

Precise Estimates of the Unrecorded Economy

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INTRODUCTION

Informal economy in Pakistan is the backbone of the economy. However, the problem is that we do not know how big it is due to non-availability of the precise estimates of unrecorded¹ economy. Precise estimates of the unrecorded economy would help policy-makers to make better macroeconomic policies. If unrecorded economy becomes part of the recorded economy government can seek revenues from it and rest of the sectors may have to take lesser burden of taxes. This would be a win-win situation for the government and for those sectors that are part of the documented system. In return, by becoming part of the documented economic system the undocumented sector can enjoy all those benefits and incentives that are available to the formal sector.

Informal activities are present in almost all the sectors of Pakistan whether it is agriculture, manufacturing, construction, finance, transport or services. National accounts covered some of the informal sector in the GDP estimates, however, considerable size is not recorded. Several approaches are present in literature to find the estimates of unrecorded economy. Most popular among these approaches is monetary approach which is based on the assumption that unrecorded² economy is operated through cash transactions in order to reduce the chances of detection. Other approaches are labour market approach, MIMIC approach, electricity approach, fiscal approach etc. Several studies in Pakistan have used monetary approach to estimates the size of undocumented economy [Shabsigh (1995); Ahmed and Qazi (1995); Iqbal, Qureshi, and Mahmood (1998); Aslam (1998); Kemal (2003, 2007); Yasmin and Rauf (2003)], while Arby, Jahanzeb, and Hanif (2009) and Gulzar, Junaid, and Haider (2010) also used MIMIC approach and electricity approach to estimate the size of unrecorded economy. However all these approaches have number of problems among which first and major problem is that indicators of unrecorded economy are indicating the size of unrecorded economy.

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¹Unrecorded economy is also known as underground economy, undocumented economy, shadow economy, parallel economy, and illegal economy. Thought there are somewhat differences in the definition of each term.

²In general term “underground economy” or “shadow economy” is used whenever monetary approach is used.

Thus it does not give the actual estimates of unrecorded economy instead it gives the trend estimates of it.³ Using these estimates for the policy measures could be misleading [Ahmed (2003)] since all the studies give different and volatile estimates of unrecorded economy (see Appendix Table). Differences in the estimates are due to the assumptions of the model and explanatory variables which are taken by different studies.

In this paper we are estimating size of unrecorded economy using a new approach. We call it “KQ” (Kemal and Qasim) approach or discrepancy approach. The introduction of the study is followed by discussion on the problems in the other approaches. Methodology is then discussed in the next section followed by data and estimates. Last section draw important conclusions of the study.

Problems with the Monetary Approach

Main theme of the monetary approach is that currency is the sole medium of exchange in the unrecorded activities and entire transactions are not detected by the tax authorities. Thus higher the currency holding means higher evasion of taxes and higher unrecorded activities. Following Cagan (1958), Tanzi (1980) regress currency ratio on the tax variables and get the tax induced currency in circulation which is known as legal currency holding and the rest is illegal holding of money [see the following procedure, taken from Kemal (2007)].

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

Where *CC* implies Currency in Circulation, *FCA* implies Foreign Currency Accounts, *M2* implies Money Supply, *T* implies Total Tax Revenues, *Y* implies GDP at current market prices, *BS* implies Banking Services, *G* implies Growth Rate of Real GDP, ε is the Error Term of the equation, and Subscript *t* shows time period.

$\frac{CC + FCA}{M2}$ is known as currency ratio and FCA is added with currency in circulation based on the assumption that they are also used as liquid as cash in hand.

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. Mathematically it is;

$$\left(\frac{CC + FCA}{M2} \right)_t - \left(\frac{CC + FCA}{M2} \right)_{wt} = \beta \left(\frac{T}{Y} \right)_t$$

We know that β is constant and the entire series depend on the fraction $\left(\frac{T}{Y} \right)_t$, therefore if it decreases unrecorded economy decreases as well. On the other hand, if it increases unrecorded economy increases. Despite the fact that decrease in revenues as

³In short Indicators of unrecorded economy are indicating about the undocumented economy whether it is going up or down. Indications can never be original estimates.

percentage of GDP means that people are involved in the unrecorded activities and evading taxes but since not all the sectors are taxed thus if non-taxed sector is increasing then there is a good chance that tax to GDP ratio decreases. Although it is possible that people show their income as agriculture income and evade taxes but national accounts do not follow this procedure of accounting agriculture value added and value added of other manufacturing sector, it's an IRS problem.

