

## **Inflation and Financial Sector Correlation: The Case of Bangladesh**

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**ABSTRACT:** This paper examines the impact of inflation on financial development in case of Bangladesh for the period of 1985-2005. In doing so, ARDL bounds testing approach and Error Correction Method (ECM) have been employed. Empirical findings reveal that high trends of inflation impede the performance of financial markets. GDP per capita promotes development of financial sector through its causal channels.

**Keywords:** Financial Sector, Inflation, Bangladesh, ARDL Approach

**JEL Classifications:** D14, E31

### **1. Introduction**

This paper deals with the correlation between inflation and financial development in case of Bangladesh for the period of 1985-2005 in long run as well as in short run. Economic theory reveals that developed financial sector mobilizes savings efficiently and reallocates the resources to productive projects and hence stimulates economic activities in the country. However, high rate of inflation worsens the efficiency of financial sector through financial market frictions and slows down the economic performance. Inflation tends to induce volatility in equity returns as well as lowers the real return on savings. In inflationary periods, governments are inclined to impose additional tax burden on the financial sector to reduce their budget deficits (Bencivenga and Smith, 1993). It is observed that inflation impedes the performance of financial markets by reducing the level of investment in the economy.

The link between inflation and financial development has not been studied for Bangladesh. The main objective of present study is to investigate the association between inflation and financial development by employing autoregressive distributive lag model (ARDL) framework utilizing time series annual data.

### **2. Review of Literature**

It is quite well-established that inflation impedes long run economic growth and distorts macroeconomic stability. De Gregorio (1993), Fischer (1993), Barro (1998), Bullard and Keating (1995), Clark (1997), Bruno and Easterly (1998), and Fischer (2005) affirm that moderate levels of inflation offset the Mundell-Tobin effect, consequently having detrimental impact on economic growth. Similarly, Cooley and Hansen (1989) and De Gregorio (1993) conclude that high levels of inflation reduce the labor supply and hence economic growth.

Inflation also adversely affects capital accumulation and investment and deteriorates income distribution (Shahbaz et al. 2010). Following Goldsmith (1969), McKinnon (1973), King and Levine (1993), Levine and Zervos (1998), Beck et al. (2000), and Beck and Levine (2004), seem to suggest that financial development has a positive impact on long run economic growth. While Bonfiglioli (2006), Bittencourt (2007) and Shahbaz and Farid (2011) conclude that financial development seems to reduce either income inequality or poverty through physical capital formation and economic growth.

Boyd and Champ (2003) find that inflation hurts economic growth through declining financial development, especially by damaging the operation of financial markets. Demirguc and Maksimovic (1998) report positive relationship between inflation and financial crisis empirically due to frictions in financial markets.

According to Mundell (1963) and Tobin (1965), portfolio allocations are influenced by inflation due to low returns on capital, leading to improvements in investment activities. This situation spurs growth process in the economy. In the same way, English (1999) argues that higher rates of inflation compel the individuals to surrogate purchased transactions services for money balances that not only augment the supply of financial services and stimulate financial development as well.

On the empirical surface, English (1999) provides empirical evidence and concludes that inflation has positive effect on financial development. In contrast, Haslag and Koo (1999), and Boyd et al. (2001) conclude that high rates of inflation adversely affect financial development as predicted theoretically. A recent case study of Brazil by Bittencourt (2007, 2011) using time series and panel data concludes that high inflation has positive impact on financial development due to poor macroeconomic performance. In the case of Zimbabwe, Murombedzi (2008) reports that increased inflation damage the development of financial institutions through troubling channels. Correlation in such case is found to be weak.

The studies also find non-linear relationship between both variables and suggest a particular threshold i.e. 15 percent per year. Conversely, Khan et al. (2006) differ with previous threshold level by suggesting a new threshold point with the argument that the threshold level of inflation is about 3-6 percent and beyond this point, inflation has a strong adverse impact on the development of financial sector. Whereas, Boyd et al. (2001) consider that inflation has negative but minimal impact on financial development. Naceur and Ghazouani (2007) using GMM approach report that inflation deteriorates financial development and financial development increases as inflation exceeds threshold point. Kim et al. (2010) investigate long-and-short runs effect of inflation on financial development using Pooled Mean Group estimator developed by Pesaran et al. (1999) for 87 countries over the period of 1965-2005. Their results indicate that inflation has inverse impact on financial development in long run while positive effect in short span of time.

