The PIDE Research Report Series offers an up-to-date exposition of various economic, demographic, and anthropological aspects of the development process in developing countries generally and in Pakistan particularly. Its wide dissemination is aimed at providing a firm foundation for useful policy-making in addition to encouraging academic interaction.

The major areas of research addressed by the Series are macroeconomics and sectoral issues, international trade, labour market issues, demographic patterns, anthropological approaches, growth, and distribution. Manuscripts submitted for publication in the Series are reviewed by the PIDE Research Report Committee and published from time to time.

ISBN 969-461-120-2

RESEARCH REPORT NO. 184

Underground Economy and Tax Evasion in Pakistan: A Critical Evaluation

M. Ali Kemal
Staff Economist,
Pakistan Institute of Development Economics, Islamabad

Acknowledgements: **I am deeply indebted to Dr Ather Maqsood Ahmed for supervising the writing of this report. Special thanks to Dr A. R. Kemal who helped me in conceptualising the issues involved at every stage. I am extremely grateful to Dr Faiz Bilquees who helped me in improving the paper by giving valuable comments and suggestions. I would like to thank my wife, Maria, for helping me in editing of this paper. Last but not the least, I would like to**

acknowledge the assistance of my friends and colleagues at PIDE who facilitated to completion of the final draft of this research report.

C O N T E N T S

List of Tables

List of Tables Appendix 2

List of Graphs

I. INTRODUCTION

A large number of economic activities are not reported to formal economy in Pakistan and thus remain out of the tax net; such activities includes smuggling, corruption, black-marketing, narcotics, etc., constitute the black or underground economy. Thus the term "black economy"[1] indicates all those activities which are concealed from the tax authorities in an attempt to evade taxes. Tax evasion refers to all the illegal actions taken to avoid the lawful assessment of taxes.

The underground economy flourishes when cash transactions such as construction, illegal sale, smuggling, and drug trafficking are common. High tax rate, recession, high unemployment, and negative public attitudes towards government and taxes are some of the factors that lead to the spread of the underground economy, tax evasion, as well as tax avoidance. The existence of a large underground economy results in high tax rates, reduction in government services, unfair competition, and an uneven playing field for honest business. Mainly, self-employed persons are involved in tax evasion and underground economic activities because there is no formal system of documentation for self-employed persons and their activities.

Tax evasion is a significant determinant of underground economy largely due to the loopholes in tax policy. Farming community exempted from taxation is part of the underground economy. Even industrialists and traders are known to have shown their income as their farming income and have been exempted from taxation. For example, industrialists invest in purchase of land and then report the incomes from industrial and trade activity as farm income, which is tax-exempt. Similarly, another type of community works both in the formal as well as the informal sector (cash economy) and reports only formal income. Again, the tax policy provides the opportunity to conceal income because income in the informal sector is not recorded by government officials. Since these earning persons work only in the cash economy, they can evade or avoid taxes.

Tax evasion and tax avoidance are two significantly different terms. Tax evasion refers to illegal way of avoiding taxes and tax avoidance is a lawful arrangement or planning in order to reduce the tax liability. For example, if we publish a book and fail to declare any royalties that we might obtain from

[1]Some other terms also refer to black economy, such as secondary economy, hidden economy, irregular economy, unrecorded economy, informal economy, unofficial economy, underground economy, parallel economy, shadow economy, twilight economy, subterranean economy, etc. However there is a slight difference in the definition of these terms.

writing the book, this implies as tax evasion. On the other hand, if we declare royalties but in order to have relief from taxation i.e., claim various expenses incurred in writing a book,[2] then it is tax avoidance. Defining and differentiating tax evasion from tax avoidance may be easy theoretically but it is hard to distinguish while calculating it. Cowell (1985) argues that distinction is based on moral criteria and is not helpful for the economic analysis. Lewis (1982) terms it as "Avosion".

Theory suggests that a large and growing segment of economic activity may escape the elaborate measurement system that government agencies have established to monitor economic activity. Since the measurement system relies to a major extent on tax information, the growth of non-compliance with tax laws can produce distortions in the information system that generates observations on the progress of economic activity. It is generally believed that the presence of black economy is responsible for distortions in the official estimates of macro-economic variables like income generation, employment, inflation etc. This might be one of the reasons why economic factors cannot be projected more precisely and therefore, the possible effect of the economic policies cannot be ascertained properly in Pakistan. Similarly, tax authorities are unable to make an optimal policy in presence of tax evasion.

It is difficult to estimate the exact number of tax evasion and the size of underground economy. Many researchers have tried to estimate the two but their results are very different and incomparable. Almost all the researchers in Pakistan have used monetary approach, which is an indirect approach to estimate the underground economy.

The primary objective of this paper is to re-estimate the old models and check for the best fit model to estimate the underground economy and tax evasion. Secondly, the paper will re-specify the best fit model by using the latest econometric techniques to check for the actual determinants of the underground economy. Finally, estimates of the size of the underground economy and tax evasion based on this methodology will be compared with the previous estimates.

The plan of the paper is as follows: Section II reviews all the methodologies and empirical findings based on these methodologies. Data and Methodological issues pertaining to the preparation of the revised models in the light of the discussion in Section II are discussed in Section III. Empirical findings and interpretation of the revised estimates are explained in Section IV. The main findings of this study are reported in Section V.

---

[2] Cost of typing, cost of paper, cost of printing etc.

II. METHODS OF ESTIMATING UNDERGROUND ECONOMY

The size of the underground economy has been estimated by direct as well as indirect methods. In this section, we review different methods of estimation used and empirical evidence estimating from these techniques.

Methods of Estimation

Direct Method

Direct method relies largely upon the rigorous examination of a random sample of taxpayer's income tax returns. This method was used in USA by a study team set up under the commissioner of the internal revenue service. Some 50,000 randomly selected individual tax returns were subjected to detailed scrutiny by auditors. However, other sorts of undisclosed incomes of those who have not filed a tax return on income from various illegal activities such as drug trafficking and smuggling could be missed out of this survey.

Indirect Method

Indirect methods rely on discovering the traces, which the black economy leaves in its wake. Monetary approach is the most commonly used indirect method to estimate the size of the underground economy. Other indirect methods are labour market approach, fiscal approach, etc. All these methods are briefly discussed below.

Monetary Approaches

To estimate the underground economy monetary approaches are based on the premise that the safe motive to hold currency is either to finance various kinds of illegal activities, or as a means of storing the proceeds of one's ill-gotten gains. This implies that the transactions in the black economy are funded largely by cash in order to reduce the chances of detection. Three variants of the monetary approach used for the estimation of the underground economy are:

(i) The ratio of currency in circulation to demand deposits and other definitions of money (M1 or M2).
(ii) The original Quantity Theory of Money.
(iii) The large denomination banknotes, the so-called, "big bill phenomenon".

Assumptions and Criticism of the Monetary Approach

(a) According to the monetary theory currency is the sole medium of transactions in the black economy. This implies that all the illegal barter transactions such as bribe taken in the form of a vehicle or in the form of any physical infrastructure is not accounted for.

According to Smith (1986), such an assumption must be of questionable accuracy.

(b) The monetary approach assumes that there is no underground economic activity before the starting (benchmark) period. So, choosing the benchmark period is essential in the estimation of the underground economy, and the benchmark period should be meaningful according to the history (situation) of that country.

(c) Income velocity of money in both the legitimate and the black economy is assumed to be identical. This is strongly contested and some researchers have argued that the velocity is higher in the black economy, while others have opposed it. However, it is generally believed that velocity of illegal money is greater than the velocity of legal money based on the fact that most of the transactions in the illegal market are through cash (liquid money).

Guttmann's Method: The First Approach (First Definition of Currency Ratio)

In addition to the above three assumptions, Guttmann (1977) assumed that the ratio of currency in circulation to demand deposits remained unchanged in the absence of a growing black economy. He assumed that there was no black economy during the period 1937–41, therefore, the ratio of currency in circulation to demand deposits was constant during this period. However, the general perception about this period was opposite.

Guttmann used demand deposits as divider to the currency in circulation. This implies that the increase in the ratio forced people to withdraw their money from demand deposits and hold more currency. However, this may not necessarily be the case; people might shift their money from demand deposits to time deposits.

Tanzi's Method: The First Approach (Second Definition of Currency Ratio)

Tanzi (1980) estimated underground economy on an earlier insight by Cagan (1958). Cagan identified a number of factors expected to influence currency ratio and found that interest rate, real per capita income, and income tax variables are the most significant variables explaining the currency ratio. Following Cagan's findings, Tanzi (1980) linked the currency ratio to the tax rates, and used it to derive the estimates of size of the black economy in the USA. He used M2 definition of money as the divider, instead of only demand deposits, to currency in circulation, i.e., CC/M2. The explanatory variables include tax rate, share of wages and salaries in personal income, real per capita income, and interest rate on time deposits. Tanzi argues that since sales tax and other indirect taxes are difficult to evade, he uses only the income tax variable.

The use of CC/M2 overcomes the problem of using only demand deposits in denominator. But the remaining three criticisms of the assumptions of monetary approach i.e., black economy transactions are through cash only, zero black economy before starting period, and the income velocity of circulation in the formal and black economies is identical are still held.

It is interesting to note that Tanzi's estimates of the underground economy vary by the time period covered. Over the period 1929–76 the underground economy estimates were $137.5 billion (8.1 percent), and $198.8 billion (11.7 percent), using weighted average tax rate on the interest income and the ratio of total income tax payments adjusted to gross income respectively. Using the same explanatory variables, for the period 1929–80, the size of the black economy was reduced to $94.3 billion (5 percent), and $61.1 billion (3.6 percent). This clearly shows that the results are not robust and stable.

The Transaction Method: The Second Approach

Feige (1979) assumed that the total bank deposits are used in "irregular purchases" rather than just currency. However, the other two assumptions are still held. The basis of Feige's contribution is the relationship between the total value of transactions and measured income in an economy. Total transactions include sales of intermediate and second hand goods, while measured income covers only sale of final goods and services produced in the current year. This implies that the difference between total transactions and the actual GDP is the black economy.

Feige's methodology is based on three assumptions: (i) the relationship between the total value of transactions and measured GDP in 1939 was normal, i.e., underground economy was zero in that period; (ii) any increase in that ratio can be attributed entirely to an increase in the size of the black economy; and (iii) the total value of transactions in any period is given by the stock of the demand deposits multiplied by the average turnover of the demand deposits plus the stock of currency multiplied by the average turnover of currency.

Feige's estimates were significantly higher than those of Guttmann and Tanzi's. However, a major limitation of the transaction method is that the data on the total value of transactions under-taken in an economy is not readily available during a particular time-period. The value of total transactions is essential to calculate the turnover figures for currency. Feige calculated the turnover figures for currency by taking figures produced by Laurent (1979) for a number of times a unit of currency can be used before it is retired from circulation and dividing it by the estimated average lifetime of a currency.

The transaction method gives a negative hidden economy for the period 1939–68, which shows falling black economy in the era of World War II from 1939–45, while the casual observation suggests strongly rising trend [Pyle (1989)]. Using 1939 as the benchmark period was highly criticised. Frey, Weck

and Pommerehne (1982) argued that the choice of the base year is crucial, especially in Feige's methodology.

