Underground Economy of Bangladesh: An Econometric Analysis*

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Sheikh Touhidul Haque[1]

Abstract

The primary objective of this paper is to estimate the size of the underground economy of Bangladesh over the period 1973-2008 by using currency demand approach. The estimation of this paper is based on Tanzi's (1980, 1983) original model but with some modification to fit Bangladesh economy. His approach assumes that underground (or hidden) transactions are undertaken in the form of cash payments, so as to leave no observable traces for the authorities. An increase in the size of the underground economy will therefore increase the demand for currency. We estimate the underground economy of Bangladesh under three assumptions. These assumptions are (a) Velocity of illegal money equals to the velocity of legal money (b) Velocity of illegal money equals to the velocity of narrow money (M1) and (c) Velocity of illegal money equals to the Average velocity of legal money and Narrow Money. According to our estimation, the size of the underground economy in Bangladesh was only 7% of nominal GDP in 1973. Since then it increased phenomenally and in 2010 it stood at 62.75% of GDP. However, underground economy imposes a burden on the economy, and results in tax distortions and the erroneous measurement of macroeconomic variables. Government policies based on these macroeconomic variables are then less likely to succeed. In our empirical analysis, we find out the long run co-integrating relationship (Fully Modified Phillips-Hansen Estimate). This method modifies least squares to account for serial correlation effects and for the endogenty in the regressors that result from the existence of a co-integrating relationship. The conventional co-integration analysis provides consistent empirical evidence in favor of Tanzi's (1980, 1983) original model and the findings are consistent with Friedrich Schneider (2004).

[1] *Senior Assistant Secretary, Macroeconomic wing, Finance Division, Ministry of Finance, Bangladesh. currently doing PhD in USA.* ***E-mail- touhid_s@yahoo.com***

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I. Introduction:

In the last two decades the number of studies investigating the underground economy has increased markedly. But knowing the unknown and therefore estimating the activities of the underground economy are still a difficult task. Hence, trying to estimate the extent and value of the underground economy can be considered as a scientific passion for knowing the unknown. The ‘‘underground economy’’ — defined as economic activities which are not registered, reported, taxed or regulated but which produce for legal markets — has been mainly explained, on the basis of standard economic arguments, as engendered by excessive taxation and regulations (Cowell, 1990; Fenn and Veljanovski, 1988; Pyle, 1989).

Rise in the underground economy creates problems for the policy-makers to formulate economic policies, especially the monetary and fiscal policies. An underground economy imposes a burden on the economy, and results in tax distortions and the erroneous measurement of macroeconomic variables. Government policies based on these macroeconomic variables are then less likely to succeed. In particular, the share of tax revenues, or even nominal tax rates, exhibit ambiguous relationships with the proportion of underground economy in GDP (see the survey by Schneider and Enste, 2000). By contrast, the stage of economic development, as measured by per-capita GDP has been shown to stand in a robust and negative relationship with the underground proportion of GDP (Johnson et al., 1998, 1999; Friedman et al., 2000; Portes, 1994) and case studies (de Soto, 1989; Turnham et al., 1990; Lubell, 1991; Thomas, 1992).

The estimation in this paper is based on Tanzi (1980, 1983) model but with some modification to fit Bangladesh economy. Moreover, currency demand methods –including Tanzi‘s (1980, 1983) original model- are built upon the regression model with multiple time series variables. Currency Demand Approach assumes that tax is the main variable impacting the size of underground economy and people use currency to avoid paying taxes. However, we find that the majority of the time-series data used in dependent and 2 independent variables are non-stationary with unit roots. Therefore, estimating currency demand models requires more formal procedures involving unit roots, corrections of serial correlations and heteroskedasticity and cointegration tests depending on the properties of time-series data.

According to currency demand approach, the annual estimates of the underground economy in Bangladesh for the period 1973-2010 under three assumptions are provided in section 6.8. Assumptions are (a) Velocity of illegal money equals to the velocity of legal money (b) Velocity of illegal money equals to the velocity of narrow money (M1) and (c) Velocity of illegal money equals to the Average velocity of legal money and Narrow Money. It is estimated that the size of the underground economy in Bangladesh was only 7% of nominal GDP in 1973. Since then it increased phenomenally and in 2010 it stood at 62.75 % of GDP under assumption (c). The highest peak started from 2000 and onwards. A downward trend in the size of this shadow economy starts from 2009.

The primary objective of this paper is to estimate the size of the underground economy of Bangladesh. We also checked the long run relationship between dependent and explanatory variables of our proposed model. At the end of the paper we also tried to explore some policy implications.

The remainder of the paper is structured as follows: Section 2 describes causes of underground economy; Section 3 gives a brief description of underground economy and consequences Section 4 gives overview of literature Review; Section 5 describes empirical model; Section 6 illustrates data source, data description and methodology; Section 7 describes econometric analysis and empirical results; Section 8 discusses the results; Section 9 describes some policy implications. Finally, Section 10 summarizes conclusion of this paper.

II. Causes of Underground Economy:

The best way to approach the issue of the causes of the underground economy is to analyze the incentives faced by economic agents (firms or individuals) making the decision whether to be official. Among the benefits to entering the underground economy, the most popular mentioned in the literature is tax rates. The most important determinant of the increase of the underground economy is the rise in tax and social security burdens [see Tanzi (1982, 1999); Frey and Pommerehne (1984); Feige (1989); Pozo (1996) and Johnson, Kaufmann, and Zoido-Lobatón (1998)]. The common theme is that high taxes (both marginal and total) have a negative impact on the decision of economic agents on whether to operate officially. Schneider and Enste (2000) state that bigger the difference between the total cost of labor in the official economy and after tax earnings (from work), greater the incentive to avoid this difference and work in the underground economy.

Johnson, Kaufmann, and Shleifer (1997); Johnson, Kaufmann, and Zoido-Lobat_on (1998) and Friedman et al. (1999) believe that institutional aspects are more important than taxes in promoting underground economies. In cross country studies that include less-developed, transition, and OECD countries, Johnson et al. (1998) and Friedman et al. (1999) find that the key determinant of underground activity is the extent of regulatory discretion. When regulations are lax and rule of law is weak, bureaucrats make decisions on individual cases without supervision. This creates corruption, which causes firms to become unofficial.

There is either a substitution or complementary relationship between the underground economy and corruption. The substitute model group shows that corruption and underground economy are substitutes since the existence of the shadow economy reduces the propensity of officials to demand grafts (Choi and Thum, 2004; Dreher, Kotsogiannis and McCorriston, 2005a, b). The complement group of models (Johnson et al., 1998; Hindriks et al., 1999) shows that labor can be either employed in the official sector or in

the underground economy. Consequently, an increase in the underground economy always decreases the size of the official market. Corruption increases the underground economy, as corruption can be viewed as one particular form of taxation and regulation, thus driving entrepreneurs underground.

Income inequality and poverty also increases underground activities in the society. But there are arguments whether it is true for developing or transition economy. Some believe that underground economy increases the standard of living in the society. But it is found that shadow activities increase the income inequality in the society. Quality of public goods and services are also affected by the size of the underground economy. Increased shadow economy will reduce the quality and quantity of publicly provided goods and services. In countries where underground activities are relatively high, revenue generation will be low and the quality and quantity of publicly provided goods and services will be lower than average.

III. Underground Economy: Bangladesh Perspective

Undisclosed, unreported, untaxed economic activities, wealth and money are the major components of underground economy in Bangladesh. Several sources of underground economy are identified as causes. The major problem areas are bribery, corruption smuggling, under-invoicing, over-invoicing, contractual cuts and commissions, tender monopolization, graft extortion, rent seeking, loan defaults so on and so forth. Undisclosed money and wealth are kept in different forms and shapes in Bangladesh. It is not easy to classify them in clear language. Some of the forms are bank account, real estates, stocks and shares, savings instruments, investment in foreign country; cash, golds, jewelry etc and under-valued assets. The larger chunk of black money is transferred abroad and only a little goes into the fixed deposits, while the black money owners spend the rest on posh living.