### 3. Model and Data

Due to its well-established advantage, [Bowers and Pierce (1975) and Ehrlich], we specify a log-linear model for our problem as follows:

$$\ln FD_t = \beta_1 + \beta_2 \ln FD_{t-1} + \beta_3 INF_t + \beta_4 \ln GDP_t + \beta_5 \ln SS_t + \beta_6 \ln TR_t + \mu_t \quad (1)$$

Where  $FD_t$  is financial development proxied by credit to private sector as share of GDP,  $INF_t$  is for inflation, GDP per capita is indicated by  $GDP_t$ ,  $SS_t$  denotes social spending as share of GDP (education, health, and infrastructure expenditures),  $TR_t$  trade as share of GDP (exports as share of GDP + imports as share of GDP) and  $\mu_t$  is residual term.

The data on all the relevant variables have been collected from the World Development Indicators (WDI-2007, CD-ROM).

Table-1 predicts that inflation is inversely but weakly linked with the development of financial sector, social spending, GDP per capita, and trade openness. Financial development is associated positively and strongly with social spending, GDP per capita and trade openness. Social spending is correlated negatively with inflation but positively with GDP per capita and openness of trade, and trade openness and GDP per capita are correlated positively.

**Table 1. Descriptive Statistics and Correlation Matrix**

Variables	$\ln FD_t$	$INF_t$	$\ln TR_t$	$\ln SS_t$	$\ln GDP_t$
<b>Observations</b>	21	21	21	21	21
<b>Mean</b>	2.83041	1.6816	3.2628	1.0995	5.7769
<b>Median</b>	2.8033	1.7917	3.3446	1.2089	5.7485
<b>Maximum</b>	3.4679	2.3978	3.6109	1.4279	6.0698
<b>Minimum</b>	2.0794	0.6931	2.8909	0.7608	5.5774
<b>Skewness</b>	0.4111	0.5478	0.2357	0.2248	0.1556
<b>Kurtosis</b>	0.0007	-0.6204	-0.1843	-0.0878	0.4058
<b>Jarque-Bera</b>	1.2716	1.7966	1.8922	1.7376	1.6644
<b>Probability</b>	0.5295	0.4072	0.3882	0.4194	0.4350
$\ln FD_t$	1.0000				
$INF_t$	-0.3358	1.0000			
$\ln TR_t$	0.9307	-0.4880	1.0000		
$\ln SS_t$	0.7786	-0.4505	0.8823	1.0000	
$\ln GDP_t$	0.9797	-0.2979	0.9104	0.7159	1.0000

**4. Methodological Framework**

To analyse long run relationship between inflation and financial development, we did not focus on traditional cointegration approaches such as Engle-Granger (1987), Johansen (1992) and Johansen-Juselius (1990) cointegration approaches. We used advanced approach to test whether long run relationship between the variables exists or not by applying autoregressive distributive lag model (ARDL) bounds testing approach developed by Pesaran et al. (2001)]. ARDL bounds testing approach has numerous advantages. For instance, this approach can be applicable if running variables have ambiguous order of integration i.e. purely I(0), purely I(1) or I(0) / I(1) which is not acceptable in traditional approaches<sup>1</sup>. The ARDL bounds testing approach is more suitable and provides better results for small sample size (Haug, 2002). The short and long-run parameters are estimated simultaneously. The unrestricted error correction model is used for equation-1 as following:

$$\Delta \ln FD_t = \alpha_1 + \alpha_2 \ln FD_t + \alpha_3 INF_t + \alpha_4 \ln GDP_t + \alpha_5 \ln SS_t + \alpha_6 \ln TR_t + \sum_{i=0}^p \xi \Delta \ln FD_{t-1} + \sum_{i=0}^q \xi \Delta INF_{t-1} + \sum_{i=0}^r \sigma \Delta \ln GDP_{t-1} + \sum_{i=0}^s \psi \Delta \ln SS_{t-1} + \sum_{i=0}^l \zeta \Delta \ln TR_{t-1} + \mu_t \tag{2}$$

Where, difference is shown by  $\Delta$ ,  $\alpha_s$  indicate long run coefficients and short run coefficients are represented by  $\xi, \zeta, \sigma, \psi$  and  $\varsigma$ . The hypothesis of no cointegration deals with  $H_n : \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$  and  $H_a : \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq 0$  is an alternative hypothesis of cointegration.

