy variables)

R-squared	0.423094	Mean dependent var	0.109191
Adjusted R -squared	0.355041	S.D. dependent var	0.251543
S.E. of regression	0.202012	Akaike info criterion	-0.259569
Sum squared resid	15.2 2174	Schwarz criterion	0.174873
Log likelihood	99.24991	Hannan -Quinn criter.	-0.087825
F-statistic	6.217110	Durbin-Watson stat	1.720432
Prob(F -statistic)	0.000000		

A.3. Determinants of ROA (Cross-section Random Effects Model)

Dependent Variable: LROE
Method: Panel EGLS (Cross -section random effects)
Date: 08/17/16 Time: 23:14
Sample: 2004 2014
Periods included: 11
Cross -sections included: 38
Total panel (balanced) observations: 418
Swamy and Arora estimator of component variances
White period standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.270801	0.432766	0.625743	0.5318
LCAR	-0.115493	0.074895	-1.542069	0.1238
LNPL	-0.868696	0.515122	-1.686391	0.0925
LLR	-0.107247	0.153772	-0.697445	0.4859
LMQ	-0.681074	1.461115	-0.466133	0.6414
LNTA	3.092303	1.013934	3.049806	0.0024
LFL	-0.031733	0.010813	-2.934832	0.0035
LGDP_R	0.033078	0.116674	0.283503	0.7769

Effects Specification	S.D.	Rho
Cross -section random	0.030585	0.0224
Idiosyncratic random	0.202012	0.9776

Weighted Statistics

R-squared	0.146074	Mean dependent var	0.097579
Adjusted R -squared	0.1 31495	S.D. dependent var	0.242442
S.E. of regression	0.225940	Sum squared resid	20.93009
F-statistic	10.01932	Durbin -Watson stat	1.223537
Prob(F -statistic)	0.000000		

Unweighted Statistics

R-squared	0.174934	Mean dependent var	0.109191
Sum squared resid	21.76947	Durbin -Watson stat	1.176360

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Does Investment Stimulate Economic Growth in Bangladesh? An Empirical Analysis

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Bishnu Pada Biswas

Abstract

This paper examines the significant role of investment in the economic growth process of Bangladesh. The study revisits empirically the impact of investment on economic growth. The study applies Ordinary Least Square (OLS) Method for using data from FY1983 to FY2017 period to investigate the responsiveness of investment to GDP growth. The key finding of the study depicts that there is a positive relationship between investment and economic growth in Bangladesh. The results enable us to estimate the desired level of investment to achieve a target for GDP growth. It also reveals that there is a gap of investment to achieve a targeted level of growth in Bangladesh and suggests to increase investment gradually to the desired level.

Keywords: Investment, GDP growth, Growth models, Ordinary least squares method, Bangladesh.

JEL Classification: C32, E22, E23, O53, O57.

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1. Introduction

The phenomenal economic growth rate that Bangladesh has achieved has drawn the attention of economists, experts and international donor agencies. Bangladesh has already achieved the status of lower middle class and is expecting upper middle-class status by 2021 as visualized by the Government Vision 2021. The government of Bangladesh has already formulated the Seventh Five Year Plan for 2016-2020 to accelerate 6.0 percent growth to 8.0 percent by FY2020. As per view of the Planning Commission, total investment (both public and private) needs to increase from 28.9% to 34.4% of GDP by FY2020 to achieve this higher growth rate. Bangladesh government emphasizes rightly on private investment in attaining the targeted higher growth rate because of share of private investment is around 77.44 percent of total investment. In the recent years, the government has also been attentive on public investment along with private investment. That is why public investment has been rising gradually from 4.50% in FY2008 to 7.41% of GDP in FY2017, whereas private investment has been relatively hovering around 22-23% of GDP. However, in this perspective we attempt to reexamine the relationship between investment and GDP growth and way out of accelerating investment to reach in optimum economic growth in Bangladesh.

The remainder of paper is structured as follows. After introduction the second section describes the literature review, the third section depicts the patterns and trends of economic growth, investment and savings in Bangladesh. The fourth section reviews theoretical framework for relationship between growth and investment. The fifth section presents trends in growth and investment in selected Asian countries. The sixth section shows methodology and data. The seventh section shows empirical results of the study. The last section concludes policy implications.

2. Literature Review

A considerable number of studies have been carried out on investment and economic growth of various countries using different samples, methodologies and procedures. Most of the studies have found substantial positive causal relationship between investment and economic growth with few exceptions.

Eberts (1986), Aschauer (1989a, 1989b) and Munnell (1990) show the relationship between government investments on economic infrastructure, and economic growth at national, regional and state levels. They find a statistically significant positive relationship

between public investment and economic growth. These studies spark up remarkable interest on relationship between growth and investment.

Nazmi and Ramirez (1997) analyze the impact on economic growth of public and private investment spending. They conclude that public investment expenditures have a positive and significant effect on output growth. At the same time, public investment's impact on economic growth is statistically identical to the impact of private capital spending. The contribution of public investment to output expansion, however, come at the expense of private investment as indicating a significant crowding out effect.

Rahaman et. al (2005) found that private and public investment do appear to have different effect on the long-economic growth of Bangladesh. In other words, the marginal productivity of private and public investment is different in Bangladesh. Further private investment plays a much larger and thus more important role in the growth process of Bangladesh.

According to Haque (2013) there exist a short-run and long-run relationship between public and private investment and economic growth in Bangladesh. This implies that public and private investment impact positively on economic growth in the short and long run process. In addition, it confirms that private investment is more effective in the long run than public investment. Another finding of the study confirms that the error correction term (ECM) is negative and significant (-0.36), which indicates that 36% of the disequilibrium will be adjusted annually and approximately after three years, short term dynamics will reach at an equilibrium level. It implies that the gestation period of most of the public and private capital investment in Bangladesh is three years.

Gazali (2010) shows the relationship of domestic investment and economic growth in Pakistan. The empirical findings of his paper indicate FDI, domestic capital stock, and economic growth have long run relationship and the causality analysis shows bidirectional causality between FDI and domestic investment. A unidirectional causality is found between FDI and economic growth and all these findings show that FDI supports both domestic investment and economic growth in Pakistan.

A study conducted by Nasir and Saima (2010) observed that the coefficient of investment /GDP ratio is 0.65 which indicates that a 1 percentage point increase in investment will cause a 0.65 percentage point increase in GDP growth in Pakistan.

Investment is the most important channel through which financial market affects economic growth (Li, 2006). Inflation, a tax on real balance, reduces real returns to

savings which in turn causes an informational friction afflicting the financial system. These financial market frictions result in credit rationing and thus limit the availability of investment and finally this reduction in investment adversely impacts economic growth.

Financial market development is positively linked with the level of investment (King and Levine, 1993; Levine and Zervos, 1998 and Atje and Jovanovic, 1993).

Raymond (1998) reexamined the issue using annual observations in United States data from 1948 to 1993. Employing both integration and cointegration tests, he concludes that public capital seems positively related to output, labor and private capital in the long run. The results also suggest and infer that innovations in public capital could have long-lasting effects.

According to Barro (1995) reduction in economic growth is occurred due to reduction in the propensity to investment that is outcome of inflation. He further shows that an increase in average inflation by 10 percentage points per year cause reduction in the ratio of investment to GDP by 0.4-0.6 percentage points and this reduction in investment reduces the real per capita GDP by 0.2-0.3 percentage points per year. So inflation reduces the level of investment and hence reduction in investment adversely affects economic growth.

Other empirical studies find positive effects of public capital spending, particularly infrastructural spending, on private investment, productivity and growth [Pereira (2000, 2001a and 2001b); and Mittnik and Neumann (2001)]. These studies suggest that a decrease in public capital spending could be harmful for economic growth.

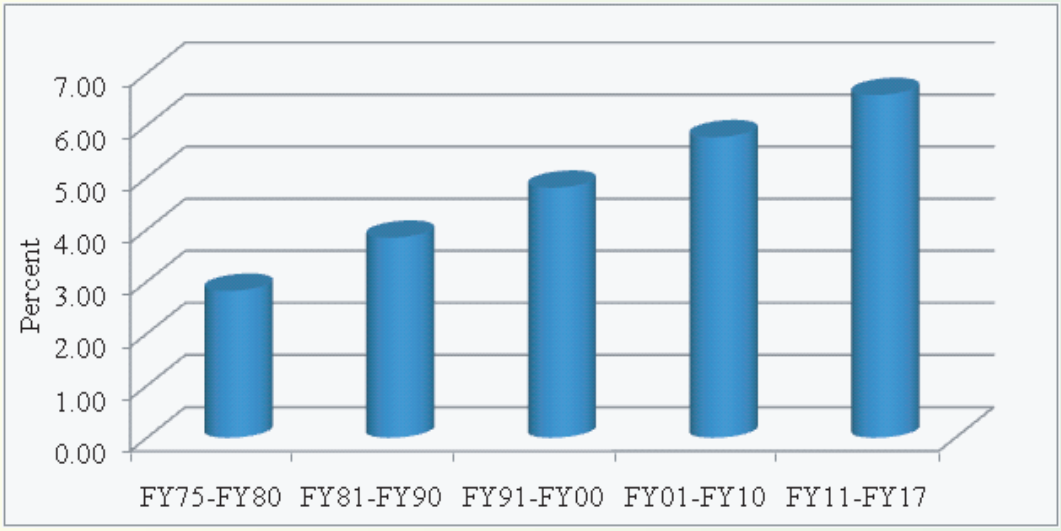
In the context of Bangladesh, there is no considerable number of studies. Hafiz and Hasan (2016) explored the causal relationship between public investments and economic growth in the case of Bangladesh for the period of 1976 - 2014 using a Vector Autoregression Model (VAR). The model also included private investment, inflation, real interest rate, money supply, and foreign direct investment. Their ECM model estimates indicated the existence of a long-run relationship between public investment and economic growth. According to the Granger Causality Test, this study shows that there exists no short run causal relationship between public investment and economic growth.

However, our paper will visit this relationship applying OLS method in order to find the magnitude of responsiveness of investment to GDP growth which is remained unexplored.

