ESTIMATING THE UNDERGROUND ECONOMY IN TURKEY

Fethi ÖĞÜNÇ
(Statistician)

Gökhan YILMAZ
(Researcher)

THE CENTRAL BANK OF THE REPUBLIC OF TURKEY
Research Department

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I. WHAT IS UNDERGROUND ECONOMY?

In the literature, underground economy is also called second, parallel, unofficial, shadow, black and irregular economy. There is also no agreement on the definition of the underground economy and on its measurement approaches as it has many different names. Therefore, there are many definitions for the underground economy and its measurement approaches.

When the literature for underground economy is analyzed, some basic definitions are observed. One of them is Schneider's definition. According to Schneider, underground economy is, all economic activities that contribute to value added and should be included in national income in terms of national accounting conventions but are presently not registered by national measurement agencies (Schneider, 1986). Smith (1994) defines it as, market based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of gross domestic product. Bagachwa (1995) thought underground economy could be categorized into three groups such as informal sector, parallel and black market activities. According to Bagachwa, informal sector refers to very small-scale units producing and distributing goods and services and consisting of both employed workers and independent self-employed persons in both rural and urban areas. They are informal in the sense that they are mostly unregistered, unrecorded in official statistics; and participants have little or no access to organized markets, to credit institutions, to formal education and training or to many public services (ILO, 1991). Parallel market activities are alternative of legal market activities. It includes illegal production and trade of goods and services that are legal in their nature. Finally, black market activities consist of production and/or

distribution of market and non-market goods that are forbidden by government. So different definitions of these three concepts reveal that using aforementioned names of underground economy interchangeably is misleading.

It is thought that Table 1 can be very useful and helpful in understanding of what is underground economy and what kind of economic activities can be classified as underground economy.

TABLE 1
UNDERGROUND ECONOMIC ACTIVITIES

Type Of Activity	**Monetary Transactions**		**Nonmonetary Transactions**	
Illegal Activities	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling and fraud.		Barter: drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
Legal Activities	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods.	Employee discounts, fringe benefits.	Barter of legal services and goods.	All do it yourself work and neighbor help.

Source: Rolf Mirus and Roger S. Smith (1997, p.5) and with additional remarks by Schneider and Enste (2000)

II THE MAIN CAUSES OF UNDERGROUND ECONOMY

In the economic literature, the most important causes of underground economy are increase of the tax burden and social security contributions, increased regulation in the official economy especially in labor markets, forced reduction of weekly working hours, earlier retirement and the declining of tax morale.

The increase of tax burden and social security contributions is the most important factor behind the increasing underground economic activities. As it is known, taxes affect labor-leisure choices of economic agents and also encourage labor supply towards to underground or untaxed sector of economy. As the difference between total cost of labor for employers in the official economy and after tax earnings of labor increases, we expect increasing underground economic activities. The difference between two items reflects overall tax burden and therefore it depends on social security system. Higher tax and social security contributions can lead lower tax income for employers and so it can create an incentive for employers to work in underground economy where they avoid from lower wage rates.

The intensity of regulations is also cause of underground economy. The increase of the numbers of laws, regulations and licenses requirements are evidence of increase of the intensity of regulations and decrease of freedom of choice of economic agents. Generally, the regulations can increase legal burden of employers and employers can transfer their burden onto employees' wages and so it can create an incentive for employees to work in the underground economy. High regulation can also cause employers to stay in the underground part of economy to avoid higher and non-transferable legal burden. Many studies in the literature reveal

positive relation among underground economy and intensity of regulation[1]. These studies give a basic message for governments. The message is giving more importance on improving enforcement of laws and regulations, rather than executing new acts and increasing intensity of regulation.

As it is known, many European governments implement forced reduction in working hours in fighting against high unemployment rates in their countries. The main idea behind this policy is to decrease incumbent supply of labor in the official economy and create a suitable economic environment for incumbent unemployed workers to be employed by the labor demanders. But, this approach can cause employees to work on their potential working hours in underground economy. Forced early retirement may also create an incentive for workers to have jobs in untaxed and unregistered sector of economy. Therefore, both of the policies, forced reduction in working hours and forced early retirement, may increase underground economic activity. These policies may create desired outcomes if they are consistent with workers' or individuals' preferences.

Public doubts about government expenditures may decrease tax morale in a society. Public may think tax revenue of state, which are paid by members of society, is expensed inefficiently by government and therefore public may prefer to pay tax as less as possible.

This kind of behavior may increase level of economic activity in a country and exacerbate volume of bribery and corruption to stay on the unregistered sector of economy. Therefore, the governments should explain detailed expenditure plans. Especially they should

[1] See Johnson, Kaufmann and Shleifer (1997).

identify reasons and results of their expenditures. Their budgetary operations should be transparent and accountable. On the contrary, they may lose basic revenue sources. Increasing underground economic activity in a country may decrease government's revenue; government's attempts to reach previous tax revenue by increasing tax rates may exacerbate negative effects of underground economy on tax revenue. So, government can get a vicious circle.

