

**SANEI WORKING PAPER SERIES**

**No. 12 - 04**

**GLOBAL COMMODITY PRICE VOLATILITY  
AND DOMESTIC INFLATION:  
IMPACT ON THE PERFORMANCE OF THE FINANCIAL  
SECTOR IN BANGLADESH**

**MONZUR HOSSAIN  
FARHANA RAFIQ**



**South Asia Network of Economic Research Institutes**

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## **GLOBAL COMMODITY PRICE VOLATILITY AND DOMESTIC INFLATION: IMPACT ON THE PERFORMANCE OF THE FINANCIAL SECTOR IN BANGLADESH**

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## EXECUTIVE SUMMARY

Overall inflation in Bangladesh saw a surge in inflation rate amid rising trend of global commodity prices in the last few years. Inflation in 2009 was 6.66 percent and 7.31 percent in 2010. In the backdrop of rising inflation worldwide, first we examine the pass-through elasticity of some selected commodities. The import pass-through elasticity for non-energy commodities is estimated to be 0.47, while a high elasticity is found for edible oil (0.77). As higher inflation might have detrimental impact on different sectors, this study aims to assess the impact of inflation on the performance of the financial sector in Bangladesh.

Descriptive analysis suggests that moderate inflation (e.g., 6-7%) is favourable for the development of the financial sector, while very low or high inflation has detrimental effect on the financial sector performance. The analysis also suggests that the impact of inflation on the financial sector might be non-linear and there exists threshold effect of inflation. Therefore, we apply the non-linear Threshold ARCH model to the aggregate time series (monthly) data of bank's performance indicators (assets, deposits and private credit) as well as capital market indicators (market capitalization, issued capital and turnover) for the period 1990-2010. The results suggest that inflation has negative long-term effect on the performance of the financial sector in Bangladesh.

In addition, we conduct a panel estimation to exploit the time-series dimension of the data and control for possible endogeneity and omitted variable bias associated with the financial sector analysis. We apply the Arelano-Bover/Blundell-Bond GMM estimator to assess the variations in the performance of different types of banks for different time-periods during 1990-2010. The results suggest that inflation contributed positively to assets and deposits of banks, particularly after 1999 when the financial sector became liberalized. However, when inflation threshold dummy is included, positive effects turn to negative. This implies that while low-to-moderate inflation has positive impact, higher inflation has negative impact on financial sector development.

The analysis broadly suggests that increasing management and operational efficiency and prudent regulatory and institutional framework might help the financial sector to overcome the negative effect of rising inflation on the performance of the financial sector.

# **GLOBAL COMMODITY PRICE VOLATILITY AND DOMESTIC INFLATION: IMPACT ON THE PERFORMANCE OF THE FINANCIAL SECTOR IN BANGLADESH**

MONZUR HOSSAIN  
FARHANA RAFIQ

## **CHAPTER 1 INTRODUCTION**

Inflation in the developing world has been rising in recent years, mainly due to rising trend in food prices in the international market. An 83 percent increase in global food prices was observed in 2007-08 (World Bank, 2010). The price of rice in the international market rose by 165 percent between April 2007 and April 2008. During the same period global wheat price was increased by more than 100 percent. Afterwards, global food prices continued to increase, but at a lesser extent. It is widely argued that global food prices showed an extraordinary increase during the period for several reasons: (i) higher food demand in the emerging economies such as China and India that have led to reductions in food exports from these countries; (ii) rising oil prices, (iii) increased demand for bio-fuel raw materials such as wheat, soybean, maize, and palm oil, and (iv) reduction of cropland due to bio-fuel production. Price developments in the global commodity markets have brought into forefront the effects of external price changes on domestic inflation.

Bangladesh has been experiencing persistent price increases, especially of food items, in the backdrop of rising global commodity prices for the last few years. For example, during the period of 2006 to 2008, the price of rice increased by 61 percent to Tk. 29.90 per kilogram (kg) from Tk. 17.69 per kg (yearly average), while it was increased by 30 percent during 2009-2010. Similar pattern of price increase can be observed for wheat during the same period. Adverse price developments in the international market coupled with rising prices of production inputs contributed to the rising prices of food commodities in the domestic markets. As a result, Bangladesh has been facing high inflationary spiral for the last few years, particularly from 2007.

Overall inflation in Bangladesh in 2008 rose to 9.94 percent (yearly averages) due to higher food inflation (12.28 percent). This rising trend of inflation persists in the subsequent years— inflation rate was 6.66 percent in 2009 and 7.31 percent in 2010. It is widely believed that higher domestic food prices reduce income of the households, particularly poor households in real terms as effective inflation is higher for the poor than average inflation due to higher share of total expenditure devoted to food by the poor households. Thus higher commodity prices at the international market not only increases the domestic price level, but it also negatively affects the welfare of the poor consumers and farmers. As Samuelson and others point out, the problem with inflation is not so much with price increases, but rather the inefficiencies and inequities that result from inflation-induced changes in relative prices. Relative price changes affect supply-demand relationships for both factor and product markets. Changes in these relationships in turn influence the level and distribution of income both at the household as well as firm level through influencing asset values, cash flows, debt, net worth, and structural characteristics of firms.

Rising trend of inflation not only affects the household welfare, it also affects the performance of the financial sector. Inflation affects financial sector through several channels. For example, high inflation rate reduces the rate of return (interest), thereby exacerbates credit market frictions, which lead to credit rationing. If inflation is high enough, it reduces returns on savings, which also limits the supply of loanable funds. Thus, high inflation rate lead to an increase in interest rate that may create credit market frictions. Several cross section studies suggest that high inflation hampers financial development. These issues are examined in this study to assess the inflation-finance relationship in Bangladesh.

## **Objectives**

In this study we aim to analyze the impact of inflation on the performance of the financial sector of Bangladesh. Although a few cross-country evidences are available on the impact of inflation on the financial sector, this is the first study that casts light on the issue in Bangladesh in the context of rising inflation.

Specifically, this study aims to examine:

1. the extent of global commodity price volatility and whether such volatility in world commodity prices contributes to volatility in domestic prices, and
2. the impact of inflation on the financial sector (banks and equity market) performance using both aggregate and bank panel data.

## **Methodology**

The analysis in this paper proceeds in two stages. First, the paper examines the extent to which increase of international food prices during the past few years have been transmitted to domestic prices in Bangladesh. Price transmission for three important food commodities, namely rice, wheat, and edible oil are examined. The pass-through elasticity has been estimated for the above food items using the Vector error correction models (VECM).

Second, the paper analyzes the impact of inflation on the performance of the financial sector in Bangladesh, particularly on the banking sector and capital market. The effects were analyzed by using both aggregate and panel data (only for banks). The Threshold ARCH (Auto-regressive Conditional Heteroschedasticity) model is applied to the aggregate data as it is assumed that inflation-finance relationship is non-linear and a threshold effect of inflation might exist. On the other hand, the Arellano-Bover/Blundell-Bond dynamic panel GMM estimator has been applied to a panel of 43 banks to assess the impact of inflation on banking performance. The data spans over the period between 1990 and 2010.

## **Organization of the study**

The Report is organized as follows. Following the Introduction, chapter 2 provides a review of theories and empirical evidences on the impact of inflation on the financial sector. Chapter 3 provides the analytical basis of the present study, that is, it analyzes how much domestic inflation is influenced by the international commodity price volatility. Chapter 4 discusses methodology and data. Chapter 5 discusses the empirical results. Finally, chapter 6 concludes the Report.

