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# *Measuring the size of underground economy in Iran with emphasis on the incentives for evasion of insurance premium payment (1961 – 2001)*

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## **Abstract**

*This paper attempts to estimate the size of underground economy in Iran and to identify the elements having taken a role in the creation of the same for the period 1961-2001 by using modified currency ratio method as a monetary approach to the estimation of the size of underground economy. Regression model has been stipulated with the consideration of special economic circumstances prevailing in Iran. Currency ratio (circulating currency to total private sector bank deposits ratio) has been considered as a function of economic development (per capita income), inflation rate, the degree of urbanization (a measure of the development of financial institutions) and private consumption expenditures. Government expenditures to GDP ratio (a measure of government economic interventions), import tax burden, direct tax burden, social security tax burden and black market foreign exchange rate have been also considered as the indicators and variables reflecting underground economy. The model has been estimated by using an auto-regressive distributed lag (ARDL) method and the results are indicative of a high volume of such activities within the frameworks of the economy of Iran. The mean size of underground economy has been 27.76 percent of GDP during the period of study. Out of all the factors creating the underground economy, the size of government fraction of economy has had the greatest effect and social insurance burden has had the smallest one. Although the increase in insurance burden is in itself a factor in the creation of underground economy, in its turn has a striking negative impact on the performance and stability of social insurance funds.*

**Keywords:** underground economy, ARDL, modified currency ratio, contribution evasion, Iran.

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## **1-Introduction**

Economic activities may be classified under a structural approach into two major group namely formal economy and black economy. It is stated that the main stimulus behind the actions of economic agents in their inclinations toward black economy is the creation of a non-transparent setting of activities in order to escape legal frameworks. Such an issue i.e., law evasion, may in its turn be the result of numerous stimulating factors some of which are related with the way of government intervention, some other arise from the structure of macro-economy and some further stimulating factors arise from the nature of a certain economic activity. Among such factors are the system for granting economic privileges, implementation of different rationing systems, tax burden, the specifications of taxation system and totally the factors interfering with competitive environment in economy.

A commonly practiced program with a taxation nature in some cases and integrated in economic system, is the payment of social security contribution. In line with an increase in insurance burden and/or in line with facilitation of insurance contribution evasion, economic agents normally find proper stimuli for doing their activities in a shadow economy environment. Such a case will have its important effects not only on major planning system of the country, but also on planning and target-setting structures in social security organizations. This will, sometimes, put its effects on social security systems by different means including non-availability of the contents of activity enclosure to such organizations and/or through economic corruption in social funds.

Anyway, a survey of the sporadic literature existing on this subject reveals an accelerated expansion and a broad scope of underground economy in Iran. This paper was drawn up in order to provide for identification of the qualitative and quantitative features of the underground economy in Iran and to provide a brief description of the relation between this subject and contribution evasion. Understanding this relation guide us, for social security policy making based on a dynamic study of macroeconomic developments.

## 2-Concepts and Definitions

On a broad aspect, black economy encompasses the operations not taken to national accounts. Omission of some economic operations from national accounts shall create numerous problems as national accounts are used as the measures of goods and services produced in the country within a certain accounting period.

Black economy activities can be classified into four categories by using the two measures “occurrence of the transaction in market” and “legality”.

- 1- Household sector
- 2- Informal sector
- 3- Hidden sector
- 4- Illegal sector

Table (1) indicates different sectors of a black economy from the viewpoint of the occurrence in marketplace and legality.

*Table (1): Different sectors of A Black Economy*

<i>Sector</i>	<i>Market Transactions</i>	<i>Production Nature</i>	<i>Distribution Nature</i>
Household	Not practiced	Legal	Legal
Informal	Practiced	Legal	Legal
Hidden	Practiced	Legal	Illegal
Illegal	Practiced	Illegal	Illegal

The classification hereinabove is not easily practicable however; it may face some difficulties in practice instead. As an example, gambling and prostitution are legally permissible in some countries and they are Illegal in some other countries. Some other problem arises when applicable law changes position as to an activity. To come to an

inclusive and full definition of underground economy, the aforesaid four sectors are described hereunder:

A feature of household sector is that its products are supplied to the market and a little the absence of price for manufactured products makes it difficult to assess of the goods values and hence they are not considered in national accounts. Unpaid activities made in the household in all countries of the world, such as those of housewives, are ignored in national accounts.

Informal sector normally includes minor producers, craftsmen, providing passenger service using private cars and some other informal services.

The activities under hidden sector have a somewhat illegal nature and among such activities are:

- 1- Tax evasion
- 2- Avoiding the social insurance contribution payment
- 3- Refusing to observe specified legal measures such as minimum wage, maximum work hours and protective or health measures
- 4- Refusing to observe specified administrative methods and procedures such as completion of statistical questionnaires, escaping bureaucratic formalities etc.

Major property of the activities classified under this category is that some illegal action is committed in the production and distribution of goods and services in spite of the legality and permissibility of goods and services production. Value assessment of the products of this sector is faced with a difficulty as those committing illegal actions (such as tax evasion, contribution evasion etc) would rarely make up their minds to provide national income statisticians with any data on the types and volume of their activities. Products of illegal sector are legally impermissible goods and services which are classified into two categories from the viewpoint of production:

- 1- The goods and services which distribution and use of them have been prohibited by law such as production, sale and purchase of narcotics, theft, bribery, blackmail etc.
- 2- The production activity which is often legal but that becomes illegal in case it is carried out by unauthorized producers (such as medical practitioners when they haven't obtained the license required).