III EFFECTS OF UNDERGROUND ECONOMY

Underground economy has both negative and positive effects on the official or registered economy. The main negative effect of underground economy is seen in the case of economics policy-making process. A high underground economy creates unreliable official macroeconomic aggregates such as unemployment rate and income level. Economic policy decisions that use these official macroeconomics data are likely to be ineffective.

On the microeconomic side, underground economy creates an unfair competition conditions for firms. Firms that are operating in the underground economy have no legal regulations and it can implement and set a more competitive price than registered firms. Underground economy firms can sell their services and products at lower price than general market price and they can increase their sales volume and profit levels.

Underground economy may deteriorate financial position of social security institutions. Unregistered firms do not pay social security contributions. Underground economy also decreases tax revenue of government and decreasing tax revenue may cause limitation on social transfer of government to low-income people. Limitation on social transfers may cause harder living standards for

low-income people and that may increase social tension in the community.

Underground economy has some positive effects on the official economy. It creates employment in the economy of a country. Firms in the underground economy have lower cost structure than registered firms, and so their labor demand can be higher than the firms in the official economy. In addition, society welfare level may increase as a result of underground economy. As mentioned above, underground economy firms may sell their goods and services at a lower price than general market price, and so lower prices may increase purchasing power of society and increase general welfare level of the public.

Underground economy may affect economic growth rate in country positively and negatively. Some researchers[2] thought that there is a positive relationship among growth of underground economy and growth of official economy. Some other researchers[3] found empirical results that show negative relationship among them by using their model. They thought that increasing (decreasing) underground economic activities might decrease (increase) tax revenue of government, and decreasing (increasing) tax revenue may diminish (increase) public infrastructure investments, which are basic element of economic growth. Briefly, there is no consensus on relationship among growth of underground economy and growth of official economy.

[2] See Adam and Ginsburgh (1985)
[3] See Loayza (1996)

IV. METHODS OF ESTIMATING SIZE OF THE UNDERGROUND ECONOMY

Measuring underground economy is not an easy task. How a researcher can estimate or measure something, which is hidden? In general, there are two approaches that use different assumptions in case of measuring underground economy. These two approaches are called direct and indirect approaches.

IV.1. Direct Approaches

These approaches are also called micro approaches since they use well-designed surveys and samples based on voluntary replies or tax auditing. Surveys were used in many studies. But it has a big disadvantage. The reliability of survey results completely depends on respondents' answers. If respondent answers the questions without fraud, survey can yield reliable conclusions. But if respondent does not answer the questions correctly, it yields misleading conclusions. This method can yield detailed information about underground economy when detailed questions are answered honestly. This is the biggest advantage in favor of the direct method.

Underground economy can be estimated by comparing income declared for tax purpose and income measured by selective checks. Researcher aims to calculate unregistered economy by getting the amount of undeclared taxable income. But as it can be thought, to obtain correct or reliable data for undeclared taxable income is not an easy task.

IV.2. Indirect Approaches

On the contrary to micro approaches, indirect approaches are macroeconomic approaches. These approaches are also called indicator approaches since they employ many economic indicators

that give information about development of underground economy over time. Indirect approaches consist of Gross Domestic Product (GDP) approach[4], employment approach, tax auditing approach and monetary approach.

IV.2.a. Gross Domestic Product Approach

GDP may be calculated by using three methods, which are production, expenditure and income methods. As it is known, in national accounting system, these three methods should yield same aggregates. But the existence of underground or unregistered sector of economy may cause discrepancies among these aggregates. Underground economy causes the income (and production) measure of GDP to be the lowest while it causes the expenditure measure of GDP to be the highest. Therefore, GDP approach depends on comparison of income (or production) measure of GDP and expenditure measure of GDP. Thus, the discrepancy among independent production measure of GDP and an independent expenditure measure of GDP can be used as an indicator of the extent of underground economy. But the word of "independent" is very important to get reliable conclusions. Endeavor of official statisticians to minimize the discrepancy between these two aggregates can make researchers to reach misleading conclusions. This approach also can yield misleading conclusions if the error part in the income (or production) measurement process is high. Income measurement, especially expenditure measure of GDP may lead to high and unknown errors. Therefore, difference between these two aggregates is often (in fact always) attributed as omissions and error term.

[4] GNP may be used instead of GDP.

The ratio of difference between production measure of GDP and expenditure measure of GDP to production measure of GDP is used to get information about underground economy, during the application of GDP approach.

In the estimation of underground economy, the GDP approach's another drawback is seen in the case of nondisposable income that is earned from underground economic activities. If the income earned by underground economic activity is not spent, instead transferred to abroad or stored in foreign currency, results of GDP approach will yield minimum level or rate for underground economy. So, reliable results could not be reached.

4.II.b. Employment Approach

Employment approach exhibits changes in some basic figures such as population, employment and labor supply in over time. In that approach, the assumption for the co-movement of ratio of labor supply to population and ratio of employment to population is accepted.