Tax avoidance and tax evasion is normal culture among the potential tax payers of Bangladesh. Different forms of veiling actual income are laundering foreign aid through fake project by some NGOs, monetary transaction without receipt between service taker and service provider, showing less remuneration-fee in the contract with consultant, doctors, engineers, lawyer, artist or such service provider, failure to issue receipt or cash memo to service recipients/clients; and concealing the illegal money earned from extortion.

Existing tax amnesty schemes also entice shadow economic activities. The Income-tax Ordinance, 1984 offers several tax amnesty schemes to attract black money. Moreover, every year during budget time, the issue of whitening black money becomes a topic of hot

debates as prominent citizens' groups think such an opportunity discourages honest taxpayers to pay tax on time. The government provided black money whitening facility several times for a total period of 11 years over the last four decades. But only Tk 180 billion was injected into the formal economy during the period after the payment of Tk14.20 billion as taxes.

Tax amnesty like tax holiday is one of the encouraging factors for black money holders in Bangladesh. It has been found by several studies that tax holiday is not only redundant under existing income tax law but it also create tax haven. A recent NBR survey revealed that 90 per cent industrial units which enjoyed tax holiday since mid- 1990s abused it as they showed 'no profit' after expiry of the facility. Another survey conducted by NBR in 2005 found that 902 companies had enjoyed tax holiday between 2000 and 2004 which led to revenue losses of Tk 847 crore to the government. Successive governments tried to suspend the facility, but failed to so because of pressure and lobbying from the industrialists.

Corruption is another major player for creating huge size of underground economy of Bangladesh. Bangladesh ranks 139th out of 180 countries in Transparency International's Corruption Perceptions Index for 2009, a slight improvement from 2008. Corruption remains a serious impediment to investment and economic growth. By some estimates, off-the-record payments by firms result in an annual loss of 2 percent–3 percent of GDP. Corruption in Bangladesh is not just an economic exchange, generated by a monetary or 'economic' motive; neither is corruption an exclusively political activity, motivated by a desire to attain or retain political power. The process of corruption is more than economic or political – it is a social process as well, existing side-by-side with, and sometimes complementing economic and political activity.

The consequence of underground economy is multidirectional and perilous for formal economy. The presence of underground economy can make macro policy less effective. In addition, official statistics provide the wrong indicators for macro-policy decisions (Tanzi, 1999). The existence of underground economy also creates distortions in resource allocation. Investment as percent of GDP is not satisfactory compared to our neighboring countries like India, Sri Lanka. Tax-GDP ratio is still below 10 percent and lowest among the south Asian countries.

Due to huge size of UE in Bangladesh, it creates asset bubble which is reflected in the land price hike in major cities and stock market boom in recent years. Capital accumulation is natural phenomenon in the developing countries. Bangladesh is not an exception. But due to large size of UE, it creates income inequality in the society. Some people become

millioners easily here whereas more than forty percent of total population is living under poverty line. Regarding the social consequences of an underground economy in Bangladesh, free-riding on public services paid for by few is common, could lead to a sense of unfairness and deepen the distrust toward the ability of the political system to govern. Moreover, it adversely affects the respect for official institutions, norms, and rule-of- law.

IV. Literature Review

In most of the studies the measurement of the underground economy is restricted purely to attempts at estimating the level of underground income earned, as opposed to the level of underground wealth. This is because of the difficulty in measuring hidden wealth as well as because of conceptual difficulties that will necessarily be encountered. There are essentially five methods of estimating the size and extent of the underground economy, all of which focus on trying to gauge the level of underground income earned. They are: the monetary approach (Currency Demand Approach), the fiscal approach, the national account approach, the labor market approach, and the physical input approach. Various versions of this approach are available in the literature depending on the assumptions used to determine the currency demand.

This paper incorporates the Currency Demand Approach to estimate the level of underground economy. The currency demand approach was first used by Cagan (1958), who considered the correlation between currency demand and tax pressure (as one cause of the shadow economy) for the United States over the period 1919–1955. Twenty years later, Gutmann (1977) used the same approach but without any statistical procedures. Cagan's approach was further developed by Tanzi (1980, 1983), who estimated a currency demand function for the United States for the period 1929 to 1980 in order to calculate the size of the shadow economy. His approach assumes that underground (or hidden) transactions are undertaken in the form of cash payments, so as to leave no observable traces for the authorities. An increase in the size of the underground economy will therefore increase the demand for currency. To isolate the resulting excess demand for currency, an equation for currency demand is estimated over time.

A numerous number of empirical researches have been conducted to estimate the size of the underground economy of Bangladesh. Friedrich Schneider (2004) estimated of the shadow economy for 110 countries, including developing, transition and developed OECD economies. He used currency demand approach and dynamic multi-factor multivariable

(MIMIC) approach for estimating the size of the underground economy of different countries. According to his findings the sizes of the shadow economy of some Asian countries are:

Table 1: The size of the shadow economy in 10 Asian countries

No.	Country	Shadow Economy [as % of GDP] using the dynamic and currency-demand method		
		Average 1990/91	Average 1994/95	Average 1990/2000
1	Bangladesh	28.4	32.4	35.6
2	China	10.5	12.0	13.1
3	India	20.6	21.8	23.1
4	Nepal	31.7	35.2	38.4
5	Pakistan	28.2	31.4	36.8
6	Sri Lanka	36.2	40.1	44.6
7	Thailand	43.2	47.3	52.6
8	Indonesia	15.4	17.6	19.4
9	Malaysia	25.1	27.4	31.1
10	Philippines	37.2	40.1	43.4

Hassan (1998) used a formal econometric modeling to estimate the size of the underground economy in Bangladesh and analyzed its impact on government fiscal position and the allocation of economic resources in the aggregate economy. Hassan (1998) found that the underground GDP averaged about 22 percent of the formal GDP during 1972-95 periods. Domestic SE activities averaged 37 percent of formal GDP. Unlike prior studies, this study estimates both the underground GDP and its three components (domestic sector, import sector and export sector), thus providing insights into the dynamics of the underground economy.

Kabir Hassan (2010) estimated the size of the underground economy of Bangladesh using currency demand approach and dynamic multi-factor multivariable (MIMIC) approach. According to currency demand approach he found that the size of underground economy in Bangladesh has averaged 10.1 percent of GDP during 1975-2008. According to MIMIC results, the size of the underground economy in Bangladesh ranges from 29% in 1996 to 46.6 in 2004. There is a downward trend in the size of this underground economy from 2006 (36.6%) to 2008 (34.4%). According to his paper the size of the underground economy in Bangladesh varies from 10% to 38% depending on the above mentioned approaches.

Though the empirical works for finding the size of the underground economy of Bangladesh is not new, findings are still mixed and inconclusive due to difference in econometric methodology, the particular assumptions of the model and methodology used. For effectual macroeconomic policy of persistently changing macroeconomic environment, continued study into this area is warranted.

V. Empirical Model:

The basic regression equation for the currency demand, proposed by Tanzi (1980, 1983), is the following cash holdings to current and deposit accounts, TW is a weighted average tax rate (to proxy changes in the size of the shadow economy), WS/Y is a proportion of wages and salaries in national income (to capture changing payment and money holding patterns), R is the interest paid on savings deposits (to capture the opportunity cost of holding cash) and Y/N is the per capita income.[2]

$$\left(ln\frac{C}{M_2}\right) = \beta_0 + \beta_1 \ln(1+TW)_t + \beta_2 \ln\left(\frac{WS}{Y}\right)_t + \beta_3 lnR_t + \beta_4 ln\left(\frac{Y}{N}\right)_t + U_t$$

with $\beta_1 > 0, \beta_2 > 0, \quad \beta_3 < 0, \quad \beta_4 > 0$

Where ln denotes natural logarithms, $\frac{C}{M_2}$ is the ratio of currency to money supply

With the increase in currency, or the amount unexplained by the conventional or normal factors is then attributed to the rising tax burden and the other reasons leading people to work in the underground economy. Figures for the size and development of the underground economy can be calculated in a first step by comparing the difference between the development of currency when the direct and indirect tax burden and government regulation are held at lowest values, and the development of currency with 1 The estimation of such a currency demand equation has been criticized by Thomas (1999) but part of this criticism has been considered by the work of Giles (1999 a, b) and Bhattacharyya (1999), who both use the latest econometric techniques, the current (higher) burden of taxation and government regulation. Assuming in a second step the same income velocity for currency used in the underground economy as for legal M1 in the official economy, the size of the underground can be computed and compared to the official GDP. This is one of the most commonly used approaches.