Considering that those violating any law would never report the illegal actions they have committed, it is evident that they shall resort to tax evasion.

Among the chaotic aspects in the literature of underground economy is the absence of a uniform and inclusive definition of such activities. The use of extremely diversified terms such as underground economy, shadow economy, parallel economy, informal economy, non-official economy, unrecorded economy, second economy, irregular economy, invisible economy and black economy with identical or highly overlapping definitions is a sign of such chaotic circumstances. In order to give a clear definition of underground economy, the relationship between such an economy and national accounting is to be considered. This paper defines underground economy as a combination of hidden sector and illegal sector.

### 3- Methodology

The hidden nature of underground economy makes it difficult to measure and study. That is why a majority of commonly used methods take use of indirect estimation. Such methods involve many restrictive hypotheses.

There are three major methods for measurement of the size of underground economy:

- 1-The Methods based on microeconomic theories.
- 2- The methods based on macroeconomic theories
- 3- Other methods

One of the sub-grouped major measures for the calculation of underground economy is utilization of monetary approaches. Monetary approaches are in turn classified into three methods that is currency ratio method, transaction method and regression models (modified currency ratio method). Regression model for cash demand having been proposed by Tanzi and forming the basis for this research shall be described here. Regression method provides two basic assumptions.

- 1- Currency is the only means of exchange in underground economy.
- 2- Velocity of money circulation is the same under both formal economy and underground economy.

In order to estimate the size of underground economy, the elements affecting currency ratio  $(CC/TD)$ <sup>1</sup> ( $CC$  is the circulating currency and  $TD$  is the total deposits of private sector with banks) should be determined and then the equation coefficients are estimated by using ordinary least squares ( $OLS$ ). Currency ratio ( $RC$ ) is a function of the explanatory variables affecting it ( $X1$ ), the indicators and variables representing underground economy ( $X2$ ) and disturbance term ( $U$ ).

$$RC = F(X1, X2, U) \quad (1)$$

Other words:

$$RC = \beta_0 + \beta_1 X1 + \beta_2 X2 + U \quad (2)$$

To estimate the size of underground economy ( $Y_U$ ), the currency ratio of the whole economy ( $RC$ ) is estimated by using the equation (2) at first and then the same is estimated supposing the absence of underground economy ( $\overline{RC}$ ) by substituting the variable representing underground economy ( $X2$ ) by a value of zero. Taking use of the difference between currency ratio in an economic system free from an underground economy and the total estimated currency ratio one may calculate currency ratio in underground economy ( $RC_U$ ).

$$RC_U = RC - \overline{RC} \quad (3)$$

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<sup>1</sup> - The first assumption of modified currency ratio method

Now, currency in underground economy ( $CC_u$ ) is estimated by multiplication of this ratio by total value of the private sector deposits with banks ( $TD$ ):

$$CC_u = RC_u * TD \quad (4)$$

Then, the size of underground economy is calculated by using Fisher's quantitative relation<sup>1</sup> and supposing that velocity of money circulation<sup>2</sup> in formal economy ( $V_f$ ) is the same as velocity of money circulation in underground economy ( $V_u$ )<sup>3</sup>.

$$Y_u = CC_u * V_f \quad (5)$$

It should be stated in general that the estimates of underground economy made through monetary methods seem doubtful since such methods are based on controversial and unstable assumptions and a comparison of the results obtained in different countries or in different periods in the same country shall indicate extreme differences. Regressive analysis application has proven more successful as it excludes the problems currency ratio method and provides for statistical tests to be carried out.

#### 4- The Model

Considering the importance of model stipulation under modified currency ratio method, effort was made to consider the special conditions of a developing country when in building a model.

Estimate of underground economy in developing countries is different from that of a developed country. The main reasons for the attraction of individuals by underground sector of economy in developed countries are their eagerness for tax evasion and social security contribution evasion and researchers are seeking to calculate the hidden incomes resulting from such activities having been ignored in national accounts. But, customs duties, governmental restrictions and non-taxation governmental incomes play a greater role in this respect in developing countries such as Iran.

Currency ratio has been considered as a function of economic development (per capita income), and inflation rate, degree of urbanization and private consumption expenditures have been considered as the explanatory variables affecting currency ratio, government expenditures to GDP ratio which has been taken as a measure of government intervention, import tax burden, direct tax burden, social insurance burden and black market exchange rate have been also considered as the indicators and variables representing underground economy. Let's introduce the aforesaid variables here and consider their effects on currency ratio.

##### A- Currency Ratio

Currency ratio has been defined in the form of  $(CC/TD)$ .  $TD$  is the total deposit of private sector with banks that is calculated as a difference between the liquidity to

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<sup>1</sup> - The Fisher's quantitative relation is defined as follows:  $M * V = P * Y$ , in that: M, V, P and Y are money supply, velocity of money circulation, average prices and real GDP respectively.

<sup>2</sup> - Velocity of money circulation is defined in tow ways:  $V_1 = GDP/M_1, V_2 = GDP/M_2$ .