3. The Patterns and Trends of Economic Growth, Investment and Savings

Bangladesh economy has been experiencing gradual acceleration in GDP growth for decades together. After liberation major observations are- economic growth had a fluctuating trend till FY1980. In this decade, the highest growth was 7.10 percent in FY1978 and the lowest was 4.10 percent in FY1975.The average growth rate of this decade stood at 2.82 percent. In the 1980s the fluctuating tendency of the growth became relaxed where the maximum growth rate recorded at 6.60 percent in FY1990 and minimum was only 1.20 percent in FY1982. The average growth rate was somewhat higher (3.84 percent) than the previous decade. The next two decades- 1990s and 2000s experienced an average growth of 4.80 percent and 5.77 percent respectively which were more inspiring than previous two decades. In the current decade, the average growth stood at 6.58 percent (Graph 1).

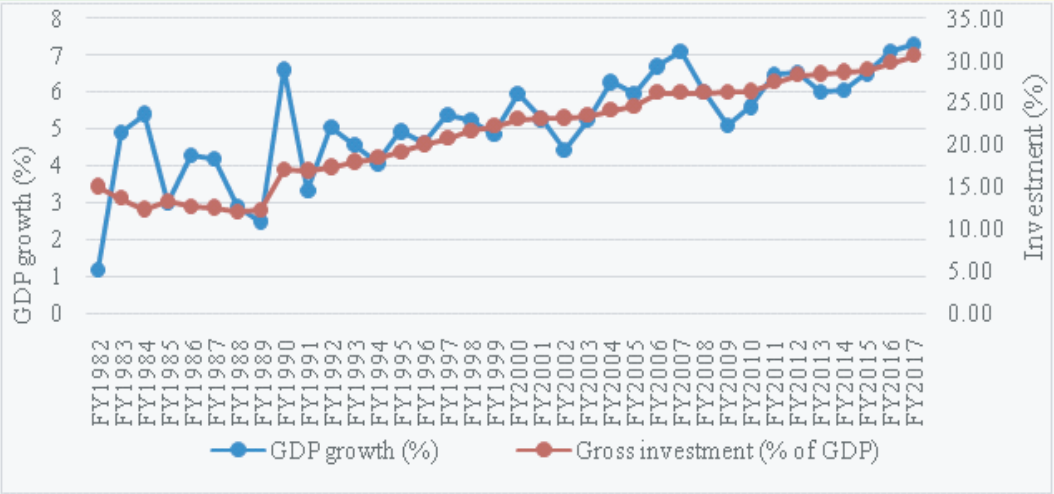
Graph 1: Average GDP Growth in Bangladesh



Source: Bangladesh Bureau of Statistics

Graph 2 shows the historical trend of GDP growth and investment from FY1975-FY2017. According to the estimates of Bangladesh Bureau of Statistics, the Bangladesh's economy grew by 7.1 percent in FY2016 exceeding 7.0 percent growth target and 6.0 percent growth trajectory. This robust growth was mainly attributed to industry and service sectors. In the recent years, Bangladesh Bank has been implementing a cautious and pro-growth monetary policy stance that encourages investment through the strategy of selective easing to support 7.0 percent growth target which has already been achieved.

Graph 2: Trends in GDP Growth and Investment in Bangladesh



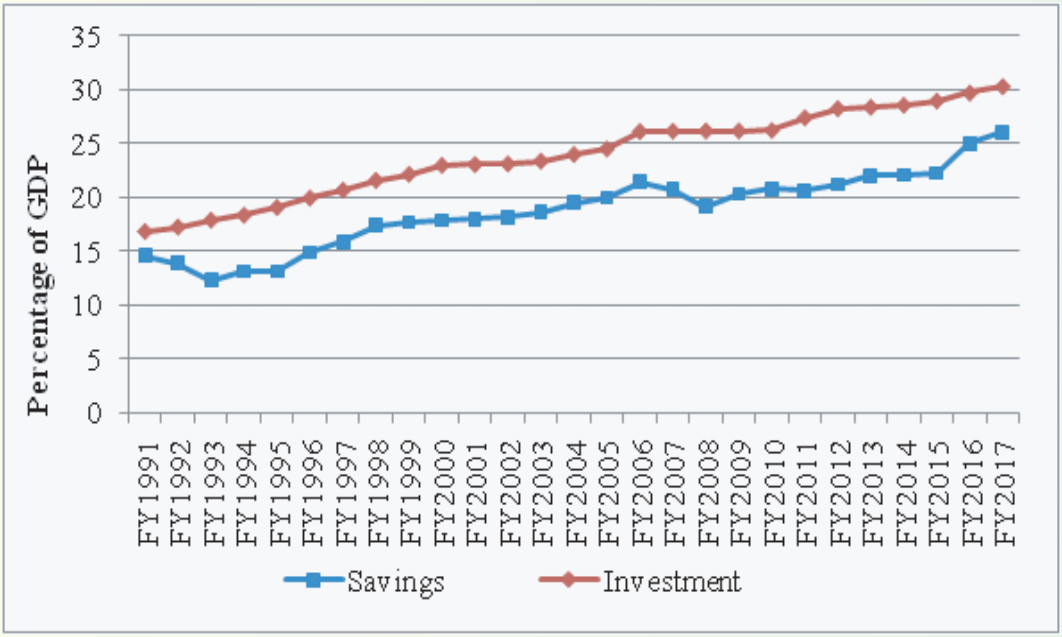
Source: Bangladesh Bureau of Statistics

The World Bank (2007 and 2012) revealed the fact that the most important determinant of growth in Bangladesh has been capital accumulation. The recent higher GDP growth has been possible due mainly to among others, steadily higher investment particularly private investment which has generated from accelerated savings. The investment has fueled the expansion of production in agriculture, manufacturing (particularly garments), infrastructure and human development. These have contributed to the acceleration in economic activities in Bangladesh.

In FY1980, total investment as share of GDP stood at 15.29 percent as compared to only 3.0 percent in FY1973. Investment increased steadily for years together and reached at 17.05 percent and 23.02 percent of GDP in FY1990 and FY2000 respectively. Latest data show that investment increased to 30.51 percent of GDP in FY2017 which was 26.25 percent of GDP in FY2010.

Domestic savings was very insignificant before 1980s. In FY1981, savings was only 3.22 percent of GDP which stood at 12.86 percent of GDP in FY1990. After that it increased to 17.88 percent and 20.81 percent of GDP in FY2000 and FY2010 respectively. Latest data show that domestic saving increased to 25.3 percent of GDP in FY2017 from 22.2 percent of GDP in FY2015. The investment-savings relationship is shown in Graph 3.

Graph3: Trends in Savings and Investment in Bangladesh



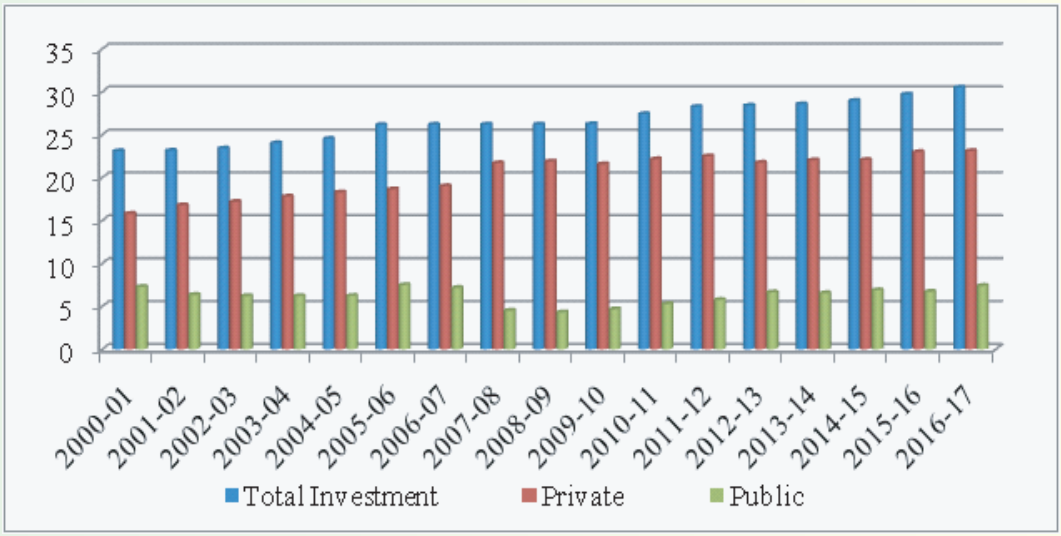
Source: Bangladesh Bureau of Statistics

After liberation, the investment was facilitated mostly by official aid. In the early 1990's, national savings financed much of the investment. It is observed that national savings has exceeded investment slightly in the recent years.

For a long time, different factors have played a positive role in acceleration of investment and savings. These are-macroeconomic environment (including fiscal, monetary and exchange rate policies), considerable increase in financial deepening (M2/GDP ratio), expansion of national saving, progressive investment deregulation, etc. Though a long term track record of investment drive was made in both private and public sectors, the recent pictures are worrisome.

The share of public investment in GDP increased a little bit from 6.7 in FY2016 to 7.4 percent in FY2017 while the share of private investment in GDP rose from 23.0 to 23.1 percent over the same period (Graph 4).

Graph 4: Investment - Public and Private in Bangladesh



Source: Bangladesh Bureau of Statistics

In the past 7 years (from FY2011-FY2017), both investments seem to be stagnant, because the private and public investment hovered over 22.0 and 6.0 percent of GDP respectively. For example, private investment was 23.1 percent of GDP in FY2017 while it was 22.16 percent of GDP in FY2011. Similarly, Public investment stood at 7.41 percent of GDP in FY2017 which was 6.64 percent of GDP in FY2013.This may be attributed to supersede the domestic investment by national savings which is suggestive of an incentive problem and other demand side limitations.