Big Bill Phenomenon: The Third Approach

According to this approach an increase in the relative importance of high denomination banknotes as part of the total amount of currency in circulation indicates an increase in the underground economic activity. This method does not give the size of the black economy, which we can calculate by using other monetary approaches. This approach only tells us whether the black economy exists or not. The approach is based on the observation that the number of high denomination banknotes have increased more rapidly than currency in general, so that an increase in proportion of the currency in circulation is made up of so-called "Big-Bills".

Empirical Findings

All the three variants of monetary approach have been used to estimate the size of the underground economy. Porter and Bayer (1984) estimated the black economy by using Guttmann, Tanzi and Feige's methodologies. They observed negative black economy for one year using Feige's methodology. According to them, Tanzi's methodology gives the most stable results. Mirus and Smith (1981) also estimated the black economy by using all the three methodologies. They seem to dismiss the transaction method as their estimates by this method showed that the size of the Canadian underground economy was less than that of the USA, which was quite surprising for everyone. They also preferred Tanzi's methodology because it gave more stable estimates. Using Guttmann's approach, Tucker (1982) estimated the size of the underground economy of Australia about 10.6 percent in 1978-79.

O'Higgins (1981) used ratio of currency to M1 and ratio of currency to M3[3] as dependent variable in estimating United State's underground economy for the period 1960–1980. His findings were not reliable because data on M1 did not exist before 1963, and there were breaks in both the M1 and M3 series in 1967, 1972 and 1975.

Mathews (1982) estimated the underground economy by using Tanzi's methodology. He used quarterly data and estimated the equations by 2SLS procedure by taking ratio of M1 to total time deposits as the dependent variable in one equation, and the ratio of notes and coins in circulation to M3 less notes and coins as a dependent variable in the other equation and estimated 7.1 percent and 5.8 percent respectively. The explanatory variables included disposable income, interest rate on bank deposits, expected inflation rate, household income tax rate, employer's rate of national insurance contributions, lagged dependent

[3] M3 money supply included M1 plus time deposits denominated in sterling.

variable, and time trend in order to capture advancement in the efficiency of the payments mechanism and the growth intermediation.

Kloveland (1984) used Tanzi's methodology to estimate the size of the underground economy for Norway and Sweden. The explanatory variables included price level, household disposable income, interest rate and tax rate. In case of Norway, all the variables except log of tax rate were significant, but the signs of variables were wrong. Therefore, he did not estimate size of underground economy for Norway. In case of Sweden, the tax variable performed better. Finally, he concluded that uncertainty involved in applying the currency approach is so great that it makes hazardous to rely on such estimates.

Schnieder and Lundager (1986) estimated the underground economy for Norway, Sweden and Denmark. Unlike Kloveland they used actual volume of transactions instead of household disposable income. Secondly, they used a 2-period lag of all variables, however they did not provide any justification for that. Finally, they used log form for all the variables, while Kloveland took all the variables in log form except for the tax rate. They obtained statistically significant coefficients for all variables and the sign of tax coefficient was also correct. This shows that minor changes in specifications, variables and lag structure can have a profound impact on the coefficient results.

Studies by Kloveland and Schnieder and Lundager have been criticised by Pyle (1989). He argues that while Kloveland's methodology is directly comparable with Tanzi's study, while Schneider and Lundager's methodology was not exactly the same as Tanzi's methodology. Overall he concluded that both studies could be using entirely incorrect methods.

Kirchgassner (1983) used Tanzi's methodology after minor adjustments to calculate the size of the underground economy. He took three different measures of the currency ratio, i.e., the ratio of currency to demand deposits, ratio of currency in circulation to M1 and the ratio of currency in circulation to M2. His explanatory variables included real per capita GNP, interest rate on time deposits, tax rate with two period lags, the lagged dependent variable and the inflation rate which was not included in Tanzi's specification. Fortunately he got statistically significant results with the ratio of currency in circulation to M2. Pyle (1989) criticised the positive coefficient of inflation as a factor discouraging deposits against currency holdings. With a rise in price level people may want to hold more money in order to maintain their levels of satisfaction, or in order to consume the same bundle of goods as they were consuming before the price change (Equivalent variation). Therefore this criticism is not very valid.

Bajada (1999) estimated the size of the underground economy for Australia by using Tanzi's methodology with some changes in the model. Instead of currency ratio he used real currency per capita as the dependent

variable, while real disposable income, interest rate, inflation, private consumption as percentage of GDP, and time trend variables were used as explanatory variables. Using the new techniques of estimation, he checked the unit root of the entire set of variables and included only those, which were integrated of the same order. Series of underground economy was generated by using the error correction equation. Furthermore, he also checked the causality between the underground economy and the formal economy. He believed that underground economy is a large and significant part of overall economic activity.

Atkins (1999) analysed the time series properties of all the variables used in the monetary approach to calculate the size of the underground economy. He found that the variables are not integrated of the same order especially tax and currency ratio variables. However, he still estimated the equation following Tanzi's methodology, and concluded that there does not exist any link between the tax rate and the currency ratio, and the only variable, which affects the currency ratio, is the interest rate. He argued that if we still estimate the size of underground economy using insignificant tax rate variable, there could be a chance of having spurious correlation.

Income and Expenditure Approach

Income and expenditure or fiscal approach was suggested by Dilnot and Morris in 1981. The approach states that when the expenditure exceeds income in a same time period, the households may have been involved in black economy activity. We can use this approach at household level as well as at national level.

At the household level Dilnot and Morris (1981) applied the approach by using data drawn from 1977 family expenditure survey (FES), which records both income and expenditures of 7200 households. Survey contains record of each household's income and expenditure during particular time-period. However, this approach is criticised on the grounds that expenditures may exceed the income level in times of unemployment or illness, but this might not happen in other periods. Similarly, elderly/retired person may have expenses more than his/her current income, which he/she finances through his/her savings.

Exceeding consumption expenses than the income level is not the sufficient condition to prove the involvement in the illegal activities. Therefore, in order to use this approach one has to find some means of eliminating all those households or individuals whose expenditures are quite legitimately in excess of their income.

FES is a special type of survey and participation in the survey is entirely voluntary. Pyle (1989) criticised the use of FES data on the grounds that households engaged in the illegal activities may or may not be willing to participate in the survey. The response rate for FES is about 70 percent, and if the remaining 30 percent households are heavily engaged in illegal activities then the results will show considerable under-estimation of the true extent of

black economy activity. Infact, mainly self-employed people are supposed to be engaged in black economy activities and were under-represented in this survey. Smith, Pissarides and Weber (1986) also found that the self-employed are more likely to under-report their incomes.

However, persons who have small amounts of moonlighting income may not realise, and report the exact amount of expenditures. So, this approach is quite successful in identifying small-scale evasion activities [Dilnot and Morris (1981)].

It is generally believed that this approach is unlikely to generate accurate estimates of the extent of black economy activity because generally people tend to over report their consumption expenditures and under report their incomes. Besides this there could be enumerator and the respondent error. This is particularly in case of Pakistan.

At the national level, the difference between the income and expenditure measures of GDP is referred to as the black economy or initial residual difference (IRD). This approach is not the most popular approach for estimating the size of the underground economy. Blades (1982) used this approach and estimated the size of underground economy for Sweden. Similarly, Park (1979) estimated for USA and Petersen (1982) for West Germany. Macafee (1980) had also tried to estimate extent of black economy by using this approach for the years 1960 to 1984 and found declining IRD from 1978, and it was negative in 1984, which is quite unreasonable.

It was found that there are other reasons for discrepancy between income and expenditure measures of GDP [Pyle (1989)]. Therefore, this measure is relatively a poor indicator to measure the extent of black economy activity.

Labour Market Approach

The basis of the labour-market approach is the number of workers who are active in the black economy and/or the total number of hours worked. This is then converted into a monetary unit by multiplying hours worked by the average productivity of the workers in the irregular market. However, Pyle (1989) argues that it is not possible to accurately measure the number of hours worked by the labour in the underground economy and the average productivity. Moreover, it is generally believed that this approach is useful for those countries having very small black economy and is very popular among the Italian economists to estimate the size of the black economy.

Main problem of using this approach is the non availability of data on number of workers involved in the black economy and the number of hours worked by the labour in the black economy.

Estimates of Underground Economy for Pakistan

Estimates of the underground economy have been subject of intense interest in the literature. In Pakistan all the authors have adopted the monetary approach and followed Tanzi’s methodology to estimate the size of the underground economy.

Shabsigh (1995) estimated underground economy for the period 1975 to 1991 by making minor changes in the Tanzi's methodology. He used ratio of currency in circulation to total demand deposits[4] as the dependent variable, while per capita real income, real interest rate, per capita banking services, average taxes on imports, average taxes on exports and average taxes on domestic activities were chosen as an explanatory variables. ARIMA specification was used to remove the autocorrelation instead of lagged dependent variable. He also estimated the long and short run variations between difference of the formal and the underground economy and the government budget deficit by using the cointegration approach. Velocity of money was assumed to be the same in legal and illegal market and was calculated by dividing GNP with legal money.

His estimates (reported in Table1) show that the size of the underground economy was 20.74 percent of GDP in 1975 and 20.46 percent of GDP in 1990, implying a stagnant underground economy. In other words rate of growth of the underground economy is more or less equals the rate of increase in formal economy.

Ahmed and Ahmed (1995) have also used Tanzi's methodology to estimate the extent of the underground economy for the period 1960 to 1990. They have estimated two models with same explanatory variables, i.e., interest rate on time deposits, total tax revenue to GDP ratio, and dummy variable for the period 1960–71 in order to capture the effects of currency holdings of the former East and West Pakistan but different dependent variables. In the first model the ratio of currency in circulation to M2 is taken as dependent variable while in the second model variable of bearer bond is included with currency in circulation in dependent variable. All the variables are taken in log form and 1960 has been taken as benchmark period. Velocity of money is calculated by dividing GNP with legal money. The results obtained from both models are identical.

Their estimates show a declining underground economy since the sixties, it declined from 51.96 percent to 35.09 percent in 1990. These results are flawed when compared to other studies. Moreover, prior to 1972 data on money supply (M2) was not separately available for East and West Pakistan, while in the post 1972 period it was bifurcated on the assumptions of asset distribution on 70:30 basis. The results may be affected by inclusion of pre-1972 data on money supply (M2).

Iqbal, Qureshi, and Mahmood (1998) have also estimated the underground economy by using Tanzi's methodology. Ratio of currency in circulation to M2 has been taken as the dependent variable, and the explanatory variables include, domestic taxes as percentage of GDP, international trade taxes as percentage of GDP, real interest rate, real per capita income growth, banking services, and dummy variable for the period 1988 to 1996, to capture the impact of structural adjustment programme. Lagged dependent variable is also used as an

[4] Total demand deposits are calculated as M2 minus currency in circulation.