Employment approach asserts that a decrease in labor force participation in the official (registered) economy can be seen as an indication of increased activity in the underground economy if total labor force participation is assumed to be constant, ceteris paribus (Schneider March, 2000). In other words, employment approach assumes increasing underground economic activity (increasing employment in underground economy) when the ratio of employment to population is decreasing and the ratio of labor supply to population is being constant approximately.

This approach's advantage is its' simplicity. Employment approach needs only simple calculations and comparisons. Although

its' simplicity, it has two major disadvantages. At first, this approach does not include and measure second job owners. People can work in both official and underground economy. But employment approach does not consider this point. Second, the changes in the ratios may have different reasons such as social reasons (for example, immigration from rural to urban areas or increasing number of women in employment). Therefore, employment approach's indicators may be unreliable and results of that approach may yield misleading conclusions.

IV.2.c. Tax Auditing Approach

In many countries, taxpayers declare their taxable income amount to government agencies. The amount of taxable income or tax return can be wrong because of misunderstanding of related tax law, calculation mistakes or tax evasion. Tax authorities aim to solve that problem by auditing taxpayers and their tax returns[5]. So, in that approach, tax authorities analyze tax returns and determine amount or undeclared income. That undeclared income amount is used for estimating underground economy.

IV.2.d. Monetary Approach

Monetary approach, as its name suggests; employs monetary statistics for estimating underground economy. This approach consists of simple currency ratio method, transaction method and currency demand method.

[5]We think, application of this method in our country cannot yield reliable estimators as a result of inadequate supervision. In Turkey, the ratio of examined or audited taxpayers to total taxpayers is approximately 1 percent. The insufficient number of tax auditors in Ministry of Finance is the main reason of that lack of supervision or auditing.

IV.2.d.1. Simple Currency Ratio Method

Currency has a basic comparative advantage over checks for payment of purchases of services and goods that individuals can hide from the authorities. Simple Currency Ratio (SCR) Method depends on that aforementioned comparative advantage. According to SCR method, a rise in currency stocks and payments are indicator of transactions, which are not registered by government.

Cagan first used this method in 1958, then Guttmann developed it in 1977. SCR method is explained below by using basic equations and identities.

$C = C_r + C_U$	C; Currency in circulation
$D = D_r + D_U$	D; Demand deposit
$k_r = C_r / D_r$	Y; Income level
$k_u = C_U / D_U$	u; Underground economy
$V_r = Y_r / (C_r + D_r)$	r; Official (registered) economy
$V_U = Y_U / (C_U + D_U)$	v; Income velocity
$\beta = v_r / v_u$	k; (C/D)

The solution of these equations yields general formula, which can be seen at below.

$$Y_U = \frac{1}{\beta} Y_r \frac{(k_u + 1)(C - k_r D)}{(k_r + 1)(k_u D - C)}$$

The general formula or solution enables us to determine the size of underground economy by using known parameters of

economy. The SCR method employs following assumptions to reach the general solution.

- All payment transactions in the underground economy are only realized by using currency.

- The ratio of currency to demand deposits remains constant except for changes induced by the growth of unreported income.

- Underground economy's income velocity of money is equal to registered (official) economy's income velocity of money.

First assumption implies that underground or unregistered transactions are always paid by currency, check is never used. Therefore k_u approaches infinity, limit of k_r approaches a constant as a result of second assumption and third assumption implies β =1. Imposing these restrictions on the general solution yields,

$$Y_U = Y_r \frac{(C - k_r D)}{(k_r + 1)D}$$

That last equation is mathematical representation of the simple currency ratio method.

Examinations of these last equations reveal theoretical defects of simple currency ratio method. According to these equations, any improvements in the measurement of official or registered economy will increase rather than decrease the estimated size of underground economy and estimated ratio of underground economy to official economy is unaffected by improvements.

IV.2.d.2. Transaction Method

Transaction method developed by Feige in 1979. The basic assumption of this method is the existence of a constant relation over

time between the volume of transactions and the official GDP. This assumption and therefore Feige's method emerge from Fisher's quantity equation[6].

In this method, relating total nominal GDP to total transactions, the GDP of the underground economy can be calculated by subtracting the official GDP from total nominal GDP (Schneider, March 2000). In order to estimate the size of underground economy, this approach requires determination of base year in which there is no underground economy. In the base year, the ratio of P*T to nominal GDP is assumed at the normal level and it stays at its normal level, if the underground economy does not exist. In this method, when a certain period's official GNP value is subtracted from the related period's GNP value that is determined by the related period's value of M*V, one can determine the size of the underground economy[7].

Feige enlarged Guttmann' analysis. In Gutmann's analysis, underground economy transactions are realized only by using currency. But in Feige's analysis, in addition to currency, financial instruments such as checks and bills may also take place in underground economy transactions.

Despite of the theoretical strength of the transaction method, there are also several difficulties in application. Determining a base year with no underground economy is not an easily acceptable assumption and the assumption for constant normal ratio over time is also not easily acceptable. In addition to these, one cannot get

[6] As we know quantity equation implies M*V=P*T and in this equation, M is money, V is velocity, P is prices and T is total transactions. Fisher's equation of exchange specifies the equality between the total volume of payments (M*V) and the total volume of transactions (PT).