The incompetence of the government agencies, rampant corruptions and money laundering to overseas countries are considered as major barriers to private sector investment in Bangladesh. Lack of quality public investment is one of the reasons behind the inadequate flow of private investment. In spite of the emphasis on public investment by the Government, a fruitful result is not seen primarily because of a lack of quality development works and poor capacity of public agencies. Last year, the missing of some high-profile persons, terrorist attacks like attack in the Holy Artisan at Gulshan in Dhaka city, secret killings of foreigners and law enforcing agencies were also giving bad messages to the local and foreign investors. The Government has been failing to utilize its potentiality for bringing more investments due to lack of energy security, transportation bottlenecks, scarcity of land, bureaucratic complexities and necessary policy reforms, which are the main factors on the way to attract private investments. Therefore, if Bangladesh needs to

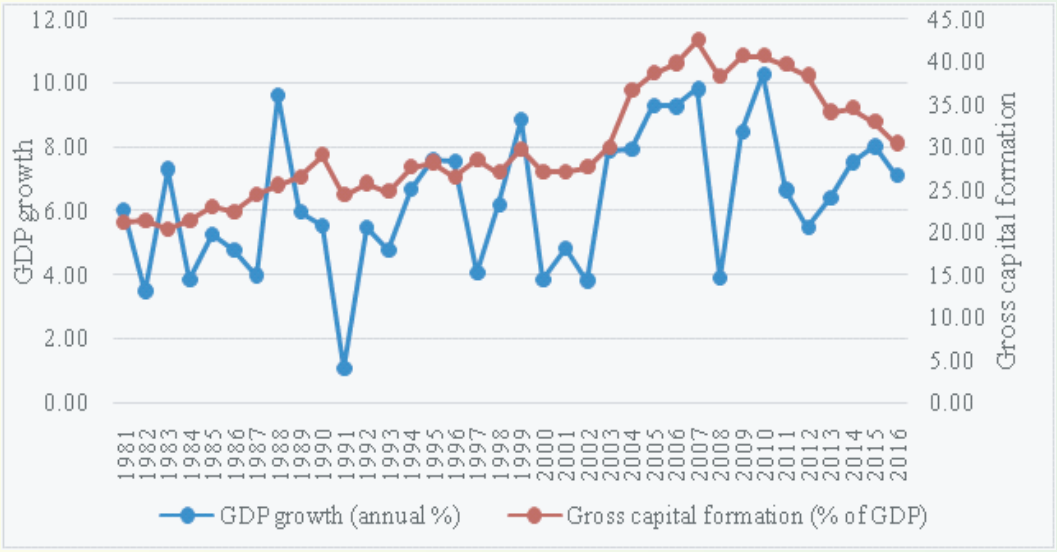
accelerate its investment drive, particularly, private investment significantly in the next few years, it will be possible to achieve expected economic growth.

4. Trends in GDP Growth and Gross Capital Accumulation in Selected Asian Countries

From the historic trends in investment and GDP growth in some leading growth generating Asian countries like India, China, Thailand, Malaysia and South Korea show that the relationship between investment and GDP growth is positive. The experiences from the selected five growth leading countries show that higher investment (% of GDP) yields higher level of growth.

In India investment (gross capital formation) as percentage of GDP had an increasing trend during 1981 to 2007 and the trend was falling afterwards. However, India's GDP growth rates were somewhat fluctuating in the entire period of 1981 to 2016. However, during the high period of continued GDP growths in India during 2003 to 2007, it is found that India's investment-GDP ratio were very high. Investment increased from 30% of GDP in 2003 to 42% of GDP in 2009 and GDP growth rose from 7.86% to 9.8% during the same period. During 2008 to 2016 investment (as % of GDP) declined and GDP growths were fluctuating with a declining trend (Graph 5).

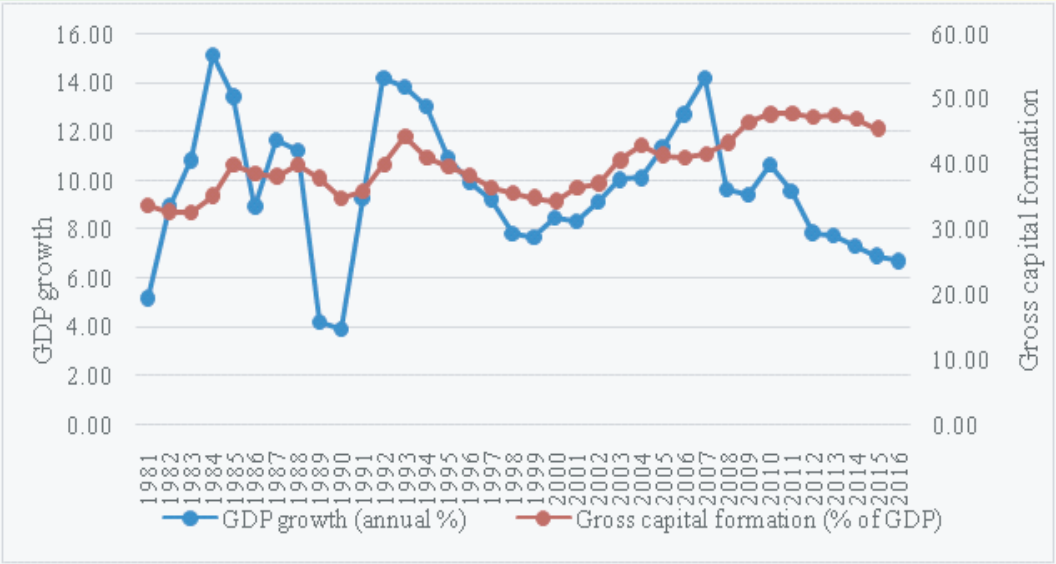
Graph 5: Trends in GDP Growth and Investment in India



Source: World Bank Database

China maintained an investment (% of GDP) above 32% during 1981 to 2016. Following a high GDP growth of 14.22% in 1992 with an investment of 40% of GDP, growth became slowdown continually to 7.67% in 1999 with a declining trend in investment of 35% of GDP. During 2000 to 2007, China's GDP growth again showed an upward trend with higher level of investment and GDP growth reached at 14.23% in 2007 with an investment of 41.46% of GDP. During 2008 to 2015, investment rose and reached at 45.40% of GDP in 2015, but GDP growth rate fell down gradually and reached at 6.9% at the same time (Graph 6).

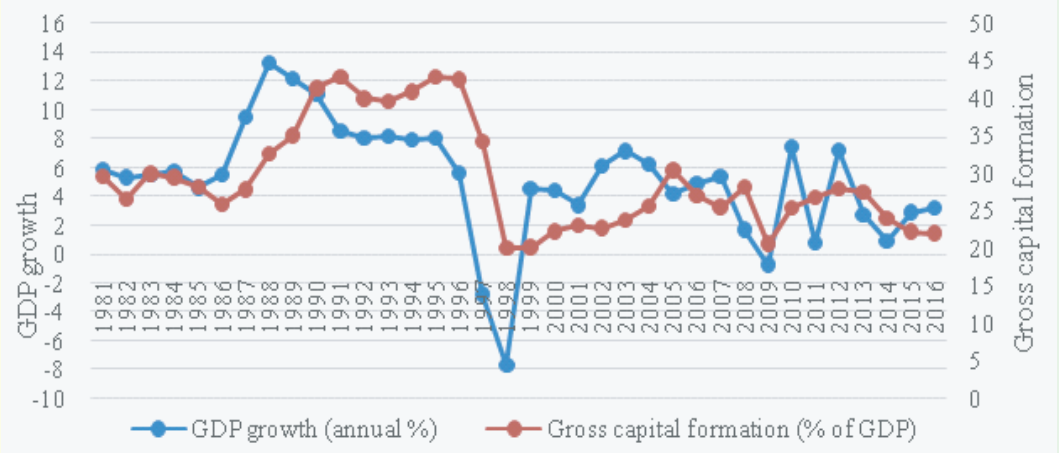
Graph 6: Trends in GDP Growth and Investment in China



Source: World Bank Database

In Thailand, it is found that investment rose from 27.87% of GDP to 42.84% of GDP during periods of the high growth of GDP from 1986 to 1991. Resultantly, GDP growth increased from 5.53% to 13.29% during the same period. Thailand maintained a high level of GDP growth above 8% till 1996. Thailand's economy hit severely in 1997 and onwards due to Asian Crises. Following the Asian Crises both investment and GDP growth fell down (Graph 7)

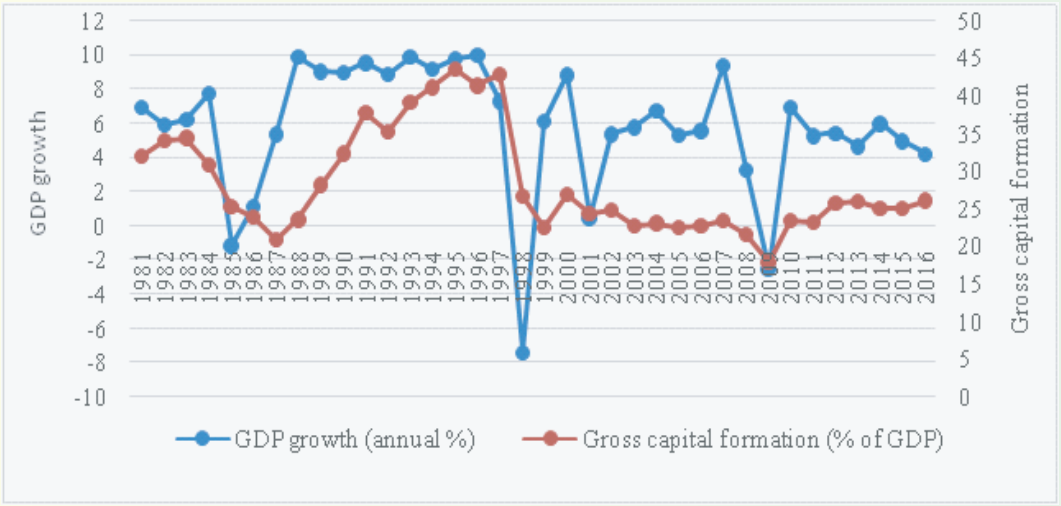
Graph 7: Trends in GDP Growth and Investment in Thailand



Source: World Bank Database

Like Thailand's economy, Malaysia's economy had been growing until Asian Crises in 1997. During 1986 to 1996, Malaysia's investment rose from 23.83% of GDP to 41.47% of GDP and GDP growth increased markedly from 1.15% to 10%. Malaysia's economy was hit by the Asian crises and the economy grew a negative 7.63% in 1998. After the Asian Crises Malaysia's investment fell down significantly between 20-25% of GDP and GDP growth remained on an average 4-5% (Graph 8).