## CHAPTER 2

### REVIEW OF LITERATURE

Inflation has not been studied seriously in Bangladesh until recently. A few studies tried to cast light on different aspects of inflation in Bangladesh. It is generally argued that inflation in Bangladesh is biased to food items than non-food items. Although Bangladesh has been able to maintain a low-to-moderate inflation, recent years saw a surge in inflation. Mortaza and Rahman (2008) estimated pass-through elasticity for some selected commodities, such as rice, wheat and edible oil. They find that pass-through elasticity for rice in the short-run is 0.19, and the corresponding figures are 0.14 for wheat and 0.15 for edible oil. Over the entire period their estimated pass-through elasticity ranges between 0.19 and 0.33 (rice), 0.14 and 0.31 (wheat) and 0.15 and 0.55 (edible oil). Ahsan et al. (2007) tried to explain the causes of inflation in Bangladesh. They find that there exists statistically significant positive relationship between world food price and domestic inflation. They find that monetary variables, such as M1, M2 and private sector credit, have long-run (positive and significant) equilibrium relationship with CPI. Moreover, market capitalization and remittances also have positive significant effects on inflation.

Mujeri et al. (2009) and Shahiduzzaman (2009) attempted to forecast inflation in Bangladesh. While Mujeri et al. (2009) showed an application of the P-star model, Shahiduzzaman (2009) argued for core inflation estimation instead of headline inflation for policy matters. However, none of the available studies examine the impact of inflation on the performance of the financial sector in Bangladesh.

A growing theoretical literature describes mechanisms how predictable increases in the rate of inflation interfere with the ability of the financial sector to allocate resources effectively. Recent theories emphasize the importance of informational asymmetries in credit markets and demonstrate how increases in the rate of inflation adversely affect credit market frictions with negative repercussions for financial sector (both banks and equity market) performance and therefore long-run real activity (Huybens and Smith 1998, 1999). The common feature of these theories is that there is an informational friction whose severity is endogenous. Given this feature, an increase in the rate of inflation reduces the real rate of return. The implied reduction in real returns exacerbates credit market frictions. Since these market frictions lead to the rationing of credit, credit rationing becomes more severe as inflation rises. As a result, the financial sector makes fewer loans, resource allocation is less efficient, and intermediary activity diminishes with adverse implications for capital investment. The reduction in capital formation negatively influences both long-run economic performance and equity market activity (Huybens and Smith, 1999; Boyd and Smith 1996).

Theoretical studies suggest that if inflation is high enough, returns on savings are reduced, which leads to a reduction in savings, the pool of borrowers is swamped, and therefore credit becomes scarce in such an economy (Moore, 1986; Choi, Smith, et al., 1996; and Azariadis and Smith, 1996). In a slightly different strand, Schreft and Smith (1997), Boyd and Smith (1998), Huybens and Smith (1998), and Huybens and Smith (1999), explore the idea that economies with higher rates of inflation do not approach or reach the steady state where their capital stocks would be high, i.e. there are bifurcations and development traps arise in such economies. Furthermore, financial markets in these economies are likely to be less-efficient because of the higher interest rates that follow high rates of inflation. That is, the Mundell-Tobin effect<sup>1</sup> is relevant in a high-inflation environment.

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<sup>1</sup> The **Mundell-Tobin effect** suggests that nominal interest rates would rise less than one-for-one with inflation because in response to inflation the public would hold less in money balances and more in other assets, which would drive interest rates

Rajan, R. and L. Zingales (2003) highlight a political-economy dimension of inflation in financial development. Vested interests or incumbents trying to curtail competition, play an important role in keeping (financial) development relatively low. Moreover, Acemoglu, D., S. Johnson, et al. (2003) argue that distortionary macroeconomic policies that fail to contain high inflation indicate weak institutions.

On the empirical side, Haslag and Koo (1999) and Boyd et al. (2001), using cross-sectional and panel international data from the 1960s to early 1990s, show that moderate inflation has a negative impact on financial development. Moreover, both studies find evidence of nonlinearities. Boyd et al. (2001) find that after a particular threshold—15 percent per year—inflation presents only smaller marginal negative effects on financial development. The intuition is that the damage on financial development is done at rates of inflation lower than the proposed threshold. Moreover, Dehesa and Druck, et al. (2007) use a panel of 120 countries between 1997 and 2004 to report that lower inflation increases the amount of credit in their sample. Furthermore, Choi, Smith, et al. (1996) use historical data from different countries, such as US, Chile, Korea and Taiwan to confirm that inflation presents a negative impact on stock-market development in each of these countries.

Boyd et al. (2001) summarizes the impact of inflation on the performance of the financial sector as follows:

1. Higher rates of inflation are associated with greater interest and stock return variability.
2. Higher inflation implies less long-run financial activity. In economies with high inflation, intermediaries will lend less and allocate capital less effectively, and equity markets will be smaller and less liquid.
3. Inflation threshold may characterize the relationship between inflation and financial sector conditions. Most prominently, once inflation exceeds a critical level, incremental increases in the (long-run) rate of inflation might have less impact on financial sector activity.

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down. In other words, an increase in the exogenous growth rate of money increases the nominal interest rate and velocity of money, but decreases the real interest rate. The importance of the Mundell–Tobin effect is in that it appears as a deviation from the classical dichotomy.

## CHAPTER 3

## GLOBAL COMMODITY PRICE AND DOMESTIC INFLATION

## 3.1 Inflation trend

The Bangladesh economy experienced a moderate rate of inflation for the last two decades. However, sources of higher inflation were different. While inflation was dominated by non-food items in the first half of the 1990s, the opposite was seen in the latter half of the 1990s. Bangladesh experienced a low rate of inflation, at an average rate of less than 2.5 percent during 2001-02; when a relatively low price of food at that time played the key role in overall price developments (Table 1). However, in the following two years, the inflation rate jumped to 5.1 percent, followed by an average of 7.0 percent during 2005-07. In 2008, the 12-month average inflation rate rose to 9.94 percent. The similar rising pattern of inflation continues in subsequent years with a dominant role of food inflation.

TABLE 1  
Inflation in Bangladesh and other areas of the World: FY01-FY10

Year	Bangladesh			Global		
	General	Food	Non-food	World	Advanced Economies	Developing economies
FY01	1.94	1.38	3.04	4.06	2.15	6.72
FY02	2.76	1.63	4.61	3.36	1.47	6.01
FY03	4.38	3.46	5.45	3.65	1.86	6.15
FY04	5.83	6.93	5.91	3.57	2.03	5.70
FY05	6.49	7.90	6.32	3.63	2.32	5.45
FY06	7.16	7.76	5.90	3.52	2.30	5.20
FY07	7.20	8.11	6.40	3.90	2.21	6.13
FY08	9.94	12.28	4.33	3.90	3.40	9.70
FY09	6.66	7.19	4.37	2.20	-0.10	5.50
FY10	7.31	8.53	5.66	3.40	1.60	6.20

Note: \* Until May 2010. Source: BBS and IFS/IMF.