Table1

Results of Previous Studies

Year	Ahmed and Ahmed (1995)		Iqbal, Qureshi and Mahmood (1998)		Aslam (1998)		Shabsigh (1995)
	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion	Underground Economy
1960	51.96	4.32			29.00	2.31	
1961	55.14	4.72			29.30	2.39	
1962	53.98	4.85			31.00	2.64	
1963	47.08	3.87			29.40	2.28	
1964	45.72	3.74			30.50	2.35	
1965	49.63	4.56			33.00	2.86	
1966	40.30	3.55			31.00	2.57	
1967	45.24	4.54			37.00	3.47	
1968	39.68	3.75			35.00	3.13	
1969	45.03	4.98			41.00	4.34	
1970	44.75	4.95			40.60	4.10	
1971	36.90	3.41			32.40	2.93	
1972	37.16	4.09			44.40	3.60	
1973	36.36	3.98	20.20	1.95	42.00	3.58	
1974	36.85	4.23	21.60	2.21	34.70	3.18	
1975	32.76	3.58	24.00	2.39	30.60	2.66	20.74
1976	33.31	3.78	24.20	2.68	27.10	2.11	22.92
1977	32.12	3.66	26.20	2.88	27.50	2.17	22.06
1978	35.48	4.13	28.20	3.14	46.30	5.36	22.01
1979	38.01	4.64	29.80	3.49	46.70	5.73	21.98
1980	45.26	6.44	32.90	4.19	52.60	7.03	22.53
1981	47.13	6.79	35.70	4.61	45.30	5.95	24.19
1982	43.65	5.96	36.10	4.44	43.10	5.30	21.91
1983	44.73	5.97	36.60	4.44	46.80	5.84	25.64
1984	45.59	6.41	39.60	5.03	42.50	5.13	23.13
1985	42.05	5.44	39.60	4.75	40.20	4.49	21.63
1986	37.00	5.05	36.90	4.81	43.00	4.98	21.55
1987	39.24	5.59	38.90	5.30	38.80	4.21	21.39
1988	38.86	5.59	37.90	5.03	45.00	5.93	24.73
1989	39.08	5.80	33.30	4.61	46.00	6.30	23.31
1990	35.07	5.18	33.20	4.44	43.90	5.85	23.56
1991			34.50	4.28	53.00	6.95	
1992			34.90	3.86	45.30	5.86	
1993			42.60	5.62	44.50	5.68	
1994			44.70	5.85	42.70	5.41	
1995			42.20	5.76	45.70	5.99	
1996			51.30	7.02	43.80	5.82	
1997					38.00	4.91	
1998					35.50	4.48	

explanatory variable to account for the inertia in the money market. Like other studies velocity of illegal money is taken to be the same as the velocity of legal money and the other two assumptions are also taken to hold. They have also estimated the sectoral decomposition of the underground economy. Their estimates show an increase in the size of underground economy from 20.2 percent of GDP in 1973 to 33.2 percent of GDP in 1990 and 51.3 percent of GDP in 1996 (Table 1).

Aslam (1998) also used Tanzi's methodology to estimate the size of the underground economy. Ratio of currency in circulation and foreign currency accounts to M2 is taken as the dependent variable, while, total tax revenues as percentage of GDP interest rate on time deposits and a dummy variable for the period 1991–1998 (in order to capture the impact of foreign currency accounts introduced in 1991 onwards) have been taken as the explanatory variables. All the variables are taken in the log form. He defines velocity of money as the ratio of GNP to currency in circulation plus foreign currency accounts but assumes same velocity for both legal and illegal money. The two other assumptions are also taken to hold.

Aslam's estimates show that the underground economy increases from 29 percent in 1960 to 43.9 percent in 1990. It was stagnant between 1990 and 1996 at 43.8 percent and then declined to 35.5 percent in 1998 (Table 1).

It is concluded from the above discussion that the conventional estimates of the underground economy are not very reliable. All the four studies using the same methodology came out with different results, which show lack of robustness of the estimates. The results may differ to some extent due to difference in the time period covered or changes in specification of the variables. However, the fluctuations in these estimates suggest that there might be a problem in the application of the methodology that need to be rectified to get consistent estimates.

The review of the empirical evidence shows that: choosing a functional form is a major concern because using equation in double log form, semi log form or simple linear form fundamentally changes the results; choosing a meaningful benchmark is also a major obstacle, which should be resolved at the outset; changing the time period changes the results drastically , as reported earlier in case of Tanzi (1980, 1981); inclusion and exclusion of variables from the model results in significant difference in the estimates so, inclusion of relevant variables is very important.[5] In the next section we shall put forward new estimates of the underground economy and tax evasion by removing the various anomalies and shortcomings of the studies reviewed above as much as possible.

---

[5]Two authors did include banking services variable and two did not. So, we have to see whether banking services variable is important (relevant) variable or not and similarly the other variables.

III. REVISITING THE UNDERGROUND ECONOMY ESTIMATES

Data

In the light of discussion of the empirical evidence on the size of the underground economy, we'll replicate three models, i.e., Ahmed and Ahmed (1995), Iqbal, Qureshi and Mahmood (1998), and Aslam (1995) by using same variables for three periods, i.e., 1973–02, 1980–02, and 1987–02. The study by Shabsigh (1995) cannot be replicated due to non-availability of data on same variables. The replication is done with a view to check the robustness and stability of the estimates by changing the period covered, changing the benchmark, inclusion and exclusion of variables etc. The replicated estimates will be then compared with the original estimates. Furthermore, we'll obtain the estimates of the underground economy and tax evasion by putting our data (described below) in to the replicated and original coefficient parameters obtained by the three studies.

Data on currency in circulation, M1, M2, total number of bank deposits, total number of bank accounts, interest rate, and resident foreign currency accounts are taken from various issues of the Annual Report of the State Bank of Pakistan. Data on GDP, GNP, inflation, real per capita income, and total tax revenues are taken from various issues of the Economic Survey of Pakistan and the data on, sales tax on imports, and custom duties are taken from various issues of the CBR Annual Report. Data are collected from 1973 to 2002 because in the pre 1973 period disaggregated data of money supply, GDP, and GNP are not available for Pakistan.

Construction of Variables

M2 comprises of M1, time deposits and other deposits (M2 = M1 + time deposits + Other Deposits). Real interest rate is computed by subtracting inflation rate from nominal interest rate (Real interest rate=nominal interest rate-inflation rate). Total international trade tax is calculated by adding sales tax on import and total custom duties (*international trade tax = sales tax on imports + custom duties*). Domestic tax is calculated by subtracting total international trade tax from total tax revenues (*Domestic tax = tax revenues – international trade tax).*

Variable of banking services is obtained by dividing total number of bank deposits by total number of bank accounts

$$\left(BS = \frac{Bank\ Deposits_t}{Bank\ Accounts_t} \right)$$

Methodology

The use of an appropriate benchmark has been a serious issue in the discussion in the last section. For the revised estimates, 1973 has been chosen as the benchmark period because the problem of the underground economy became serious after the nationalisation.

Results obtained from the three periods, i.e., 1973–02, 1980–02, and 1987–02 (by using the data and methodology described above), are compared with the original results. Results of estimated equations are shown in Table 1 of Appendix 2 and estimates of underground economy based on the estimated (original and replicated) parameters of Table 1 are given in Table 2 to Table 13 of Appendix 2.

The results of replication are quite interesting and radical. In case of Ahmed and Ahmed (1995), signs of both the explanatory variables came out to be opposite of those in the original study except for the constant. R^2 was quite high in the original estimates but in replication it turned out to be quite low i.e., 0.28, 0.31, and 0.35 for the three periods (Table 1, Appendix 2). Durbin-Watson statistic is too low in replicated results compared to the original results implying a serious autocorrelation problem.

The replications of Aslam's study shows that the signs of the coefficient and constant are the same, except for the nominal interest rate, and GDP growth rate compared to its original estimates. The constant has a negative sign but it is insignificant, while it was significant in the original estimates. Sign of interest rate is opposite but significant as compared to original estimates. Sign of GDP growth rate is negative and insignificant, while it was positive and insignificant in original results.

Looking at the sign and significance of the coefficients we see that the coefficient of dummy variable is high and significant in replicated results compared to the original estimates. Coefficient of tax variable has positive sign for the three periods, but is too low and insignificant in replicated results. R^2 is close to the original estimates and so is the Durbin-Watson, which shows that there is no serious autocorrelation problem.

The replicated study of Iqbal, Qureshi and Mahmood (1998) shows that the signs of all the variables are same for the three replicated periods as compared to the original results except for the real interest rate. However, the size and significance of the coefficient of domestic tax is very low for the period 1973–02, but it is quite high for 1980–02 and 1987–02, as compared with the original estimates; but it is insignificant for all the periods. Similarly, the coefficient of trade tax came out to be lower than the original estimates and is significant at 10 percent for the period 1973–02 but insignificant for the other two periods, while it was highly significant in the original results. Coefficient of the banking services variable turns out to be more or less the same for 1987–02 as compared with the original estimates but is lower for the other two periods, but insignificant for all the three periods, while it was highly significant in the original estimates. Coefficient of the real interest rate was higher than the original estimates but was insignificant. Coefficient of the growth rate of GDP was the same but insignificant for the period 1973–02 and lower and insignificant for 1980–02 and 1987–02 than the original estimates. The sign of the coefficient in replicated result is opposite compared to the original estimates. The sign of the coefficient of the dummy variable turns out to be opposite and insignificant as well. R^2 is quite high in the

replicated equations and close to what it was in the original estimates. *h*-test is used to detect the autocorrelation problem in the regression in presence of lagged dependent variable, but unfortunately, *h*-test could not be calculated for the periods 1980–02 and 1987–02, therefore, we checked corellogram, which shows that there was no serious autocorrelation problem (Corellogram 1 and Corellogram 2, Appendix 2 respectively).

The comparison of the replicated and original estimates of the three studies shows that the coefficients of the explanatory variables are very sensitive to the benchmark period chosen, velocity of money, inclusion and exclusion of variables, and functional forms used. Having obtained the three sets of coefficients for the three studies we'll estimate the size of the underground economy and the extent of tax evasion by putting our data (described below) in the replicated coefficient parameters, and original parameters obtained by the three authors in their studies. These estimates are given in Table 2 to Table 13 in Appendix 2. Standard procedure is adopted to estimate the underground economy and tax evasion using the monetary approach as suggested by Tanzi (1980).[6]

Iqbal, Qureshi and Mahmood (1998)

Estimates of the underground economy and tax evasion based on the original and replicated parameters of the Iqbal, Qureshi and Mahmood (1998) study have then been obtained by putting our data in these parameters. Estimates based on the original parameters are given in Table 2, while estimates based on the replicated parameters are given in Tables 3, 4 and 5. It has been observed that based on the original estimates 25.76 percent was the size of the underground economy in 1974, which increased to 35.28 percent in 1990, 70.92 percent in 1998 and 47.41 percent in 2002. Tax evasion was estimated 2.74 percent in 1973, 4.73 percent in 1990, 9.40 percent in 1998, and 5.99 percent in 2002. However, in case of replicated results for the period 1973–02, the underground economy was 9.14 percent in 1974, 12.23 percent in 1990, 18.22 percent in 1998, and 12.66 percent in 2002. Similarly, tax evasion was estimated to be 0.97 percent in 1974, 1.69 percent in 1990, 2.41 percent in 1998, and 1.60 percent in 2002. The replicated results for the period of 1980–02, however, showed that the size of the underground economy fluctuated over the period. It declined from 14.48 percent in 1980 to 13.44 percent in 1990, increased to 20.90 percent in 1998 and declined again to 14.66 percent in 2002, slightly higher than that of in 1980. Likewise, tax evasion was estimated to be 1.89 percent in 1980, 1.86 percent in 1990, 2.77 percent in 1998, and 1.85 percent in 2002. The replicated results for the period 1987–02, however, were very divergent. The size of the underground economy was 45.52 percent in 1987, it declined to 43.11 percent in 1990, it jumped to 105.24 percent in 1998 and was 68.76 percent in

[6]See Appendix 1.