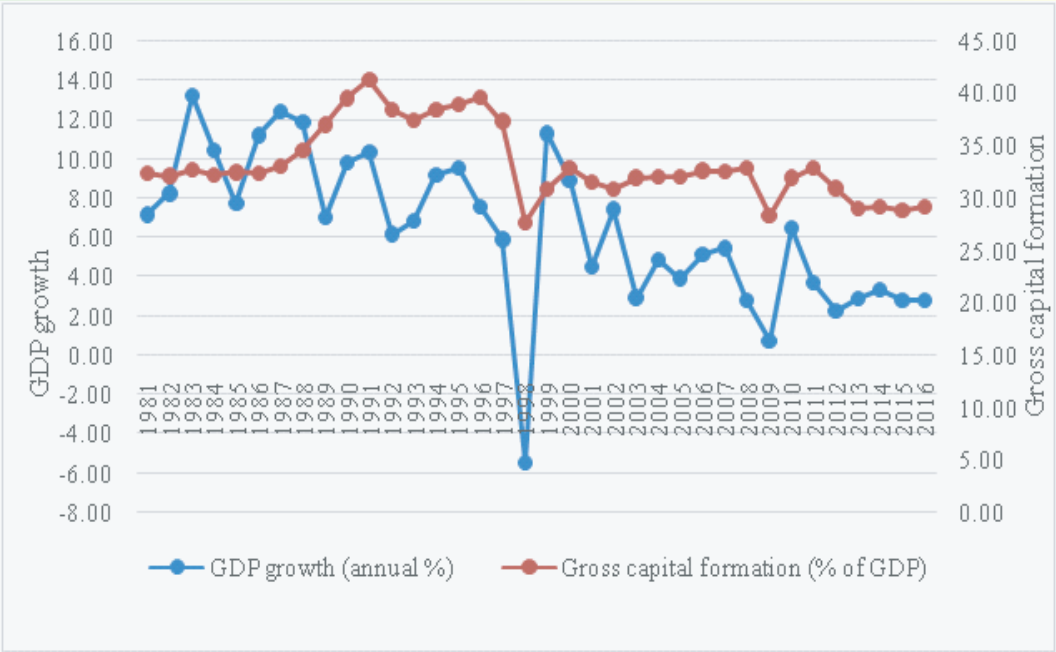
Graph 8: Trends in GDP Growth and Investment in Malaysia



Source: World Bank Database

In South Korea the economy was growing well during 1981-1991. During the period, investment increased from 32.45% of GDP to 41.37% of GDP and GDP growth increased from 7.18% to 10.35%. In the following five years till Asian Crises (1992-1997) the economy maintained persistent investment and growth performance. At that period investment remained on an average of 38.44% of GDP and GDP growth on an average of 7.55%. South Korea's growth drastically dropped to negative 5.47% in 1998 as an immediate impact of Asian Crises. Since 1998 and onwards, South Korean's economy regained, but slowed the growth path. The economy's investment was ranged from 30 to 35% of GDP and GDP growth remained on an average 4-5% (Graph 9).

Graph 9: Trends in GDP Growth and Investment in South Korea



Source: World Bank Database

5. Theoretical Framework for Growth and Investment Relationship

The British Sir Roy Harrod (1939) and American Economist Evsey Domar introduced a very popular and well known model namely Harrod-Domar Growth Model where they show that GDP growth is driven by investment (I) and the capital output ratio *(k)* measured by *(K/y)*.The lower rate of *k* and higher rate of *I* means higher rate of output growth *(y)*. Here *I* depends upon national savings rate *(s)* which encourage higher rate of

I. The equation for Harrod-Domar growth model can be derived in the following ways.

Output is a function of capital stock. Symbolically, we can write

$$y = f(K) \qquad (1)$$

Assuming that the marginal product of capital is constant. Therefore, the production function shows constant returns to scale which indicates that marginal and average products of capital are equal.

$$\frac{dy}{dK} = \frac{Y}{K} = \frac{1}{\frac{K}{y}} = \frac{1}{k} \qquad (2)$$

Equation (2) shows that the marginal product of capital is the reciprocal of capital output ratio (k). Rearranging equation (2) we get,

$$dy = \frac{1}{k}(dK) \qquad (3)$$

Dividing by y in both sides of equation (3) we get,

$$\frac{dy}{y} = \frac{(dK)}{ky} = \frac{I}{ky} \qquad (4)$$

Assuming that investment equals savings, i.e. $I = S$, the equation (4) can be rewritten as

$$\dot{y} = \frac{S}{ky} = \frac{s}{k} \qquad (5)$$

where $\dot{y}$ denotes GDP or output growth rate, *s* denotes savings-GDP ratio or savings rate i.e. $\frac{S}{y}$

From the equation (5), it can be found that when an economy has a saving rate, *s*, of 20 percent and a capital output ratio, *k*, of 4, GDP growth will be 5 percent per year. To achieve growth double, it needs either saving rate to be 40 percent or k to behalf. Here the challenge is to increase capital *(K)* and its productivity $(\frac{1}{k})$.

Thereafter, due to some limitations of this simplified Model, this was replaced by Neo-classical growth model by Robert Solow where he identified three factors of output growth *(y)* -increase in the stock of capital *(K)*, increase in stock of labor force *(L)* and change in technology (Ω). So, the production function is defined as

$$y = f(K, L, \Omega) \qquad (6)$$

Equation (6) can be written in growth form as follows:

$$\frac{dy}{y} = f(\frac{\partial K}{K}, \frac{\partial L}{L}, \frac{\partial \Omega}{\Omega}) \qquad (7)$$

where $\frac{\partial \Omega}{\Omega}$ is change of technology which is exogenously determined, thus the equation (7) becomes

$$\frac{dy}{y} = f(\frac{\partial K}{K} \ \frac{\partial L}{L}) \qquad (8)$$

From equation (8), it can be viewed that in order to increase growth of output (y), it needs to increase growth of either capital stock *(K)* or labor stock *(L)*. In this Model, an increase in *K*, increases labor productivity with fixed labor supply and output growth temporarily. An increase in *K* overtime with fixed labor supply occurs diminishing return and growth effects disappear in the long term. When *K* and *L* go upward then *y* also upturns, the output per worker remains fixed. But technological progress which is exogenously determined can increase the productivity of the factors of production, *K* and *L*.

6. Methodology and Data

To find the relationship between GDP growth and investment empirically, the most appropriate growth model is neo-classical growth model stated in equation (8). Because the model includes more factors of production influencing the growth compared to Harrod-Domar model. But for Bangladesh perspective, data on neither capital nor labor is available. Therefore, we cannot estimate equation (8).

However, there are many studies in which Harrod-Domar model is estimated. Few of them are mentioned below. Siraj and Bengali (2007) used Harrod-Domar model to estimate the relationship between GDP, national savings and capital output ratio in the following ways:

$$y = f(s,k) \qquad (9)$$

where *y* denotes for GDP and *s* for national savings and *k* for capital output ratio. Sumer (2012) used Harrod-Domar model to estimate the relationship between GDP and investment in following ways:

$$y = f(i) \qquad (10)$$

where *y* denotes for GDP and *i* for investment

In the light of the above estimating Harrod-Domar growth models, we can drive a suitable growth model differently for Bangladesh in the following ways.

We rewrite the equation (4) as

$$\frac{dy}{y} = \frac{I}{ky}$$

Alternatively, we write

$$\dot{y} = \frac{1}{k}\, i \qquad (11)$$

where i stands for investment-GDP ratio, $\frac{I}{y}$ or investment rate and $(\frac{1}{k})$ denotes marginal productivity of capital.

Equation (11) shows the relationship between GDP growth and investment rate. It gives us the source of formulating a linear regression model for growth. Thus we can state our estimating equation as follows:

$$\dot{y}_t = \alpha + \beta i_t + u_t \qquad (12)$$

where β = coefficient of Investment-GDP ratio or responsiveness of investment rate to GDP growth, and α = constant (all other variables which affect GDP growth).

Equation (12) uses annual data for the period from FY1982 to FY2017. The source of data on GDP growth rate and investment-GDP ratio is Bangladesh Bureau of Statistics (BBS).

All the variables in equation (12) are in linear form. While choosing an ordinary least square (OLS) method, it is often very useful to see nature of data i.e. whether there is a unit root. There are two most popular unit root tests - Phillip Parron (PP) and augmented Dickey-Fuller (ADF). The ADF test adjusts Dickey-Fuller test to take care of possible serial correlation in the error terms by adding the lagged difference terms of the regressand while PP test uses nonparametric statistical methods to take care of serial correlation in the error terms without adding the lagged difference terms (Gujrati, 2003). We use both unit root tests for all variables. If unit root tests show that all variables have no unit root at the levels, then the variables are considered as stationary i.e. *I* (0).

We also test the Granger causality tests to find whether the relationship between growth and investment is unidirectional and causality comes from which variable.

7. Empirical Results and Findings

The correlation coefficient between GDP growth rate and investment-GDP ratio is 0.79 (Table 1 in the appendix) which is highly significant. It indicates that there is a positive strong significant relationship between GDP growth and investment-GDP ratio.

The results of Granger causality tests for lags 1 through 3 for the variables- GDP growth and investment-GDP ratio are shown in Table 2 in the appendix. Results show that causality come from investment-GDP ratio to GDP growth significantly at all lags.

Moreover, there is unidirectional causal relationship at lags. Therefore, we conclude that causality comes basically from investment-GDP ratio to GDP growth. The results of unit root tests with data on investment-GDP ratio and GDP growth (Table 3 in the appendix) show that both variables are stationary at levels. Therefore, we applied OLS method for estimating our econometric model stated in equation (12) and regression results are summarized in Table 5 in the appendix. Te estimated equation is shown as follows:

$$\dot{y} = 1.328^{**} + 0.181^{*}\, i \qquad (13)$$

(3.29) (6.89)

Adj R^2 : 0.57 *F*-Statistic : 47.51

Note: Figures in the parentheses show *t*-values. * and ** show 1% and 5% levels of significance.