Our estimation is based on Tanzi (1980, 1983) model but with some modification to fit Bangladesh economy. Moreover, currency demand methods - including Tanzi's (1980, 1983) original model- are built upon the regression model with multiple time series variables. The first step is to specify and estimate a demand function for currency of the following form:

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[2] *The estimation of such a currency demand equation has been criticized by Thomas (1999) but part of this criticism has been considered by the work of Giles (1999 a, b)and Bhattacharyya (1999), who both use the latest econometrics techniques.*

$$CM_r = \alpha_0 + \alpha_1 TG_r + \alpha 2\pi + \epsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where,

$CM_r = Currency - money\ supply\ ratio$

$TG_r = Tax - GDP\ ratio\ rati$

$\pi = Inflation$

ε= *standard error term*

Model Assumptions:

- All activities in the underground economy/market avoid the use of checks and rely on currency for making payments.
- The velocity of money for currency in the underground economy is the same as that of narrow money (M1) or that of legal money or an average of these two velocities.

VI. Data Source, Data Description and Methodology

6.I Data Source:

Annual data on currency in circulation, M1, broad Money (M2), total number of bank branches are taken from various issues of the Annual Report of Bangladesh Bank and Monthly Economic Trends on Bangladesh Economy by the Central Bank of Bangladesh (BB). Data on GDP, total population, price indices are taken from various issues of the Bangladesh Bureau of Statistics (BBS) and the data on Tax Revenues are taken from various issues of the Annual Report of National Board of Revenue (NBR). Data are collected from 1973 to 2010. We ignore the data set from 1971 to 1973 because the data for the pre 1973 period are suspected to be noisy due to sudden political disruption (military coup), economic shocks (famine, flood etc.) and post war reconstruction due to very low economic activity in the early stage of independence of the country during that period. All the data are collected in nominal terms. Unit of data are expressed in local currency[3] (million). All data are collected in local currency. Table 3 shows the descriptive statistics of the variables. From Graph 5, Graph 6, Graph 7 and Graph 8, we can visualize the trending behavior of the observed variables.

[3] *Local currency of Bangladesh is Taka*

6.2 Data Description:

Data used in this model are currency money supply ratio, tax GDP ratio, inflation rate and number of bank branches per head. Currency-Money Supply ratio (CMR) is the ratio of currency outside the bank and broad money. The most commonly used measure of broad money is M2, which includes currency and coins, and deposits in checking accounts, savings accounts and small time deposits, overnight repos at commercial banks, and non-institutional money market accounts. This is the main measure of the money supply, and is the economic indicator usually used to assess the amount of liquidity in the economy as it is relatively easy to track. For calculating Tax-GDP ratio (TGr) we took nominal GDP at current price and total Tax revenue mobilized in the whole economy at that respective fiscal year. Number of Bank Branches per head (BANKP): To get this ratio we divide total number of bank branches by total population.

6.3 Methodology

By and large, macroeconomic time series data shows non-stationary behavior. When non-stationary series are included in a regression, the outcome of that regression suffers from spurious problem. In order to eschew the problem, prior determination of unvaried properties of the time series need to be done to estimate the parameters. We can get a meaningful long run relationship between/among the variables if the properties of the series (variables) follow the same order of integration. Through co-integration technique we can identify a combination of stationary series from non-stationary series set. Testing for co-integration involves two steps. At first we have to test the presence of unit root or non-stationarity and in the second stage co-integration techniques are performed to identify the existence of a long-run relationship. Unit root test (test of stationarity), Johansen (1988, 1995) maximum likelihood estimation system are used in our study. In addition, we verify whether there is a long run relationship exists among our model variables. The whole process of estimation is run by the sixth version of the package Econometric Views, i.e., EViews 5.

At the beginning of the analysis, stationary properties of the data series are verified to determine the order of integration of the individual series with certainty. Two types of tests are conducted with different null hypothesis: the ADF (Dickey & Fuller,1981; Said & Dickey, 1984) tests the unit-root-null, and the KPSS (Kwiatkowski, Phillips, Schmidt, & Shin, 1992) tests the no-unit-root-null. The reason why we employ two unit root test with different null hypothesis is that: Although ADF unit root test shows that the variables are non-stationary but graphical representation of the observed series demonstrate trending behavior. That's why ADF regression exhibit strong multicollinearity between deterministic trend and the lagged variable. In order to handle this potential multicollinearity problem,

the alternative way is to consider the stationary test. KPSS is the relevant technique for checking the stationarity where deterministic trend is removed from the data. Under KPSS test, the null hypothesis is specified as "trend stationary[4]" and alternative hypothesis is specified as "difference stationary[5]".

After verifying the stationary properties of our data series individually and we investigate whether there exists a long run relationship in our proposed model. In this paper, we considered Johansen (1988, 1995) maximum likelihood estimation system. At last we find out the long run cointegrating relationship (Fully Modified Phillips-Hansen Estimate). This method modifies least squares to account for serial correlation effects and for the endogeneity in the regressors that result from the existence of a co-integrating relationship. The resulting Fully Modified OLS (FMOLS) estimator is asymptotically unbiased and has fully efficient mixture normal asymptotic allowing for standard Wald tests using asymptotic Chi-square statistical inference.

VII. Econometric Analysis and Empirical Results

7.I Stationary Test

We begin by examining the time-series properties of the series (TGr, CMr, DP and BANKP). To this end, stationary properties of the relevant variables have been verified by performing Augmented Dickey-Fuller (ADF) statistic (Said and Dickey, 1984) to test for unit root null, and Kwiatkowski- Phillips-Schmidt-Shin (KPSS) statistics (Kwiatkowski et al., 1992) to test for no-unit root null. In implementing ADF and KPSS unit root test, each variable is regressed with and without a trend variable. If the trend variable was not significant, it was dropped. The Schwarz Info Criteria determine nine leys for the calculation of ADF statistics including both trend and intercept. The results Trend stationary series becomes stationary series if deterministic trend is removed from time series data. We can generate stationary series by differentiating the data but it induces moving average behavior in the resulting series. Difference stationary series becomes stationary series when differenced the appropriate number of times. They are termed as I (k) which means series are integrated of order K shown in Table 2 present that the variables under consideration are well characterized as non-stationary or I (2) processes.

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[4] *Trend stationary series become stationary series if deterministic trend is removed from time series data. We can generate stationary series by differentiating the data, but it induces moving average behavior in the resulting series.*

[5] *Difference stationary series becomes stationary series when differenced the appropriate number of times. They are termed as I(k) which means series are integrated of order k.*

7.2 Scenario 1: (Simple Ordinary Least Square)

Regression Equation:

CMR = 0.26889 - 1.67746*TGR + 0.08819*DP
t-statistics: (7.451) (-3.587) (1.271)

DW-Statistics: 0.65788
Adjuster R-Squared: 0.48691

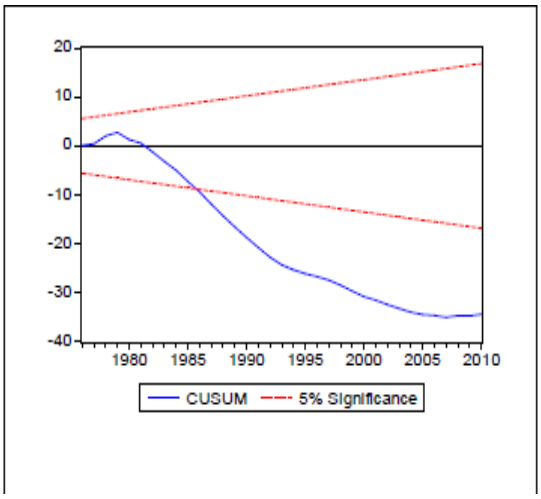
The estimated coefficient of TGR is statistically significant at 1% level, with t statistic values well in excess of 2 but inflation rate (DP) is not significant. The overall regression fit, as measured by the R-squared statistic, indicates considerably poor. The low value of the Durbin-Watson statistic reported above is indicative of the presence of serial correlation in the residuals of the estimated equation. If uncorrected, serial correlation in the residuals will lead to incorrect estimates of the standard errors, and invalid statistical inference for the coefficients of the equation.