One general characteristic of recent inflation is that food inflation is higher than non-food inflation along with increasing gap between food and non-food inflation. Though the role of food inflation in overall inflation was insignificant during 2001-03, food inflation started to soar since 2004 which, in turn, led to rising overall inflation (Table 1). Figure 1 shows that the price movements of some selected commodities in Bangladesh and global markets exhibit almost similar trend. It is clear from Figure 1 that the prices of some commodities, particularly rice, Soyabean oil and wheat were exceptionally high in 2008.

FIGURE 1  
International price of selected commodities (\$/mt)

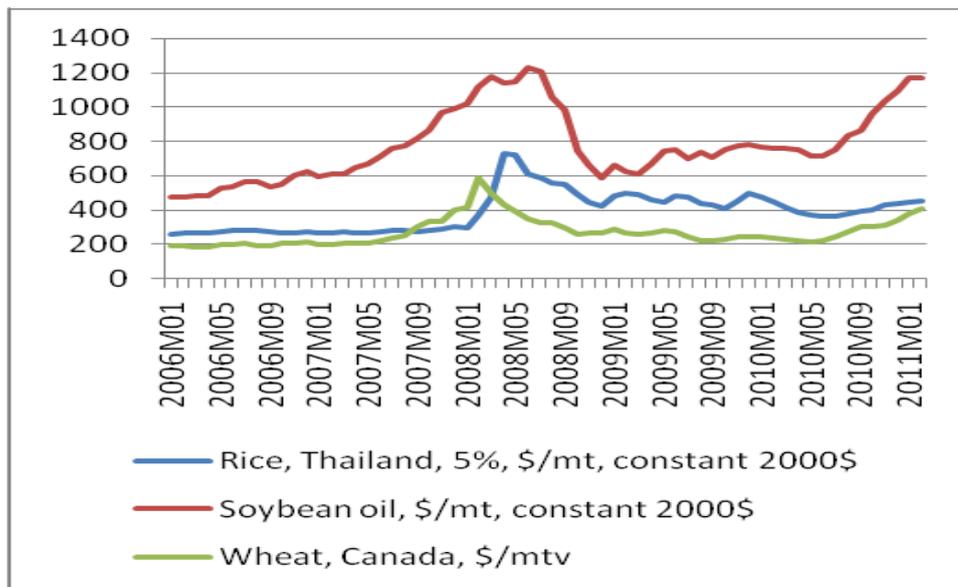
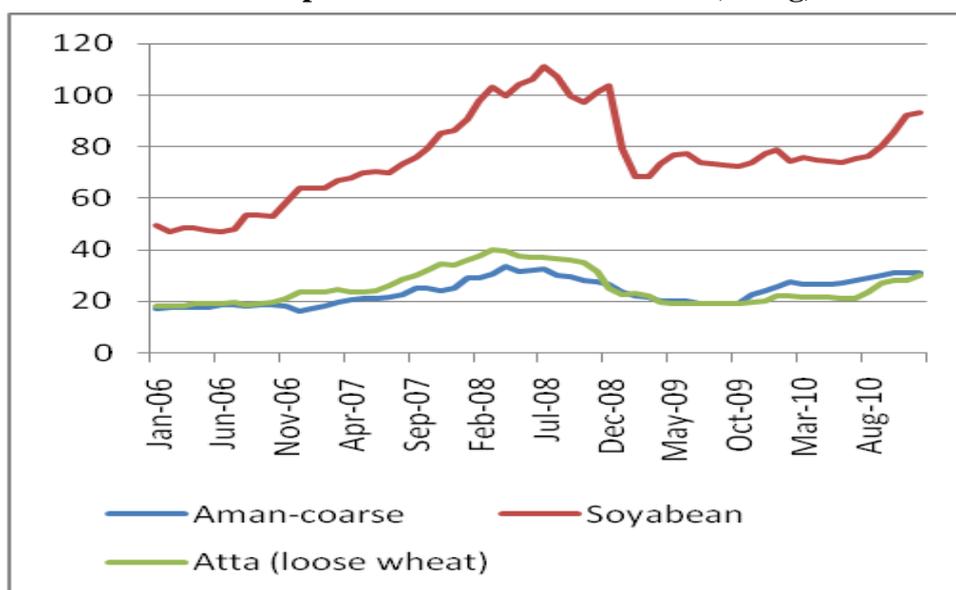


FIGURE 2  
Domestic price of selected commodities (Tk/kg)



### 3.2 Commodity Price Volatility

We have estimated commodity-specific price volatility for the period 2006-2010 in Table 2. Using monthly data, we estimate volatility of prices for Aman rice (coarse and medium), Soyabean oil, Palm oil, TSP and urea fertilizer for Bangladesh in Panel A and global price volatility in Panel B of Table 2. Commodity-specific price volatility was estimated to be higher in 2007-08 and again in 2010 in Bangladesh. For the year 2008, high price volatility was observed for rice, palm oil, TSP and Urea in Bangladesh as well as international markets.

Commodity price volatility was slightly reduced in 2009; however, it was again increased in 2010.

The volatility of commodity prices indicates that commodity price movements in Bangladesh largely follow the global commodity price trend. It calls for the analysis of the extent of pass-through effect on specific commodities so that policy makers can understand how much global commodity price transmits to domestic prices.

TABLE 2  
Commodity-specific price volatility, 2006-2010

A. Commodity-specific price volatility in Bangladesh (monthly)

	Aman medium	Aman coarse	Soyabean oil	Palm oil	TSP	Urea
2006	2.315	0.721	4.971	4.443	0.502	0.341
2007	2.183	2.809	7.498	12.082	9.617	0.175
2008	3.961	2.350	5.328	12.996	18.178	2.966
2009	2.893	1.846	3.400	5.111	7.443	0.113
2010	2.060	2.326	6.963	8.522	0.349	0.130

B. Global Commodity-specific price volatility (monthly)

	Rice Thai 5%	Rice Thai 25%	Soyabean oil	Palm oil	TSP	Urea
2006	8.15	6.23	26.58	19.00	1.39	18.8
2007	5.88	6.24	70.27	80.35	79.25	39.32
2008	127.06	158.85	161.49	134.49	248.13	197.12
2009	56.55	104.19	161.31	28.56	43.38	12.8
2010	36.42	32.21	51.74	20.65	60.17	48.81

Sources: A. Department of Agricultural Marketing, Dhaka; B. Global commodity Price, World Bank Pink Data Set and UNCTAD Commodity Price Statistics.

### 3.3 Pass-through Effect: Error Correction Model Estimation

In this section, we estimate the pass-through elasticities for Bangladesh for the period 2000-2010 using a simple methodology applied for Australia by de Brower and Ericsson (1995), for Mexico by Garces Diaz (1999) and for a cross-country analysis by Hausmann et al. (2001). The analysis is performed to assess the extent of pass-through of international commodity price volatility into domestic inflation.