From equation (13) we found that positive and significant relationship between GDP growth rate and investment-GDP ratio.

From the diagnostic tests for estimated equation (13) shown in Table 4, we found that there exists heteroscedasticity in residuals. So, we corrected it through applying heteroskedasticity and autocorrelation consistent (HAC) covariance estimation.

The results of HAC covariance estimation is shown below.

$$\dot{y} = 1.328^{**} + 0.181^{*}\, i \qquad (14)$$

(2.72) (8.71)

Adj R^2 : 0.57 *F*-Statistic : 47.51

Note: Figures in the parentheses show t-values. * and ** show 1% and 5% levels of significance.

The results of HAC covariance estimation corrected only standard errors and thus t-values. We find that all coefficients of equation (14) are statistically significant. We see that investment-GDP ratio has a positive impact on GDP growth. The magnitude of the coefficient of investment-GDP ratio is not very high, it is only 0.181 indicating that if other factors remained constant, only 1 percentage point increase of investment-GDP ratio will increase GDP growth by 0.181 percentage points.

Moreover, adjusted R^2 (0.57) shows that the model is a modest goodness of fit. Therefore, the results can be accepted for interpretation.

7. Conclusion

In the sixth five-year plan (2010-2015) of Bangladesh, it was targeted to achieve 8 percent GDP growth with an investment rate of 32 percent of GDP by FY2015, which was not realized. The actual GDP growth rate and investment (% GDP) in FY2015 stood at 6.6% and 28.9% respectively. Moreover, actual GDP growth rates fell below the targets in the 6th five-year plan. However, in the seventh five-year plan, Bangladesh projects to achieve 8.0 percent GDP growth with an investment of 34.4% of GDP by FY2020. In this regard, the economies of selected countries, grew by 8% in the past had needed investment above 35% of GDP. Our findings show that to achieve a sustainable of 8.0 percent GDP growth, investment needs to increase gradually to 36.85% of GDP by FY2020. Since capital is not the only factor of production, the other important factor of production, labor and its productivity may play influential role in increasing output growth with a relatively low level of investment. In addition, technology, innovation, infrastructure facilities, investment environment, etc. are regarded as influential factors on GDP growth. As the labor productivity in Bangladesh remains below than those in selected countries, even the South Asian average (World Bank Database, 2014), it is a challenge for Bangladesh's economy to achieve a high GDP growth with relatively a low level of investment. Therefore, the paper suggests that Bangladesh needs to increase investment gradually to a desired level to achieve an optimum growth in the economy of Bangladesh.

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Table 1 Correlation analysis

Pair variables	Coefficient	Test Statistic	Probabilities	Obervations	Conclusion
$\dot{y}$ and I	0.76	6.89	0.00	36	Positive significant relationship
Note : $\dot{y}$ = Real GDP growth and I = Investment-GDP ratio					

Table 2 Pairwise Granger Causality Tests

Test Hypothesis	F-statistics in Lags		
	1	2	3
I does not Granger Cause $\dot{y}$	19.50 (0.00)	5.65 (0.01)	4.11 (0.02)
$\dot{y}$ does not Granger Cause I	0.01 (0.93)	0.34 (0.71)	0.44 (0.73)
Observations	36	36	36

Note: Figures in the parenthesis are p-values used to decide on causality at the 5% significance level.

Table 3 Unit Root Tests

Variables (in level)	ADF Test		Phillips -Peron Test		Decision
	With intercept	With intercept and trend	With intercept	With intercept and trend	
$\dot{y}$	-1.57 (0.49)	**-4.98 (0.00)**	-3.37 (0.00)	**-8.94(0.00)**	I(0)
I	-0.38 (0.98)	**-3.72 (0.03)**	-0.38 (0.98)	**-3.71 (0.03)**	I(0)

Note: Figures in the parenthesis are p-values used to decide on unit roots at the 5% significance level. The decision on the basis on the figures marked as bold.

Table 4 Diagnostic tests for equation (13)

Test for	Test Statistic	Probabilities	Conclusion
1. Normality (JB test)	6.70	0.04	Residuals are not normally distributed.
2. Breusch -Godfrey Serial Correlation (LM Test)	2.85	0.07	No Autocorrelation
3. Heteroscedasticity			Heteroskedasticity exists.
White (cross terms)	2.74	0.08	
White (No cross terms)	5.37	0.03	

Table 5 Results of Regression of GDP growth (y)

Regressors/other estimators	Model 1	Model 2 (HAC covariance)
Constant	1.328** (2.29)	1.328** (2.72)
i	0.181* (6.89)	0.181* (8.71)
Adj.R^2	0.57	0.57
F-statistic	47.51	47.51
Observations	36	36

Note: Figures in the parenthesis are *t*-values. * and ** show that coefficients are significant at 1% and 5% levels.

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Employee Job Satisfaction of State-Owned Commercial Banks in Bangladesh: An Empirical Study

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Abstract

The word job satisfaction refers to an individual's common attitude toward his or her job. The study has been attempted to understand and explain the job satisfaction, which is influenced by utilitarian reasons (e.g., future progression, job motivation, salary structure, job security, responsibility, working environment etc.). Only 100 employees have randomly selected for this study from the state - owned commercial banks of Bangladesh. The data collected through an interview with a specific questionnaire. The collected data were analyzed using descriptive statistics, correlation, and regression analysis. The results indicate a weak positive correlation between variables. The overall result of the study shows that the employees of SOCBs are significantly satisfied.

Keywords: Job satisfaction, Employee, State-Owned Commercial Bank (SOCBs).

JEL Classification: J28, N25.

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1. Introduction

The commercial banks are important financial institutions in the financial system and the economy. The commercial banking system dominates Bangladesh's financial sector. There are 56 scheduled banks in Bangladesh. Scheduled Banks are classified into: (a) State Owned Commercial Banks (SOCBs) (b) Specialized Banks (SDBs). (c) Private Commercial Banks (PCBs). (d) Foreign Commercial Banks (FCBs). Alongside, there are 4 non-scheduled banks in Bangladesh (Bangladesh Bank, 2016).

A satisfied, happy and hardworking employee is the biggest asset of any organization, including banks. The success or failure of the organization largely depends on their satisfaction and dissatisfaction. One of the reasons for deteriorating conditions in an organization is low job satisfaction.

Job satisfaction has been defined as an enjoyable expressive situation resulting from the evaluation of one's job; an emotional feedback to one's job and an attitude towards one's job. Research indicates that both physical and mental heaths are directly related to job satisfaction (Smith, 1990). Job satisfaction as an effective (emotional) reaction to a job that results from the incumbent comparison of actual outcomes with those is desired (Cranny et al.1992).

Providing quality service is possible when the service provider or employees are satisfied with his or her job. A satisfied employee spontaneously levels best tries to satisfy his client and its support to organizational goal achievement. Lower job satisfaction tends to have increased absenteeism and turnover (Bullen and Famboltz, 1985). In order of factors finding is difficult, but very essential for effective & efficiently positive result on the competitive banking sector. In fine, the present challenging and dynamic banking sector induces researcher to divulge the factors of satisfaction of bank employees, which is the most important to retain the efficient employees in a bank.

This article is divided into four parts. The first part contains a literature review on employee job satisfaction; the part two specifies the methodology used in analyzing the factors of job satisfaction; in part three results have been analyzed. Discussion and concluding comments are included in part four.

2. Objectives

The basic objective of the study is to identify the critical factors regarding the job satisfaction among the employees of state - owned commercial banks in Bangladesh. In

addition to this objective, the following sub-objectives were also considered.

- To analyze the employee satisfaction level.
- To find out problems and provide recommendations based on findings of the study for improving job satisfaction level among the employees of state -owned commercial banks.

3. Literature Review

Employee Satisfaction is simply how individual think about their jobs and different aspects of their jobs. It is the level to which people like (satisfaction) or dislike (dissatisfaction) their jobs. Spector (1997) & Locke (1976) have defined employee satisfaction as the enjoyable expressive state resulting from the evaluation of one's job or job experiences. Hoppock (1935) defined job satisfaction as any combination of psychological & surroundings conditions that reason an employee honestly, to say, "I am satisfied with my job." An employee tends to be absent less often, to make constructive contributions and to stay with the institution very willingly if he/she satisfied (Hakim 1993). However, an employee may be absent more often, much job pressure that disrupts co-workers, and may be often looking for another job it is mean that he is un-satisfied for their job. One review indicates that also country to popular view, Japanese workers are less satisfied with their jobs than their counterparts in the USA (Lincoln 1989).

Vermon (1931) found that the need satisfaction studies emphasized that if the job unsuccessful to satisfy employee's needs of various categories, need-deprivation would tend to cause absenteeism. Nahar et al (2008) found that the success of any institution greatly depends on its skilled, professional and dedicated workforce. This is also important to know how much satisfied the employees are in the institution with its present facilities, system and policy and other job linked factors. To examine what the employees are pleased by and measuring the employee satisfaction in the workplace is critical to the success and increases the success of the organization for having a competitive advantage (Kelley, 2005). Employees who can produce the organization's product or gives services can more easily relate to the organizational culture and make the necessary adjustment to become an active member of that culture (Coleman and Kleiner, 1999).

Iqbal (2006) exposed the key factors of job satisfaction in banking sector of Bangladesh and it was found that compensations are the most motivating factors to employees' satisfaction. The study also found that public bank lead in terms of job security, autonomy, the balance between work and life, authority and responsibility compared to their position where as foreign banks lead in terms of salary and future benefits. Zaman (2013) showed that in context of Bangladesh commercial bank limited are significant positive relationships among motivation, job security, and job satisfaction. Ahmed and Uddin (2012) study reveal that salary, promotion, supervision, benefits, rewards, operating procedure, co-worker, nature of work, communication etc. are main factors of job satisfaction of the bankers.

The different studies found different aspects as determinants of employee satisfaction. The majority of the studies exposed that level of employee satisfaction highly depends on attractive salary, congenial promotional policy, helpful working environment etc. In addition to this, organizational culture, relation with colleagues and superior, participation in decision making etc. also have an influence on the level of employee satisfaction. However, this study investigates some new aspects such as future progression, a strong balance between work and family etc. also have an impact on the level of employee satisfaction. These studies tend to support the concept that viewing the employee as a customer is much more important than is generally perceived by management. The employees confess that employee satisfaction will improve if the types of training program they require are developed for themselves and thus their needs be better met.