Next step is to compare the calculated F-statistic with critical bounds generated by Pesaran et al. (2001). There is no cointegration if calculated F-statistic is less than lower critical bound (LCB). If calculated F-statistic is more than upper critical bound (UCB) then hypothesis of cointegration is accepted. The decision about cointegration is inconclusive if value of F-statistic is between lower and upper critical bounds. The selected ARDL model is used to estimate long run relationship between the variables. For short run behaviour of the variables, we use error correction version of ARDL model as following:

<sup>1</sup> The Engle-Granger (1987), Johansen (1992) and Johansen-Juselius (1990) cointegration approaches require that variables should be integrated at unique level of integration.

$$\Delta \ln FD_t = \delta_1 + \sum_{j=0}^p \delta_2 \Delta \ln F_{t-1} + \sum_{k=0}^q \delta_3 \Delta \ln GDP_{t-k} + \sum_{r=0}^m \delta_4 \Delta \ln SS_{t-r} + \sum_{s=0}^n \delta_5 \Delta \ln T_{t-s} + \eta ECM_{t-1} + \varepsilon_t \quad (3)$$

The significance of an error correction term i.e.  $ECM_{t-1}$  shows deviations in regressed variable. These deviations are a function of both the levels of disequilibrium in the cointegration relationship as well as the deviations in the other regressors. The stability tests such as cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) are also applied to test the goodness of fit for ARDL model.

## 5. Empirical Results

Primarily ADF unit root test is applied to test the order of integration of the variables and results are reported in Table-2. The unit root analysis shows that the variables do not seem to be stationary at their level form. At 1<sup>st</sup> difference, all the variables are found to be integrated at  $I(1)$ . This implies that variables have same level of stationarity and we should apply ARDL bounds testing approach to cointegration to test long run relationship between the variables.

**Table 2. Unit-Root Analysis**

Variables	ADF at Level		ADF at 1 <sup>st</sup> Difference	
	Intercept and Trend	Prob - values	Intercept and Trend	Prob - values
$\ln FD_t$	-3.0405	0.1476	-4.3839	0.0133
$\ln F_t$	-3.1687	0.1199	-4.8237	0.0063
$\ln TR_t$	-1.6065	0.7515	-3.4508	0.0778
$\ln SS_t$	-2.6716	0.2575	-4.5713	0.0100
$\ln GDP_t$	-3.0492	0.1456	-3.9980	0.0288

The appropriate lag order of variables should be fixed before proceeding to the ARDL bounds testing approach to cointegration (Pesaran et al. 2001). The results reported in Table-3 imply that lag order is 1 based on the minimum value of SBC. In such small sample data set, we cannot take lag more than 1. The appropriateness of lag order avoids the spuriousness of ARDL bounds testing approach to cointegration results. The results of the ARDL bounds testing approach are also shown in Table-3 indicating that our estimated F-statistic is 25.265 exceeds upper critical bound (UCB) i.e. 11.65 at 1 percent level of significance. This implies that the hypothesis of cointegration may be accepted and confirm long run relationship between the variables. Next step is to examine the marginal impacts of inflation, social spending, economic growth and trade openness on financial development.

**Table 3. Lag Length Selection**

Order of lags	LR	PFE	SBC	F-test Statistics
0	NA	1.19e-09	-6.112267	NIL
1	132.2365*	7.06e-13*	-12.41004*	25.265*
<b>Sensitivity Analysis</b>				
Serial Correlation LM, F = 0.4858 (0.6322)				
ARCH Test = 1.7594 (0.2081)				
Normality J-B Value = 0.6572 (0.7199)				
Heteroscedasticity Test, F = 4.1972 (0.2092)				
Ramsey RESET Test, F = 3.0480 (0.1233)				

Note: \* shows significant at 1% level of significance.