Another problem which can be handled in the regression but it may have impact on the estimates is that currency holding can be increased and decreased due to variety of reasons such as increase in inflation, decline in real interest rate, and otherwise during recessions. Moreover, T-bill auctions and issuance of bonds by the SBP also reduces currency in circulation.

As Tanzi (1980) reported that unrecorded economy estimates from the monetary approach should not be considered as precise estimates, because they are sensitive to assumptions. However, these estimates can be broad indicators of a fluctuating trend over the period of analysis. However, in a recent exercise in estimating unrecorded economy from monetary approach tells us the problem that unrecorded economy varies due to changes in the tax-GDP ratio even though evasion does not happen.

Problems with MIMIC Approach

The multiple indicators multiple causes (MIMIC) model is a structural equation model. It was first introduced by Joreskog and Goldbreger (1975) and its contemporary version is best described by Giles and Tedds (2002). Unrecorded economy is unobservable in the model which is caused by various factors and it affects several indicators. Mathematically we can write it as;

$$\eta_t = \gamma x_t + \zeta_t \quad \text{Undocumented Economy is a function of it Causative Factors}$$

The variable η_t is unobservable caused by several factors represented by vector " x_t ", γ is a vector of coefficients and ζ_t is the error term.

$$\check{Y}_t = \lambda \eta_t + \varepsilon_t \quad \text{Indicators are explained by undocumented economy}$$

\check{Y}_t is a vector of indicators explained by unrecorded economy, λ is a vector of parameters and ε_t is the error term.

These two models are connected through the unobservable variable and final equation is estimated by using some econometric technique.

$$\check{Y}_t = \Pi x_t + v_t \quad \text{Indicators are dependent on the causative factors of undocumented economy.}$$

Where $\Pi = \lambda \gamma$ and $v_t = \lambda \zeta_t + \varepsilon_t$.

Recently the MIMIC approach obtains burgeoning attention of the researcher especially in estimating the unrecorded economy. Many research endeavors have been made to estimate the unrecorded economy using this MIMIC approach. In case of Pakistan this method was first applied by Arby, Malik, and Hanif (2010) and later by Gulzar, Junaid, and Haider (2010). They considered tax revenue, financial development, and interest rate as the cause variables and currency in circulation and electricity consumption as the indicator variables.

Several deficiencies of the approach are discussed by Breusch (2005) such as it is based on the common errors and anomalies. The results are sensitive to the unit of measurement. *Ibid* also asserted that the unrecorded economy is not a latent or hypothetical variable thus mimic model is not applicable to get unrecorded economy estimates. Estimation of the model involves differencing the variables by doing this we might lost the long run relationship among the variables. Moreover, condition of rank of Π should be equal to *one*, i.e., rows and columns need to be dependent, creates difficulties if these are orthogonal. Another problem with the approach is to set λ equals to ± 1 to calculate parameter γ . Choosing sign of the coefficient sometimes chosen simply out of convenience which might invert the time path of the results. This also implies that unrecorded economy has one-to-one association with its indicators.

The actual estimates of the parameters in the MIMIC model are obtained by using the Model's covariance matrix in such a way that the model's covariance is as close as possible to sample covariance matrix. The estimates of unrecorded economy give us the time path of unrecorded economy, which has little to do with unrecorded activities.

Problems with the Electricity Approach

Electricity approach is a physical indicator approach based on the assumption that the usage of electricity in the unrecorded economy is same as in the recorded economy. Thus, by analysing the aggregate electricity consumption and economic activity we can find the traces of unrecorded economy. Kaufman and Kaliberda (1996) are prominent champions of this method. They assumed that elasticity of electricity consumption to GDP is unity, which is also confirmed by many other studies.⁴ Based on this assumption, if in an economy the electricity consumption grows by say 10 percent, subsequently the growth in the GDP should be 10 percent. However, if the growth of the GDP is less than the growth in electricity consumption then this indicates the existence of unrecorded economy. The difference between the electricity consumption growth and the formal GDP growth gives the growth in the unrecorded economy.

Problem started with first assumption of the model that in case of Pakistan, especially, not everyone is paying full electricity payments whether there are involved in recorded or unrecorded activity. In short this approach cannot capture the unrecorded consumption of electricity. Moreover, not all the sectors involved in unrecorded activities consume electricity such as transport, financial services, etc. The technological advancement makes more efficient usage of resources especially energy. This is true for both recorded and unrecorded economy therefore growth rate of electricity consumption might not able to indicate the actual growth in the economy. Last, it is not necessary that the elasticity of electricity consumption to GDP is unity for all countries and remain constant over the time. This challenges the basic assumption of the electricity consumption approach.