We consider the model of domestic prices using a mark-up equation as follows:

$$P = \alpha W^\theta F^\gamma \quad (1)$$

where P is domestic price, W wages, F international prices in domestic currency (obtained by multiplying the exchange rate with an index of international prices) and  $\alpha$ ,  $\theta$ , and  $\gamma$  are three

parameters representing mark up and the long run elasticities of wages and external prices. By taking the natural logarithm of the above equation it is possible to estimate the long run relationship among wages, international prices and local prices. Since we do not have monthly data for wages, we estimate the following four long-run equations:

$$p = \ln(\alpha) + \gamma f \quad (2)$$

$$R_d = \ln(\alpha) + \gamma_2 R_f \quad (3)$$

$$W_d = \ln(\alpha) + \gamma_3 W_f \quad (4)$$

$$S_d = \ln(\alpha) + \gamma_4 S_f \quad (5)$$

In Eq. (2),  $p$  is the log of CPI (Consumer Price Index) of Bangladesh and  $f$  is obtained by adding the log of the US dollar exchange rate of Taka to the log of an index of international non-energy commodity price. In Eq. (3),  $R_d$  represents log of prices of rice (Aman coarse) in the domestic market and  $R_f$  represents log of price of rice in the international market (Thai rice, 5%) expressed in domestic currency Taka. Similarly, Equations 4 and 5 are estimated for wheat and soyabean oil. All the series we use are monthly and can be described as having a unit root process. Hence, we need to study the long-run relationship between internal and external prices using cointegration analysis as well as the speed of adjustment. For this reason, we apply the Vector Error Correction model.

TABLE 3  
Estimates of pass-through elasticities (2000-2010)

	Changes in international prices (non-energy)	Rice (Thailand, 5%)	Soyabean Oil
Pass-through Coeff ( $\gamma$ )	0.47 (0.05)***	-0.21 (0.08)**	0.77 (.03)***
Constant	-0.52	-7.09	1.81
ECT (Error correction term)	-0.01 (0.01)**	-0.06 (0.02)**	-0.23 (.10)**

Note: \*\*\*, \*\* indicate significance at 10 percent and 5 percent level respectively.

Table 3 shows that the long run pass-through coefficient is reasonably high and significant for Bangladesh. It is 0.47 for international commodity prices, -0.21 for the rice price and 0.77 for the Soyabean oil prices. This indicates that except for rice, any change in international commodity prices has a moderate positive effect on domestic prices. Since the amount of imported rice is not substantial from Thailand, the pass-through effect is found negative for Thai rice. For Soyabean oil, which is completely an imported item, 77 percent change of its international prices translates to the domestic prices. The estimated error correction term is negative and significant indicating that the speed of adjustment to equilibrium is 1 percent for international commodity prices, 6 percent for rice prices and 23 percent for Soyabean oil prices.

In sum, the analysis in this section suggests that commodity price volatility has been substantially high worldwide since 2007, and this has been the case for Bangladesh as well. Pass-through elasticity for non-energy commodities is estimated to be about 0.5, implying

that almost 50% change in global commodity prices translates into domestic prices. As we discussed earlier, high inflationary episodes might affect the performance of the financial sector. Since the Bangladesh economy has been facing a structural change in inflationary episodes, in the following sections we endeavour to analyze the impact of inflation on the performance of the financial sector of Bangladesh.

## CHAPTER 4

### DATA AND METHODOLOGY

We use data on inflation, banking sector activity, equity market size, equity market liquidity, and the rates of return on stocks for Bangladesh for the period 1990–2009<sup>2</sup>. To assess the consequences of different long-run rates of inflation, we primarily use data averaged over the entire period. Next we examine the cross-sectional relationship between inflation and financial sector conditions using bank panel data for about 48 banks. Since Bangladeshi banking sector is characterized by different types of banks, such as state-owned commercial banks, private commercial banks, specialized banks and foreign commercial banks with different level of efficiency, their performance might vary with the increase of inflation. Inflation may affect banks credit, net worth, profit margin, interest margin etc. It is therefore important for the policy makers, particularly for the central bank, how inflation, whether it is induced by domestic demand or global supply side factors, can influence the performance of the financial sector.

Analyzing the aggregate data enables us to focus on the long-run relationship, as opposed to the cyclical relationship between inflation and financial sector activity. In addition, we conduct a panel estimation to exploit the time-series dimension of the data and control for possible endogeneity and omitted variable bias associated with the financial sector analysis.

We regress each of our measures of financial sector performances on inflation plus a conditioning information set of variables designed to control for economic development and other factors influencing financial sector performance. In particular, we examine the following aspects of inflation on the financial sector of Bangladesh:

1. Applying the Threshold ARCH model to the time series aggregate data for the period 1990-2010, we assess the impact of inflation on the banking sector activities such as private credit, bank assets, liquid liabilities as well as on capital market indicators, such as market capitalization, value traded, turnover after controlling for other factors, and
2. Applying the Arelano-Bover/Blundell-Bond GMM estimator to a panel of 43 commercial banks in Bangladesh for the same period, we examine whether there is any particular variations in the performance of specific types of banks in the context of rising trend of domestic inflation.

#### 4.1 Data

As already mentioned, our dependent variables are ASSETS, LIQUID LIABILITIES (Deposits only) and PRIVATE CREDIT for the banking sector analysis. For the capital market analysis, we use MARKET CAPITALIZATION (MCAP), ISSUED CAPITAL, VALUE TRADED, TURNOVER and EQUITY RETURN.

These variables are regressed on a set of explanatory variables including inflation. For the analysis of aggregate data, we consider only the per capita income as a control variable. For

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<sup>2</sup> The formal financial sector in Bangladesh, as in other regions of the developing world, essentially consists of banks. Although non-bank financial institutions and stock markets have been developing in Bangladesh, their influence generally remains marginal compared to the banking sector. The banking sector comprises of 48 banks including 4 state-owned banks (SCBs), 30 private commercial banks (PCBs), 5 specialized banks (SBs) and 9 foreign commercial banks (FCBs). Bangladeshi banks have been operating in a sound and stable macroeconomic environment for the last two decades. During this period, Bangladesh registered 5 to 6 percent GDP growth with annual inflation rate ranges between 2 to 9 percent. The expectation is high on the banking sector as Bangladesh is envisioned to be a middle income country by 2020.

bank panel data, some bank-specific variables such as management efficiency (ME), bank rate, interest rate spread etc. are used as control variables.

#### 4.1.1 Banking Data Set: 1990–2010

The “banking data set” focuses on measures of banking development. Both aggregate and panel data cover the period 1990–2010.

*LIQUID LIABILITIES* is the ratio of liquid liabilities of the financial sector (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) to *GDP*. Particularly, we consider different types of deposits held with banks in this category. This indicator measures the overall size of the formal financial intermediary sector, and has been found to be very strongly associated with both the level and rate of change of real per capita *GDP* (King and Levine 1993a,b).

An alternative measure is *BANK ASSETS*, which is the ratio of total assets of “deposit money banks” (commercial banks and other deposit taking banks) to *GDP*. This variable measures the importance of deposit money banks, as reflected in their total assets, relative to the economy. Both *LIQUID LIABILITIES* and *BANK ASSETS* are expressed as a percent of *GDP*. *LIQUID LIABILITIES* and *BANK ASSETS* are size measures and do not consider the allocation of capital between the private and public sectors.

Therefore, *PRIVATE CREDIT* is used as a financial intermediary development measure. This measure equals banking institution credits to the private sector as a percent of *GDP*. Thus, *PRIVATE CREDIT* is not merely a measure of size. It isolates credits to the private sector and excludes credits issued to the government, government agencies, and public enterprises. This measure of financial development has been found to exert a causal impact on economic growth (Levine, Loayza, and Beck 2000).

For inflation, we use 12-month average inflation from the CPI data.

The sources of data are Economic Trends, Schedule Bank Statistics, Monetary Policy Review of Bangladesh Bank. Bank-specific data are collected from commercial banks’ annual reports.