Diagnostic tests of OLS residuals (Normality test, Serial Correlation test and Heteroskedasticity test) were performed in order to test the characteristics of the OLS for further econometric analysis. Diagnostic test of the OLS residuals show strong autocorrelation and Heteroskedasticity of the variables. Jarque-Bera Statistics reveals them departure of the normality of the residuals (See Table 3 in Appendices).

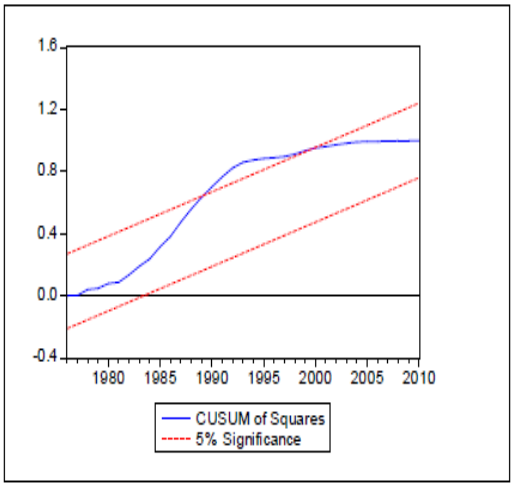
7.3 Structural Stability (Stability Test)

Structural break is one of the important concerns in non-stationary time series prediction. Cumulative Sum of Recursive Residual (CUSUM) and Cumulative Sums of Square (CUSUMS) statistics (Brown et al. 1975) have been developed as general methods for single structural break detection. The structural break detection performance can be improved if we can increase the pre-break data size or decrease the post-break data size resulting a modified Centered CUSUMS that overcome the existing weakness. Parameter stability is indicated when the plots of CUSUM and CUSUMSQ stay within 5% significance level. However the parameters and hence the variance are unstable if the plots of the CUSUM and CUSUMSQ outside the 5% critical lines.

Graph 1: Cumulative Sum of Recursive Residuals



Graph 2: Plot of Cumulative Sum of Squares of Recursive Residuals



7.4 Scenario 2: Development of Banking Sector and a Dummy to capture the Structural Change in the Economy)

BANK is the ratio of number of bank branches per head and DT is a dummy which assumes 0 up to 1995 and then it increases cumulatively by one.

Regression Equation:

CMR = 0.38046 -1.21787*TGR - 0.02680*DP - 0.00191*DT - 2799.63*BANKP
t-statistics (8.239) (-2.1014) (-0.4306) (-1.305) (-7.202)

DW-Statistics: 0.6580
Adjuster R-Squared: 0.7977

The estimated coefficients BANK and TGR are statistically significant at 1% and 5% level. Inflation Rate & DT are not significant. The overall regression fit, as measured by the R-squared statistic, indicates a very tight fit. The above model also fails to pass through the normality and autocorrelation test but passes heteroskedasticity test.

7.5 Scenario 3: Ordinary Least Square Estimation (Dropping Dummy and Adding Time Trend)

Regression Equation:

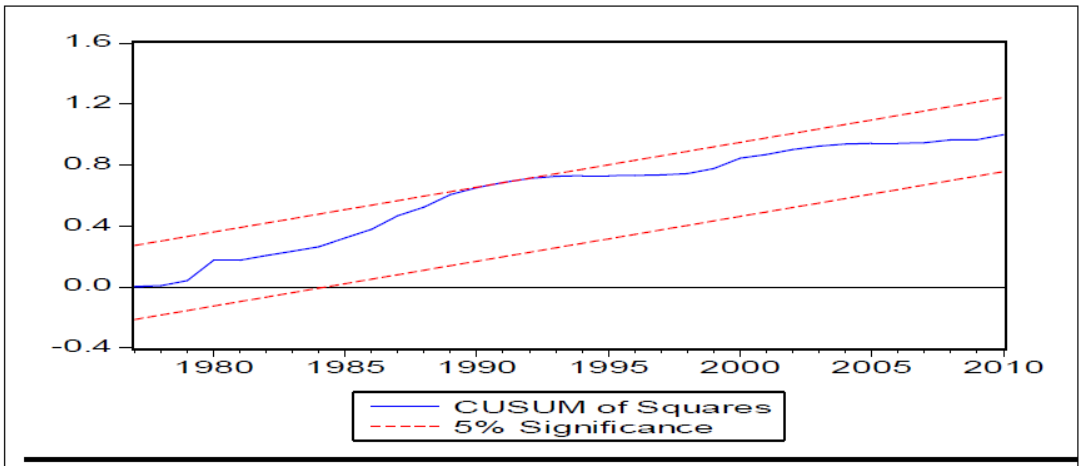
CMR = 0.235 + 0.715*TGR + 0.0740*DP - 1302.739*BANKP - 0.0035*@TREND
t-statistics: (6.037) (1.472) (1.707) (-3.422) (-5.906)

DW-Statistics: 1.2013
Adjuster R-Squared: 0.8966

The estimated coefficients BANK and time trend are statistically significant at 1% level but inflation rate (DP) and tax-gdp ratio (TGr) are not signiificant. The overall regression fit, as measured by the R-squared statistic and Durbin-Watson statistic has improved slightly considerably. Scenario three passes all the diagnostics tests at conventional significance level except the heteroscadasticity test. So, autoregressive conditional heteroscedasticity test of residuals has been carried out and found out that both low value of Langrange Multiplier and F-statistic fail to confirm the presence of heteroscedasticity. Plot of cumulative sum of squares of residuals also indicates the constancy of regression coefficients of scenario 3.

The model 3 is estimated by OLS and the residuals are subjected to the CUSUMSQ test. Since plot of the CUSUMSQ is confined within the 5% critical bounds of parameter stability. To check whether there exists a long-run relationship between the explained and the explanatory variables, a VAR (2) cointegrating Johansen's ML procedure has been applied on the basic structure of Scenario 3.

Graph 3: Plot of Cumulative Sum of Squares of Recursive Residuals



7.6 Johansen Co-integration Test

The set of stationary properties of observed variable series allow us to exercise the Johansen co-integration test for estimating long-run relationship among the dependent variable currency-money supply ratio, tax-gdp ratio, inflation rate, number of bank branches per head and time trend. I first employ conventional cointegration technique of the Johansen (1988, 1991) using the "trace" and "maximum Eigen value" statistics. In this regard, first step is to choose a specific lag length. In general, the number of lags to capture autocorrelation was set to one in the test equations since we have annual data.

Both the “trace statistic” and the “Eigen value statistic” lead to a clear rejection null hypothesis of r=0 (no cointegrating vector) against alternative hypothesis r=1 (one cointegrating vector) while same for r=1 against the alternative hypothesis of r=2 (two cointegrating vectors) cannot be rejected at 5% level of significance. Therefore trace test indicates 2 cointegrating equations among the variables CMr, TGr, DP and BankP at 5 percent levels of significance. (See table 7 at Appendices)

Johansen cointegration method provides a long run relationship among the dependent variable currency-money supply ratio (CMr), tax-gdp ratio (TGr), inflation rate (DP), number of bank branches per head (BANKP).