2002. Correspondingly, tax evasion was estimated to be 6.16 percent in 1987, 5.78 percent in 1990, 13.94 percent in 1998, and 8.69 percent in 2002.

Besides the changes in the periods covered, two major jumps were observed in 1996 and in 1997 when velocity changed rapidly, which shows that estimates are very sensitive to velocity of money which is assumed to be same in both the legitimate and the black economy. Moreover, estimates are largely dependent on the magnitude of the tax variable; higher the coefficient of tax variable, higher will be the underground economy estimates.

Ahmed and Ahmed (1995)

Ahmed and Ahmed estimated the log linear form of equation.[7] The estimates based on the original parameters are given in Table 6, and based on the replicated parameters are given in Tables 7, 8, and 9. Size of the underground economy turns out to be 0.68 percent in 1973 (Table 6 Appendix 2), which declined to 0.54 percent in 1990, increased to 1.03 percent in 1998, and then again declined to 0.98 percent in 2002. Similarly tax evasion was 0.07 percent in 1973, it remained the same in 1990, increased to 0.14 percent in 1998 and in 2002 it was 0.12 percent. These estimates are very different from what they obtained in their own study. The results are quite unreasonable when estimates are obtained by using replicated parameters. For all the three periods (1973–02, 1980–02, and 1987–02) the size of the underground economy was negative (Tables 7, 8, and 9 Appendix 2 respectively). Similarly, tax evasion estimates obtained for these three replicated periods are found to be negative.

Aslam (1998)

Similar to Ahmed and Ahmed (1995), underground economy is found to be negative based on both the original and replicated parameters for all the three periods (Tables 10, 11, 12, and 13 Appendix 2).

The poor performance of the original and replicated coefficients to estimate the underground economy and tax evasion cannot be attributed to data problems. The data sets used were checked thoroughly and found to be correct. However, we should include only those variables which are integrated of the same order in order to get robust estimates.[8] Stationarity test is applied on all those variables which are used by the three authors in order to get the estimates of underground economy and tax evasion. The results show that all the variables are integrated of the same order (Table 14 Appendix 2) i.e., of order one.

After all the refinements in the calculations and re-estimations we see that the results are not robust. These are subject to change in time period, which may

[7]Methodology to estimate underground economy and tax evasion is given in Appendix 1.

[8]If a regression runs using non-stationary variables, it is well known that there could be spurious correlation amongst the variables [Atkins (1999)].

change the size and significance of coefficients, resulting in different estimates of the underground economy. Choosing the appropriate benchmark period is also very important and the change in the functional form can also change the results entirely.

On the basis of the extensive review of the empirical studies of the underground economy for Pakistan, test for robustness, ability to provide reliable and consistent estimates of the size of the underground economy and extent of tax evasion, we have formulated the Tanzi specification according to the new econometric techniques and the macro economic situation in Pakistan. The model is specified as follows.

$$\left(\frac{CC+FCA}{M2}\right)_t = \alpha + \beta\left(\frac{T}{Y}\right)_{t-1} + \gamma BS_t + \varphi G_t + \lambda D + \delta\left(\frac{CC+FCA}{M2}\right)_{t-1} + \varepsilon_t$$

CC = Currency in Circulation
FCA = Foreign Currency Accounts
M2 = Money Supply
T = Total Tax Revenues
Y = GDP at current market prices
BS = Banking Services
G = Growth Rate of Real GDP
D = Dummy variable defines 1 for 1990 to 2002 and zero otherwise
ε = Error Term
Subscript *t* shows time period.

Year 1973 has been chosen a benchmark because reliable statistics for Pakistan in the pre-1981 period are not available. Significance of using foreign currency accounts in conjunction with the currency in circulation as the dependent variable arises from the fact that foreign currency accounts serve as a powerful source of financing the transactions in the underground economy because the accounts are completely confidential, easily transferable and can be used as liquid money. Dummy variable is used to capture the impact of foreign currency accounts after 1990.

IV. EMPIRICAL FINDINGS AND RESULTS

Results of the model are reported in Table 2. Coefficient of the tax to GDP ratio is positive and significant at 5 percent level, which implies that higher the tax rate, higher will be the currency holdings. Coefficient of tax to GDP ratio shows that one percent change in the tax to GDP ratio leads to a change in currency ratio by 1.067. Negative and significant association between the banking services and currency ratio implies that the improvement in banking services lower, the demand for currency holdings. Coefficient of growth rate is

negative, which implies that higher level of economic growth is expected to decrease the demand for currency holdings. Value of *t*-statistic shows that its impact is insignificant, but since its *t*-value is greater than one, we can use it for predicting (estimating) the size of the underground economy. Dummy variable turns out to be a highly significant variable, which shows the impact of *hundi* and other transactions through foreign currency accounts. Coefficient of the lagged dependent variable is positive and significant at seven percent, which indicates that it is significantly capturing the impact of inertia. R^2 is 0.75 and the *F*-statistic is also significant, which shows that the variables in specification explain significantly variations in the dependent variable. Value of *h*-test is –1.36 which lies inside the critical range, thus there is no serious autocorrelation problem.

Table 2

Results of Estimates of Regression Equation

Variables	Coefficient	*t*-Statistic	Probability
Constant	0.114	1.87	0.07
Tax to GDP ratio	1.067	2.22	0.04
Banking Services	–1.34E-05	–2.08	0.05
Growth Rate of GDP	–0.506	–1.58	0.13
DUM 91	0.060	2.92	0.01
Lag Dependent Variable	0.327	1.92	0.07
R^2 = 0.75	*F = 14.67*	*h = –1.36*	

The estimated results of the underground economy and tax evasion are reported in Table 3.[9] Result shows that in the base year (1973), underground economy was 20.27 percent of the GDP and, it increased to 25.51 percent in 1991. Between 1991 and 1998 the underground economy increased rapidly; it was 54.52 percent in 1998. However, by 2002 it had declined to 37.25 percent of GDP.[10] Correlation coefficient between the velocity of money and estimates of underground economy is 0.81. This implies that the estimates are highly sensitive to the velocity of money which is assumed to be equal for legal and illegal money.

Estimates of tax evasion[11] show similar trends. It increased from 2.15 percent in 1973 to 3.42 in 1990, peaked at 7.22 in 1998 and then 4.17 percent in 2002. We assumed that tax evasion is the major source of expansion in the underground economy. This is revealed by the high correlation of 0.984 between tax evasion and the underground economy.

[9]Methodology used to calculate estimates of underground economy and tax evasion is given in Appendix 1.

[10]It is also revealed from Graph 1 and Graph 2.

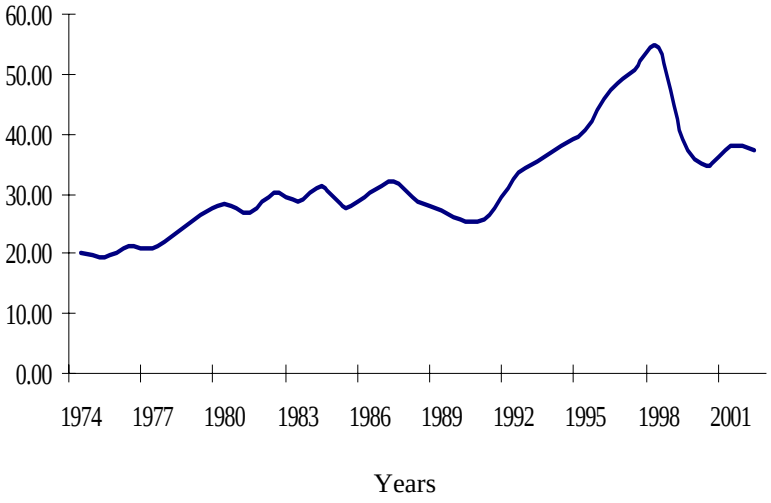
[11]The estimates of tax evasion are derived based on a strong assumption that incomes in the underground economy would have been taxed at the same rate as incomes in the formal economy.

Table 3

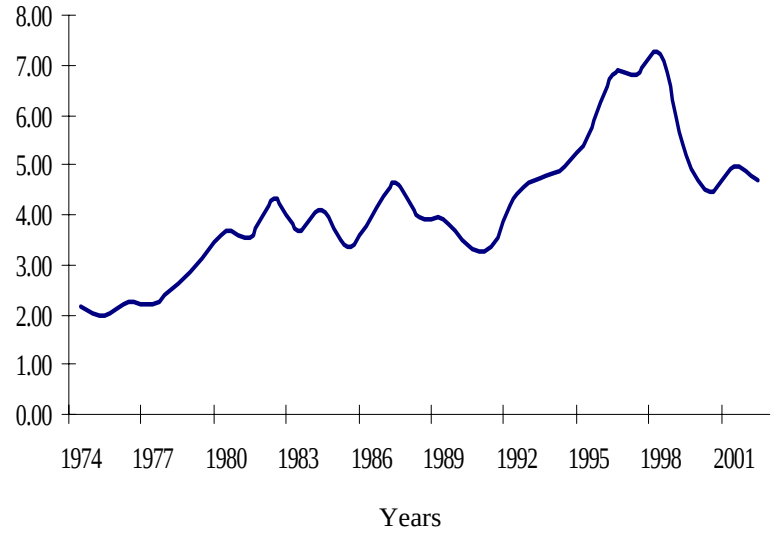
Estimates of Underground Economy and Tax Evasion