4. Methodology of the Study

Research Design:

This study is an empirical nature and the city of Comilla has been selected as the study area. The study is carried out with survey through a structured questionnaire.

Data Collection:

The study is conducted on the basis of primary data. Primary Data is collected through interview with the help of a structured questionnaire. A survey method is followed for this purpose. The survey was conducted from 1 February 2016 to 31 March 2016. This survey collected data on 15 independent variables and 1 dependent variable. The survey was conducted depending on a five scale questionnaire.

Designing the Questionnaire:

The main objective of the study was to identify the factors of employee job satisfaction of state - owned commercial banks in Bangladesh. The Questionnaire is designed in such a way that there are several questions included in stating the objectives of the research. The questions are designed on the basis of a close end and Likert Scale which has five scales like highly disagree, disagree, neutral, agree, and highly agree.

Sample design:

The target population was the employees of state owned commercial banks in Bangladesh. The Individual opinion was considered as a sample unit. Respondents were selected on the basis of the random sampling method. Total sample respondents are 100 employees of SOCBs in Bangladesh.

Data Analysis Methods:

Descriptive statistics, frequency analysis, Pearson correlation, and the analysis of variance (ANOVA) were used to understand the influencing the factors of employee job satisfaction of state owned commercial banks in Bangladesh. The results are analyzed by using statistical software SPSS version 20 and percentage analysis on a 5 Point Likert scale.

In this study, there are different statistical outputs were computed by using statistical software SPSS. Characteristic evaluation of respondents, descriptive statistical techniques including mean scores, standard deviation, frequency distribution, analysis of variance, and correlation have used to assess the importance of each principles variables form.

5. Empirieal Results Analysis

5.1 Evaluation of Respondent Characteristics

To get more result that is accurate, report is conducting a questionnaire survey. This study has tried to break down the term 'Employee Satisfaction' into the following variables-

Table-1: Characteristic Evaluation of Respondents

Variables	Highly Agreed		Agreed		Neutral		Disagreed		Highly Disagreed	
	No.	%	No.	%	No.	%	No.	%	No.	%
Job Location	3	3	80	80	13	13	4	4	-	-
Salary Structure	12	12	18	18	63	63	7	7	-	-
Working Environment	19	19	23	23	50	50	5	5	3	3
Friendly Atmosphere	11	11	73	73	13	13	3	3	-	-
Job Motivation	13	13	77	77	8	8	2	2	-	-
Responsibility	5	5	85	85	4	4	6	6	-	-
Flexibility	20	20	8	8	70	70	2	2	-	-
Recognition & Rewards	13	13	11	11	68	68	6	6	2	2
Job Efficiency	12	12	14	14	64	64	6	6	4	4
Compensation & Responsibility	-	-	17	17	74	74	6	6	3	3
Balance Work & Family	17	17	43	43	31	31	4	4	5	5
Future Progression	18	18	76	76	3	3	3	3	-	-
Job Security	5	5	81	81	11	11	3	3	-	-
Working Pressure	9	9	11	11	14	14	62	62	4	4
Job Migration	4	4	11	11	12	12	73	73	-	-

Source: Sample Survey, February and March 2016

5.2 Descriptive Statistics:

Based on the descriptive statistic result, factors are divided into three criterion based on mean of sample data-

Strong Influence Factors:

Strong influence factor that is future progression, job motivation, salary structure, job security is highly contributed to picking up the satisfaction level of an employee toward the bank. The mean of these factors is above 4 that means employees are satisfied on those criterions.

Table-2: Presentation of Descriptive Statistic Result

Variables	N	Mean	Std. Deviation
Future Progression	100	4.30	0.830
Job Motivation	100	4.22	0.941
Salary Structure	100	4.08	0.998
Job Security	100	4.02	0.967
Responsibility	100	3.88	0.518
Job Location	100	3.82	0.539
Balance Work & Family	100	3.63	0.981
Working Environment	100	3.50	0.958
Flexibility	100	3.46	0.834
Friendly Atmosphere	100	3.35	0.783
Recognition & Rewards	100	3.27	0.839
Job Efficiency	100	3.24	0.889
Compensation,& Responsibility	100	3.05	0.592
Working Pressure	100	2.59	1.045
Job Migration	100	2.46	0.845

Source: Sample Survey, February and March 2016

Moderate Influence Factors:

Moderate influence factors those are responsibility, job location, the balance between work & family life, working environment, flexibility, friendly atmosphere, recognition & reward, job efficiency, compensation & responsibility refers that these factors have a little contribution in improving the satisfaction level of an employee toward the bank. The mean result of these factors is between 3 to 3.99. It means an employee is neither satisfied nor dissatisfied. So, these factors have little contribution to determine the satisfaction level of employee.

Figure-1: Classification of Descriptive Statistic toward Influencing Factor

Less Influence Factors: Less influence factors these are working pressure, job migration refers that employees dissatisfied toward those factors and reduce the satisfaction level toward Bank. The mean result of these factors is below 3 that means employee approach level is negative toward these factors.

5.3 Mean Analysis with Likert Scale

Table-3: Mean Analysis by Likert Scale

Serial No .	State ments	Mean results in Likert poin t
1	Future Progression	4.30
2	Job Mot ivat ion	4.22
3	Salar y Str ucture	4.08
4	Job Securit y	4.02
5	Res ponsibili ty	3.88
6	Job L ocati on	3.82
7	Balance Work & Family	3.63
8	Working Environment	3.5
9	Flexibili ty	3.46
10	Frien dly A tmosphere	3.35
11	Recognition & Rewa rds	3.27
12	Job Effici ency	3.24
13	Compensati on & Respons ibility	3.05
14	Working Pressure	2.59
15	Job Migrati on	2.46
Total Mea n Re sult of Likert Poi nt		52.87

Source: Authors own calculation

Level of Satisfaction = Total Mean Result of Likert Point / Number of Statement

=52.87/15

= 3.52

From the above calculation, it can be seen that employee's satisfaction level in accordance with the human practice of state owned commercial bank is 3.52 whereas the average satisfaction level is 3. Therefore, we can say that there is a moderately good satisfactory level existing among the employees of state owned commercial banks.

5.4 Frequency Analysis

The frequency analysis has basically done in order to find out what percentage of the respondents answered to a specific question. These are as follows-

Job Location:

Table 4: Satisfaction Level about Job Location

	Frequency	Percent	Cumulative Percent
Disagree	4	4.0	4.0
Neutral	13	13.0	17.0
Agree	80	80.0	97.0
Highly Agree	3	3.0	100.0
Total	100	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents have agreed to the statement that is 80%. Where 3% highly agreed, 13% were neutral and 4% opposed the statement. Typically, the segment of the respondents who disagreed (4%) does not to their job location.

Salary Structure:

Table 5: Satisfaction Level about Salary Structure

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	7	7.0	7.0	7.0
Neutral	63	63.0	63.0	70.0
Agree	18	18.0	18.0	88.0
Highly Agree	12	12.0	12.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents were neutral to the statement that is 63%. Where 18% have agreed, 12% have highly agreed, and 7% have disagreed with the statement. Typically, the segment of the respondents who disagreed (7%) does satisfy their salary structure.

Working Environment:

Table 6: Satisfaction Level about Working Environment

	Frequency	Percent	Valid Percent	Cumulative Percent
Highly Disagree	3	3.0	3.0	3.0
Disagree	5	5.0	5.0	8.0
Neutral	50	50.0	50.0	58.0
Agree	23	23.0	23.0	81.0
Highly Agree	19	19.0	19.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

About 23% employees have agreed with the satisfaction to find the company as a suitable place to work because of the perfect office environment. 19% employees of SOCBs have highly agreed with this fact because they found the office place as a standard office to work. They think that the entire branch has good office environment and employees to work with. 50% employees of this branch were neutral because they think that their workplace is good but it could be better with broad floors, facilities, and decoration that will help them to reduce the boring work life and bring enjoyment to their jobs. Typically, the segment of the respondents who disagreed (3% + 5%= 8%) does not find their working environment to be interesting.

Friendly Atmosphere

Table 7: Satisfaction Level about Friendly Atmosphere in the Workplace

	Frequenc y	Percent	Valid Percent	Cumulative Percent
Disagree	3	3.0	3.0	3.0
Neutral	13	13.0	13.0	16.0
Agree	73	73.0	73.0	89.0
Highly Agree	11	11.0	11.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents were agreed to the statement that is 73%. Where 11% have highly agreed and 13% neutral and 3% opposed the statement. Typically, the segment of the respondents who disagreed 3% do not find their colleagues to be interesting.

Job Motivation

Table 8: Satisfaction Level of Motivation in the workplace

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	2	2.0	2.0	2.0
Neutral	8	8.0	8.0	10.0
Agree	77	77.0	77.0	87.0
Highly Agree	13	13.0	13.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

About 77% employees of SOCBs have agreed for receiving the amount and frequency of informal praise and appreciation from their supervisor. The supervisors appreciated their work and performance every time. However, 13% have highly agreed, 8% have neutral about this fact and 2% employees have disagreed because they do not receive any praise from their supervisor for their performance due to the biases and negligence for few staffs.

Responsibilities

Table 9: Satisfaction Level about Responsibility

	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Disagree	6	6.0	6.0	6.0
Neutral	4	4.0	4.0	10.0
Agree	85	85.0	85.0	95.0
Highly Agree	5	5.0	5.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents are agreed to the statement that is 85% where 5% have highly agreed and 4% neutral to the statements. Typically, the segment of the respondents who have disagreed (6%) does not find satisfaction about the responsibility.

Flexibility

Table 10: Satisfaction Level about Flexibility

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	2	2.0	2.0	2.0
Neutral	70	70.0	70.0	72.0
Agree	8	8.0	8.0	80.0
Highly Agree	20	20.0	20.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents were neutral to the statement that is 70%. Where 8% have agreed, 20% have highly agreed and 2% disagreed to the statement. Typically, the segment of the respondents who disagreed (2%) does not find their job location to be interesting.