[7] (C+D)*V=P*T and the size of underground economy is equal to V*M minus official economy. In the Feige's approach, money supply consists of currency in circulation (c) and deposit (D). Fisher' equation becomes (C+D)*V=P*T.

precise figures of the total volume of transactions. So there is also a data availability problem in the application stage. In sum, although the method is theoretically attractive, satisfying the empirical requirements to obtain a reliable estimate for the underground economy is not easy.

IV.2.d.3. Currency Demand Method

The currency demand approach was first used by Cagan (1958). He calculated a correlation of the currency demand and the tax pressure for the United States. Tanzi further developed Cagan's approach. He estimated a currency demand function for United States and tried to estimate the size of the underground economy.

This method also assumes that underground economic activities or transactions are realized only by using cash or currency. As mentioned above, underground economy's agents prefer cash payments in order to escape from government authorities. This basic tenet implies that an increase in the underground economy will increase demand for money. Therefore, in order to determine excess demand part of the money demand, this method requires estimation of a econometric currency demand equation in over time. Therefore, the essence of this method is the estimating currency demand equation. The second assumption of this method is related to the velocity of money. Due to this assumption, the velocity of money in an official economy is equal to the velocity of money in underground economy. The third assumption explains the fundamental reason for the existence of an underground economy. According to the third assumption, the underground economy is caused by a tax burden, such as high tax rates. In this method, workers or people prefer to be in the underground economy to escape from high tax burden.

As mentioned above, Tanzi (1983) developed a currency demand equation, which can be seen below.

$$\ln(C/M_2)_t = \beta_0 + \beta_1 \ln(1+TW)_t + \beta_2 \ln(WS/Y)_t + \beta_3 \ln R_t + \beta_4 \ln(Y/N) + \mu_t$$

In the model, ln represents natural logarithms,

C/M_2 is the ratio of currency in circulation to broad money supply,

TW is the weighted average tax rate,

WS/Y is the proportion of wages and salaries in national income,

R is the interest paid on saving deposits

Y/N is the per capita income.

In the equation, while the ratio of currency to broad money supply is the dependent variable, per capita income, interest paid on saving deposits, the ratio of wages and salaries to national income and weighted average tax rate are used as independent variables. In the equation, the expected signs of β_1, β_2 and β_4 coefficients are positive and the expected sign of β_3 coefficient is negative.

In the model, after estimating the parameters of the above equation, currency in circulation is estimated by using relevant variables. Then, currency in circulation is estimated again by imposing zero tax rate value. The difference between these two-estimates represents the volume of currency in circulation in the underground economy. Multiplying this difference with the velocity of money yields the nominal aggregate of the underground economy.

V. UNDERGROUND ECONOMY IN TURKEY

Many researchers, academics and policy makers are interested in underground economy and its measurement in Turkey. In this section, the authors will present the results of the main studies on underground economy in Turkey. Table 2 shows their measurement methods, relevant years and the size of underground economy.

TABLE 2
UNDERGROUND ECONOMY MEASUREMENTS IN TURKEY

Researcher	Method or Approach	Relevant Year	Underground/ registered (%)
ALTUĞ	Underground wage level method	1993	35
DERDİYOK	Monetary Approach	1987	27,3
ÖZSOYLU	GNP Approach	1990	7,5
	Simple Currency Ratio Method	1993	12,9
	Transaction Method	1993	8,5
KASNAKOĞLU	Monetary Approach	1990	9,3
TEMEL, ŞİMŞEK, YAZICI	GNP Approach	1994	2,2
	Tax-Auditing Approach	1984	23,1
	Simple Currency Ratio Method	1981	7,8
	Transaction Method	1992	1
	Currency Demand Method	1992	8,1

V.1. Gross Domestic Product Approach

In GDP approach, it is anticipated that the GDP by expenditure should be greater than the GDP by activities and, consequently a positive difference between these two values is expected. However, contrary to the expectations, in the Turkish case mostly negative differences were obtained (Table 3).

TABLE 3
GDP APPROACH BY ACTIVITIES AND EXPENDITURE

	GDP by Expenditure	GDP by Activities*	Difference*	Difference/GDP by Activities (%)
1987	74416.1	74721.7	-305.6	-0.41
1988	125801	129224.3	-3423.3	-2.65
1989	220151.8	227323.8	-7172	-3.15
1990	392580.5	393059.9	-479.4	-0.12
1991	638130.3	630116.9	8013.4	1.27
1992	1098773	1093368	5405	0.49
1993	1802477	1981867.1	-179390.5	-9.05
1994	3458475	3868429.1	-409954.5	-10.60
1995	7926359	7762456.1	163903	2.11
1996	14345413	14772110.2	-426697.6	-2.89
1997	28720649	28835883.2	-115234.1	-0.40
1998	53522970	52224945.2	1298024.7	2.49
1999	83198135	77374801.5	5823333.9	7.53

Source: CBRT
* Billion TL

According to this approach, estimated ratio of underground economy to official economy was calculated as 2.49 percent in 1998. However, as stated before, this approach is so inadequate for the countries like Turkey where a high tendency for saving instruments, such as foreign exchange and gold exists.