						(As Percentage of GDP)	
Years	***Illegal Money***	***Legal Money***	***Velocity***	***Underground Economy***	***Tax Evasion***	Underground Economy	Tax Evasion
1974	3477	17273	5.2	18020	1914	20.27	2.15
1975	3599	18725	6.0	21756	2219	19.42	1.98
1976	4708	22763	5.9	27781	2944	21.15	2.24
1977	5892	29358	5.3	31412	3351	20.80	2.22
1978	7540	34649	5.5	41832	4644	23.51	2.61
1979	10441	42551	5.0	51774	6186	26.35	3.15
1980	12871	49118	5.2	66414	8670	28.24	3.69
1981	14647	58933	5.1	74784	9814	26.88	3.53
1982	17779	63147	5.5	98406	14076	30.36	4.34
1983	19869	76583	5.3	104759	13361	28.75	3.67
1984	22925	80520	5.7	130796	17215	31.16	4.10
1985	24065	94903	5.4	129443	15878	27.42	3.36
1986	29498	105333	5.3	155677	20390	30.26	3.96
1987	37092	122533	5.0	184308	26698	32.19	4.66
1988	39761	145319	4.8	192752	26672	28.54	3.95
1989	43121	163238	4.9	210487	30209	27.38	3.93
1990	48818	191339	4.7	227245	30473	25.51	3.42
1991	54292	210849	5.0	268951	34163	26.35	3.35
1992	73531	229377	5.3	390366	53219	32.39	4.42
1993	85001	242821	5.5	470124	62913	35.27	4.72
1994	98449	260319	6.0	591899	77655	37.92	4.97
1995	121605	301534	6.2	758163	104787	40.63	5.62
1996	144332	303677	7.0	1004289	144748	47.37	6.83
1997	150216	293335	8.2	1233620	164923	50.80	6.79
1998	170484	309847	8.6	1459891	193397	54.52	7.22
1999	181657	461386	6.3	1146839	152499	39.03	5.19
2000	192679	546354	5.7	1094052	141077	34.76	4.48
2001	211962	549470	6.1	1298233	169025	38.00	4.95
2002	236262	638715	5.9	1388064	175472	37.25	4.71

There could be various reasons of this sharp increase in the underground economy and tax evasion between 1991 and 1998. For instance, rise in private investment level which increases the overall economic activity (formal and informal), increase in smuggling etc. Similarly, decline in underground economy from 1998 to 2002 may have various reasons, for instance, decline in smuggling, but probably low level of economic activity is the most important. The low level of economic activity is matched with low black economy activity which is evident from the correlation between black economy and formal economy (97.35 percent). But there are certain other factors which may cause growth in black economy and in last four years of our analysis, documentation of the economy is one of the reasons which helped in preventing black economy not to grow faster.



Graph 1. Underground Economy as Percentage of GDP.



Graph 2. Tax Evasion as Percentage of GDP.

V. SUMMARY AND CONCLUSIONS

Our primary objective was to replicate the earlier models. However, our estimates of the underground economy and tax evasion are not similar to the earlier studies. By changing time period, functional forms, exclusion or inclusion of variables, and/or changing the benchmark period, change the results totally (i.e., the results are not robust). Sometimes it gives us negative underground economy and tax evasion, which does not make sense. In order to overcome these problems we re-specified the model. We have included only those variables which are affecting currency ratio, related with the underground economy, and integrated of the same order.

Monetary approach assumes that before benchmark period there is zero or insignificant underground economy. The problem arises when we choose unreasonable benchmark period after specifying the model by applying statistical tests and using economic theory. Therefore, it is the most important of all the other problems. Year 1973 has been chosen a benchmark because reliable statistics for Pakistan in the pre-1973 period are not available.

According to Tanzi (1980), the estimates of the underground economy computed from indirect approach (monetary approach) should not be taken as precise measures, it could be taken as broad indications of trends and of orders of magnitude because they are sensitive to the assumptions. In the light of the above statement, it is concluded that underground economy and tax evasion as percentage of GDP doubled in the last thirty years. Underground economy increased at a rate of 4.21 percent till 1998 then declined sharply in 1999 by –28.41 percent and from 1999 to 2002 it declined by –1.55 percent per annum. Similarly, tax evasion increased at a rate of 5.17 percent till 1998, then it declined sharply in 1999 by –28.14 percent and from 1999 to 2002 it declined by –3.19 percent per annum. The rate of increase in the underground economy after 1991 is greater than the rate of increase in the formal economy, which was a major concern. But for the last four years rate of increase in underground economy and tax evasion is negative, which is a positive sign, mainly due to low level of economic (formal and informal) activity and documentation of the economy.

The estimates of the underground economy represent those sectors which are exempted from tax or hide taxes from tax authorities. It is not necessary that all these sectors are involving in illegal activities, so, we don't need to tear down all those activities which are not taxed or hide taxes. We should improve our taxation policy.[12] It is pragmatic that our tax rates are too high[13] and, if possible, should be reduced to minimum level where every person in the tax net is willing

[12]Tax policy includes change in tax rates, get rid of corrupt officers, broaden tax base, remove all the anomalies etc.

[13]People don't want to pay taxes because of high tax rates and Government has usual practice to increase tax rate if they want to increase their revenues, while "Tax Laffer Curve" tells the opposite story.

to pay tax. Moreover, people have general dissatisfaction with the way government manages its budget and utilises tax income. Smuggling went down marginally because Government had initially started anti smuggling policy when it came into power. As a consequence of that initial anti smuggling policy, some people left their businesses from *Bara* markets and either they are now unemployed or working somewhere else on wages.

An important point to note is that if anyone wants to estimate the underground economy and tax evasion by using our model and change the variables or change the benchmark or change the time period, it may show different results due to change in the magnitude of parameters of the coefficients and estimates of the underground economy and tax evasion are based on these parameters.

We will recommend policy-makers not to use these estimated figures or any other estimated figures estimated from any indirect approach for policymaking, but what they can get from our results is the overall trend of the direction of growth of the underground economy and tax evasion. In order to trim down the underground economy activity, strict administrative measures are needed. Good governance might help in reducing the underground economy activity in Pakistan.

Appendices

APPENDIX 1

1. Jacque-Bera Test Statistic

Jacque-Bera is a test statistic for testing whether the series is normally distributed or not. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. The statistic is computed as:

$$JB = \frac{N-K}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where S is skewness, K is kurtosis, and k represents the number of estimated coefficients used to create the series. Under the null hypothesis of a normal distribution, the Jacque-Bera test statistic is distributed as χ^2 with 2 degrees of freedom.

2. Coefficient of Variation

Coefficient of variation is used to check the fluctuation (volatility) in the data. It is calculated by following formula

$$CV = \frac{SD}{\overline{X}} * 100 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where *CV* represents coefficient of variation, *SD* is standard deviation and represents mean.

3. Method of Estimation Underground Economy

For each year predicted values of currency ratio including tax variables $\left(\frac{CC+FCA}{M2}\right)_t$ and without tax variables $\left(\frac{CC+FCA}{M2}\right)_{wt}$ are calculated by estimated regression equation. The difference between the two terms gives us an indication that how much currency holding is tax induced. This difference is then multiplied with M2 to get illegal money. Subtracting illegal money from M1 gives legal money in the economy. Velocity of money is calculated by dividing national income with legal money. Assuming velocity of money same in both legal and illegal money, multiplying velocity of money with illegal money gives underground economy. Tax evasion is calculated by multiplying underground economy with total tax to GDP ratio. Mathematically, we can write it as,

$$Illegal\ Money(IM) = \left(\left(\frac{CC+FCA}{M2}\right)_t - \left(\frac{CC+FCA}{M2}\right)_{wt}\right) * M2 \quad \ldots \quad (3)$$

$$Legal\ Money(LM) = M1 - IM \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

$$Velocity\ (V) = \frac{National\ Income}{LM} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$Underground\ Economy(UE) = IM * V \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$Tax\ Evasion(TE) = UE * \left(\frac{Total\ Taxes}{National\ Income}\right) \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

If we have log linear equation, the expression (3) is obtained by the following procedure and rest of the procedure is same.

$$IM = anti\log\left[\log\left(\frac{CC+FCA}{M2}\right)_t\right] - anti\log\left[\log\left(\frac{CC+FCA}{M2}\right)_{wt}\right] * M2$$

Appendix Table 1

Appendix Table 1

Appendix Table 2

Iqbal, Qureshi and Mahmood (1998) Based on Original Estimates

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1974	4226.87	16523.13	5.42	22903.65	2432.94	25.76	2.74
1975	4551.96	17772.04	6.37	28994.21	2957.28	25.88	2.64
1976	5516.07	21954.93	6.12	33747.77	3575.73	25.70	2.72
1977	6954.94	28295.06	5.53	38473.21	4104.03	25.47	2.72
1978	8667.87	33521.13	5.73	49710.05	5518.84	27.94	3.10
1979	11770.67	41221.33	5.12	60251.80	7199.08	30.67	3.66
1980	14461.89	47527.11	5.33	77122.21	10067.26	32.79	4.28
1981	17723.68	55856.32	5.39	95474.30	12529.55	34.32	4.50
1982	19628.71	61297.29	5.70	111919.98	16009.14	34.53	4.94
1983	26017.06	70434.94	5.73	149147.84	19022.76	40.93	5.22
1984	26686.10	76758.90	5.98	159714.57	21021.50	38.05	5.01
1985	30994.80	87973.20	5.80	179848.58	22060.31	38.09	4.67
1986	33267.88	101563.12	5.47	182086.93	23849.25	35.39	4.64
1987	40741.82	118883.18	5.12	208658.13	30225.38	36.45	5.28
1988	49991.55	135088.45	5.21	260705.11	36074.70	38.60	5.34
1989	50016.94	156342.06	5.10	254916.98	36585.15	33.16	4.76
1990	62625.82	177531.18	5.02	314192.68	42131.83	35.28	4.73
1991	69368.17	195772.83	5.34	370100.44	47011.39	36.26	4.61
1992	82050.72	220857.28	5.51	452403.12	61676.69	37.54	5.12
1993	103212.89	224609.11	5.98	617138.85	82587.12	46.30	6.20
1994	118315.72	240452.28	6.51	770111.20	101035.21	49.33	6.47
1995	134836.31	288302.69	6.52	879240.99	121521.27	47.12	6.51
1996	162153.32	285855.68	7.39	1198632.66	172758.62	56.53	8.15
1997	189127.00	254424.00	9.47	1790710.55	239400.07	73.74	9.86
1998	200378.36	279952.64	9.48	1899115.13	251582.10	70.92	9.40
1999	204165.45	438877.55	6.64	1355046.88	180185.08	46.12	6.13
2000	222687.93	516345.07	6.01	1337934.88	172525.35	42.51	5.48
2001	239069.35	522362.65	6.44	1540250.36	200534.73	45.09	5.87
2002	280099.79	594877.21	6.31	1766881.98	223360.61	47.41	5.99