#### 4.1.2 Stock Market Data Set: 1990–2010

The “stock market data set” consists of data from Dhaka Stock Exchange and Chittagong Stock Exchange and covers the period 1990–2010. We consider five financial performance measures, such as market capitalization (*MCAP*), issued capital, value traded, turnover and equity returns.

*Market capitalization (MCAP)*, equals the value of listed domestic company shares on major stock exchanges as a percent of *GDP*. *MCAP* measures the overall size of markets. Analysts frequently use this as an indicator of stock market development, although of course *MCAP* does not measure stock market activity, but merely the value of listed shares. While positively associated with the level of economic development (Demirguc-Kunt and Levine, 1996), *MCAP* is not robustly linked to economic growth (Levine and Zervos 1998).

*TURNOVER* equals the total value of shares traded (times 100) divided by the market capitalization (that is,  $VALUE\ TRADED * 100 / MCAP$ ). Thus, *TURNOVER* measures trading volume relative to the size of the market. Both *VALUE TRADED* and *TURNOVER* are frequently used as indicators of market liquidity—the ability to trade equities easily. The measures complement one another since *VALUE TRADED* measures trading relative to the size of the economy and *TURNOVER* measures trading relative to the size of the market.

Both *VALUE TRADED* and *TURNOVER* are very highly correlated with the level of real per capita *GDP* as well as its rate of growth (Demirguc-Kunt and Levine, 1996; Levine and Zervos, 1998). Here we therefore consider only *TURNOVER* for the analysis.

Finally, *EQUITY RETURNS* is the rate of growth of the nominal stock market price index. Thus, this measures the nominal rate of return (excluding dividends) from holding the index portfolio of major stock exchanges.

Stock market data are collected from Stock Exchange websites, publication of Stock Exchange Commission (SEC) and Economic Trends of Bangladesh Bank. Summary statistics of variables are reported in Table 4.

TABLE 4  
Summary Statistics of variables (Yearly data)

A. Banks

Variable	Obs	Mean	Std. Dev.	Min	Max
PRIVATE CREDIT	18	24.02	6.25	15.01	34.83
ASSET	18	115.34	41.78	40.59	159.09
LIABILITY	18	31.13	7.53	19.36	42.76
INFLATION	18	5.70	2.46	1.94	9.94

B. Capital Market

Variable	Obs.	Mean	Std. Dev.	Min	Max
TURNOVER	19	49.29	56.02	--	212.56
EQUITY RETURN	13	11.84	54.26	-67.66	126.39
MCAP	19	4.34	3.05	0.86	11.17
VALUE TRADED	19	2.74	4.32	0.009	16.42
INFLATION	18	5.69	2.46	1.94	9.94

\*Variables are expressed as percent of GDP.

## 4.2 Methodology

A general regression model is specified as follows:

$$FSI_{i,t} = \alpha + \beta B_{i,t} + \gamma I_t + \delta M_t + \varepsilon_{i,t} \quad (7)$$

Where, FSI represents financial sector indicators,  $B_{i,t}$  is a vector of bank-specific variables for bank  $i$  and time  $t$ ;  $I_t$  contains time-varying market and ownership structure variables;  $M_t$  is a vector of time-varying macroeconomic variables.

### 4.2.1 For aggregate time-series data: Threshold ARCH Model

The aggregate data might have some time series properties and they might depict long-term relationship. To examine the order of integration of the series, the Augmented Dickey-Fuller (ADF) test has been employed. The test suggests that the series under consideration have unit root properties.

As was discussed, variations in financial data depict non-linearity with inflation and thus a non-linear time-series model, namely the Threshold Auto Regression Conditional

Heteroschedasticity (ARCH) model is applied to aggregate time-series data. In the context of nonlinear time series, threshold autoregression (TAR) appears to be useful in a variety of financial applications mainly because TAR models are known to explain nonlinear features such as limit cycles and asymmetry (cf. Tong, 1990, Chapter 1). The simplest First-order TAR model was investigated by Petrucci and Woolford (1984). It is defined by the equation

$$X_t = \theta_1 X_t^+ + \theta_2 X_t^- + \varepsilon_t; \quad (8)$$

where  $\{\varepsilon_t\}$  is a sequence of iid random variables. The notation  $X_t^+ = \max(X_t; 0)$  and  $X_t^- = \min(X_t; 0)$  will be used throughout. They studied necessary and sufficient conditions of the ergodicity of (8) and discussed conditional least-squares estimation of the parameters. The random coefficient version of (8) in which  $\theta_1$  and  $\theta_2$  are permitted to be random was studied by Brockwell et al. (1992) and later by Hwang and Basawa (1994).

The present paper deals with the case where the innovation  $\{\varepsilon_t\}$  in (1) forms a variant of autoregressive conditional heteroscedastic (ARCH) process where threshold concept is built into  $\{\varepsilon_t\}$ . Specifically  $\{\varepsilon_t\}$  is assumed to be generated by the following equations:

$$\varepsilon_t = \sqrt{h_t} e_t \quad (9)$$

$$h_t = \alpha_0 + \alpha_1 (\varepsilon_{t-1}^+)^2 + \alpha_2 (\varepsilon_{t-1}^-)^2 \quad (10)$$

where  $\{e_t\}$  is a iid sequence with arbitrary marginal probability density function (*pdf*) of zero mean and unit variance, and  $e_t$  is independent of  $\varepsilon_{t-s}$ ;  $s \geq 1$ . Also  $\alpha_0$ ,  $\alpha_1$  and  $\alpha_2$  are parameters satisfying  $\alpha_0 > 0$  and  $0 \leq \alpha_j < 1$ ;  $j = 1, 2$ .

Consequently, the model specified by (8)–(10) allows a “threshold” both in the conditional mean and in the conditional variance of the time series and thus we call this threshold ARCH(1) (TARCH(1), for short).

It may be noted that for  $\theta_1 = \theta_2$  and  $\alpha_1 = \alpha_2$ , the TARCH(1) process reduces to the standard AR(1)-ARCH(1) model first introduced by Engle (1982).

#### 4.2.2 For bank panel data: GMM Estimator

In the banking sector analysis, not all firm characteristics are captured in the available data. Information on managerial risk aversion, revealed preferences, governance structure, cash flow characteristics, and other relevant information may be difficult to measure. Ignoring the unobserved firm-level heterogeneity imposes the incorrect assumption of zero correlation between the observed variables and the unobserved effect. This leads to biased and inconsistent estimates (Wooldridge, 2002).

To address biases, there are a number of choices. The first option is to use a traditional instrumental variables (IV) approach. If an appropriate IV is available, it can be used to instrument for the lagged dependent variable. However, in corporate finance, reliable instruments are difficult to find. Arellano and Bond (1991) suggest a generalized method of moments (GMM, or difference GMM) estimator. They first-difference the panel data and then use the endogenous (or predetermined) lagged variables' levels to instrument for the transformed lagged dependent variable. The lagged levels provide little information about the first differences when the underlying series are relatively stationary and, therefore, are weak instruments (Arellano and Bover, 1995; Blundell and Bond, 1998). The Arellano-Bover/Blundell-Bond GMM employs additional moment conditions based on the lagged variables' first differences (in addition to their levels) to increase the efficiency of estimation.