<sup>3</sup> - The second assumption of modified currency ratio method.

private sector ( $M_2$ ) and the currency in circulation ( $CC$ ). Private sector bank deposits may be classified into three categories:

- 1- Demand deposits ( $DD$ )
- 2- Saving accounts ( $SA$ )
- 3- Time deposits ( $DT$ )

$$TD = DD + SA + DT \quad (6)$$

Or

$$TD = M_2 - CC \quad (7)$$

### **B- Per Capita income**

The improvement of banking service and the means of payment including checks and credit cards that are the products of a development process, shall bring decrease in currency ratio. This shall result in a decrease in the amount of currency utilized in transactions. Per capita income has been taken as a measure of economic development in this model. It is predicted that currency ratio shall decrease in line with an increase in per capita income. Taking per capita income as a measure of development remains in a shadow of doubt in economic development literature; however it still remains an important measure used beside the other measures and indicators.

### **C- Inflation rate**

Currency reservation opportunity cost that is measured by the interest rate of bank deposits has an inverse relation with currency ratio according to Keynesian Monetary Theory, because the increase in the aforesaid rate brings an increase to currency reservation opportunity cost and a decrease to the numerator of currency ratio ( $CC/TD$ ). Nominal interest rate may not be used as currency reservation opportunity cost in Iran because of the absence of developed financial markets, stability of nominal interest rate for long periods of time and also the absence of a variation in nominal interest rate on a coincident basis with the increase in general price level. Therefore a real rate should be considered in order to decide relative return over investment or real interest rate for currency in capital markets. Edwards (1985) future real interest rate in developing countries and under the conditions similar to that of a closed economy in the following terms:

$$EX \text{ Ante Real Rate of Interest} = \text{Nominal Interest Rate} - \text{Expected Inflation Rate} \quad (8)$$

Real interest rate in Iran calculated for the period of study (1961-2001) is mostly a negative value and inflation rate may be used as currency reservation opportunity cost since the variables are considered in the form of logarithms in the model and that the logarithms for negative numbers have not been defined. As stated, it is assumed that the interest rate of bank deposit shall have a reverse effect on currency ratio as the increase in the aforesaid rate brings on increase to currency reservation opportunity cost.

#### **D- Urban to rural population ratio**

Development of urbanization and population concentration along with specialized affairs, have all increased the requirements for transactions.

The requirement for rapid satisfaction of miscellaneous needs necessitates the utilization of some other payment means in addition to currency.

That is why the development of urbanization decreases requirements for currency for transactions considering the concentration of advanced financial systems in cities apart from level of economic development. The logarithm of the variable “urban population to rural population ratio” has been considered as a measure of urbanization under the model provided and the extent of urbanization is expected to be in inverse relation with the currency ratio.

#### **E- Per Capita Private consumption expenditure**

People would normally take use of currency to meet their needs for goods and services. The increase in these needs shall result in an increase of need for currency and it is predicted that an increase in private consumption expenditure shall be accompanied by an increase in currency ratio.

#### **F- Direct Taxation Burden**

Different types of taxation by a government set the ground for hidden economic activities with the aim of tax evasion.

We have used the logarithm the variable “direct tax burden” within the framework of the model in this research. Weck-Hanneman and Frey (1984) believe that people would have gotten used to previous taxation rates and that they would often resort to a reactive behavior in the face of changes in taxation rate.

To calculate direct taxation burden ( $BTAXD$ ), one may add up corporate tax ( $CORPTAX$ ), income tax ( $INCTAX$ ), and property tax ( $PROPTAX$ ), and divide it by GDP calculated at the factor price.

$$BTAXD = \left( \frac{CORPTAX + INCTAX + PROPTAX}{GDP} \right) \quad (9)$$

An increase in tax burden is expected to result in an increase in tax evasion and hence a development of underground economy.

#### **G-Government expenditure to GDP Ratio**

Theobald believes that severe government intervention in economic affairs accompanied by complicated control systems shall set the ground for the emergence and development of underground activities. Uppal believes that bribery is some form of taxation imposed by formal authorities.

Such officials misuse their authority and power in granting different permissions and licenses and resort to bribery in order to cater for their personal interests.

There are different indicators such as the number of public employees to total number of employed person ratio the number of public employees to Private sector employees, government consumption in the form of a percentage of GDP and GNP, government



ownership of agencies and industries, the economic output created by the government and government investment to total investment ratio to indicate the extent of government economic intervention and of government control over goods and service production and distribution. The present model has taken use of government expenditure to GDP ratio calculated at the factor price in order to indicate the extent of government economic interventions. This variable is expected to be in a direct relation with currency ratio.

### **H-Import Tax Burden**

The way to prevent the development of underground economy is usually said to be a reduction of legal restrictions. As an example it is believed that trade liberalization will decrease illegal trade. On the other hand, there is an opposite opinion that holds that any liberation effected without due attention to general economic, social and cultural circumstances or without a regarding the capacity of the government in providing for proper enforcement of laws and regulations and for their proper application may result in the increase of size of underground economy.

Statistics and data are indicative of an ascending trend of unauthorized import of goods to Iran during recent years. This study takes use of import-tax burden (*BTAXIMP*) i.e. an indicator of commercial restrictions, to give an estimate of underground activities. The aforesaid indicator is defined as import tax (*IMPORTAX*) to import (*IMPORT*) ratio.

$$BTAXIMP = \left( \frac{IMPORTAX}{IMPORT} \right) \quad (10)$$

It should be noted that some other indicators such as import to GDP ratio, total import-and export value to GDP ratio, mean tariff rate, Non-tariff obstructions and complications in customs services can also be used as commercial restriction indicators.