Appendix Table 3

Iqbal, Qureshi and Mahmood (1998) Based on Replicated Estimates (1973–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1974	1726.91	19023.09	4.71	8127.69	863.36	9.14	0.97
1975	2064.12	20259.88	5.59	11533.19	1176.33	10.29	1.05
1976	2523.93	24947.07	5.38	13589.53	1439.87	10.35	1.10
1977	2864.43	32385.57	4.83	13844.02	1476.77	9.17	0.98
1978	3682.98	38506.02	4.99	18387.42	2041.38	10.34	1.15
1979	5315.97	47676.03	4.43	23527.36	2811.13	11.97	1.43
1980	6850.19	55138.81	4.60	31487.72	4110.30	13.39	1.75
1981	8092.58	65487.42	4.59	37182.11	4879.59	13.37	1.75
1982	8555.53	72370.47	4.83	41318.30	5910.21	12.75	1.82
1983	9812.27	86639.73	4.66	45729.78	5832.51	12.55	1.60
1984	11543.31	91901.69	5.00	57702.56	7594.76	13.75	1.81
1985	13358.55	105609.45	4.83	64569.17	7920.08	13.68	1.68
1986	14548.85	120282.15	4.62	67238.35	8806.70	13.07	1.71
1987	18493.76	141131.24	4.31	79784.29	11557.23	13.94	2.02
1988	21607.22	163472.78	4.31	93116.06	12884.80	13.79	1.91
1989	21777.19	184581.81	4.32	94009.24	13492.01	12.23	1.75
1990	26824.23	213332.77	4.18	111991.98	15017.62	12.57	1.69
1991	31000.70	234140.30	4.46	138295.22	17566.72	13.55	1.72
1992	35015.37	267892.63	4.55	159166.94	21699.43	13.21	1.80
1993	43091.63	284730.37	4.72	203252.31	27199.75	15.25	2.04
1994	46733.04	312034.96	5.02	234401.66	30752.47	15.02	1.97
1995	50977.90	372161.10	5.05	257513.95	35591.41	13.80	1.91
1996	62254.87	385754.13	5.48	341012.14	49149.99	16.08	2.32
1997	71418.49	372132.51	6.47	462320.33	61807.60	19.04	2.55
1998	74585.69	405745.31	6.54	487738.52	64612.35	18.22	2.41
1999	62915.32	580127.68	5.02	315899.01	42006.14	10.75	1.43
2000	65625.96	673407.04	4.61	302326.60	38984.71	9.61	1.24
2001	78240.58	683191.42	4.93	385415.54	50179.63	11.28	1.47
2002	97737.42	777239.58	4.83	471876.19	59652.29	12.66	1.60

Appendix Table 4

Iqbal, Qureshi and Mahmood (1998) Based on Replicated Estimates (1980–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1980	7342.64	54646.36	4.64	34055.46	4445.48	14.48	1.89
1981	8729.80	64850.20	4.64	40504.01	5315.54	14.56	1.91
1982	9306.56	71619.44	4.88	45416.68	6496.44	14.01	2.00
1983	10977.90	85474.10	4.72	51859.88	6614.36	14.23	1.82
1984	12574.21	90870.79	5.06	63568.89	8366.89	15.14	1.99
1985	14561.31	104406.69	4.89	71193.53	8732.63	15.08	1.85
1986	15816.35	119014.65	4.67	73874.65	9675.90	14.36	1.88
1987	19970.68	139654.32	4.36	87067.04	12612.18	15.21	2.20
1988	23540.33	161539.67	4.36	102660.74	14205.54	15.20	2.10
1989	23693.57	182665.43	4.36	103355.04	14833.30	13.44	1.93
1990	29273.03	210883.97	4.22	123635.00	16578.90	13.88	1.86
1991	33569.62	231571.38	4.51	151416.56	19233.43	14.84	1.88
1992	38238.10	264669.90	4.60	175932.74	23985.14	14.60	1.99
1993	47251.90	280570.10	4.79	226180.01	30268.00	16.97	2.27
1994	51798.80	306969.20	5.10	264097.81	34648.47	16.92	2.22
1995	57005.02	366133.98	5.13	292700.06	40454.53	15.69	2.17
1996	69397.32	378611.68	5.58	387307.39	55822.52	18.27	2.63
1997	79881.86	363669.14	6.62	529141.32	70740.90	21.79	2.91
1998	83673.03	396657.97	6.69	559698.75	74145.16	20.90	2.77
1999	73631.30	569411.70	5.12	376661.76	50085.96	12.82	1.70
2000	77647.97	661385.03	4.69	364211.85	46964.75	11.57	1.49
2001	90279.61	671152.39	5.01	452697.47	58939.49	13.25	1.73
2002	111166.70	763810.30	4.91	546149.17	69041.52	14.66	1.85

Appendix Table 5

Iqbal, Qureshi and Mahmood (1998) Based on Replicated Estimates (1987–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1987	45588.31	114036.69	5.34	243402.04	35258.24	42.52	6.16
1988	57474.83	127605.17	5.52	317307.65	43907.00	46.98	6.50
1989	57278.90	149080.10	5.34	306148.75	43937.83	39.82	5.72
1990	72345.42	167811.58	5.31	383978.05	51489.74	43.11	5.78
1991	78309.86	186831.14	5.59	437803.21	55611.22	42.90	5.45
1992	94967.78	207940.22	5.86	556150.96	75820.77	46.15	6.29
1993	120813.19	207008.81	6.49	783793.86	104889.33	58.80	7.87
1994	142263.20	216504.80	7.23	1028406.71	134922.45	65.88	8.64
1995	165356.38	257782.62	7.29	1205916.13	166671.56	64.63	8.93
1996	197512.76	250496.24	8.44	1666099.88	240134.56	78.58	11.33
1997	232056.39	211494.61	11.39	2643164.37	353364.61	108.85	14.55
1998	247392.93	232938.07	11.39	2817940.83	373302.00	105.24	13.94
1999	270587.25	372455.75	7.82	2116157.97	281392.54	72.02	9.58
2000	299379.16	439653.84	7.06	2112462.64	272399.92	67.12	8.66
2001	310377.30	451054.70	7.46	2315795.85	301507.80	67.79	8.83
2002	355053.90	519923.10	7.22	2562578.96	323948.74	68.76	8.69

Appendix Table 6

Ahmed and Ahmed (1995) Based on Original Estimates

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1973	115.63	18780.37	3.66	423.08	46.05	0.68	0.07
1974	115.39	20634.61	4.34	500.65	53.18	0.56	0.06
1975	113.35	22210.65	5.10	577.70	58.92	0.52	0.05
1976	142.49	27328.51	4.92	700.36	74.21	0.53	0.06
1977	168.81	35081.19	4.46	753.17	80.34	0.50	0.05
1978	216.87	41972.13	4.58	993.34	110.28	0.56	0.06
1979	301.83	52690.17	4.00	1208.73	144.42	0.62	0.07
1980	370.28	61618.72	4.11	1523.06	198.82	0.65	0.08
1981	406.25	73173.75	4.11	1670.47	219.22	0.60	0.08
1982	514.13	80411.87	4.35	2234.63	319.64	0.69	0.10
1983	570.10	95881.90	4.21	2400.84	306.21	0.66	0.08
1984	652.63	102792.37	4.47	2916.72	383.90	0.69	0.09
1985	708.32	118259.68	4.32	3057.47	375.03	0.65	0.08
1986	760.27	134070.73	4.15	3152.26	412.87	0.61	0.08
1987	988.14	158636.86	3.84	3792.55	549.37	0.66	0.10
1988	1068.56	184011.44	3.83	4090.98	566.08	0.61	0.08
1989	1145.33	205213.67	3.88	4447.15	638.25	0.58	0.08
1990	1284.19	238872.81	3.73	4788.30	642.09	0.54	0.07
1991	1577.01	263563.99	3.96	6249.72	793.86	0.61	0.08
1992	2123.62	300784.38	4.05	8597.58	1172.12	0.71	0.10
1993	2445.67	325376.33	4.13	10094.59	1350.88	0.76	0.10
1994	2822.18	355945.82	4.40	12409.10	1628.02	0.79	0.10
1995	3454.09	419684.91	4.48	15472.51	2138.48	0.83	0.11
1996	4024.17	443984.83	4.76	19152.07	2760.38	0.90	0.13
1997	4315.62	439235.38	5.48	23668.76	3164.28	0.97	0.13
1998	4923.45	475407.55	5.58	27478.19	3640.13	1.03	0.14
1999	5480.24	637562.76	4.57	25037.58	3329.33	0.85	0.11
2000	5959.21	733073.79	4.23	25218.52	3251.90	0.80	0.10
2001	6739.87	754692.13	4.46	30055.30	3913.09	0.88	0.11
2002	8453.40	866523.60	4.33	36607.78	4627.78	0.98	0.12

Appendix Table 7

Ahmed and Ahmed (1995) Based on Replicated Estimates (1973–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1973	–4380.03	23276.03	2.95	–12930.81	–1407.57	–20.80	–2.26
1974	–4394.98	25144.98	3.56	–15648.89	–1662.30	–17.60	–1.87
1975	–4867.82	27191.82	4.16	–20264.99	–2066.94	–18.09	–1.84
1976	–6591.61	34062.61	3.94	–25993.25	–2754.10	–19.79	–2.10
1977	–8747.48	43997.48	3.56	–31119.34	–3319.57	–20.60	–2.20
1978	–11032.40	53221.40	3.61	–39850.55	–4424.23	–22.40	–2.49
1979	–14896.21	67888.21	3.11	–46299.05	–5531.96	–23.57	–2.82
1980	–17998.65	79987.65	3.17	–57031.22	–7444.65	–24.25	–3.17
1981	–21291.25	94871.25	3.17	–67526.05	–8861.77	–24.27	–3.19
1982	–24032.62	104958.62	3.33	–80027.66	–11447.23	–24.69	–3.53
1983	–28057.36	124509.36	3.24	–90989.60	–11605.08	–24.97	–3.18
1984	–32351.86	135796.86	3.38	–109445.45	–14405.12	–26.07	–3.43
1985	–33416.02	152384.02	3.35	–111939.62	–13730.57	–23.71	–2.91
1986	–46513.36	181344.36	3.07	–142581.53	–18674.94	–27.71	–3.63
1987	–54652.84	214277.84	2.84	–155292.61	–22495.06	–27.13	–3.93
1988	–58873.72	243953.72	2.89	–170014.19	–23525.47	–25.17	–3.48
1989	–63936.95	270295.95	2.95	–188482.00	–27050.54	–24.52	–3.52
1990	–74729.99	314886.99	2.83	–211376.89	–28344.70	–23.73	–3.18
1991	–75728.68	340869.68	3.06	–232051.18	–29475.91	–22.74	–2.89
1992	–101047.26	403955.26	3.01	–304611.43	–41528.07	–25.27	–3.45
1993	–117964.09	445786.09	3.01	–355385.46	–47558.60	–26.66	–3.57
1994	–138007.82	496775.82	3.15	–434793.57	–57043.01	–27.85	–3.65
1995	–169477.92	592616.92	3.17	–537636.61	–74307.60	–28.81	–3.98
1996	–202594.89	650603.89	3.25	–657989.45	–94835.85	–31.03	–4.47
1997	–208875.39	652426.39	3.69	–771233.19	–103106.15	–31.76	–4.25
1998	–236357.43	716688.43	3.70	–875031.95	–115918.39	–32.68	–4.33
1999	–239754.16	882797.16	3.30	–791080.46	–105192.59	–26.92	–3.58
2000	–249710.62	988743.62	3.14	–783486.75	–101029.82	–24.89	–3.21
2001	–265685.07	1027117.07	3.28	–870535.98	–113340.47	–25.48	–3.32
2002	–262327.40	1137304.40	3.30	–865543.75	–109417.82	–23.23	–2.94