Therefore, to increase the efficiency of estimates as well as to capture some unobserved effects, the Arellano-Bover/Blundell-Bond GMM model is applied in the analysis following Boyd et al. (2001). We employ the GMM regressions for different sub-periods (pre- and post-liberalization period—before 1999 and after 1999) as well as for different types of banks in Bangladesh.

## CHAPTER 5

**EMPIRICAL RESULTS—IMPACT OF INFLATION ON THE FINANCIAL SECTOR**

The empirical results are obtained by analyzing aggregated banking and capital market data as well as bank panel data. For aggregate data, we analyze data for 18 years covering the period 1991-2010. Bank panel data, consisting of 48 banks data, also covers the same period.

**5.1 Aggregate Analysis****5.1.1 Correlation between variables**

Pair-wise correlation between variables is estimated in Table 5. Since the literature review suggests that threshold effect of inflation may exist, we therefore examine if there is any such threshold effect exists in the case of financial performance in Bangladesh. We find that if annual inflation rate exceeds 4.6%, it has some negative effects on financial development indicators (Panel A). Considering the inflation threshold at 4.6%, we thus observe correlation between variables. While financial performance indicators and inflation depict positive and negligible correlation, they have negative correlation once inflation exceeds the threshold level. Particularly, higher inflation is negatively and significantly correlated with asset value of the banking sector, indicating existence of threshold effect.

In Panel B of Table 5 we estimate the correlation coefficients between capital market indicators and inflation. While inflation has positive correlation with capital market indicators, higher inflation (threshold effect) has negatively correlated with MCAP and value traded.

All the financial variables are positively and significantly correlated with each other at high confidence levels.

**TABLE 5**  
**Estimated pair-wise correlation between variables**

**A. Banks**

	OVERALL			IF INFLATION>4.6		
	PRIVATE CREDIT	ASSET	LIABILITY	PRIVATE CREDIT	ASSET	LIABILITY
PRIVATE CREDIT	1			1		
ASSET	0.79 (0.0001)	1		0.63 (0.05)	1	
LIABILITY	0.96 (0.00)	0.78 (0.0001)	1	0.9706 (0.00)	0.72 (0.01)	1
INFLATION	0.26 (0.27)	0.02 (0.94)	0.11 (0.64)	-0.09 (0.79)	-0.52*** (0.11)	-0.24 (0.49)
N						

**B. Capital Market**

	OVERALL				IF INFLATION > 4.6			
	TURNOVER	EQUITY RETURN	MCAP	VALUE TRADED	TURNOVER	EQUITY RATIO	MCAP	VALUE TRADED
TURNOVER	1				1			
EQUITY RETURN	0.19 (0.51)	1			0.11 (0.78)	1		
MCAP	0.49 (0.03)	0.63 (0.02)	1		0.45 (0.16)	0.68 (0.06)	1	
VALUE TRADED	0.89 (0.00)	0.30 (0.30)	0.60 (0.01)	1	0.93 (0.00)	0.20 (0.62)	0.51 (0.10)	1
INFLATION	0.22 (0.3791)	0.12 (0.70)	0.39*** (0.10)	0.46*** (0.05)	0.44** (0.19)	-0.38 (0.39)	-0.19 (0.58)	0.44** (0.19)

Table 6 (Panel A) presents average of indicators after sorting by inflation and creating percentile (quartile) groups. The first noteworthy feature is that the inflation rate in the second and third percentile groups remains very close to each other (about 6% vs. 7%). However, inflation in the second and fourth percentile group dramatically exceeds the one in the first and third percentile group. The second noteworthy feature is that the three banking sector performance measures tend to increase albeit slightly as inflation rises up to the third percentile group level, and decline very substantially if inflation exceeds third percentile group level, i.e. if annual average inflation rate exceeds 7.2 percent. Note, however, that most of the “action” occurs at the extremes—in the sense that the two middle quartile groupings differ substantially from the lowest and highest inflation quartiles. The second and third quartiles, however, do not exhibit much difference in banking development, suggesting that the finance-inflation relationship may be nonlinear.

**TABLE 6**  
**Financial indicators (average) sorted by inflation**

**A. Banks**

	<b>ASSET</b>	<b>LIABILITY</b>	<b>PRIVATE CREDIT</b>	<b>INFLATION</b>
p25	106.10	29.63	21.58	3.28
p50	118.59	30.58	23.33	6.15
p75	137.01	35.57	27.70	7.2
p99	96.55	28.02	23.18	9.94

**B. Capital Market**

<b>STATS</b>	<b>TURNOVER</b>	<b>EQUITY RETURN</b>	<b>MCAP</b>	<b>VALUE TRADED</b>	<b>INFLATION</b>
p25	40.79	1.19	2.40	0.99	3.28
p50	24.33	17.34	3.41	0.79	6.15
p75	36.88	23.50	6.77	2.74	7.20
p99	59.60	-17.12	3.78	3.46	9.94

Table 6 (Panel B) reports the results for the capital market indicators after the data have been sorted by inflation and broken into quartiles. For the lowest and highest inflation category, turnover and value traded are found to be the highest while for the second and third inflation category, all the indicators tend to increase. This implies that with the rise of inflation, value of stocks rises, thereby Value Traded increases. However, the rise in inflation decreases equity returns and market capitalization, as expected. Note that correlation analysis does not mean causality; therefore, we perform regression analysis in the following section.

### 5.1.2 Regression analysis

Before running regression, we test the unit root properties of variables. Augmented Dickey Fuller (ADF) test confirms that the financial sector indicators have a unit root. The results of the unit root tests are reported in Table 7. Since our preliminary analysis in the previous

section suggests that threshold effect of inflation might exist on the financial sector performance, we therefore apply the Threshold ARCH model.

TABLE 7  
ADF test statistics

Variables	Test Statistic	Variables	Test Statistic
ASSET	1.488	MCAP	-2.209
LIQUID LIABILITY	5.933	VALUE TRADED	3.533
INFLATION	-2.444	TURNOVER RATIO	-0.372
PER CAPITA GDP	11.146	EQUITY RETURN	-2.65*

\*Significant at 10% level.

The Threshold ARCH model estimates for Banks and capital market are reported in Table 8 (Panel A and B) respectively. For estimating the TARARCH model, we consider only three indicators of capital market depending on the availability of monthly data.