The cointegrating equation for the entire sample is:

CMR = -1.25282 + 1.399*TGR + 5.2632*DP - 15625.33*BANKP
t-statistics (0.5538) (4.10612) (0.74092) (6331.36)

7.7 Scenario 4: Long run cointegrating Relationship

Table 2: Regression Output for Long run cointegrating Relationship

Dependent Variable: CMR				
Method: Fully Modified Least Squares (FMOLS)				
Date: 05.05.2011, Time: 23:19				
Sample (adjusted): 1974 2010				
Included observations: 37 after adjustment				
Co-integrating equation deterministic: C@ TREND				
Long Run co-variance Estimate (Bartlett kemel, Andrews bandwidth=3.7701)				
Variables	**Co-efficient**	**Std. Error**	**t-statistic**	**Prob.**
TGR	1.169677	0.466336	2.508230	0.0174
BANKP	-1199.131	380.6074	-3.150573	0.0035
DP	0.105718	0.039468	2.678577	0.0116
C	0.201261	0..038500	5.227512	0.0000
@TREND	-0.003747	0.000568	-6.600651	0.0000
R-squared	0.0871995	Mean Dependent Variable		0.162475
Adjusted R-Squared	0.855251	S.D. of Dependent Variable		0.040235
S.E. of Regression	0.015308	Sum Squared Resid		0.007499
Durbin-Watson Stat	1.180932	Long-run Variance		0.000173

In equation form, Long Run Cointegrating Relationship (Fully Modified Phillips-Hansen Estimate) can be written as:

CMr = 0.201+ 1.169*TGr-1199.131*Bankp+0.105*DP-0.0037*@Trend
t-statistics (5.2275) (2.508) (-3.150) (2.678) (-6.600)

DW-Statistics: 1.180
Adjuster R-Squared: 0.855

All the variables are significant at 1% level of significance and Durbin-Watson statistics also reveals no autocorrelation in the residuals. Adjusted R-Squared also shows a good fit of the model.

7.8 Empirical results:

For each year CMr with the explanatory variable TGr (CMrt) and without it (CMrwt), that is, TGr set equal to zero - were calculated. This difference between CMrt and CMrwt gives an idea of excess currency that is being held to finance those underground activities arising from attempts at tax evasion. The level of increased demand for currency is presumed to indicate the magnitude of tax evasion, which in literature has been defined as illegal money (IM):

$$IM=\left[\left(\frac{CC}{M_2}\right)_t - \left(\frac{CC}{M_2}\right)_{wt}\right]$$

Following Tanzi (1980) legal money (LM) is defined as the difference between the sum of currency and demand deposits (that is, the definition of the money supply) and the estimated illegal money:

$$LM = M_1 - IM$$

Assumption 1: Velocity of Illegal Money Equals to the Velocity of Legal Money Dividing gross nominal domestic product (GDPM) by legal money gives an estimate of income velocity (IV):

$$IV = \frac{GDPM}{LM}$$

Assuming that the velocity of illegal money is the same as that of legal money an estimate of the underground economy (UE) has been obtained by multiplying the estimated volume of illegal money(IM) by the income velocity of money(IV):

$$UE = IM*IV$$

The annual estimates of the underground economy in Bangladesh for the period 1973-2010 are provided in Annex A. It shows that the size of the underground economy in Bangladesh was only 7% of nominal GDP in 1973. Since then it increased phenomenally and in 2010 it stood at 80% of GDP.

Assumption 2: Velocity of Illegal Money Equals to the Velocity of Narrow Money (M1)) Under this assumption the relative size of the Underground Economy has been estimated by the following equation:

$$\mathrm{UEr} = \frac{\left[IM * \left(\frac{GDPM}{M_1}\right)\right]}{GDPM} * 100$$

Under this case, the UE has accelerated from 6.8% of GDP in 1974 to 45% of GDP in 2010.

Assumption 3: Velocity of Illegal Money Equals to the Average Velocity of Legal Money and Narrow Money It is natural that the first case might overestimate and the second one underestimates the actual size of UE in Bangladesh. Therefore, a third approach is also been taken recourse to reconcile the two extremes of the above scenarios. Here, the relative size of the UE has been estimated by averaging the two velocities calculated under Case 1 and Case 2:

$$\mathrm{UE_r} = \frac{(\mathrm{IM} * \mathrm{IV_3})}{\mathrm{GDPM}} * 100$$

Where,

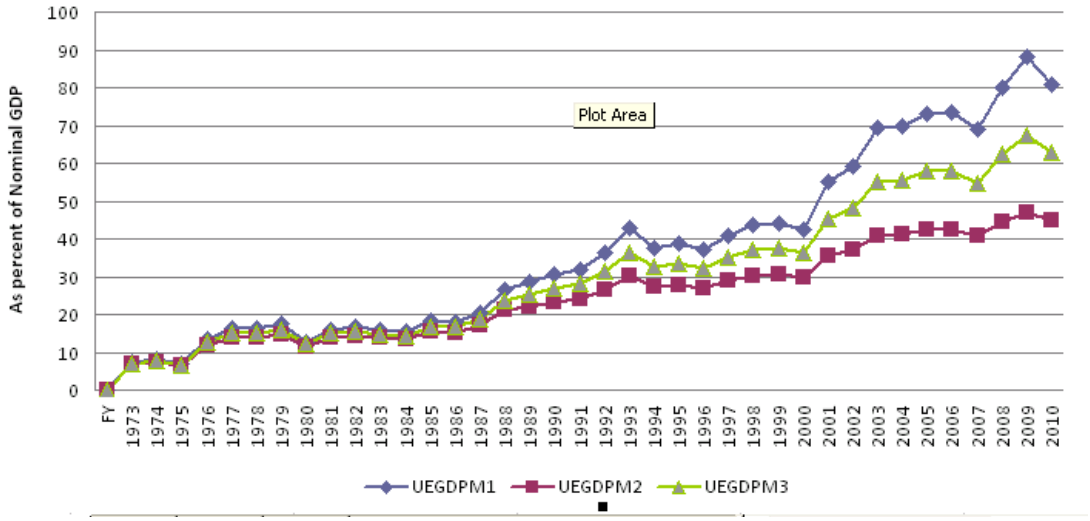
$$\mathrm{IV_3} = \frac{\left[\mathrm{GDPM}\left(\frac{1}{\mathrm{LM}} + \frac{1}{\mathrm{M_1}}\right)\right]}{2}$$

Under this case, it has been found out that the present size of UE in Bangladesh is about 62.75% of its official estimate of GDP.

VII. Discussion of Results

From the options discussed above, suggests that the size of the underground economy in Bangladesh varies in three different cases. The sizes of the underground economy as percentage of GDP in FY10 are 80%, 45% and 63% respectively.

Graph 4: Historical Movement of Underground Economy of Bangladesh under three alternative Options.



From the Graph 4, it revealed that the size of the underground economy under UGDPM3 in FY2000 was 37.24% of GDP which is consistent with the findings of Friedrich Schneider (2004) (See Table-1). Under UGDPM3, Underlying assumption is Velocity of Illegal Money equals to the Average Velocity of Legal Money and Narrow Money.

Under all the cases the growth of the size of the underground economy of Bangladesh was fairly stable until FY1986. But it started to move upward with systematic growth without much fluctuation. Undergrowth Economy got its momentum from FY2000 and expanding its size alarmingly irrespective of three cases. The highest peak started from 2000 and onwards. This is due the government policy of investing unreported /black money to housing and other unproductive sectors by giving minimum tax as penalty. A downward trend in the size of this shadow economy starts from 2009.

IX. Policy Implication

During the most arduous part of the transition period underground activity can actually improve growth prospects. This is because it provides a platform for informal firm creation limits the impact of an out-of-date regulatory regime and may improve income distribution at a time of austerity. But it is also true that the continued presence of an underground economy hinders long-term growth and international competitiveness. We believe that the presence of an underground economy is not an irreversible plague on a country's development. If institutional and regulatory problems are addressed and improvements

are maintained, then one should expect an eventual turn-around of underground activity. Followings are some of the policies which policy maker can consider for reducing the ever growing size of the underground economy of Bangladesh.

I) Taxation

One of the main motivations of underground activity is to evade taxes. Tax reform can directly address this. Such reform comprises several components.

(a) Tax Amnesty: Pakistan tried it out tax amnesty even under military rule but could not succeed. India too experimented with various measures to mop up such money but to little avail on the whole. In Bangladesh the tax amnesty scheme failed due to the fact that there existed several similar tax amnesty schemes which are less costly and more convenient for the black money holders. In spite of the apparent failure this scheme may time to time be offered to allure the black money holders because whatever may be the quantity of revenue, the administrative cost involved to collect it is very minimal.