Furthermore, GDP figures measured by activities and expenditures should be calculated independently from each other in order to obtain more significant results reflecting the extent of the underground economy. Namely, accepting this statistical difference as a calculation error and trying to minimize this discrepancy decreases the significance level of the interpretation and can give rise to misleading conclusions.

V.2. Employment Approach

As seen in Figure 1 and Table 4, the labor force/ population ratio and the employment/ population ratio move together in the given

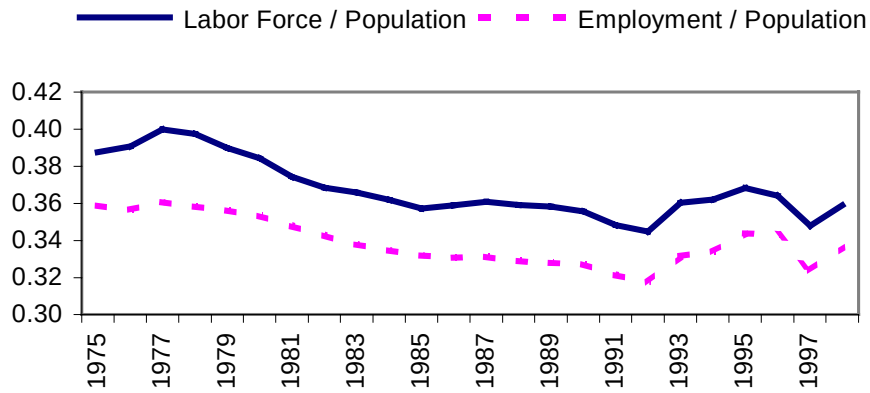
period. For this reason, this approach also does not provide any meaningful conclusions concerning the Turkish underground economy. In addition, Turkey has a young population and it continuously enrolls increases. From this point of view, a fall in these ratios, compared to past years, does not appear to be reasonable. If it is thought that these ratios change between 45-50 percent in OECD countries, realization of these figures in 1998 as 36 and 34 percent respectively points out that both labor force and employment ratios are low. And all these results give the impression of an increase in the unofficial economical activities.

TABLE 4
EMPLOYMENT APPROACH **

	Labor Force*	Employment*	Mid-year Population *	Labor Force/ Population	Employment/ Population
1976	15985	14594	40915	39.1	35.7
1977	16702	15070	41768	40.0	36.1
1978	16941	15276	42640	39.7	35.8
1979	16969	15505	43530	39.0	35.6
1980	17078	15702	44438	38.4	35.3
1981	17047	15839	45540	37.4	34.8
1982	17205	16006	46688	36.9	34.3
1983	17513	16169	47864	36.6	33.8
1984	17763	16419	49070	36.2	33.5
1985	17973	16699	50306	35.7	33.2
1986	18462	17010	51433	35.9	33.1
1987	18974	17402	52561	36.1	33.1
1988	19285	17668	53715	35.9	32.9
1989	19672	18005	54893	35.8	32.8
1990	19954	18364	56098	35.6	32.7
1991	19967	18420	57326	34.8	32.1
1992	20196	18600	58584	34.5	31.7
1993	21628	19906	60034	36.0	33.2
1994	22136	20397	61110	36.2	33.4
1995	22900	21378	62171	36.8	34.4
1996	23030	21698	63221	36.4	34.3
1997	22359	20815	64266	34.8	32.4
1998	23415	21958	65235	35.9	33.7

Source: SIS, SPO
* Thousand people
** Figures calculated for age of 12 and over were used.

FIGURE 1
MOVEMENTS IN THE RATIOS OF LABOR SUPPLY/POPULATION AND EMPLOYMENT/POPULATION



V.3. Simple Currency Ratio Method

Simple currency ratio method was applied for the period between 1960-1998 for Turkey. Data was examined for two different time periods, 1960-1979 and 1980-1998, due to the structural economic changes occurred after 1980. By using this method following results are obtained for Turkey.

TABLE 5
SIMPLE CURRENCY RATIO APPROACH BETWEEN THE YEARS 1960-1979 (BASE YEAR =1975)