TABLE 8  
Threshold ARCH estimates

## A. For the Banking Sector

	Deposits			Asset			Private sector credit		
	Whole period (1990-2009)	Pre- liberalization (before 1999)	Post- liberalization (after 1999)	Whole period (1990-2009)	Pre- liberalization (before 1999)	Post- liberalization (after 1999)	Whole period (1990-2009)	Pre- liberalization (before 1999)	Post- liberalization (after 1999)
Inflation rate	- 0.009 (0.007)	- 0.02 (0.01)**	- 0.002 (0.001)**	-0.006 (0.008)	-0.004 (0.01)	-0.002 (0.01)	-0.006 (0.005)	-0.02 (0.01)**	0.0009 (0.001)
Per capita income (logarithm)	0.28 (0.11)***	0.43 (0.52)	0.29 (0.01)***	1.03 (0.08)***	3.69 (0.34)***	-0.73 (0.14)***	0.24 (0.08)***	0.33 (0.43)	0.28 (0.01)***
Constant	-2.41 (1.04)***	-3.82 (4.87)	-2.55 (0.10)***	-9.02 (0.84)***	-34.4 (3.25)***	8.66 (1.43)***	-2.12 (0.77)***	-2.91 (4.05)	-2.47 (0.14)***
N	212	112	117	212	111	118	212	112	117

## A. For Capital Market

	Market capitalization			Total issued capital+	Private sector credit+
	Whole period (1990-2009)	Pre-liberalization (before 1999)	Post-liberalization (after 1999)	Post-liberalization (after 1999)	Post-liberalization (after 1999)
Inflation rate	- 0.00008 (0.002)	- 0.002 (0.0009)***	- 0.009 (0.002)***	-0.0006 (0.0002)	0.003*** (0.0006)
Per capita income (logarithm)	0.16 (0.02)***	0.15 (0.03)***	0.46 (0.02)***	0.04 (0.002)***	0.095 (0.009)***
Constant	-1.90 (0.20)***	-1.35 (0.28)***	-4.55 (0.23)***	-0.35 (0.02)***	-0.92 (0.09)***
N	230	113	117	90	110

+Data are analyzed only for the post-liberalization period based on data availability. \*, \*\* and \*\*\* represent significance at 10%, 5% and 1% level respectively.

The Threshold ARCH Model estimates suggest a long-run negative inflation-finance relationship. Inflation has negative effect on bank assets, private credit and deposits as well as capital market indicators, such as market capitalization, total issued capital and turnover. The results are consistent with existing cross-country studies.

## **5.2 Panel Estimation**

In this section, we present the results of a panel GMM estimator. The panel estimation (i) exploits the time-series (as well as the cross-section) dimension of our data set, and (ii) accounts for the possibility that financial market performance and inflation are simultaneously determined variables. We conduct the analysis for the banking performance measures. The panel consists of 43 banks over the period 1990–2010.

Blundell and Bond (1997) show that this estimator reduces the inefficiencies and inconsistencies of alternative panel estimators (e.g., Arellano and Bond 1991). The consistency of the GMM estimator depends on (1) the validity of the instruments and (2) the assumption that the differenced error terms do not exhibit second order serial correlation. We use two tests proposed by Arellano and Bond (1991) to test these assumptions. The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation procedure. The second test examines the assumption of no second-order serial correlation. Failure to reject the null hypotheses of both tests gives support to our estimation procedure.

Table 9 reports the results. While inflation has positive and significant impact on assets, relatively high inflation has negative and significant effect (as INFTH is negative). Again, while there is some attenuation of the coefficient estimates relative to the pure cross-section estimates, the GMM panel estimates are consistent with our earlier finding that inflation exerts a positive impact on banking sector development, especially at low-to-moderate rates of inflation, but exerts a negative impact when it crosses a certain threshold. Furthermore, the diagnostic tests indicate that our econometric specification and the assumption of no serial correlation in the white-noise error terms cannot be rejected.

**TABLE 9**  
**GMM estimator for assessing the impact of inflation on bank activities**

	(1)	(2)	(3)	(4)
	ASSET	DEPOSITS	ASSET	DEPOSITS
L1.	0.64 (0.04)***	0.77 (.02)***	0.66 (.03)***	0.77 (.02)***
INF	0.02 (0.01)**	0.005 (0.005)	--	--
INFTH	--	--	-0.03 (.07)	0.02 (.04)
GDP	0.14 (0.04)***	0.11 (.02)***	0.15 (.04)***	0.11 (.02)***
INTSPREAD	-0.08 (0.03)**	-0.04 (.01)***	-0.09 (.03)***	-0.04 (.01)***
ME	-0.39 (.63)	0.24 (.30)	-0.46 (.63)	0.22 (0.005)
BANKRATE	-0.01 (.01)	-0.02 (.005)***	-0.002 (.01)	-0.02 (.005)***
CONS	8.27 (0.89)	5.12 (0.45)***	7.90 (0.90)***	5.09 (0.45)***
N	350	348	350	348
Sargan Test	116.24	275.06***	116.64	274.25***

*Notes:* Standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% level. INF represents Inflation rate (annual average), INFTH represents Inflation Threshold at 4.6%, GDP represents GDP growth rate, INTSPREAD represents interest rate spread, ME represents Management Efficiency ( interest expense/total loan), and BANKRATE represents central bank discount rate.

In Table 10 we assess the impact of inflation on the Bangladeshi banking sector for the pre-liberalization (before 1999) and post-liberalization (after 1999) period. With liberalization toward a market oriented interest rate policy under the Financial Sector Reform Program (FSRP)<sup>3</sup> in the 1990s, the banks were allowed to set lending and deposit interest rates within bands set by Bangladesh Bank; later the bands were removed allowing the banks to set interest rates along the lines of market conditions. In 1999, other restrictions were removed in order to enable banks to enjoy greater flexibility in setting interest rates and other banking operations. Thus, inflation might have a different impact on the banking activities in the liberalized period as banks were allowed to set interest rates based on market conditions. The results suggest that inflation has positive and significant effect on ASSETS and DEPOSITS of banks in the liberalized period. We do not find any significant impact of inflation on the banking activities for the pre-liberalized period.

<sup>3</sup> This is a World Bank led reform program.

TABLE 10

## Impact of inflation on bank activities in the liberalized period

	(1)	(3)	(2)	(4)
	ASSET (pre-liberalization period—before 1999)	ASSET (post-liberalization—after 1999)	DEPOSITS (pre-liberalization period—before 1999)	DEPOSITS (post-liberalization—after 1999)
L1.	0.94 (0.05)***	0.58 (.05)***	0.82 (.07)***	0.72 (0.03)***
INF	0.01 (0.01)	0.05 (0.02)***	0.001 (0.01)	0.02 (0.01)**
GDP	- 0.06 (0.05)	0.16 (0.06)***	0.03 (0.06)***	0.12 (0.03)***
INTSPREAD	-0.02 (0.03)**	-0.08 (.03)***	0.01 (0.04)***	-0.04 (.01)***
ME	1.86 (1.08)*	-0.31 (0.73)	3.52 (1.38)***	0.23 (0.31)
BANKRATE	-0.10 (.07)	-0.02 (0.02)	-0.03 (0.10)***	-0.02 (.01)***
CONS	2.62 (0.91)***	9.60 (1.13)***	3.86 (1.27)***	6.22 (0.57)***
N	101	249	101	249
Sargan Test	71.63***	77.82	91.78***	190.16***

*Notes:* Standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% level. *Notes:* Standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% level. INF represents Inflation rate (annual average), INFTH represents Inflation Threshold, GDP represents GDP growth rate, INTSPREAD represents interest rate spread, ME represents Management Efficiency ( interest expense/total loan), and BANKRATE represents central bank discount rate.

Next we analyze the impact of inflation on different types of banks. In Bangladesh, there are about 48 banks including 4 state-owned banks (SCBs), 30 private commercial banks (PCBs), 5 specialized banks (SCBs) and 9 foreign commercial banks (FCBs). Private banks were allowed to operate in Bangladesh from the early 1980s. Since the nationalized commercial banks are highly controlled by the Government, private commercial banks appear to lack proper competition and efficiency (Hossain, 2010). Therefore, behaviour of different banks in response to inflation may vary. In Table 11 we analyze the impact of inflation on assets and deposits of different types of banks.