Tax Amnesties are costly since it realizes less than full tax revenue and undermines the credibility of tax authority. A poorly designed and poorly timed tax amnesty creates the moral hazard problem among the potential tax payers. Such amnesty schemes may fuel expectations that one can generate black money in anticipation of another opportunity to get amnesty. Before declaring tax amnesties, authority should consider the previously generated revenue when it was declared. International experience suggests that authority should consider for playing one shot game with the higher degree of discounting in order to large turn-out at a time. Since recovery of undeclared income is a difficult task, tax administration should pay attention for stricter monitoring and auditing practice over the existing TIN holders so that they can not avail more than one such opportunity.

Therefore, Tax amnesty should be timely designed and well timed so that authority can reap the full benefit of one off revenue impact from tax payers declaring their past income and more importantly the future tax revenue stream that is generated once these tax payers are properly registered in the tax system. Most importantly, amnesty window should be relatively of short duration ideally not exceeding 4-6 months. Besides, Tax audit should be designed to minimize evasion; audit should be random. Incomes corresponding to lower taxes should be audited with higher frequency. Internal audit and inspection system must attain efficiency of international standard. Penalty policies should also be designed to minimize tax evasion. Detection of evasion by itself is not sufficient, detected evaders must be effectively penalized.

b) Voluntary Disclosure of Income Scheme: Voluntary Disclosure of Income Scheme (VDIS) was a very unconventional but successful step among the Indian economic policies. It would give an opportunity to the income tax defaulters to disclose their undisclosed income at the prevailing tax rates. In the budget for the fiscal year 2009-09, Nepal announced the VDIS scheme for collecting 10 percent tax on income that has no source in order to spend that money for infrastructural development.

NBR may also explore the opportunities for launching long-term sectoral bonds or infrastructure bonds to unearth unaccounted money and use it to fund the country's development needs. Such scheme can partially suck out the unaccounted money in circulation and simultaneously help the government fund its development programmes. The Scheme will not apply where the Income Tax Division has already commenced an investigation into individual's tax affairs or if the Income Tax Division starts an investigation during the period of the Scheme.

(c) Broadening the Tax Base: The development of the financial system (Financial deepening defined as the ratio of M2 to GDP) and economic development are closely intertwined. Although financial system has developed considerably by this time, but government has failed to increased its tax net. As a result, underground ground economy is expanding. Most of the Government policies based on such macroeconomic variables were then less likely to succeed. One policy option is that NBR should consider about the widening its territory up to Upazila Level to capture the potential small and medium entrepreneurs, self employed person, grocery shoppers for paying taxes. Special incentive should be launched for bringing them in the tax net.

(II) Stricter, more strategic enforcement

Most penalties are too low to be significant in Bangladesh. The prosecution and conviction of income tax department of Bangladesh is somewhere around 15 percent. Increase of penalties and evenness of application may increase compliance, though there are several important caveats to consider. The first refers to ''exit'' from the underground economy .The second refers to whether the regulatory administration is up to the task of defending itself legally. Due to limited budgets the regulatory authorities often lack the expertise and skilled lawyers to match those that the private sector might muster in face of high penalties. An additional enforcement tactic is to bring together the various sources of information concerning economic activity that the government has at its disposal. Comparing these can help them identify shadow firm activity and aid in the development of compliance enforcement programs. Finally, policy to improve enforcement must go hand-in-hand with successful reform of the regulations themselves, in order not to destroy shadow activities whose only cause is over burdensome regulations.

(III) Institutional strengthening

It is not enough to design good regulations in order to reduce the regulatory avoidance incentive to operate in the shadow. Three other institutional aspects must be addressed. First, pro active measures of modernizing and strengthening tax administration through the use of IT, improved training, risk assessment based scrutiny, and better taxpayers' services can go a long way in reducing the volume of unreported income. Second, civil service reform must be begun. This requires retiring the old-style bureaucrats that see enterprise control, hiring better educated replacements using a system based on merit, and improving management structures and incentives. Third, the new staff needs to be trained and paid higher civil service salaries. Fourth, imposing a regulatory mandate on an underfunded regulatory body is a recipe for inefficiency, rent-seeking, and corruption, all leading to greater shadow activity. Any law that adds to a regulatory body's responsibilities should therefore identify feasible and sufficient funding sources.

IV) Bank privatization and capital market development

(A factor that would encourage firms to remain official is the availability of banking services and capital markets. Therefore, for example, banking sector privatization and restructuring that increases competition, financial deepening, and intermediation tends to reduce shadow activity by increasing the opportunity cost of being excluded from the service. Likewise, private banks that are less subject to political pressure will be less inclined to provide loans to big government owned companies that have extensive shadow operations.

(viii) Macro-stabilization

Lax budgetary and monetary policies and the resulting inflation raise the benefits from unofficial activities. They distort financial accounting, and make it harder to get caught for tax evasion. They also induce disintermediation and flight into foreign currency, both associated with shadow activity and capital flight. Conversely, attracting unofficial activities back into the official economy may assist macro stabilization.

X. Summary and Conclusion

The primary objective of this paper is to estimate the size of the underground economy of Bangladesh in case of post independence Bangladesh over the period 1973 -2010. This study also tried to find out the long run relationship of the dependent variable and explanatory variables described in the model. We also tried to draw some policy implication based on the size of the underground economy and macroeconomic situation of Bangladesh.

The estimation in this paper is based on Tanzi (1980, 1983) model but with some modification to fit Bangladesh economy. Currency demand methods -including Tanzi's (1980, 1983) original model- are built upon the regression model with multiple time series variables. Moreover, Fully Modified Phillips-Hansen Estimate (FMOLS) is used to find out the long run cointegrating relationship. This method modifies least squares to account for serial correlation effects and for the endogeneity in the regressors that result from the existence of a cointegrating relationship.

We used three assumptions under three cases to estimate the size of the underground economy of Bangladesh in terms of GDP. These assumptions are (a) Velocity of illegal money equals to the velocity of legal money (b) Velocity of illegal money equals to the velocity of narrow money (M1) and (c) Velocity of illegal money equals to the Average velocity of legal money and Narrow Money. The size of the underground economy varies depending on the assumptions used in the long run cointegrating relationship. The estimated sizes of the underground economy as percentage of GDP in FY10 under the above mentioned assumptions are 80%, 45% and 62.8 % respectively. Under all the cases the growth of UE of Bangladesh was fairly stable until FY1986. Incremental growth of underground Economy got its momentum from FY2000 and expanding its size irrespective of the cases. The highest peak started from 2000 and onwards due to some poorly design tax policy. A downward trend in the size of this shadow economy starts from 2009.

At the end of the paper we tried to put some policy implications for reducing the size of UE in Bangladesh. We mentioned some bad practices such as tax amnesty, undisclosed money whitening used by tax authority and lack of institutional capability to mobilize more tax revenue. We also suggested the some successful policies used by our neighboring countries to unearth unaccounted money and use it to fund the country's development needs.

The key findings of the study under assumption 3 are consistent with the findings of Friedrich Schneider (2004) (See Table-1). It is expected that our projection in FY2010 is also justified. Nevertheless, the findings of the present study seem reliable given the application of conventional econometric methodologies compared to many other earlier studies. Moreover, this study has added a new dimension over existing literatures since this paper tried to find out the size of the underground economy under three cases by using three different assumptions.

References

Ahumada, H., Facundo, A., Canavese A., Canavese, P., 2004. The demand for currency approach and the size of the shadow economy: a critical assessment. Discussion Paper, Delta Ecole Normale Superieure, Paris.

Aigner, D., Schneider, F., Ghosh, D., 1988. Me and my shadow: estimating the size of the US hidden economy from time series data. In: Barnett, W.A., Berndt, E.R., White, H.(Eds.), Dynamic Econometric Modeling. Cambridge University Press, Cambridge, UK,pp. 224–243.