METHODOLOGY

Recorded GDP by National Accounts (expenditure on GDP at market prices) is the addition of private consumption, investment, government expenditures and net exports.

⁴see for instance, Dobozi, and Pohl (1995), and Johnson, Kaufmann, and Shleifer (1997).

Calculation of all the variables are given on the website of Pakistan Bureau of Statistics and it is easily accessible.

Data on exports and imports of merchandise items are collected from the International Trade Statistics of the Pakistan Bureau of Statistics and non-factor services and other current transfers are collected from the State Bank of Pakistan's balance of payments statistics. Data on government expenditure are calculated by the national accounts and investment data is computed by a combination of approaches i.e. commodity flow, expenditure (survey method) and financial approach. Rest is consumption which is a residual.⁵ It is calculated as the difference between total national income and total national savings. Savings are derived from the Twin deficit identity, i.e., Current Account Balance = Saving – Investment.

Thus if we believe that agriculture value added and industry value added are underestimated in the GDP records then we can comfortably assume that National Accounting approach of calculating consumption underestimate the total private consumption since people involved in the unrecorded sector does not report their activities in the recorded GDP. For instance, manufacturers do not report their actual production and report underemployment to avoid labour laws and taxes. Moreover, services sectors including transports services, and especially wholesale and trade services are difficult to document and mostly remain unaccounted in the recorded GDP because these are estimated/predicted for some of the products of manufacturing sector based on survey conducted in 1999-2000. Thus consumption calculated as a residual to the GNP is definitely underestimating the overall private consumption of the country.

Our idea in this paper is to calculate total private consumption from the household survey for the total population and then compares it with private consumption in recorded GDP. The difference between the two is the expenditure on private consumption from the income generated in the unrecorded sector.

Misinvoicing of imports and exports are among the important illegal activities, which are not recorded in GDP (by national accounts). Recently Mahmood (2012) estimated misinvoicing of exports and imports for Pakistan since the early 1970s and we used *Ibid* estimates to incorporate the illegal activities in the international trade sector. Thus, component of the net exports gives us unrecorded activity in international trade.

Although, data on investment are also under reported as it is calculated on the basis of old survey methodologies for certain sectors and predicted according to commodity flow mechanism for rest of the sectors. Survey was done in 1999-2000 and since then several changes in the economy has happened thus there is a need to do a new survey to get up-to-date estimates. Investment using commodity flow could be under reported because commodity producing sector under report as well. Thus there are ample chances that investment data is also under estimated and increases the national income if it is calculated correctly. However, in this paper we are taking investment and government expenditures same as in the formal GDP. Thus our unrecorded GDP is the difference between “formal GDP” and “GDP in which private consumption is taken from household survey and net exports are adjusted for trade misinvoicing”. Mathematically, it can be written as;

⁵All the computational procedure of national accounts is given on the following link. http://www.pbs.gov.pk/sites/default/files/national_accounts/methodology/methodology_new1.1.pdf

$$GDP_f = C_f + G_f + I_f + Nx_f \quad \text{GDP in Recorded Sector}$$

$$GDP_T = C_H + G_f + I_f + Nx_T \quad \text{GDP adjusted for total consumption and net exports}$$

$$GDP_i = GDP_T - GDP_f \quad \text{GDP in Unrecorded Sector}$$

GDP = Gross Domestic Product

C = Consumption

I = Investment

G = Government Expenditures

NX = Net Exports

Subscript f , T , H , and i represent formal, total, household, and undocumented respectively

Since, Pakistan is among the very few countries if not the only country where consumption is estimated as a residual to GDP. Thus, our approach can safely be used in situations where the data discrepancy is present and large.

DATA AND ESTIMATES

We have used two data sets to estimate the unrecorded economy. Consumption is calculated using the PSLM 2007-08 data and exports and imports misinvoicing is taken from Mahmood (2012). Rest of the data on investment and government expenditures is taken from Economic survey. Since one needs to calculate unrecorded economy for each year thus we need household data set for all those years for which we want to estimate/calculate unrecorded economy. The latest data set for PSLM is available for the year 2007-08 thus we estimated unrecorded economy for 2007-08 in this paper.