The OLS regression results are reported in Table-4. The lag of dependent variables is also included in model to test the impact of previous financial sector's policies on financial development. Our empirical evidence reveals that lagged coefficient of financial development shows positive effect on financial development in current period at 1 percent significance level. This implies that improved financial sector policies in previous period will develop financial sector in current period in Bangladesh. The relationship between inflation and financial development is negative and statistically significant. This confirms that inflation has deleterious effect on financial development and it is statistically significant at 5 percent level of significance but that is found to be minimal i.e. a 0.0264 percent financial development is eaten up by 1 percent increase in inflation. This shows that inflationary environment deteriorates financial development by lowering money supply and restricting financial resources for investment projects. Furthermore, high inflation is linked with high opportunity cost of holding money that declines the efficiency of financial institutions and hence development of financial sector.

**Table 4. Long-Run Analysis**

Dependent Variable = $\ln FD_t$			
Variable	Coefficient	T-Statistic	Prob-values
Constant	-6.1861	-6.3626	0.0000
$\ln FD_{t-1}$	0.3360	3.7253	0.0023
$INF_t$	-0.0264	-2.1710	0.0476
$\ln GDP_t$	1.4020	6.7822	0.0000
$\ln SS_t$	0.2541	4.9487	0.0002
$\ln TR_t$	-0.0713	-0.9254	0.3704
R-squared = 0.9966 Adjusted R-squared = 0.9954 Akaike info criterion = -4.223 Schwarz criterion = -3.925 Log likelihood = 48.238 F-statistic = 827.22 Prob(F-statistic) = 0.00 Durbin-Watson stat = 2.240			

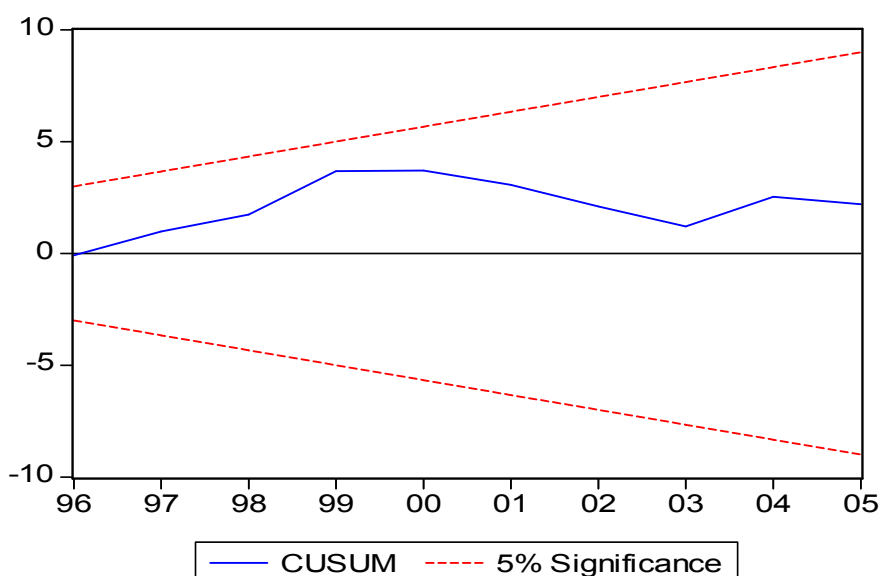
The positive and statically significant relationship is found between economic growth and financial development at 1 percent level of significance. This implies that a rise in income per capita increases financial development i.e. there is 1.4 percent increase in financial development due to 1 percent increase in GDP per capita. The impact of social spending on financial development is positive and statistically significant at 1 percent level of significance. A 1 percent increase in social spending improves the development of financial sector by 0.2541 percent. Finally and surprisingly, coefficient of trade pushes down the performance of financial intermediaries insignificantly.