Cagan, P., 1958. The demand for currency relative to the total money supply. Journal of Political Economy 66, 302– 328.

Friedman, E., Johnson, S., Kaufmann, D., Zoido-Labton, P., 2000. Dodging the grabbing hand: the determinants of unofficial activity in 69 countries. Journal of Public Economics 76, 459– 493.

Gerxhani, K., 2003. The informal sector in developed and less-developed countries: a literature survey. Public Choice 114, 295– 318.

Johnson, S., Kaufmann, D., Shleifer, A., 1997. The Unofficial Economy in Transition. Brookings Papers on Economic Activity. Brookings Institute, Washington, DC.

Johnson, S., Kaufmann, D., Zoido-Lobato´n, P., 1998b. Corruption, public finances and the unofficial economy.

Schneider, F., 1986. Estimating the size of the Danish shadow economy using the currency demand approach: an attempt. The Scandinavian Journal of Economics 88, 643–668.

Schneider, F., 2000. The increase of the size of the shadow economy of 18 OECD Countries: some preliminary explanations. Paper presented at the Annual Public Choice Meeting, Charleston, SC.

Schneider, F., 2003. The shadow economy. In: Rowley, C.K., Schneider, F. (Eds.), Encyclopedia of Public Choice. Kluwer Academic Publishers, Dordrecht.

Schneider, F., Enste, D., 2000. Shadow economies: size, causes, and consequences. Journal of Economic Literature 38, 77–114.

Schneider, F., Enste, D., 2002. The Shadow Economy: Theoretical Approaches, Empirical Studies, and Political Implications. Cambridge University Press, Cambridge, UK.

Schneider, F., Hofreither, M.F., Neck, R., 1989. The consequences of a changing shadow economy for the official economy: some empirical results for Austria. In: Boes, D.,Felderer, B. (Eds.), The Political Economy of Progressive Taxation. Springer, Heidelberg, pp. 181– 211.

Tanzi, V., 1980. The underground economy in the United States: estimates and implications. Banca Nazionale del Lavoro 135, 427– 453.

Tanzi, V., 1983. The underground economy in the United States: annual estimates, 1930–1980. IMF Staff Papers 30, 283–305.

Tanzi, V., 1999. Uses and abuses of estimates of the underground economy. Economic Journal 109, 338– 340.

Thomas, J.J., 1986. The underground economy in the United States: comment on Tanzi. IMF Staff Papers 33, 782–789.

Appendices

Table 3 Descriptive Statistics of the Variables

Descriptive Statistics	Tax-GDP Ratio (TGr)	Currency-Money Supply Ratio (CMr)	Inflation Rate (DP)	Number of Bank Branches Per Head (BANKP)
Mean	0.066281	0.166029	0.094367	0.0000449
Maximum	0.092613	0.297523	0.526207	0.0000537
Minimum	0.034060	0.121582	-0.054642	0.0000177
Standard Deviation	0.0515332	0.045333	0.103363	0.0000102

Table 4 Results of Stationary Tests

Unit Root Test						
Tests	Trend Assumption	Level/First differenced	TGr	CMr	DP	BANKP
ADF	Intercept	Level	-1.682045	-3.667974***	-4.270367***	-2.878891*
	Trend & Intercept	Level	-2.919809	-4.545583***	-4.582778***	-0.215973
	Intercept	First Difference	-6.993217***	-5.393340***	-6.138001***	-1.709807
	Trend & Intercept	First Difference	-6.89554***	-8.498501***	-6.7162779***	-1.416624
KPSS	Intercept	Level	0.7859**	0.662837**	0.574401**	0.302277
	Trend & Intercept	Level	0.081174	0.200834**	0.150739**	0.168816**
	Intercept	First Difference	-0.067876	0.453385*	0.267243	0.413453*
	Trend & Intercept	First Difference	-0.066942	0.078544	0.177452**	0.162599**

Note: 1. *, ** and *** indicates the rejection of nullhypothesis at 10, 5, 1 percent level of significance
2. lag length of ADF test has been determined by Schwarz Info Criterion
3. Maximum bandwidth for KPSS has been determined by the Newey-West method
4. Critical values are obtained from Mackinnon (1996) for ADF and PP test.
5. TGr denotes Tax- GDP ratio, CMr denotes Currency-Money Supply ratio and DP denotes inflation rate and BANKP denotes number of Bank Branches per Head.

Table 5 Diagnostic Statistics for Scenario 1

Diagnostic Test Statistics	Normality Test	Seial Correlation (LM Test)	White Heteroskedasticity
Jarque-Bera Statistics	6.639 (P-value:0.036)		
LM Statistics		20.305 (P-value:0.000)	
Obs*R-squared (LM Statistics)			8.6433 (P-value:0.1247)

Table 6 Diagnostic Statistics for Scenario 2

Diagnostic Test Statistics	Normality Test	Seial Correlation (LM Test)	White Heteroskedasticity
Jarque-Bera Statistics	3.4725 (P-value:0.176)		
LM Statistics		22.28 (P-value:0.000)	
Obs*R-squared (LM Statistics)			24.37 (P-value:0.0106)

Table 7 Diagnostic Statistics for Scenario 3

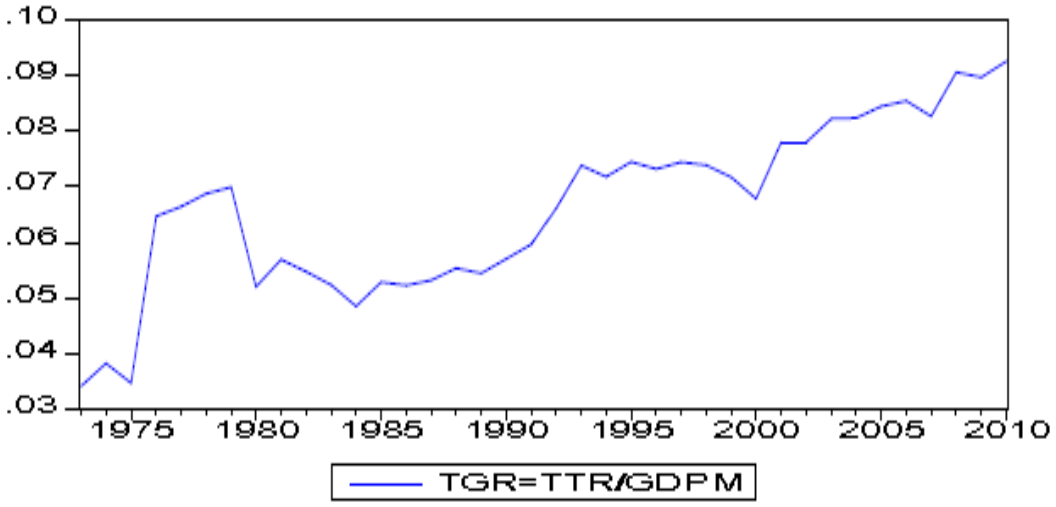
Diagnostic Test Statistics	Normality Test	Seial Correlation (LM Test)	White Heteroskedasticity
Jarque-Bera Statistics	2.00 (P-value:0.367)		
LM Statistics		6.153 (P-value:0.054)	
Obs*R-squared			19.193 (P-value:0.1315)
Obs*R-squared (ARCH LM)			0.4689 ((P-value:0.5070)