Recognition and Rewards

Table11: Satisfaction Level about Recognition & Rewards

	Frequency	Percent	Valid Percent	Cumulative Percent
Highly Disagree	2	2.0	2.0	2.0
Disagree	6	6.0	6.0	8.0
Neutral	68	68.0	68.0	76.0
Agree	11	11.0	11.0	87.0
Highly Agree	13	13.0	13.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

Among 100 employees of SOCBs, only 11% have agreed for receiving appropriate recognition and rewards for their contributions where as about 13% have highly agreed with this fact. However, about 68% employees have disagreed, 2% have highly disagreed and think that they are receiving recognition for their contribution for lacking of proper management of the branch.

Job Efficiency

Table 12: Satisfaction Level about Job Efficiency

	Frequency	Percent	Valid Percent	Cumulative Percent
Highly Disagree	2	2.0	2.0	2.0
Disagree	6	6.0	6.0	8.0
Neutral	68	68.0	68.0	76.0
Agree	11	11.0	11.0	87.0
Highly Agree	13	13.0	13.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents were neutral to the statement that is 68%. Where 11% have agreed, 13% have highly agreed, 6% have disagreed, and 2% have highly disagreed to the statement. Typically, the segment of the respondents who disagreed (2%+6%= 8%) does not find freedom in their workplace.

Compensation & Responsibility

Table 13: Satisfaction Level about Compensation & Responsibility

	Frequency	Percent	Valid Percent	Cumulative Percent
Highly Disagree	3	3.0	3.0	3.0
Disagree	6	6.0	6.0	9.0
Neutral	74	74.0	74.0	83.0
Agree	17	17.0	17.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

About 6% of employees have disagreed and 3% have highly disagreed about this fact. From their point of view, they were supposed to do more than necessary but they do not get as much as they do. Managers are less concerned about this fact from the beginning. However, 17% of employees have agreed and 74% were neutral because they have given proper compensation as they do.

Healthy Balance between Work and Family Life

Table 14: Satisfaction Level about Balance between Work and Family

	Frequen cy	Percent	Valid Percent	Cumulative Percent
Highly Disagree	5	5.0	5.0	5.0
Disagree	4	4.0	4.0	9.0
Neutra l	31	31.0	31.0	40.0
Agree	43	43.0	43.0	83.0
Highly Agree	17	17.0	17.0	100.0
To tal	100	100.0	100.0	

Source: Authors own calculation

Most of the employees that are about 43% have agreed with the ability to maintain a balance between family and work life because they think that they have less work flexibility that hampers to maintain a balance between family and work life. However, 17% have highly agreed with this fact due to maintaining proper balance on both sides without any tension. Typically, the segment of the respondents who disagreed (5%+4%= 9%) does not find a healthy balance between work and family life.

Future Progression

Table15: Satisfaction Level about Future Progression

	Frequency	Perce nt	Valid Percent	Cumulative Perce nt
Disagree	3	3.0	3.0	3.0
Ne utral	3	3.0	3.0	6.0
Ag ree	76	76.0	76.0	82.0
Highly Agree	18	18.0	18.0	100.0
To tal	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it has observed that a greater percentage of the respondents have agreed to the statement that is 76%. Where 18% have highly agreed, 3% have neutral and 3% disagreed to the statement. Typically, the segment of the respondents who disagreed (3%) does not find an immense chance for future progression.

Job Security

Table 16: Satisfaction Level about Job Security

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	3	3.0	3.0	3.0
Neutral	11	11.0	11.0	14.0
Agree	81	81.0	81.0	95.0
Highly Agree	5	5.0	5.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

About 81% employees have agreed about the overall job security according to their job rules whereas 3% were disagreed with the overall job security because of the new comers. They had a fear to lose their job at any time from the order of the higher level officers but 5% have highly agreed because they have the satisfaction of not to lose their job in any condition and 11% were neutral to the statements.

Working Pressure

Table 17: Satisfaction Level about Working Pressure

	Frequency	Percent	Valid Percent	Cumulative Percent
Highly Disagree	4	4.0	4.0	4.0
Disagree	62	62.0	62.0	66.0
Neutral	14	14.0	14.0	80.0
Agree	11	11.0	11.0	91.0
Highly Agree	9	9.0	9.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents have disagreed with the statement that is 62%. Where 11% have agreed, 9% have highly agreed and 14% neutral. Typically, the segment of the respondents who disagreed (62%) does not prefer the working pressure.

Job Migration

Table 18: Satisfaction Level about Job Migration

	Frequency	Percent	Valid Percent	Cumulative Percent
Disagree	73	73.0	73.0	73.0
Neutral	12	12.0	12.0	85.0
Agree	11	11.0	11.0	96.0
Highly Agree	4	4.0	4.0	100.0
Total	100	100.0	100.0	

Source: Authors own calculation

From the frequency analysis above it is observed that a greater percentage of the respondents have disagreed to the statement that is 73%. Where 11% have agreed, 4% have highly agreed and 12% were neutral with the statements. Typically, the segment of the respondents who disagreed (73%) does plan to switch their job.

5.5 Correlation Analysis

There is a positive weak correlation between two variables job location and balance between work & family, r =0.314, p =0.042, n =100 (Appendix 2: Table-19). Overall, there is a weak correlation between job location and balance between work & family. Improve in job location has correlated with improving in a balance between work & family. The decrease in job location has correlated with reducing in balance work & family. The significant level is below 0.05 that means there is a statistical correlation between two variables. There is a positive week correlation between two variables, r=0.399, p=0.008, n=100. Overall, there is a positive week correlation between working pressure and job migration. Improve in working pressure has correlated with improve in job migration. Decrease in working pressure has correlated with reducing in job migration. The significant level is below 0.05 that means there is statistically correlation between two variables. There is a positive week correlation between two variables, r =0.234, p =0.003, n =100. Overall, there is a positive week correlation between job motivation and future progression. Improve in job motivation was correlated with improve in future progression. Decrease in job motivation has correlated with reducing in future progression. The significant level is below 0.05 that means there is statistically correlation between two variables. There is a positive week correlation between two variables, r = 0.0.213, p = 0.005, n =100. Overall, there is a positive week correlation between job efficiency and responsibility. Improve in job efficiency has correlated with improve in responsibility.

Decrease in job efficiency has correlated with reducing in responsibility. The significant level is below 0.05 that means there is statistically correlation between two variables. There is a positive week correlation between two variables, r=0.0.315, p=0.015, n=100. Overall, there is a positive week correlation between friendly atmosphere and flexibility. Improve in friendly atmosphere has correlated with improve in flexibility. Decrease in friendly atmosphere has correlated with reducing in flexibility. The significant level is below 0.05 that means there is statistically correlation between two variables. There is a positive week correlation between two variables, r=0.0.322, p=0.008, n=100. Overall, there is a positive week correlation between future progression and job security. Improve in future progression has correlated with improve in job security. Decrease in future progression has correlated with reducing in job security. The significant level is below 0.05 that means there is statistically correlation between two variables.

5.6: Regression Analysis

The regression analysis was conducted to find out how different factors affect the employee job satisfaction of the state-owned commercial banks. The regression result shows that the overall regression is statistically significant.

Table 20: Analysis of Variance (ANOVA)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	0.871a	0.759	0.757	0.22585	308.792	.000
2	0.878b	0.770	0.765	0.22173	162.533	.000
3	0.885c	0.783	0.776	0.21656	115.483	.000
4	0.892d	0.796	0.788	0.21092	92.858	.000
5	0.899e	0.808	0.798	0.20589	79.095	.000
6	0.905f	0.818	0.806	0.20144	69.728	.000
a. Predictors: (Constant), Friendly_Atmosphere.						
b. Predictors: (Constant), Friendly_Atmosphere, location.						
c. Predictors: (Constant), Friendly_Atmosphere, location, Working_pressure.						
d. Predictors: (Constant), Friendly_Atmosphere, location, Working_pressure, Working_Environment.						
e. Predictors: (Constant), Friendly_Atmosphere, location, Working_pressure, Working_Environment, Job_security.						

Source: SPSS output

In Table 20, the Colum labeled R2 is the value of the multiple correlation coefficients between the predictors and the independent variable. The model would be better explanatory power if the r-square value would be greater than 0.5. In the case of this model, it is more than 0.5 which indicates good performance of the independent variables in explaining the dependent variable. The table also shows that the whole model is significant as p = 0 .000 and less than significant level 5%.

6. Findings of the Study

While studying the level of employee satisfaction in State owned Commercial Banks, the finding is that on average they were satisfied with their jobs. After collecting and analysing data, the major findings are -

- 52% of the respondents are neutral with their salary and working environment.
- 76% of the satisfied respondents agree that they are not willing to lose the job at any condition.
- 62% of the respondents disagree with dissatisfaction attributed to the workload. The nature of work has contributed positively towards the employee satisfaction level.
- 68% of the respondents are neutral about their recognition and rewards.
- 76% of the respondents believe that there is a potential chance to future progression.
- 43% of the respondents are happy with their work & family life.
- 8% of the respondents feel that there is no chance to use their abilities because most of the times they need to follow organizations policies in that case additional abilities no need to use.
- Basic salary structure is satisfactory and the bank provides a handsome bonus to the employees. Besides SOCBs maintain a high standard pension scheme for employees. So financial satisfaction of the employees of SOCBs is tremendous.
- About 81% employees have agreed about the overall job security according to their job rules. Therefore, job security is so high in the SOCBs.
- About 83% of the employees of SOCBs are neutral about their adequate freedom to perform their job efficiently. About 8% of employees are not satisfied enough with their freedom to perform their job. From this situation, we can assume that employees of SOCBs are not satisfied with their freedom to perform their job efficiently.

From the result of this study, it has revealed that the overall satisfaction of the employees of SOCBs is at the satisfactory level. However, from the analysis of the individual aspect of job two areas (promotion, freedom to work efficiently) are identified sources of dissatisfaction. On the other hand, nine different aspects of job areas (supervision, co-workers, reward, salary structure, working environment, job motivation, a balance between work and family, job security and nature of works) are identified as sources of satisfaction. The overall result of the study shows that the employees of SOCBs are significantly satisfied.