### **I- Social Insurance Burden**

As stated, any taxation and also insurance premium provide the ground for payment evasion. Contribution evasion is a serious problem on the way of financing of social security funds in many countries. The case arises when workers and employers have failed to pay insurance premium or they have paid little than they were expected to.

Contribution evasion by employers and workers takes different forms to itself among which are the following:

- Workers evade from contribution payment by choosing the jobs not covered by social security system

- Employers arrange the work and payment system in a way that the employees wouldn't be classified as workers

- In case an exemption is considered for small firms, then employers might employ fewer workers for longer hours of daily work.

- Smaller amounts are declared as wages and payments are declared within the frameworks that are different from those of wage.

Social Security Organization and Civil Pension Fund are the most important social insurance Organizations in Iran. Whereas Civil Pension Fund provides insurance coverage government employees and hence there is little contribution evasion and little increase in size of underground economy, therefore we have taken use of the ratio of S.S.O revenue from contribution (*CUIN*) to production in industry, mining and services (*GDPIS*)<sup>1</sup> for the calculation of social insurance burden (*BSINSU*) .

$$BSINSU = \left( \frac{CUIN}{GDPIS} \right) \quad (11)$$

### J– Free Market Exchange Rate

The presence of black market for foreign exchange in a country is indicative of control measures on foreign exchange imposed by monetary authorities of the related country. The difference among formal, free market and export foreign exchange rates shall foster the stimulus for opportunistic initiatives. The presence of a foreign exchange black market beside a formal market and the open difference of profitability rates between the two markets provides for illegal transfer, capital flight, foreign exchange contrabandist, development of fake statements for import- export activities and saving run-off.

Having determined the factors having a role in currency ratio, its linear regression model shall be considered as follows:

$$\begin{aligned} LnRC = & \alpha_0 + \alpha_1 LnPY + \alpha_2 LnRPCI + \alpha_3 LnPCSUMP + \alpha_4 LnURPOP \\ & + \alpha_5 Ln(BTAXD + 1) + \alpha_6 Ln(BTAXIMP + 1) + \alpha_7 Ln(BSINSU + 1) + \alpha_8 Ln(PXR + 1) \\ & + \alpha_9 Ln(GVR + 1) + U \end{aligned} \quad (12)$$

The variables in the equation (12) are:

*RC* : Currency in circulation to total private bank deposits ratio

*PY* : Per capita Income

*RPCI* : Inflation rate

*URPOP* : Urban population to rural population ratio

*PCSUMP* : Per capita private consumption expenditure

*BTAXD* : Direct tax burden

*BTAXIMP* : import tax burden

*BSINSU* : Social insurance burden

*GVR* : Government expenditure to GDP ratio.

*PXR* : Free market exchange rate

*U* : Disturbance term

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<sup>1</sup> - Iran's SSO doesn't include agricultural sector.

As stated, the variables representing underground economy should be given a value of “Zero” in order to estimate currency ratio. Whereas the variables have been considered in logarithmic form in this model and that Zero logarithm has not been defined, the variable representing underground economy has been included in the model in the form of the logarithm of such a variable plus one (1) as was the practice with Tanzi’s study (1983).

## **5-Model Estimation Method**

Application of traditional and common econometric methods for the estimation of coefficients by using time series data is based on the assumption that the model variables are stationary. A time series variable is stationary only if its mean value, variance and correlation coefficients remain constant through the time. In case time series variables used in the estimation of the coefficients are non-stationary, then its R2 coefficient can be of a high value and may cause an erroneous understanding about the degree of relation between the variables while there may be no significant relation between the variables. Pesaran & Shin (1995) have proven that in case an autoregressive relation with distributive lags(*ARDL*) is considered to obtain co-integration vector in mean squares method, not only the estimate of mean squares shall have normal distribution but also a smaller bias and greater efficiency shall be achieved with small samples.

### **5-1- Unit Root Test**

To approach a valid and reliable understanding about the estimation of the model, first of all the time series shall be evaluated in terms of their being stationary or non-stationary. This paper takes use of Dicky- Fuller Unit Root test for stationary test.

The results from Dicky- Fuller unit root test are indicative of the fact that all variables except for variable “inflation logarithm(*RPCI*)” and the dummy variable of revolution<sup>1</sup> (*DUM<sub>78</sub>*) at level, have unit root and are non-stationary. As a result, this test is applied to the first difference of variables and the results are indicative of fact that the logarithm of the variables “currency ratio (*RC*)”, “per capita Income (*PY*)”, “Urban population to rural population ratio (*URPOP*)”, “direct tax burden (*BTAXD*)”, “income tax burden(*BTAXIMP*)”, “social insurance burden (*BSINSU*)”, “free market exchange rate (*PXR*)”, “government expenditure to GDP ratio (*GVR*)” and the variable “per capita private consumption expenditure (*PCSUMP*)” are stationary at a 95% level.

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<sup>1</sup> - Iran revolution shock in the year 1987 has been affected most economic variables.