	Currency in Circula-tion* (C)	Total Deposits * (D)	C/D	GNP*	V	Under-ground Economy*	Percentage Ratio (Underground / registered)
1960	3828	5428	0.7052	46664.3	6.19	10647.5	22.8
1961	4140	5885	0.7035	49535.5	6.06	11240.3	22.7
1962	4527	6437	0.7033	57592.7	6.44	13060.0	22.7
1963	4926	7241	0.6803	66801.4	6.64	14042.4	21.0
1964	5835	8164	0.7147	71312.8	6.29	16759.1	23.5
1965	6326	10108	0.6258	76726.3	5.47	13119.6	17.1
1966	7164	12616	0.5679	91419.0	5.22	11813.7	12.9
1967	8714	13968	0.6239	101480.6	5.23	17207.2	17.0
1968	8237	17731	0.4646	163892.7	6.66	8985.8	5.5
1969	9081	21046	0.4315	183356.2	6.27	5685.7	3.1
1970	11900	23500	0.5064	207814.8	6.37	17654.8	8.5
1971	13900	29700	0.4680	261072.6	6.33	14964.5	5.7
1972	16000	36900	0.4336	314139.6	6.13	10221.0	3.3
1973	20700	49100	0.4216	399088.6	5.85	9531.1	2.4
1974	26200	62600	0.4185	537677.6	6.19	11656.6	2.2
1975	32900	84700	0.3884	690900.8	5.88	0.0	0.0
1976	42500	107900	0.3939	868065.8	5.79	3409.6	0.4
1977	63000	146200	0.4309	1108270.7	5.46	33913.8	3.1
1978	93900	189800	0.4947	1645968.5	6.25	126019.3	7.7
1979	143700	300700	0.4779	2876522.9	6.89	185331.6	6.4

Source: SIS, CBRT
- Million TL

V: Income Velocity of Money

In order to estimate the size of the underground economy, it is necessary to choose a base year. Therefore, the year 1975, where the ratio of currency in circulation to deposits (C/D) is minimum, is selected as the base year for the 1960-1979 period. Namely, it is assumed that there is no underground economy in 1975 or it is so small that it can be disregarded. The choice of the base year is a crucial subject in this approach, since the results are fairly sensitive to the choice. Different base year selections result in various conclusions. For the period 1960-1979, it is seen that ratio of underground economy to official economy is 8.5 percent in 1970 and the underground economy is 17.655 billion TL in this year. While the

ratio of the underground economy to the official economy fell between 1960 and 1975 (except the years 1964, 1967 and 1970), it rose in the period of 1975-1979 (Figure 2).

FIGURE 2
THE RATIO OF UNDERGROUND ECONOMY TO OFFICIAL ECONOMY FOR THE 1960-1979 PERIOD (%)

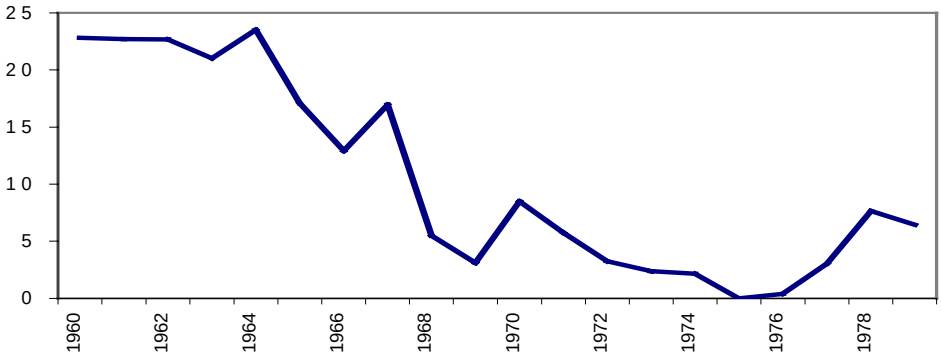


TABLE 6
SIMPLE CURRENCY RATIO APPROACH BETWEEN THE YEARS 1980-1998 (BASE YEAR =1986)

	Currency in Circulation* (C)	Total Deposits * (D)	C/D	GNP*	V	Underground Economy *	Ratio ** (%)
1980	217600	486400	0.4474	5303010.2	8.20	471037.2	8.9
1981	280600	691500	0.4058	8022745.3	8.73	461643.3	5.8
1982	411800	930100	0.4427	10611859.2	8.58	905708.5	8.5
1983	547600	1393400	0.3930	13933008.1	7.52	667682.8	4.8
1984	735500	1517200	0.4848	22167739.9	10.99	2592835.3	11.7
1985	1011400	2197300	0.4603	35350318.4	12.10	3483659.2	9.9
1986	1301800	3953300	0.3293	51184759.3	9.74	0.0	0.0
1987	2211900	6417200	0.3447	75019388.0	8.79	868459.0	1.2
1988	3425700	7885900	0.4344	129175103.7	12.32	10214499.0	7.9
1989	6839900	12717800	0.5378	230369937.1	13.63	36138143.0	15.7
1990	11377600	20020400	0.5683	397177547.4	14.92	71412124.6	18.0
1991	17448900	29344100	0.5946	634392841.1	16.26	126629062.7	20.0
1992	30388900	47952200	0.6337	1103604908.9	17.31	252750612.5	22.9
1993	51645100	77442000	0.6669	1997322597.4	19.40	507248053.9	25.4
1994	102328400	128518500	0.7962	3887902916.5	22.76	1365643797.9	35.1
1995	188505900	199678600	0.9440	7854887200.0	29.59	3632609713.2	46.2
1996	315893100	580961500	0.5437	14978067300.0	19.39	2416324676.0	16.1
1997	598568600	982641400	0.6091	29393262100.0	22.50	6187977131.6	21.1
1998	1030504300	1531973800	0.6727	53518331600.0	26.28	13824314676.2	25.8