7. Recommendations

This study finds three major areas of dissatisfaction. These are promotion, freedom in the workplace, and work efficiently. The dissatisfaction regarding promotion is serious than any other issue. It is factual that the promotion opportunity is narrower in the upper levels. In spite of this, the authority should think positively and take care of it so that the dissatisfaction level can be reducing at least up to an acceptable level.Freedom is the most vital and important factor for satisfaction. In order to more freedom, have a negative effect but it supports to creativity. The authority should think about this matter and try to a positive attitude. Always an employee confident his work but his seniors' find out his inefficiency. Actual work efficiency is a developing process, authority should arrange regular training program, provide to update information, new laws and rules, board decisions and real requirement of the organization. The authority should implement the pre active correction methods. In addition to salary, there are some kinds of benefits such as insurance coverage, leave and other fringe benefits. There should be maintaining equal opportunity for every stage of officers in providing these benefits. The study determined six areas of job satisfaction of SOCBs officers. They are supervision, rewards, operating procedure, co-workers, nature of work and communication system. The bank authority should be careful to maintain this trend, so that the level of job satisfaction can prevail in the minds of officers. A friendly and encouraging atmosphere should maintain in the working place so that officers can enjoy their job. The helpful approach of co-workers to each other should establish. Operating procedure of the bank should be easy and transparent. The employees should feel at abode and find satisfaction in their job if the working system is simply understandable to them. In this regard, requirements in service training and direction should provide to perform banking job efficiently. Sharing of information among different divisions within the bank should be possible; so that the employees feel belongingness. All the superiors at each level should be amiable and friendly to their subordinates.

8. Conclusion

Job satisfaction is the term that effects from various factors and derived by inner force of human mind. Job Satisfaction improves the efficiency of workers as well as the strength of the organization. Job satisfaction has a great impact on employee and organization. Overall, the bank is a good place to work and the employees are quite satisfied. Almost all of the respondents think that they made the correct selection to work with the organization

The study attempted to identify factors and indicators that affect the employee's job satisfactions in working at state owned commercial banks of Bangladesh and evaluate their satisfaction level. The study concludes that future progression, job motivation, salary structure, job security have a significantly higher impact on the employee satisfaction.

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Appendices: 1. Questionnaire

Questionnaire

On

A Study on Employee Job Satisfaction of State-Owned Commercial Banks in Bangladesh: An Empirical Study

Dear Respondent,

We hereby undertake that the information obtained through this questionnaire will exclusively be used for research purpose and in no case disclosed to anybody. Your kind cooperation will be highly appreciated.

Husne Jahan Chowdhury & Ayesha Begum

Read the questions carefully and consider that your chosen number corresponds with your own opinion. The question corresponds are (1= Highly Disagree; 2= Disagree; 3= Neutral; 4= Agree; 5= Highly Agree).

Bank Name :

Name :

.....

Age : ☐ 18-24 ☐ 25-30 ☐ 31-40 ☐ 41-50 ☐ 51-62

Gender : ☐ Male ☐ Female

Monthly Income : ☐ 15,000-25,000 ☐ 25,000-35,000 ☐ 35,000-45,000 ☐ 45,000-55,000 ☐ Above 55,000

Designation : ☐ Officer ☐ Asst. Executive Officer ☐ Executive Officer ☐ Senior Executive Officer ☐ Second Assistant General Manager

[Please tick (√) your opinion about the following statements range from highly disagree to highly

[Please show the extent to which you feel]

Sl. No	Criteria	Highly Disagree	Disagree	Neutral	Agree	Highly Agree
1	I am satisfied with my job location.	1	2	3	4	5
2	I am satisfied with the existing salary structure of the bank.	1	2	3	4	5
3	I am satisfied with the working environment of the bank.	1	2	3	4	5
4	The colleagues are friendly with me.	1	2	3	4	5
5	My superiors motivate me to work better.	1	2	3	4	5
6	I feel comfortable in carrying out my responsibilities.	1	2	3	4	5
7	I am fully able to use my skills in this position.	1	2	3	4	5
8	I am happy with the recognition and rewards for my outstanding works and contributions.	1	2	3	4	5
9	I am given adequate freedom to do my job efficiently .	1	2	3	4	5
10	I am satisfied with the compensation I get & I think it matches with my responsibility.	1	2	3	4	5
11	I am satisfied & able to maintain a healthy balance between work and family life.	1	2	3	4	5
12	There is immense chance for future progression.	1	2	3	4	5
13	I am happy with overall job security.	1	2	3	4	5
14	The workload is too high.	1	2	3	4	5
15	I have a plan to switch this job.	1	2	3	4	5

Some recommendation for enhancing the quality of information:

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Appendix: 2 Correlations

Table 19: Correlation

		Job Location	Salary Structure	Working Environment	Friendly Atmosphere	Job Motivation	Responsibility	Flexibility	Recognition & Rewards	Job Efficiency	Compensation & Responsibility	Balance Work & Family	Future Progression	Job Security	Working Pressure	Job Migration
Job Location	Pearson Correlation	1	.115	.069	-.189	-.042	-.132	.124	.063	.034	-.086	.314	.162	-.094	.163	.164
	Sig. (2-tailed)		.382	.601	.148	.749	.314	.346	.634	.796	.512	.042	.216	.475	.213	.212
Salary Structure	Pearson Correlation	.115	1	.029	.147	.039	.175	-.094	.162	.044	.085	.080	-.094	.080	.129	.399
	Sig. (2-tailed)	.382		.824	.263	.698	.180	.351	.216	.737	.957	.432	.353	.431	.775	.008
Working Environment	Pearson Correlation	.069	-.074	1	-.106	.088	.084	.152	.019*	.012	-.009	.016	.120	.081	.035	.085
	Sig. (2-tailed)	.601	.465		.295	.386	.408	.132	.852	.907	.930	.874	.234	.421	.728	.405
Friendly Atmosphere	Pearson Correlation	.018	.039	.106	1	-.060	.183	.315	-.037	-.002	.068	-.103	.127	.001	.028	.014
	Sig. (2-tailed)	.601	.701	.295		.553	.069	.015	.714	.988	.499	.309	.208	.990	.784	.888
Job Motivation	Pearson Correlation	-.189	.039	-.088	-.060	1	-.095	-.077	.050	-.047	-.033	-.012	.234*	.004	.307	-.099
	Sig. (2-tailed)	.148	.698	.386	.553		.346	.444	.618	.642	.744	.906	.003	.966	.742	.331
Responsibility	Pearson Correlation	-.189	.065	.084	.183	-.095	1	-.212*	-.107	.267	.047	-.128	.000	.299**	-.026	-.082
	Sig. (2-tailed)	.148	.521	.408	.069	.346		.034	.290	.356	.645	.203	.998	.003	.799	.419
Flexibility	Pearson Correlation	-.042	-.094	.152	.115	-.077	.212*	1	.052	-.028	.147	.111	.040	-.152	.126	.110
	Sig. (2-tailed)	.749	.351	.132	.254	.444	.034		.610	.784	.647	.272	.696	.132	.212	.280
Recognition & Rewards	Pearson Correlation	-.132	.299	.419	-.037	-.050	.107	.052*	1	.129	.034	.324	.054	-.227*	.081	.121
	Sig. (2-tailed)	.637	.327	.852	.714	.618	.290	.610		.201	.741	.809	.592	.023	.421	.235
	N	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Call for Research Papers

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2. The author should not mention his name and address on the text of the paper. A separate sheet bearing his full name, affiliation, mailing address and telephone number should be sent along with the main paper.
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6. The numbering of the footnote will be consecutive, and the footnotes themselves will be placed at the end of the article.
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Introduction to Bangladesh Bank Training Academy (BBTA)

Bangladesh Bank Training Academy (BBTA) is a training wing of central bank of Bangladesh, Bangladesh Bank pursues tasks of capacity building and human capital development in order to prepare skilled human resources in central bank as well as for commercial banks. BBTA organizes different training courses, training workshops, conferences, seminars and other related activities on main topics of economics, banking and finance, financial sector development, human resources development and macroeconomic management. It was established in 1977.

BBTA's Mandate

The purpose of the Academy is to undertake training activities for enabling the officials of central bank and the banking sector to perform their jobs efficiently well-equipped with the latest knowledge of economic, financial and banking developments. To this end, BBTA extends its all-out efforts to facilitate training to personnel engaged in the financial sector. It also works to modernize its library and information center to collect, systematize and disseminate information in the financial arena. Recently, a plan has been adapted to reorganize BBTA library as a **Knowledge Management Centre (KMC).** This new role puts more weight on BBTA for knowledge creation and application. Since information is important to create new knowledge for educating staff and professionals, we hope that it would contribute to the creation of knowledge and disseminate knowledge for use by others.

BBTA's Strategic Objectives

Bangladesh Bank has adopted its 5-year Strategic Plan 2015-2019 and bestowed responsibilities upon BBTA (Strategic Goal # 8) to adopt all-out efforts to enhance professional excellence and grooming of the officers of Bangladesh Bank. To fulfill the target of the plan document, BBTA has been employing its full capacity to provide need-based training to the officials both from central bank and commercial banks; continuously striving to diversify the contents of its courses in order to ensure their consistency with evolving training needs; facilitating the practical application aspects of knowledge of economics, banking and finance; and developing training as a scientific discipline.

In order to achieve the above mentioned strategic objectives, BBTA has introduced the following initiatives.

1. Building and enhancing training capacities of the trainers;

2. Improving quality, efficiency, impact and cost-effectiveness of training programs;
3. Linking training with real-world cases and experiences;
4. Building training partnership programs with the public and private sector domestic and overseas training institutions;
5. Building and maintaining the BBTA financial institutions information system,
6. Utilization of the Internet for dissemination of the Academy's biannual Journal 'Thoughts on Banking and Finance';
7. Building a database on trainers and training institutions in the field of banking and finance; as well as
8. Facilitating the digitization of BBTA documents.

Organization

The Executive Director is the head of the Academy. There are seven wings to look after the administration, training and research programs of the Academy.

Location

The Academy is located in Mirpur-2, Dhaka-1216, Bangladesh.

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