Table 2- Dicky- Fuller Unit Root Test

Variables	Test Statistics Variable Level		Test Statistics 1 <sup>st</sup> difference	
	With Trend	Without Trend	With Trend	Without Trend
<i>LnRC</i>	-1.42	-1.16	-3.87	-3.93
<i>LnPY</i>	-1.97	-1.41	-4.47	-4.32
<i>LnPCSUMP</i>	-2.61	1.91	-3.83	-2.71
<i>LnURPOP</i>	-3.02	-0.79	-3.55	-3.66
<i>Ln(BTAXD+1)</i>	-2.03	-1.65	-4.47	-4.55
<i>Ln(BTAXIMP+1)</i>	-2.61	-2.12	-3.61	-3.68
<i>Ln(BSINSU+1)</i>	-2.28	-1.43	-5.75	-5.78
<i>Ln(PXR+1)</i>	-1.23	1.88	-4.46	-3.19
<i>Ln(GVR+1)</i>	-1.69	-1.62	-4.40	-4.41
<i>LnRPCI</i>	-3.97	-1.95	-	-
<i>DUM78</i>	-4.29	-4.35	-	-

Critical quantity at 5% level: A)without trend -2.93 B)with trend -3.53

Critical quantity at 10% level: A)without trend -2.61 B)with trend -3.19

### 5-2- Dynamic model Co-integration Test

Co-integration is a concept that implies the presence of a long-term equilibrium among the variables of the model toward which they approach gradually. In case total coefficients of the lag variables concerning a dependent variable is smaller than one,

$$\left( \sum_{i=1}^p \hat{\phi}_i < 1 \right)$$

the dynamic model shall have inclination toward long-term equilibrium model.

The results of this test have been given under table 3. The results represent a long-term equilibrium relation among the variables of the model at a significance level of 95%.

Table 3: Unit Root Test to Evaluate Co-integration among Variables

Dolado & Master Critical Quantity at 10% level	Dolado & Master Critical Quantity At a 5% level	T-ratio
-2.93	-3.28	-3.41

### 5-3- Autoregressive distributed lag estimates

Schwartz- Bayesian Criterion was used to estimate the number of optimal lags in this model considering the limited time period of study (1961-2001). The best model to be used according to such a criterion is of the type in which the logarithm for currency ratio, per capita private consumption expenditure, urban population to rural population ratio, import tax burden and government expenditure to GDP ratio have been attributed with one lag and inflation rate, per capita income, direct tax burden, social

insurance burden, free market exchange rate and the dummy variable of revolution have been attributed with no lag at all.

Before estimating long-term and short-term relations of this model, some diagnostic tests are to be made. The statistics  $R^2$  and  $F$  have proper signs of fitting  $R^2$  equals to 0.98 and  $F$  equals to 288.8 and is significant at a 100% level. The results from serial correlation of residuals, error in functional form of the model, normality of residuals and heteroscedasticity are indicative of a desirable estimation.

#### 5-4- Estimated long run coefficients

Table 4: Long-run model Coefficients

<i>Regressor</i>	<i>Coefficient</i>	<i>Standard Error</i>	<i>T-ratio</i>	<i>Insignificance Level</i>
<i>C</i>	-0.41	3.25	-1.12	0.08
<i>LnPY</i>	-1.19	0.57	-2.05	0.051
<i>LnPCSUMP</i>	0.93	0.75	2.25	0.023
<i>LnURPOP</i>	-3.44	1.63	-2.11	0.046
<i>LnRPCI</i>	-0.022	0.09	-0.24	0.807
<i>Ln(BTAXD+1)</i>	0.037	12.32	3.07	0.005
<i>Ln(BTAXIMP+1)</i>	0.066	0.27	2.46	0.021
<i>Ln(BSINSU+1)</i>	0.008	0.21	2.58	0.034
<i>Ln(PXR+1)</i>	0.021	0.24	2.89	0.038
<i>Ln(GVR+1)</i>	0.094	4.2	2.23	0.035
<i>DUM78</i>	5.9	1.81	3.27	0.003

Considering the results obtained, it is observed that the signs of all estimated coefficients are in line with theoretical principles and that every coefficient, except for the coefficient of the variable “inflation rate”, is significant.

It is noteworthy that the coefficients for the variables “per capita income” and “intercept” are significant at a 90% level and the other variables at a 95% level. Insignificance of the variable “logarithm of inflation” can be indicative of the fact that the individuals would have some money illusion upon taking a decision and that they would take decisions in accordance with nominal values. The coefficient for “revolution dummy variable” is positive and it is significant from a statistical point of view, the fact that indicates the positive effects of revolution on currency ratio. In other words, the absence of public reliance and acceptance for the banking system at the outbreak of Islamic Revolution in 1979 and the increase of currency reservation opportunity cost in banks resulted in the personal reservation of the currency and other assets.

Whereas the variables have been applied in logarithmic form in the model, the estimated coefficients are indicative of elasticity concept. In other words, the percentage of variations in a dependent variable is indicative of variation in an independent variable for a variation unit. As an instance, currency ratio is expected to have a variation of 0.008 percent against a 1% variation in social insurance burden. Considering the coefficients obtained, the greatest effect of the variables reflecting underground economy on currency ratio is that of the indicator “government

intervention extent” and the smallest effect is that of the variable “social insurance burden”.

### 5-5- Estimation Short – Run Coefficients

The coefficients concerning the estimation of error correction in the model is indicative of a short-run relation between currency ratio and independent variables. The coefficient of error correction term is  $-0.15$  and it is significant at a 95% level. The error correction coefficient obtained, is indicative of the fact that the imbalance in each period shall be corrected in the following period at an annual rate of 0.15.