Table 8 Results of Johansen's Co-integration Test

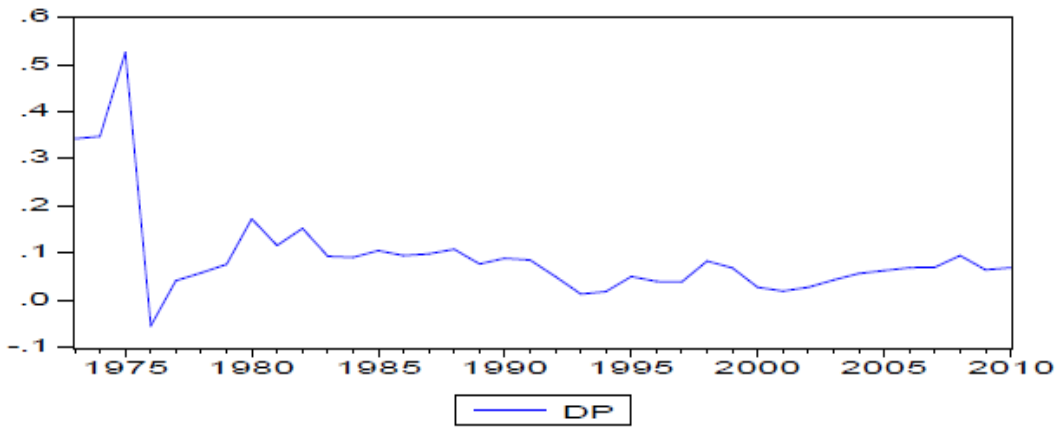
Hypothesis	Eigenvalue	Trace statistics	Critical Value (0.05)	Prob**
Cointegraing Equation: CMR = -1.25282 + 1.399*TGR + 5.2632*DP - 15625.33*BANKP				
SE		(0.5538)	(4.10612) (0.74092)	(6331.33)
Ho: r=0; Ha: r=1	0.769182	52.78056	28.58808	0.0000
Ho: r=1; Ha: r=2	0.536818	27.70688	22.29962	0.0080
Ho: r=2; Ha: r=3	0.185848	7.401915	15.89210	0.6202
Ho: r=3; Ha: r=4	0.091804	3.466626	9.164546	0.4973

Note: (*), (**) denotes the rejection of the hypothesis at the 5% and 1% level. Numbers beneath the cointegrating equation are corresponding standard errors. "r" denotes the number of cointegrating vector

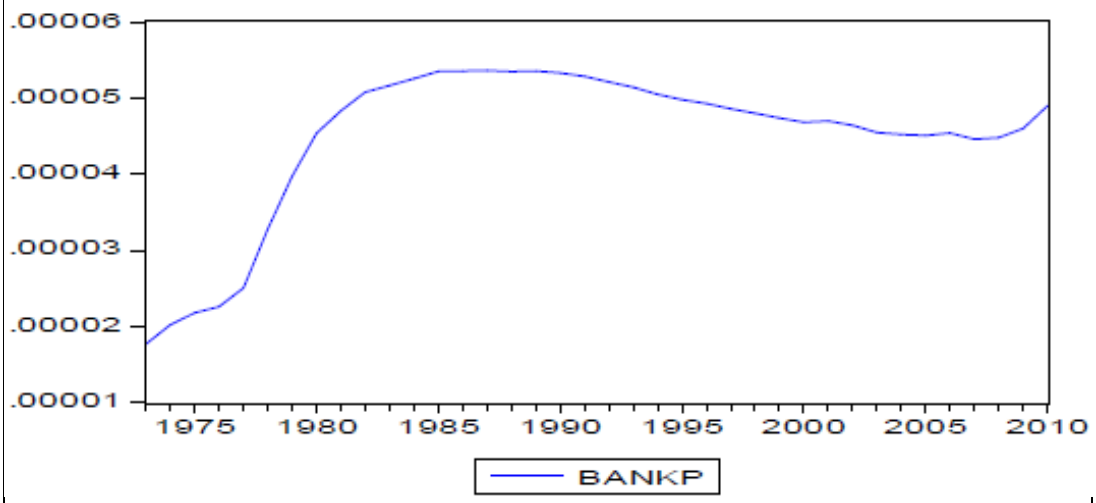
Graph 6 Historical Movement of Currency-Money Supply Ratio



Graph 7 Historical Movement of Inflation Rate (base year 1985-86) DP



Graph 8 Historical Movement of No. of Bank Branches per head (BANKP)



Graph 9 Autocorrelation Plot of Residuals

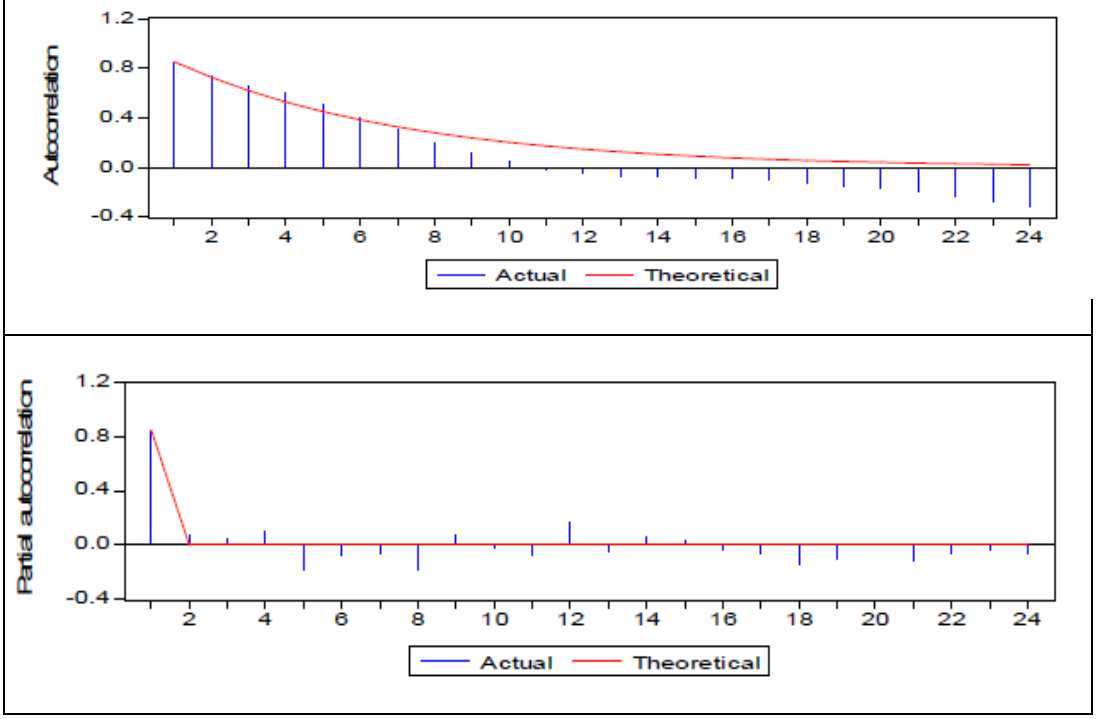


Table 9: Size of the underground Economy (as Percent of GDP) of Bangladesh from 1973 to 2010

	$UEGDPM_1$	$UEGDPM_2$	$UEGDPM_3$
FY	$\frac{ue}{gdpm} * 100$	$\frac{IM * IV_2}{GDPM} * 100$	$\frac{IM * IV_3}{GDPM} * 100$
1973	7.27	6.77	7.02
1974	8.05	7.45	7.75
1975	6.81	6.38	6.60
1976	13.61	11.98	12.80
1977	16.14	13.89	15.02
1978	16.37	14.07	15.22
1979	17.37	14.80	16.09
1980	12.85	11.39	12.12
1981	16.08	13.85	14.96
1982	16.90	14.46	15.68
1983	15.86	13.69	14.78
1984	15.45	13.38	14.42
1985	18.17	15.37	16.77
1986	18.05	15.29	16.67
1987	20.41	16.95	18.68
1988	26.62	21.03	23.82
1989	28.59	22.23	25.41
1990	30.42	23.33	26.88
1991	31.92	24.20	28.06
1992	36.43	26.70	31.57
1993	42.95	30.05	36.50
1994	37.71	27.38	32.55
1995	38.69	27.89	33.29
1996	37.09	27.05	32.07
1997	40.98	29.07	35.02
1998	43.67	30.40	37.03
1999	44.17	30.64	37.41
2000	42.52	29.84	36.18
2001	55.26	35.59	45.43
2002	59.36	37.25	48.30
2003	69.49	41.00	55.25
2004	69.65	41.05	55.35
2005	73.25	42.28	57.77
2006	73.44	42.34	57.89
2007	68.87	40.78	54.83
2008	80.10	44.47	62.29
2009	88.14	46.85	67.49
2010	80.82	44.70	62.76