The results in Table 11 suggest that the impact of inflation on ASSETS of NCBs and PCBs are positive and significant, while the impact is negative for DEPOSITS of NCBs. For SCBs, none of the indicators are significantly associated with inflation—one of the reasons could be small sample size for SCBs.

TABLE 11

**Impact of inflation on different types of banks**

	NCB		PCB		SCB	
	ASSET	DEPOSITS	ASSET	DEPOSITS	ASSET	DEPOSITS
L1.	0.90 (0.03)***	0.96 (0.03)***	0.58 (0.04)***	0.73 (0.02)***	0.79 (0.34)**	0.69 (0.13)***
INF	0.01 (0.003)***	-0.004 (0.002)**	0.03 (0.01)***	0.01 (0.01)	- 0.02 (0.03)	0.0004 (0.01)
GDP	0.01(0.01)	-0.001 (0.01)	0.19 (0.05)***	0.15 (0.02)***	- 0.04 (0.13)	0.06 (0.05)
INTSPREAD	0.003 (0.01)	-0.02 (0.01)**	-0.09(0.03)***	-0.05 (0.01)***	0.04 (0.22)	-0.002 (0.06)
ME	-0.48 (0.73)	-0.41 (0.51)	-0.24 (0.69)	0.22 (0.33)	3.50 (9.12)	3.65 (2.79)
BANKRATE	-0.01 (0.004)***	0.004 (0.003)	-0.02 (0.01)**	-0.03 (0.01)***	- 0.01 (0.04)	-0.03 (0.01)***
CONS	2.47 (0.86)***	1.27 (0.70)	9.46 (1.01)***	5.83 (0.54)***	4.87 (7.64)	5.89 (2.42)***
N	58	58	279	277	13	13
Sargan Test	70.03	105.29***	89.38	203.58***	8.04	8.43

*Notes:* Standard errors are in parentheses. \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% level. INF represents Inflation rate (annual average), INFTH represents Inflation Threshold, GDP represents GDP growth rate, INTSPREAD represents interest rate spread, ME represents Management Efficiency ( interest expense/total loan), and BANKRATE represents central bank discount rate.

## CHAPTER 6 CONCLUSION

This study for the first time analyses the impact of inflation on the financial sector in Bangladesh. Bangladesh maintains a low-to-moderate inflation for the last two decades. However, in recent years, as like as in other developing countries, Bangladesh also faces higher inflationary spiral. Our analysis suggests that inflation in Bangladesh follows the global trend of inflation. The estimated pass-through elasticities are found to be high for the commodities that are fully imported, for example, edible oil.

In the backdrop of rising inflationary spirals worldwide particularly after 2007, what happened to Bangladesh and particularly to the financial sector of Bangladesh? It is very important to analyze the impact of inflation on the financial sector as high inflation is likely to affect credit market by shrinking the supply of loanable funds. Our descriptive analysis suggests that moderate inflation (6-7%) might have positive impact on the financial development, while very low and high inflation has detrimental effect on the financial sector. Also it is evident from the analysis that threshold effect of inflation might exist, that is, inflation affects the financial activities if it crosses a critical level (threshold). Therefore, we apply the non-linear Threshold ARCH (TARCH) model to the aggregate time-series (monthly) data of banks and capital market. The results suggest that there has been a long-run negative effect of inflation on financial development in Bangladesh. Though not significant for some cases, the negative sign of coefficients suggests long-term negative impact of higher inflation on the financial sector.

We then turn to analyze bank panel data to examine whether effect of inflation varies for different types of banks. We find positive effect of inflation on bank assets and deposits in the post-liberalization period, particularly after 1999 when inflation was on a rising trend. However, when an inflation dummy with a threshold is included, the effect of inflation becomes negative on financial sector indicators. This finding is consistent with our TARCH model estimates. Note that the results may be improved with the use of monthly bank panel instead of yearly bank panel data that we have used in this study.

Thus, to have a deeper and more active financial sector with all its attached benefits at the outset of rising inflation, the country should strive to increase institutional (financial) efficiency and strengthen legal and regulatory frameworks. Poor macroeconomic performance with high inflation only brings detrimental effects to the economy, i.e. high inequality, erratic growth, and most importantly here, a restrictive financial sector. Therefore, it is also important that macroeconomic policies must be very prudent and pragmatic so that inflation can be kept at a tolerable level.

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**TABLE A1**  
**List of Banks**

<b>State-owned Commercial Banks (SCBs)</b>	<b>Specialized Banks (SBs)</b>	<b>Private Commercial Banks (PCBs)</b>	<b>Foreign Commercial Banks (FCBs)</b>
<ul style="list-style-type: none"> <li>• Agrani Bank Limited</li> <li>• Janata Bank Ltd</li> <li>• Sonali Bank Ltd</li> <li>• Rupali Bank Ltd.</li> </ul>	<ul style="list-style-type: none"> <li>• BASIC Bank Limited</li> <li>• Bangladesh Krishi Bank</li> <li>• Bangladesh Shilpa Bank</li> </ul>	<ul style="list-style-type: none"> <li>• AB Bank Limited</li> <li>• A L-Arafa Islami Bank LTD</li> <li>• BRAC Bank Limited</li> <li>• Bangladesh Commerce Bank Ltd.</li> <li>• Bank Al-Falah Limited</li> <li>• Bank Asia</li> <li>• Dhaka Bank</li> <li>• Dutch-Bangla Bank Ltd</li> <li>• EXIM Bank Limited</li> <li>• Eastern Bank Limited</li> <li>• First Security Islami Bank Ltd</li> <li>• ICB Islami Bank</li> <li>• IFIC Bank Limited</li> <li>• Islami Bank Bangladesh Limited</li> <li>• Mercantile Bank Ltd</li> <li>• Mutual Trust Bank</li> <li>• National Bank Limited</li> <li>• National Credit and Commerce Bank Limited</li> <li>• One Bank Limited</li> <li>• Premier Bank Limited</li> <li>• Prime Bank Ltd</li> <li>• Pubali Bank Ltd</li> <li>• Rupali Bank Ltd</li> <li>• Shahjalal Bank Ltd</li> <li>• Southeast Bank Ltd</li> <li>• Standard Bank Ltd</li> <li>• The City Bank Ltd</li> <li>• Trust Bank</li> <li>• United Commercial Bank</li> <li>• Uttara Bank Limited</li> </ul>	<ul style="list-style-type: none"> <li>• Citibank N.A</li> <li>• Commercial Bank of Ceylon</li> <li>• Habib Bank Ltd</li> <li>• Standard Chartered Bank</li> <li>• State Bank of India</li> <li>• The Hong Kong and Shanghai Bank Ltd</li> <li>• Woori Bank</li> </ul>



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Monzur Hossain obtained his Ph.D. in International Economics from the National Graduate Institute for Policy Studies (GRIPS), Tokyo, Japan in March, 2007 and Master's in Public Policy from the same institute in 2003. Prior to joining the BIDS as a Research Fellow directly in December, 2008, Dr. Hossain taught at the Department of Economics of the American International University – Bangladesh. He also worked at Bangladesh Bank (the central bank) and Asian Development Bank Institute (ADBI), Tokyo. He has published many articles in domestic and international academic journals, and attended many international conferences in the USA, UK, Japan, China, Hong Kong etc. His research interests include monetary and fiscal policy, exchange rate policy, FDI and remittance, trade, banking and financial sector, SME and ICT sector.



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