The logarithmic difference of a variable is indicative of the growth of that variable. The growth in the variables “direct tax burden” and “import tax burden” is significant in a short run. This confirms the theory of Weck-Hanneman and Frey in believing that people have gotten used to former taxation levels and would show more reaction in the face of the variations and the growth of taxation rates. This applies to the variable “Social Insurance burden” as well. The variable “free market exchange rate” has also a negative coefficient and this is indicative if currency devaluation is expected in a short run (that is in case foreign exchange conversion rate is increased), then the public would increase its demand for foreign exchange in order to prevent a reduction in their purchase power and hence the demand for home currency shall be subject to a decrease. But, in a long run the public would convert much of time-deposit to foreign exchange in order to compensate for a decrease in purchase power and this shall create a positive relationship between currency ratio and free market foreign exchange rate.

People would have money illusion in a short run and wouldn't take decisions in accordance with real values and hence the logarithm coefficient for the variable “short-run inflation” would be insignificant. The growth in per capita private consumption expenditure has no short-run effect on currency ratio. In other words, people wouldn't reserve more currency in line with the growth in their per capita consumption expenditure in a short run.

### 6-Estimation of the Size of Underground Economy

The time arrives for the estimation of the size of underground economy after the model estimation has been made. The estimated model can be summarized as follows:

$$\begin{aligned} LnRC = & -0.41 - 1.19 * LnPY + 0.93 * LnPCSUMP - 3.44 * LnURPOP \\ & - 0.22 * LnRPCI + 0.037 * Ln(BTAXD + 1) + 0.066 * Ln(BTAXIMP + 1) \\ & + 0.008Ln(BSINSU + 1) + 0.021 * Ln(PXR + 1) + 0.094 * Ln(GVR + 1) + 5.9 * DUM78 \end{aligned} \quad (13)$$

If  $BSINSU = BTAXD = BTAXIMP = PXR = GVR = 0$ , then the size of underground economy shall be zero (0). Therefore, the equation (13) can be rewritten as:

$$\begin{aligned} Ln\bar{RC} = & -0.41 - 1.19 * LnPY + 0.93 * LnPCSUMP - 3.44 * LnRURPOP \\ & - 0.22 * LnRPCI + 5.9 * DUM78 \end{aligned} \quad (14)$$

Where  $Ln\bar{RC}$  is the logarithm of currency ratio in a formal economy. Now, in case the equation (13) is subtracted by the equation (14), we shall have:

$$\begin{aligned} LnRC - Ln\bar{RC} = & 0.037 * Ln(BTAXD + 1) + 0.066 * Ln(BTAXIMP + 1) \\ & + 0.008Ln(BSINSU + 1) + 0.021 * Ln(PXR + 1) + 0.094 * Ln(GVR + 1) \end{aligned} \quad (15)$$

The logarithmic difference of total currency ratio with the currency ratio in a formal economy is equal to the logarithm of currency ratio in underground economy,  $LnRC_U$  :

$$LnRC_U = LnRC - Ln\bar{RC} \quad (16)$$

The sum of the logarithm of currency ratio with the logarithm of total private sector deposit with banks ( $LnTD$ ) equals to the logarithm of the value of currency available to underground sector:

$$LnCC_U = LnRC_U + LnTD \quad (17)$$

Then, the sum of logarithm of currency available in underground sector and logarithm of velocity of money circulation<sup>1</sup> would give the logarithm for the value of underground economy

$$LnY_U = LnCC_U + LnV_f \quad (18)$$

An antilogarithm of the logarithm for underground economy value shall yield the underground economy value:

$$Y_U = EXP(LnY_u) \quad (19)$$

The results have been given in table (5).

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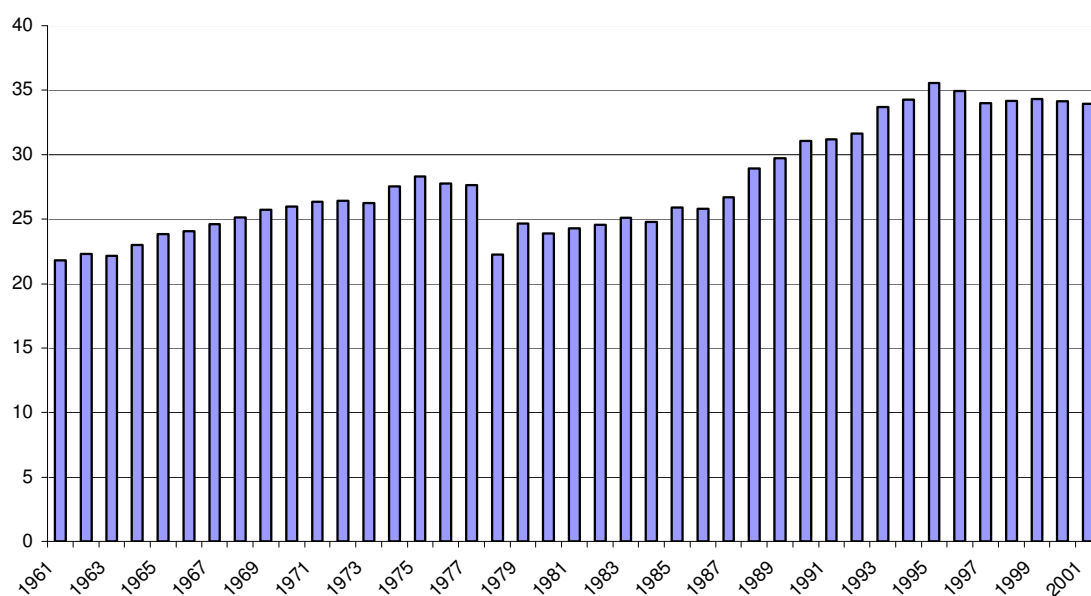
<sup>1</sup> - In this paper,  $V_2 = GDP/M_2$  has been used as the velocity of money circulation because Time deposits are easily changeable to currency in Iran.