We have taken all those transactions done by the households present in section 6 of both male and female survey questionnaire and all the purchases done in that current year otherwise in the other sections of survey questionnaire. There are certain issues on the inclusion of certain transactions such as land purchased, house purchased, refrigerator purchased, seeds and pesticides purchased etc. In this study we have not included land and house purchased since it can be considered as part of investment. By excluding house and land purchased we are committing omission biased since it is generally observed that people involve in unrecorded activities buy real estate to make their money white. People in the last few years are also involved in buying agricultural land to make their money white. Thus by excluding these two transactions our calculation might under estimate the true size of unrecorded economy. Total transactions per household are then calculated by excluding land and house purchased. In the end we calculated the weighted total sum of the private consumption for the entire population.

Total private consumption for the entire population is Rs 17261.6 Billion in 2007-08 (Table 1). Private consumption recorded in the economic survey is Rs 7835.31 Billion. Thus Rs 9426.29 Billion is the consumption, which is not reported in the recorded economy.

Next step is to include misinvoicing in exports and imports in the calculations. According to (*Ibid*) in 2007-08, on average during 2000-09 imports misinvoicing were-\$732.15 Million and exports misinvoicing were -\$238.14 Million (Table 1).

Table 1 below shows the calculation of the unrecorded economy. It shows that the unrecorded economy was 91.44 percent of the recorded economy in 2007-08. In our view it is still an underestimated figure since investment data is not adjusted and we are assuming that investment in the recorded economy is total investment made by the people. Moreover, land and house purchased are not part of the calculations. On the other hand, some people would argue that consumption is over reported in the household's survey, thus it could be over estimation, in this case. Our concern would be how much? Is it 10 percent or 20 percent and if it more than 20 percent then we need to check the reliability of our surveys as well. Estimates of unrecorded economy falls to 74.58 percent of GDP if we reduce overall consumption by 10 percent to check for the over reporting of consumption in household survey.

Table 1

Estimates of Undocumented Economy

	GDP	C	I	G	X	M
	(in Rs millions)					
Formal	10,242,800	7,835,310	2,258,628	1,278,431	1,316,439	2,446,008
Total	19,608,404	17,261,602	2,258,628	1,278,431	1,301,544	2,491,801
Undocumented	9,365,604	9,426,292			-14,895	45,793
% of GDP	91.44%	120.31%			-1.13%	1.87%
If household consumption is over-reported by 10 percent						
Undocumented	7,639,444	9,426,292			-14,895	45,793
% of GDP	74.58%	120.31%			-1.13%	1.87%

Table 2 shows an extreme example of increase in tax revenues and decreases in overall deficit by keeping the percentage of direct taxes and indirect taxes same among the recorded and unrecorded economy. Since unrecorded economy and recorded economy is almost the same thus the revenue collection from the undocumented economy would be the same as in the formal economy. Accordingly our tax revenues would jump from ten percentage of GDP to 19.64 percentage of GDP. Initially our budget deficit was 7.59 percent but if we include the unrecorded economy estimates it becomes surplus to 2.7 percent.

Table 2

Change in Revenues After Inclusion of Undocumented Economy

	Tax Revenues	Direct Taxes	Indirect Taxes	Budget Balance
Revenues from the Formal Sector (in Rs millions)	1050696	391350	659346	-777,169
%of GDP	10.26%	3.82%	6.44%	-7.59%
Revenues from Undocumented Sector (in Rs millions)	960911	357766	603145	
%of GDP	9.38%	3.49%	5.89%	
Total Revenues as Percentage of Formal GDP	19.64%	7.31%	12.33%	2.70%

CONCLUSIONS

Measurement of variables in the national accounts has some problems. These problems lead us to calculate unrecorded economy. It's a new approach and can be applied in all those countries which have data discrepancy problems. The estimates of unrecorded economy are very crucial for the policymakers and, in general, researchers came up with vague estimates which do not make much sense. This study calculated the precise estimates of unrecorded economy. Since we do not have the data for PSLM 2010-11, thus we estimate the unrecorded economy using 2007-08 and it was 91 percentage of GDP in the year 2007-08. This implies that our recorded GDP is almost half of the actual GDP. However, it is still an under estimated figure since we did not work out unrecorded proportion of investment and excluded some of the transactions from private consumption.