Appendix Table 8

Ahmed and Ahmed (1995) Based on Replicated Estimates (1980–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1980	–21081.22	83070.22	3.05	–64320.01	–8396.11	–27.35	–3.57
1981	–25093.16	98673.16	3.05	–76517.58	–10041.77	–27.50	–3.61
1982	–28049.28	108975.28	3.21	–89960.28	–12868.00	–27.75	–3.97
1983	–32898.96	129350.96	3.12	–102697.41	–13098.33	–28.18	–3.59
1984	–37953.23	141398.23	3.25	–123308.48	–16229.76	–29.37	–3.87
1985	–39050.53	158018.53	3.23	–126150.05	–15473.62	–26.72	–3.28
1986	–55525.87	190356.87	2.92	–162149.82	–21237.94	–31.51	–4.13
1987	–64678.67	224303.67	2.71	–175565.83	–25431.76	–30.67	–4.44
1988	–69662.03	254742.03	2.77	–192648.95	–26657.53	–28.52	–3.95
1989	–75726.27	282085.27	2.82	–213906.35	–30699.39	–27.82	–3.99
1990	–88833.98	328990.98	2.71	–240498.55	–32249.78	–27.00	–3.62
1991	–88617.38	353758.38	2.95	–261651.93	–33235.90	–25.64	–3.26
1992	–118127.72	421035.72	2.89	–341655.01	–46578.26	–28.35	–3.86
1993	–138067.75	465889.75	2.88	–398002.17	–53261.68	–29.86	–4.00
1994	–161721.79	520489.79	3.01	–486290.97	–63799.24	–31.15	–4.09
1995	–198620.42	621759.42	3.02	–600552.92	–83003.36	–32.19	–4.45
1996	–237905.47	685914.47	3.08	–732894.67	–105631.92	–34.57	–4.98
1997	–244542.69	688093.69	3.50	–856124.75	–114455.31	–35.26	–4.71
1998	–276539.10	756870.10	3.51	–969438.46	–128424.74	–36.20	–4.80
1999	–278362.42	921405.42	3.16	–879985.01	–117014.52	–29.95	–3.98
2000	–288919.65	1027952.65	3.02	–871931.37	–112434.67	–27.71	–3.57
2001	–305842.51	1067274.51	3.15	–964408.97	–125562.38	–28.23	–3.68
2002	–296087.21	1171064.21	3.20	–948770.18	–119938.90	–25.46	–3.22

Appendix Table 9

Ahmed and Ahmed (1995) Based on Replicated Estimates (1987–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1987	–88287.25	247912.25	2.46	–216827.98	–31408.83	–37.88	–5.49
1988	–95254.09	280334.09	2.51	–239375.04	–33123.18	–35.44	–4.90
1989	–103469.84	309828.84	2.57	–266102.80	–38190.52	–34.61	–4.97
1990	–122052.17	362209.17	2.46	–300125.82	–40245.53	–33.70	–4.52
1991	–120551.63	385692.63	2.71	–326470.18	–41469.33	–31.99	–4.06
1992	–160133.45	463041.45	2.63	–421130.92	–57413.32	–34.94	–4.76
1993	–187471.47	515293.47	2.61	–488603.84	–65386.23	–36.65	–4.91
1994	–219961.81	578729.81	2.70	–594855.26	–78042.40	–38.10	–5.00
1995	–269616.21	692755.21	2.71	–731671.20	–101125.42	–39.21	–5.42
1996	–322887.16	770896.16	2.74	–885038.15	–127560.33	–41.74	–6.02
1997	–332131.53	775682.53	3.11	–1031468.68	–137897.03	–42.48	–5.68
1998	–375537.29	855868.29	3.10	–1164209.62	–154226.72	–43.48	–5.76
1999	–375738.38	1018781.38	2.86	–1074286.20	–142851.40	–36.56	–4.86
2000	–389420.07	1128453.07	2.75	–1070565.29	–138048.31	–34.02	–4.39
2001	–410475.95	1171907.95	2.87	–1178782.68	–153473.02	–34.51	–4.49
2002	–391880.98	1266857.98	2.96	–1160775.79	–146739.62	–31.15	–3.94

Appendix Table 10

Aslam (1998) Based on Original Estimates

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1973	–6941.06	25837.06	2.66	–18460.37	–2009.49	–29.69	–3.23
1974	–7105.12	27855.12	3.21	–22837.29	–2425.89	–25.68	–2.73
1975	–7032.53	29356.53	3.86	–27117.97	–2765.91	–24.20	–2.47
1976	–8412.33	35883.33	3.74	–31489.86	–3336.49	–23.98	–2.54
1977	–9705.81	44955.81	3.48	–33792.57	–3604.73	–22.37	–2.39
1978	–12260.69	54449.69	3.53	–43288.25	–4805.89	–24.33	–2.70
1979	–15750.87	68742.87	3.07	–48346.78	–5776.63	–24.61	–2.94
1980	–17789.55	79778.55	3.18	–56516.41	–7377.45	–24.03	–3.14
1981	–19134.32	92714.32	3.25	–62097.08	–8149.30	–22.32	–2.93
1982	–22683.03	103609.03	3.37	–76517.45	–10945.13	–23.60	–3.38
1983	–27981.48	124433.48	3.24	–90798.87	–11580.76	–24.92	–3.18
1984	–30617.16	134062.16	3.43	–104917.23	–13809.12	–24.99	–3.29
1985	–36710.94	155678.94	3.28	–120374.40	–14765.18	–25.49	–3.13
1986	–35071.54	169902.54	3.27	–114747.86	–15029.36	–22.30	–2.92
1987	–41645.32	201270.32	3.03	–125980.06	–18248.96	–22.01	–3.19
1988	–47354.52	232434.52	3.03	–143526.44	–19860.27	–21.25	–2.94
1989	–48459.79	254818.79	3.13	–151533.11	–21747.71	–19.71	–2.83
1990	–57837.61	297994.61	2.99	–172869.84	–23181.07	–19.41	–2.60
1991	–85780.86	350921.86	2.98	–255324.06	–32432.11	–25.02	–3.18
1992	–108287.82	411195.82	2.96	–320690.31	–43720.12	–26.61	–3.63
1993	–124200.35	452022.35	2.97	–369010.94	–49382.00	–27.68	–3.70
1994	–147357.49	506125.49	3.09	–455673.61	–59782.38	–29.19	–3.83
1995	–171378.63	594517.63	3.16	–541928.14	–74900.74	–29.04	–4.01
1996	–191744.69	639753.69	3.30	–633311.89	–91279.08	–29.87	–4.31
1997	–218903.64	662454.64	3.64	–796025.14	–106420.59	–32.78	–4.38
1998	–254303.43	734634.43	3.61	–918472.14	–121673.06	–34.30	–4.54
1999	–286797.33	929840.33	3.13	–898425.68	–119466.64	–30.58	–4.07
2000	–323584.64	1062617.64	2.92	–944689.76	–121816.79	–30.02	–3.87
2001	–363515.65	1124947.65	2.99	–1087502.66	–141588.71	–31.83	–4.14
2002	–489638.75	1364615.75	2.75	–1346441.50	–170210.57	–36.13	–4.57

Appendix Table 11

Aslam (1998) Based on Replicated Estimates (1973–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1973	–3002.50	21898.50	3.14	–9421.64	–1025.58	–15.15	–1.65
1974	–3088.27	23838.27	3.76	–11598.95	–1232.10	–13.04	–1.39
1975	–3628.83	25952.83	4.36	–15828.23	–1614.41	–14.13	–1.44
1976	–4613.74	32084.74	4.19	–19315.30	–2046.54	–14.71	–1.56
1977	–5955.34	41205.34	3.80	–22621.85	–2413.13	–14.98	–1.60
1978	–6839.06	49028.06	3.92	–26816.52	–2977.18	–15.07	–1.67
1979	–8709.36	61701.36	3.42	–29783.95	–3558.68	–15.16	–1.81
1980	–9369.21	71358.21	3.55	–33277.82	–4343.97	–14.15	–1.85
1981	–10905.17	84485.17	3.56	–38837.99	–5096.90	–13.96	–1.83
1982	–11228.93	92154.93	3.79	–42586.99	–6091.68	–13.14	–1.88
1983	–14994.79	111446.79	3.62	–54327.49	–6929.09	–14.91	–1.90
1984	–17095.19	120540.19	3.81	–65152.37	–8575.30	–15.52	–2.04
1985	–18534.10	137502.10	3.71	–68806.70	–8439.86	–14.57	–1.79
1986	–23037.72	157868.72	3.52	–81120.94	–10625.00	–15.77	–2.06
1987	–24652.08	184277.08	3.30	–81451.22	–11798.70	–14.23	–2.06
1988	–27913.91	212993.91	3.31	–92326.13	–12775.50	–13.67	–1.89
1989	–29396.58	235755.58	3.38	–99355.60	–14259.31	–12.92	–1.85
1990	–37030.20	277187.20	3.21	–118987.19	–15955.65	–13.36	–1.79
1991	–50459.51	315600.51	3.31	–167000.23	–21212.92	–16.36	–2.08
1992	–61014.83	363922.83	3.35	–204164.88	–27834.06	–16.94	–2.31
1993	–76346.39	404168.39	3.32	–253689.50	–33949.39	–19.03	–2.55
1994	–89156.55	447924.55	3.49	–311521.67	–40870.28	–19.96	–2.62
1995	–102047.32	525186.32	3.58	–365290.16	–50487.32	–19.58	–2.71
1996	–113548.21	561557.21	3.76	–427261.14	–61581.04	–20.15	–2.90
1997	–135782.35	579333.35	4.16	–564605.03	–75482.04	–23.25	–3.11
1998	–152878.53	633209.53	4.19	–640595.83	–84861.86	–23.92	–3.17
1999	–156516.14	799559.14	3.64	–570195.75	–75820.82	–19.41	–2.58
2000	–171243.62	910276.62	3.41	–583605.46	–75255.33	–18.54	–2.39
2001	–185241.59	946673.59	3.55	–658533.35	–85738.53	–19.28	–2.51
2002	–197553.33	1072530.33	3.50	–691189.08	–87376.75	–18.55	–2.34

Appendix Table 12

Aslam (1998) Based on Replicated Estimates (1980–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1980	–19383.99	81372.99	3.11	–60375.20	–7881.17	–25.67	–3.35
1981	–22642.35	96222.35	3.13	–70802.79	–9291.79	–25.45	–3.34
1982	–23334.99	104260.99	3.35	–78224.51	–11189.30	–24.13	–3.45
1983	–30993.38	127445.38	3.17	–98195.55	–12524.15	–26.95	–3.44
1984	–35341.24	138786.24	3.31	–116983.21	–15397.24	–27.87	–3.67
1985	–38190.54	157158.54	3.25	–124047.01	–15215.66	–26.27	–3.22
1986	–48204.41	183035.41	3.04	–146400.07	–19175.08	–28.45	–3.73
1987	–51635.39	211260.39	2.88	–148814.32	–21556.64	–25.99	–3.77
1988	–58311.04	243391.04	2.89	–168778.58	–23354.50	–24.99	–3.46
1989	–61516.74	267875.74	2.97	–182985.82	–26261.74	–23.80	–3.42
1990	–77299.09	317456.09	2.81	–216874.28	–29081.87	–24.35	–3.27
1991	–104961.80	370102.80	2.82	–296224.30	–37627.39	–29.02	–3.69
1992	–127587.26	430495.26	2.83	–360905.81	–49202.75	–29.95	–4.08
1993	–158946.44	486768.44	2.76	–438535.48	–58685.95	–32.90	–4.40
1994	–185834.35	544602.35	2.87	–534055.44	–70065.73	–34.21	–4.49
1995	–213566.00	636705.00	2.95	–630584.97	–87154.14	–33.79	–4.67
1996	–238874.27	686883.27	3.08	–734841.27	–105912.49	–34.66	–5.00
1997	–282630.05	726181.05	3.32	–937569.28	–125343.62	–38.61	–5.16
1998	–318340.07	798671.07	3.32	–1057568.25	–140099.58	–39.50	–5.23
1999	–324655.25	967698.25	3.01	–977232.52	–129945.85	–33.26	–4.42
2000	–353670.50	1092703.50	2.84	–1004095.08	–129477.04	–31.90	–4.11
2001	–381215.89	1142647.89	2.95	–1122788.88	–146182.84	–32.87	–4.28
2002	–401323.91	1276300.91	2.94	–1179951.20	–149163.68	–31.66	–4.00