Table (5): underground Economy size as a percentage of GDP (YUGDP)

Year	YUGDP	Year	YUGDP	Year	YUGDP
1961	2.78	1975	28.29	1989	29.71
1962	22.28	1976	27.76	1990	31.04
1963	22.18	1977	27.61	1991	31.21
1964	23.02	1978	22.25	1992	31.62
1965	23.85	1979	24.66	1993	33.68
1966	24.07	1980	23.91	1994	34.25
1967	24.59	1981	24.29	1995	35.56
1968	25.16	1982	24.56	1996	34.91
1969	25.71	1983	25.10	1997	34.01
1970	25.97	1984	24.77	1998	34.16
1971	26.35	1985	25.91	1999	34.29
1972	26.41	1986	25.79	2000	34.11
1973	26.25	1987	26.68	2001	33.96
1974	27.54	1988	28.92		

Mean size of underground activities would form 27.76% of GDP during the 41 year period under study (1961-2001). This is indicative of the high volume of such activities in the economy of Iran. The lowest ratio of underground activities to GDP during the period of study is that of the year 1961 that equals to 21.78% and the highest ratio is that of 1995 that equals to 35.56% of GDP. Fig (1) shows the trend of such activities within the period of study.

Fig (1): The trend of variations in the size of underground economic activities



To investigate the trend of variation in the size of underground economy, this variable has been considered in three time periods; (1961-1978), (1979-1988) and (1989-2001).



During the time period 1961-1978 the mean ratio of underground economy to GDP was 25.06%.

Underground economy has experienced a constant trend during the early years of the aforesaid period. But, the increase in oil-revenues from 1974 onwards brought a reduction to the reliance of the government on tax revenues and the liberation in import sector because of an increase in foreign exchange revenues and the rapid industrialization having been fixed as an objective of the fifth pre-revolutionary development plan that would justify low cost import of goods, all resulted in an increase in the volume of underground economy in line with an increase in government intervention. Capital flight began in 1977 with the outbreak of strikes and intensification of environment of mistrust. The year 1975 saw the approval of Social Security Act and the establishment of S.S.O. This brought an increase to insurance burden in line with the growth in the revenues of the organization that was in turn due to an increase in minimal wages and in the number of the insured persons in 1976 and 1977. The year 1978 was a witness to the stoppage in oil export, decrease in foreign exchange revenues and hence a reduction in government activities. On the other hand, the decrease in import and in GDP brought reduction to tax burden over domestic activities and in the tax burden over imported commodities. all these factors resulted in a reduction in the volume of underground economic activities in 1978.

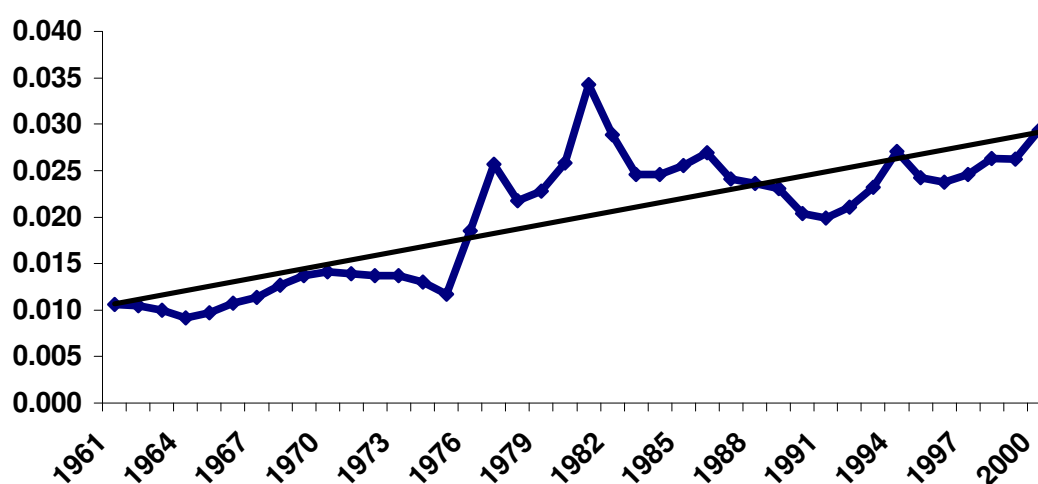
The second part of the period of study i.e. the years from 1979 to 1988 saw a size of underground economy that would form 25.45% of GDP as a mean. The outbreak of war in 1980 brought a capital flight. Free market foreign exchange rates were increased and the decrease in GDP and imported goods resulted in a reduction in the tax burden over domestic activities and in the tax burden over imported goods. We were witnesses to a reduction in the volume of government intervention as well. The output from all the aforesaid factors resulted in a reduction in the size of underground economy in 1980. Despite the fact that the country had been experiencing a period of recession from 1977 and in spite of the reduction in number of the insured person, an increase was witnessed in insurance premium collection revenues for S.S.O because of a 170% increase in minimum wages as a result of early revolutionary trends in 1979 and hence an increase was brought to insurance burden that would continue to the year 1981.