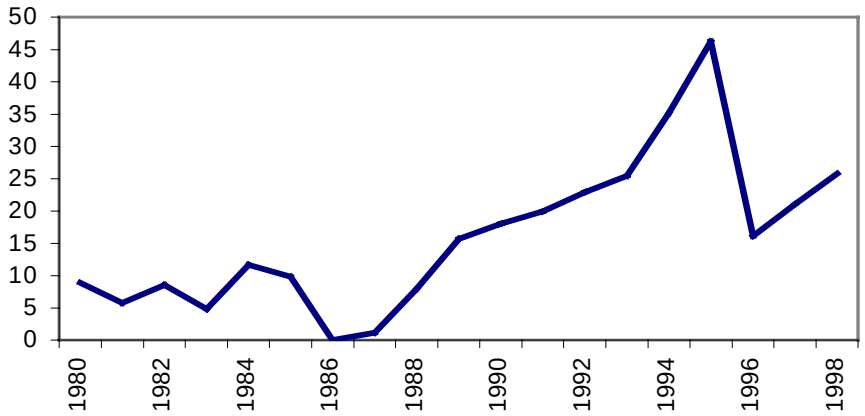
Source: SIS, CBRT

- Million TL

**Underground / registered

The year 1986 where the C/D ratio is smallest selected as the base year for the 1980-1998 period. According to simple currency ratio approach, illegal economic activities are 13.8 quadrillion TL in year 1998, i.e. it constitutes 26 percent of the official GNP. The ratio of the underground economy to official one is low before 1987 compared to the subsequent period and it reaches to its utmost value in 1995 as 46.2 percent (Figure 3).

FIGURE 3
THE RATIO OF UNDERGROUND ECONOMY TO OFFICIAL ECONOMY FOR THE 1980-1998 PERIOD (%)



As stated above, the assumption of a base year with no underground economy is open to discussion and different reference years (what the value of k will be) can produce different conclusions and for this reasons it yields different estimates of the unofficial economy. Another criticism is the equality of the income velocities of money in both registered and unregistered economy. In fact, underground economy income velocity of money is expected to be higher compared to the official economy income velocity of money due to the intensity of cash usage in the underground economy.

V.4. Transaction Method

Transaction method applied to Turkish data for the sample period of 1960-1998 and the same results with the simple currency ratio was attained. The lack of adequate data concerning the amount of financial instruments like check and promissory note was the main cause. Thus we cannot get the figures of the total volume of transactions. Consequently, the amount of currency and the velocity was the same in both approaches.

V.5. Currency Demand Method

Currency demand equation, which is developed by Tanzi, does not give the expected results for the estimation of underground economy in Turkey. Hence using appropriate empirical proxies derives the following model:

$$DLCCR = \beta_0 + \beta_1 DLRGNP + \beta_2 TAX + \beta_3 DINT$$

In the model, D refers to the first difference; L refers to the natural logarithm of the related variable.

TABLE 7:

	Empirical proxies used	**Expected Sign**
Dependent variable	CCR: Currency in circulation in real terms	
Independent Variables:	RGNP: Gross national product in real terms	+
	TAX: Ratio of tax revenues to consolidated revenues	+
	INT: 1 year nominal saving deposit interest rate	-

One of the assumptions of the method is that underground economic activities or transactions are realized by using cash or currency. This assumption implies that an increase in the underground economy will cause an increase in the demand for

money. Therefore, positive (negative) expected sign means there is a positive (negative) relation between underground economy and related variable(s).

OLS results for the above model as follows:

TABLE 8:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
β_0	-0.5675	0.2813	-2.0177	0.0545
β_1	0.2757	0.4822	0.5717	0.5726
β_2	0.7267	0.3481	2.0873	0.0472
β_3	-0.004	0.0022	-2.0057	0.0558

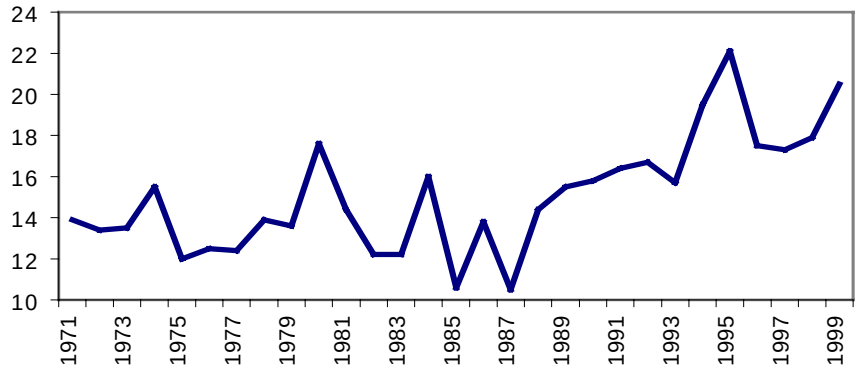
Expected signs for the variables of the model are as required and all variables are statistically significant apart from real gross national product. Residual and stability tests are applied and reasonable results are obtained from the diagnostic tests (Appendix). On the other hand, limited sample size and relatively small explanatory power of the independent variables on dependent variable, which is 31 percent, are the disadvantages of the model.