Appendix Table 13

Aslam (1998) Based on Replicated Estimates (1987–2002)

(As Percentage of GDP)

Years	Illegal Money	Legal Money	Velocity	Underground Economy	Tax Evasion	Underground Economy	Tax Evasion
1987	–58742.72	218367.72	2.79	–163787.56	–23725.61	–28.61	–4.14
1988	–65701.07	250781.07	2.81	–184564.79	–25538.89	–27.33	–3.78
1989	–70753.89	277112.89	2.88	–203446.90	–29198.27	–26.46	–3.80
1990	–89357.97	329514.97	2.70	–241532.43	–32388.42	–27.12	–3.64
1991	–120876.57	386017.57	2.71	–327074.61	–41546.10	–32.05	–4.07
1992	–145042.23	447950.23	2.72	–394293.52	–53754.54	–32.72	–4.46
1993	–190183.17	518005.17	2.59	–493076.53	–65984.78	–36.99	–4.95
1994	–217630.35	576398.35	2.72	–590930.77	–77527.53	–37.85	–4.97
1995	–249277.28	672416.28	2.80	–696938.15	–96324.91	–37.35	–5.16
1996	–276427.87	724436.87	2.92	–806284.64	–116209.60	–38.03	–5.48
1997	–339697.66	783248.66	3.08	–1044775.17	–139675.98	–43.02	–5.75
1998	–375151.88	855482.88	3.10	–1163538.75	–154137.85	–43.45	–5.76
1999	–374268.10	1017311.10	2.86	–1071629.03	–142498.07	–36.47	–4.85
2000	–405211.26	1144244.26	2.71	–1098603.79	–141663.85	–34.91	–4.50
2001	–438958.53	1200390.53	2.80	–1230666.74	–160228.12	–36.02	–4.69
2002	–438379.59	1313356.59	2.86	–1252534.68	–158339.33	–33.61	–4.25

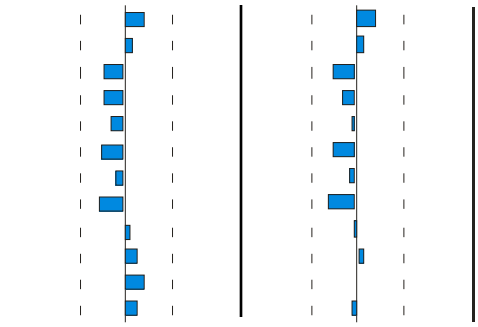
Appendix Table 14

Stationarity Results

Variables	Level	1st Difference
Currency Ratio	–0.36	–4.92*
Currency Ratio including Foreign Currency Accounts	0.09	–5.92*
Domestic Taxes as Percentage of GDP	0.03	–6.75*
Trade Taxes as Percentage of GDP	–0.14	–4.89*
Total Tax Revenues as Percentage of GDP	0.25	–6.65*
Banking Services	8.78	–2.25**
Growth rate of GDP	–1.17	–8.17*
Real Interest Rate	–0.47	–6.01*
Nominal Interest Rate	–0.47	–6.07*

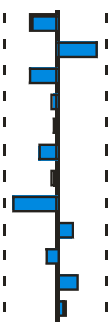
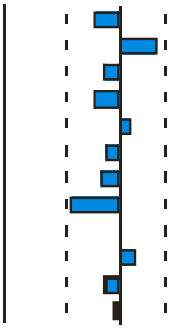
Note: *indicates significant at 1 percent and ** indicates significant at 5 percent.

Corellogram 1



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.174	0.174	0.7953	0.373
		2	0.070	0.041	0.9302	0.628
		3	-0.177	-0.202	1.8312	0.608
		4	-0.173	-0.121	2.7394	0.602
		5	-0.122	-0.052	3.2149	0.667
		6	-0.202	-0.204	4.5981	0.596
		7	-0.079	-0.071	4.8201	0.682
		8	-0.231	-0.270	6.8612	0.552
		9	0.015	0.026	6.8704	0.651
		10	0.115	0.049	7.4550	0.682
		11	0.165	0.006	8.7654	0.644
		12	0.106	0.048	9.3559	0.672

Corellogram 2

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.228	-0.228	0.9957	0.318
		2	0.340	0.304	3.3719	0.185
		3	-0.250	-0.147	4.7564	0.191
		4	-0.038	-0.232	4.7912	0.309
		5	-0.017	0.088	4.7986	0.441
		6	-0.154	-0.126	5.4857	0.483
		7	-0.015	-0.170	5.4925	0.600
		8	-0.409	-0.433	11.504	0.175
		9	0.134	-0.006	12.246	0.200
		10	-0.107	0.125	12.791	0.236
		11	0.166	-0.131	14.369	0.213
		12	0.070	-0.047	14.720	0.257

REFERENCES

Ahmed, M., and Qazi Masood Ahmed (1995) Estimation of the Black Economy of Pakistan through the Monetary Approach. *The Pakistan Development Review* 34:4, 791–807.

Aslam, S. (1998) The Underground Economy and Tax Evasion in Pakistan: Annual Estimates (1960–1998) and the Impact of Dollarisation of the Economy. *The Pakistan Development Review* 37:4, 621–631.

Atkins, F. J. (1999) Macroeconomic Time Series and the Monetary Aggregates Approach to Estimating the Underground Economy. *Applied Economic Letters* 6, 609–611.

Bajada, C. (1999) Estimates of Underground Economy in Australia. *The Economic Records* 75:231, 369–384.

Blades, D. (1982) The Hidden Economy and the National Accounts. OECD Economic Outlook. (Occasional Studies: 28–45.)

Cagan, P. (1958) The Demand for Currency Relative to Total Money Supply. *Journal of Political Economy* 66, 303–28.

Cowell, F. (1985) The Economic Analysis of Tax Evasion. *Bulletin of Economic Research* 37:3, 163–93.

Dilnot, A., and C. N. Morris (1981) What Do We Know About the Black Economy? *Fiscal Studies* 2, 58–73.

Feige, E. (1979) How Big is the Irregular Economy? *Challenge* 22, 5–13.

Frey, B. S., H. Weck, and W. W. Pommerehne (1982) Has the Shadow Economy Grown in Germany? An Explanatory Study. *Weltwirtschaftliches Archiv* 118, 499–524.

Guttmann, P. M. (1977) Subterranean Economy. *Financial Analysis Journal* November, 26–27.

Iqbal, Z., S. K. Qureshi, and R. Mahmood (1998) The Underground Economy and Tax Evasion in Pakistan. Pakistan Institute of Development Economics, Islamabad. (Research Report No. 158.)

Kirchgassner, G. (1983) Size and Development of the West German Shadow Economy. *Journal of Institutional and Theoretical Economics* 139, 197–241.

Klovland, J. T. (1984) Tax Evasion and the Demand for Currency in Norway and Sweden: Is there a Hidden Relationship? *Scandinavian Journal of Economics* 86, 423–39.

Lewis, A. (1982) *The Psychology of Taxation and the Black Economy.* Oxford: Martin Robertson.

Macafee, K. (1980) A Glimpse of the Hidden Economy in the National Accounts. *Economic Trends* February, 81–7.

Matthews, K. G. P. (1982) Demand for Currency and the Black Economy in the UK. *Journal of Economic Studies* 9, 3–22.

Mirus, R., and R. S. Smith (1981) Canada's Irregular Economy. *Canadian Public Policy* 7, 444–53.

O'Higgins, M. (1981) Aggregate Measures of Tax Evasion: An Assessment-I. *British Tax Review* 286–302.

Park, T. (1979) Reconciliation between Personal Income and Taxable Income, 1974–77. Bureau Economic Analysis. Washington, D.C. (Mimeographed).

Persson, M., and P. Wissen (1984) Redistributional Effects of Tax Evasion. *Scandinavian Journal of Economics* 86, 131–179.

Petersen, H. G. (1982) Size of Public Sector, Economic Growth and the Informal Economy: Development Trends in Federal Republic of Germany. *The Review of Income and Wealth Series* 28, 191–215.

Porter, R. D., and A. S. Bayer (1984) A Monetary Perspective on Underground Economy Activity in the United States. *Federal Reserve Bulletin* 70, 177–89.

Pyle, D. J. (1989) *Tax Evasion and Black Economy*. London: Macmillan.

Schneider, F., and J. Lundager (1986) The Development of the Shadow Economies for Denmark, Norway and Sweden: A Comparison. University of Aarhus. (Mimeographed.)

Shabsigh, G. (1995) The Underground Economy: Estimation, and Economic and Policy Implications—The Case of Pakistan. (IMF Working Papers, WP/95/101.)

Smith, S. (1986) *Britain's Shadow Economy*. Oxford: Clarendon Press.

Smith, S., C. A. Pissarides, and G. Weber (1986) *Evidence of Survey Discrepancies*. Chapter 12 of Smith (1986).

Tanzi, V. (1980) The Underground Economy in the United States: Estimates and Implications. *Banca Nazonale Del Lavoro* – Rome.

Tanzi, V. (1983) The Underground Economy in United States: Annual Estimates, 1930–80. *IMF Staff Papers* 30:2, 283–305.

ABSTRACT

This paper is an attempt to get fresh estimates of the underground economy and tax evasion in Pakistan. Various methodologies have been used to measure the size of the underground economy, i.e., the monetary, fiscal, and labour market approaches in particular. The monetary approach has strong assumptions but this is the best, easiest, and the most appropriate approach for estimation. The year 1973 has been chosen as the benchmark period, because the pre-1973 data on money supply is not reliable. The results obtained in the study show that the underground economy and tax evasion as a percentage of GDP have increased by 1.83 times in the last 29 years. These were the maximum in 1998 but after that, due to low level of economic activity, there was a decline. This shows that there is a strong relationship with the formal economy. The underground economy and tax evasion increased sharply from 1991 to 1998, and then declined till 2002. Between 1991 and 1998, the rate of increase in the underground economy is greater than the rate of increase in the formal economy, which is a major concern to the Government. It is recommended not to use estimates of the underground economy (estimated by any indirect methodology) for policy-making purposes, but rather to use the results to observe the overall trend of growth of the underground economy.