The years from 1981 to 1988 severe import control accompanied by an increase in customs duties rates, an increase in black market foreign exchange rates due to great difference between export foreign exchange rates and those of black market, the presence of foreign exchange conventions, acceptance of the Resolution 598 and the cease that was brought to the imposed war, were all the factors that brought an increase to the size of underground economy. It is noteworthy that we were witnesses to a decrease in government expenditure to GDP ratio because of the decrease in oil price and the engagement of the government in war- related affairs during those years. The third part of the period of study saw a volume of underground economy that would form 33.27% of GDP as a mean. The years from 1989 to 1993 were witness to a development of underground activities. A brief survey is made here on the actions taken under the first socioeconomic development plan. Two financial policy aspects would be the focus of attention during the first socioeconomic development plan: the

first was the increase in government revenues for which a correction in tax collection system was required and the second one was a decrease in government expenditure that would involve an issue of privatization and amalgamation of parallel companies. Export encouragement and import liberalization were the points of focus under commercial policy sector. In the field of foreign exchange rates, the issue of foreign exchange rates unification and increase in foreign exchange rates (currency depreciation) were the aspects of priority.

Totally, direct tax to GDP ratio and import tax to import ratio were decreased because of an increase in the volume of domestic activities and import during the first socioeconomic development plan. The aforesaid period was also a witness to a decrease in government expenditure to GDP ratio. The most important factor for the increase in underground economy during the aforesaid years was the increase in black market foreign exchange rates. The increase in black market foreign exchange rates has resulted in an increase in the volume of transactions in this market because of the decrease in the return of home currency reservation (due to inflation) and the increase in the return of foreign exchange (due to currency depreciation). The floating rates for foreign exchange and the sale of Dollars to the public by banking system in year 1993 increased speculative motives in foreign exchange market because of the interpretation of the temporary conditions of the market. Tax burden in local activities and import sectors was continuing to decrease from 1993 onwards but increase and sever fluctuations in foreign exchange rates and in government expenditures to GDP ratio brought an increase to the volume of underground economy.

*Fig (2): Trend of Variations in Social Insurance Burden*



The years from 1991 onwards were witnesses to increase in social insurance burden because of a 67% increase in minimum wages and in insurance premium collection revenue. The increase in social insurance burden continued to the year 1994. the creation of foreign exchange reserve account in 2000 and the Amendment to Direct

Taxation Act in 2001 brought a decrease in the volume of underground economy during the late years of the period of study. Despite a recession period in the country from 1997, the insurance premium collection revenues were growing and it brought a growth to social insurance burden.

## **7- Summary and Conclusion**

The application of modified currency ratio has indicated that the size of underground economy was about 27% of GDP during the period 1961-2001. A research into the model and the stimuli for the inclination of economic agents toward underground economy is indicative of the fact that against the ideas common to some economic authorities of the country, social insurance burden has no considerable effects on the increase of cost burden in economic agencies and hence it can't be considered as a main factor in the growth of underground economy.

The development in underground economy has many destructive effects on macroeconomic operations and stability of revenues and expenditures of social security funds. The increase in the size of underground economy brings disintegration to the configuration of jobs and a decrease to the possibility for the application of production scales and to the profitability from job classification and specialization. This shall in itself entail a decrease in workplace safety and inobservance of legal timetables in jobs. On the other hand, the distortion in statistics and data removes the possibility for proper planning and hence the proper allocation of resources by politicians which shall in turn result in an undesirable distribution of revenues and wealth among different classes of a society. The increase in underground activities brings a reduction to the possibility of proper use of advanced exchange system due to the in cash and in kind natures of exchanges in national economy and corruption develop because of negligence for ethical and social values.

Considering that a great size of underground economy as compared to formal economy has damaging effects on the economy of a country, a main objective of development plans should be focused on a campaign against underground economy and all preparative, executive and legal means should be employed. The improvement in taxation system, removal of discrimination between private and government sectors, increase in efficiency of government, inflation control, campaign against commodity contrabandist, amendment of customs tariffs, adoption of proper foreign exchange policy, continuous supervision over banking transfer, amendment of social insurance system and greater attention toward business cycles are among the actions to be taken in a campaign against underground economy.

It can be said that the phenomena in the macroeconomic structure may affect the balance in the revenues and expenditures of insurance organizations through the development of underground economy. Under such circumstances, there are two approaches to be taken by insurance organizations and by the newly established Ministry of Welfare & Social Security. The first is the encouragement of macro policy- makers to the application of proper policies and the second is an effort for providing parallel trends of insurance policies and macroeconomic setting in the country. Application of market – oriented strategies to insurance policies and change of approach from mandatory to optional insurance and involvement of social security

elements (workers and employers) are among proper approaches in the field of policy making for social security system.

Altogether, any step taken in the direction for the reduction of underground economy shall open up the space for sound economic operations, shall develop investment, production and work and shall have its positive effects for all the public.

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