TABLE 9
CURRENCY DEMAND METHOD 1971-1999

	CC	CC*	CC**	Illegal Money CC*-CC**	V	Underground Economy	Ratio (%)***
1971	13900	14122.7	8046.4	6076.4	6.0	36384.8	13.9
1972	16000	16657.3	9548.9	7108.4	5.9	42212.3	13.4
1973	20700	20514.6	11095.7	9418.9	5.7	53853.3	13.5
1974	26200	29000.5	15238.1	13762.4	6.1	83330.0	15.5
1975	32900	30898.8	16757.0	14141.7	5.9	83082.8	12.0
1976	42500	40885.7	22158.0	18727.7	5.8	108090.8	12.5
1977	63000	55973.3	30013.5	25959.9	5.3	137526.5	12.4
1978	93900	92598.1	53061.6	39536.6	5.8	229383.1	13.9
1979	143700	144949.6	84616.8	60332.8	6.5	390523.7	13.6
1980	217600	282587.0	158530.1	124056.9	7.5	934481.4	17.6
1981	280600	310679.1	170643.9	140035.2	8.3	1155710.9	14.4
1982	411800	353354.3	189034.6	164319.7	7.9	1299454.2	12.2
1983	547600	551674.6	315276.5	236398.1	7.2	1696927.5	12.2
1984	735500	835588.4	475495.1	360093.3	9.8	3543505.2	16.0
1985	1011400	924614.2	585031.2	339583.1	11.0	3741194.2	10.6
1986	1301800	1513980.2	786759.1	727221.1	9.7	7083145.5	13.8
1987	2211900	1874734.9	964390.9	910343.9	8.7	7914318.5	10.5
1988	3425700	3546725.7	1917332.5	1629393.2	11.4	18607184.6	14.4
1989	6839900	6589107.5	3563822.9	3025284.6	11.8	35634794.3	15.5
1990	11377600	10986400.4	6034951.3	4951449.1	12.6	62634703.2	15.8
1991	17448900	17142487.4	9474307.1	7668180.3	13.6	103960821.3	16.4
1992	30388900	29258442.0	16206181.7	13052260.3	14.1	183869495.8	16.7
1993	51645100	48112192.3	27857063.2	20255129.1	15.5	313401005.7	15.7
1994	102328400	103022083.7	58075331.4	44946752.4	16.8	756989197.7	19.5
1995	188505900	198903881.5	113022102.0	85881779.5	20.2	1737812021.1	22.1
1996	315893100	345404656.0	188898523.4	156506132.6	16.7	2613756328.9	17.5
1997	598568600	601336312.3	328415695.7	272920616.6	18.6	5073347130.8	17.3
1998	1030504300	1046264060.9	587211076.9	459052984.0	20.9	9587496502.7	17.9
1999	1887152800	1591971799.8	894996052.4	696975747.4	23.1	16069586528.9	20.5

Source: CBRT, SIS
Million TL
*** Underground / registered
CC: Currency in circulation
CC*: Currency in circulation that is estimated by equation.
CC**: Currency in circulation that is estimated by equation imposing zero tax rate value.
V: Income velocity of money

FIGURE 4
THE RATIO OF UNDERGROUND ECONOMY TO OFFICIAL ECONOMY FOR THE 1971-1999 PERIOD (%)



According to currency demand approach, the volume of underground economy in 1999 was realized as 16.070 quadrillion TL and the ratio of underground economy to official one was 20.5 percent.

VI. CONCLUSION

The methods for the measurement of the underground economy yield different results. This can be attributed to the absence of any well-established theory to estimate the size of the underground economy. In this study, existing approaches were applied to Turkish data. The results obtained in this study should not be taken as precise measurements of the underground economy since they are not so reliable for the following reasons:

All these approaches are formed by the countries that have stable economies or at least applied to the countries that have a stable economy. Therefore, it is a discussion subject to apply these methods to a country, which does not have a stable economy. As stated before, the absence of any well-established theory causes the results to change depending on the researcher and the country for which the related approach is applied. Furthermore, the lack of necessary statistical data in many fields in Turkey, or even if the required data are found, the existence of the differences between different sources also limits the reliability of the results.

APPENDIX

TABLE
DIAGNOSTIC TEST RESULTS

		Value of related test statistic	p-values
LM Test*	(1)	0.514	0.480
	(2)	0.308	0.738
	(3)	0.999	0.412
	(4)	0.948	0.456
RESET**	(2)	0.001	0.975
	(3)	0.908	0.417
	(4)	1.923	0.155
White Heteroskedasticity Test		0.877	0.561
Jarque-Bera		1.180	0.554

* Breusch-Godfrey serial correlation Lagrange Multiplier test for (i)th order autocorrelation.

** Ramsey RESET test using (i) powers of the conditional mean.

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