APPENDIX TABLE

Estimates of Unrecorded Economy by Different Studies

Year	Qasim (2011)	Arby, Malik, and Hanif (2010)			Gulzar, Junaid, and Haider (2010)				Labor app	Kemal (2007)			Ahme and Hussain (2006)		Bushra and Rauf (2003)	Kemal (2003)	Iqbal, Qureshi and Mahmood (1998)	Aslam (1998)	Ahmed and Ahmed (1995)	Shabsigh (1995)
	Monetary	ARDL Model	MIMIC	Elec Cons	Elec Cons	DOLS	MIMIC	Monetary		Eq1	Eq2	Eq3	Eq1	Eq2	Monetary	Monetary	Monetary	Monetary	Monetary	Monetary
1960	...	...	...	...	...	...	...	...	...	...	...	51.6	60.2	...	...	29	52	...		
1961	....	...	...	...	...	...	...	...	...	...	...	44.8	51.3	...	...	29.3	55.1	...		
1962	....	...	...	...	...	...	...	...	...	...	...	40	45.1	...	...	31	54	...		
1963	....	...	...	...	...	...	...	...	...	...	...	36.3	40.4	...	...	29.4	47.1	...		
1964	....	...	...	...	...	...	...	...	...	...	...	33.4	37.2	...	...	30.5	45.7	...		
1965	....	...	...	...	...	...	...	...	...	...	...	31	35.2	...	...	33	49.6	...		
1966	....	24.4	...	...	...	...	...	...	...	...	...	29	33.8	...	...	31	40.3	...		
1967	....	29.2	...	...	...	...	...	...	...	...	...	27.3	32.9	...	...	37	45.2	...		
1968	....	28.8	...	...	...	...	...	...	...	...	...	25.7	31.7	...	...	35	39.7	...		
1969	....	33.1	...	...	...	...	...	...	...	...	...	24.2	30.2	...	...	41	45	...		
1970	...	36	...	...	...	...	...	...	...	...	...	22.7	27.9	...	...	40.6	44.8	...		
1971	22	32.3	...	...	...	...	...	...	...	...	...	21.2	25.1	...	...	32.4	36.9	...		
1972	23.04	29.8	...	...	...	...	...	...	...	...	...	20	22.5	...	...	44.4	37.2	...		
1973	22.85	29.3	29.3	...	...	27.7	31.8	...	...	...	...	18.8	20.4	...	20.2	42	36.4	...		
1974	24.01	27.1	29.5	...	30.7	26.6	31.6	...	...	16.3	38	22.4	18.3	19.3	13.8	20.3	21.6	34.7	36.9	...
1975	22.18	25.9	29.8	1.2	38.3	27	32	...	...	15.7	33.1	21.4	18.1	18.8	16.2	19.4	24	30.6	32.8	20.7
1976	24.03	28.4	29.8	2.8	43.4	27.5	32.5	...	...	17	31.6	23.4	18.4	19.3	15.1	21.2	24.2	27.1	33.3	22.9
1977	23.69	27.9	29.7	5.5	46.3	27.1	32.1	...	...	16.8	30.9	23	19.3	21.1	16.2	20.8	26.2	27.5	32.1	22.1
1978	28.11	29.2	29.7	5.1	54.8	27.1	32.1	...	...	18.9	34.9	26	21	24.6	17.6	23.5	26.2	46.3	35.5	22
1979	30.95	31.1	29.6	7.9	56.5	26.8	31.8	...	...	21.1	39.2	29.2	22.5	28	19.3	26.4	29.8	46.7	38	22
1980	33.47	33.3	29.7	7.9	50.1	26.3	31.3	...	...	22.6	45.6	31.4	24	31	20.9	28.2	32.9	52.6	45.3	22.5
1981	31.6	33.1	29.8	9.6	47.8	26.2	31.2	...	...	21.5	43	29.8	25.2	32.9	21.5	26.9	35.7	45.3	47.1	24.2
1982	38.95	31.6	29.7	12	51.5	26.4	31.4	36.2	...	24.2	47.8	33.8	25.8	33.1	21.0	30.4	36.1	43.1	43.7	21.9
1983	38.71	32.8	29.6	14.2	56.9	25.7	31.3	36.2	...	23	42	31.9	27.2	34.2	22.5	28.8	36.6	46.8	44.7	25.6
1984	38.22	32.1	29.4	17.9	53	21.8	31.1	36.6	...	24.8	49.3	34.7	27.2	33.5	23.3	31.2	39.6	42.5	45.6	23.1
1985	35.77	29.6	29.4	19.4	57.1	26	31.1	33	...	21.9	39.3	30.4	27	33.1	23.9	27.4	39.6	40.2	42.1	21.6

Continued—

Appendix Table

Appendix Table

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