The short run results are shown in Table-5 and we used error correction method to obtain short run behaviour of independent variables on development variable. The estimate of lagged ECM term identifies the speed of adjustment from short run towards long run equilibrium path. It is pointed out by Bannerjee and Newman (1998) that error correction term with negative sign and statistically significant at high level of significance further corroborates established long run relationship between the variables. Our empirical exercise considers that the estimated value of coefficient of  $ECM_{t-1}$  is equalant to -0.9359 and it is statically significant at 5 percent significance level. This shows that any changes in short run towards long run is corrected by 93.59 percent per year in development of financial sector.

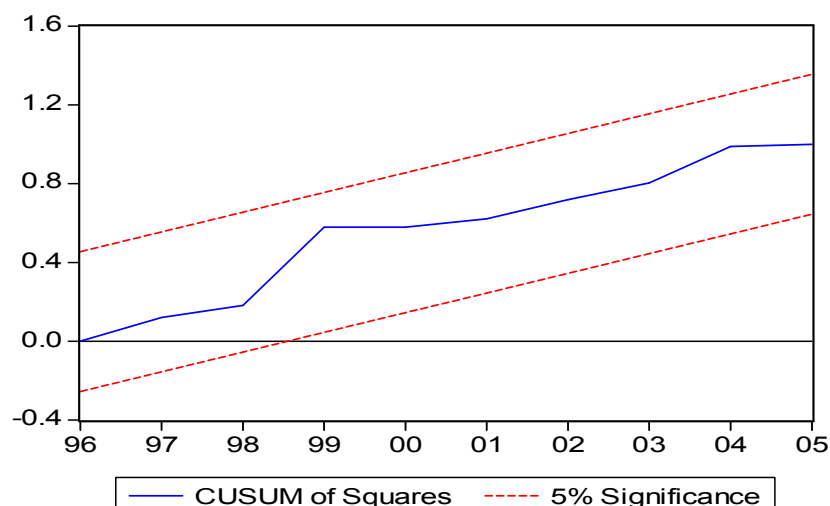
**Table 5. Short Run Analysis**

Dependent Variable = $\Delta \ln FD_t$			
Variable	Coefficient	T-Statistic	Prob. Value
Constant	-0.0078	-0.4282	0.6776
$\Delta \ln FD_{t-1}$	0.4379	3.9943	0.0025
$\Delta \ln GDP_t$	1.0802	1.8030	0.1015
$\Delta \ln GDP_{t-1}$	0.3971	0.6210	0.5485
$\Delta INF_t$	-0.0366	-3.6148	0.0047
$\Delta \ln SS_t$	0.0350	0.5373	0.6028
$\Delta \ln SS_{t-1}$	0.1660	3.7759	0.0036
$\Delta \ln TR_t$	-0.0900	-0.7632	0.4630
$ECM_{t-1}$	-0.9359	-2.7574	0.0202
R-Squared = 0.8441 Adj-R-Squared = 0.7194 Akaike Info Criterion = -4.403 F-Statistic = 6.771 Prob(F-statistic) = 0.003 Durbin-Watson = 2.065			

In this section, empirical results also provide evidence for short run, current value of financial development is also improved by its previous policies at 1 percent level of significance. Income per capita spurs the financial development at 10 percent level of significance. Inflation decreases the efficiency of financial sector over a short span of time. Improved social spending increases the development of financial sector with lag impact. The effect of trade openness on financial development is genitive but statistically insignificant. The stability of ARDL model is investigated by applying the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMsq) test on the recursive residuals (see Figure 1 and 2).

**Figure 1. Plot of Cumulative Sum of Recursive Residuals**

The straight lines represent critical bounds at 5% significance level.

**Figure 2. Plot of Cumulative Sum of Squares of Recursive Residuals**

The straight lines represent critical bounds at 5% significance level.

## 6. Conclusions and Policy Implications

The present study also confirms that inverse correlation between inflation and financial development exists in case of Bangladesh. From the ARDL bounds testing approach to cointegration, we report that inflation reduces the efficiency of financial intermediaries in the long-and-short runs. Financial sector improves its performance through its previous policies and developments. Economic growth also promotes financial development through the causal channels. Social spending enhances the performance of financial sector in the long run. Policy making authorities should formulate appropriate steps to curb inflation in the country to obtain the fruits from financial sector's development.

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