

Use of method of ARDL for Relationship Between underground economy and economic developmentEbrahim Yazdi (corresponding author)¹, Seyed Masoud Tabatabaee²¹M.A in Energy Economics, University of Mashhad Ferdowsi²M.A in in Economic Science, Payame Noor University of Isfahan
mohsen8203934@yahoo.com

Abstract: The underground economy is a part of the economy of all countries, particularly developing countries and has serious repercussion on the economy performance and can cause deviations from correct detecting the state of economy and administrating wrong policies. One of concerns of politicians is determination of size and using of strategy methods for decreasing in size and sectional control. Financial development is one of the effective factor for this part and it causes reduction in credit costs and induce reduction for activity in underground parts. For the investigation of financial development on underground economy, we use Autoregressive Distributed Lag (ARDL). In this article, we have used structural equation modelling and multi-index methods. The results show that the ratio of the underground economy volume to gross domestic product were 16.16 percent in 1973 to 2009 and for increasing in monetary development, the underground economy size reduce to 0.21 percent. Also, the results show that the financial development had negative and significant effect on the underground economy on short and long time.

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Key Word: Underground economy, MIMIC model, ARDL method, Financial Development.

Introduction

Economic planning are depend on the knowledge of general operation in country economy. But in most country, some of economy activity aren't showing for economy politicians. So, one of the main concerns of politicians in diverse country is facing with activity that are ignored from formal observers and disturbing economy operation. One of them underground or shadow economy. Underground economy has serious results on economy operation. This function could cause of self-abandonment in economy and social programs, deviation in correct identification in economy, money problems, unsuitable economy politics prescription, and social strategy failures. Economy realities deviate by development in underground economy such as formal statics, also. So, it is very important we know about process and mass underground activity for effective and correct politics.

Underground economy consist on economy activities that they are done legal or illegal and they haven't recorded (Esfandyari and Jamal Manesh, 2001). We considered this investigation by this tariff.

While there are disagreement about suitable method for underground economy estimation, there are no doubt informal activity are very important about economy. So we had to find a solution for reduction in underground economy. Financial development is a factor that could be effective on activity and volume in economy and it has less attractive by economists. About relationship between the size of underground economy and level financial

development, we could say when the people or companies do underground activity their ability and tendency to disclosure incomes and assets and also accessibility to low-cost financial resources is lower through formal resources, so credit costs enhance. When financial markets develop, accessibility to effective financial inductor could reduce accessibility costs to credit financial resources and enhance chance costs for continuing underground activity. On the other words, we could say financial development causes of reduction on credit costs and motivations for underground activity. Summarily, we could plea financial development have negative relationship with underground economy (Capasso and Jappelli, 2013). On the other words, trying for financial development creation can cause reduction in underground activity allowing with create interests financial development. It causes a reduction in formal economic activity and causes a reduction on underground activity motivation (Blackburn et al. 2012).

This relation hasn't considered in Iran and few researches has done it in other country as theoretical and general. Represent study is the first investigation has considered underground economy and financial development in Iran's economic.

The article structure is following as: after that, we consider financial development concept and its relation with underground economy. In the future section, the researches has considered in underground economy and financial development areas. In second part, we have considered pattern and investigation

method and mass temporal serial underground economy in 1973-2009. In final section, we have considered the relationship between underground economy and financial development by using of ARDL method.

Theoretical foundations

Financial development concept and its relation with underground economy

Financial development is the process multidimensional and consist on new capital markets, introduction of new financial tools and more competition financial inductors (Capasso and Jappelli, 2013). By financial development factors, we could develop politics and institutions that causes creation markets and financial inductor effective and financial services and capital accessibility (Heshmati and Molaii, 2003). The importance of financial development originate that efficient financial parts has essential role in financial resources for investing, persuasions and equipping of foreign capital and optimizing of mechanism allotment resources. On the other words, financial development indicates improvement in financial inductor services amount, quality and efficiency and this process include of combination of many activity and institutions (Calderon and Liu, 2003).

Theoretical studies are done for investigation and test of the relation between financial development and the size of underground economy, recently. By theoretical facet, institutes are able to distribution their investor to a rusty technology and low efficiency and financial supports is through the organization or selecting superior technology and higher efficiency and financial supports are out of organization. By selecting of out of organization menu, the company use their assets as a security and efsh and also paying more taxes. So, we can claim that financial development, reduction in external investigation, can cause reduction in the tax evasion and the underground economy size (Capasso and Jappelli 2013).

First point for investigation in underground activity and financial development relation is ability in determination for incomes that reduce credit costs (Ellul et al. 2012). When the company or people do underground activity, their ability and tendency will be low in income revelation and credit cost reduces and chance cost for continuing underground activity enhances. As summary, market financial development is in negative correlation with underground economy size.

The example of underground economy and financial development relationship

For determination of underground economy size and financial development level relationship, we will

explain a simple economy concept. For example, you suppose a scenario that a person is trying to receive a loan from credit market. Before that the person asked for this, he should determine his current income and assets. By saying this statics, he can use it as a security that they are kind of signal for lender for expressing borrower credit worthiness. But in this case, they will include financial guaranty bases too. Now, you suppose the person in low level financial development that he is described by some parameters like financial resources shortage for loaning, no competition, high financial repression, and low ability lender in information collecting and data processing. By this factors, the cost for accepting the loan is high and the possibility for getting credit is low. In this situation, the person has less inducement for determining of his incomes and assets. By this, financial development low level induce bigger underground economy (Bose et al., 2012).

The main section in upper subject is the truth that low accessibility to external credit causes participation in informal section decreases. This case emphasis by many researches. In this case, Dabla-Norris et al represent reasonable study on answering a sample consist of 4000 registered companies in formal economy section in 41 countries. Their results show that the company that suppose the financial problems as the main difficulty sell 16% half of its products without registration in financial office. While the company considered it as trivial mane, maybe it has informal level as 7.6 percent (Dabla-Norris et al. 2008). As similar method, Gatti and Honorati by using of data in level company in 49 developing countries found that financial amenability is related with more accessibility to credit (Gatti and Honorati, 2008).

Background

There are no investigation about underground economy and financial development in Iran. We can refer some researches that have done out of Iran:

Pant et al (2009) checked the relationship between busyness, informal activities and financial inductor. The writers reported that formal busyness is effective on financial inductor. So, workers inclined to use bank system as deposits by regular jobs.

Ellul et al (2012) by using World Bank investor report through data microeconomics resulted investment and accessibility to financial resources have positive effect on accountant transparency and negative effect on levy bar. Also, they found accounting transparency has negative effect on levy bar especially in sectors that have lower dependency to financial resources out of organization and financial development lead to more accountant transparency for companies that need to more foreign investment.

Blackburn et al. (2012) investigated the relationship between underground economy and

financial development. Agents are looking for borrowing loan for doing investment risk projects. The results show that whatever financial development was lower tax evasion was higher and underground economy sizes will be higher, too.

Capasso and Jappelli (2013) checked underground economy content and its relationship with financial development. They used the data in the bank in Italia in 1995-2004. They could built index for underground economy by using of microeconomic. After that, they used the index for development, incompetence justice, and other personal and logical scales regression. The results show that mass underground economy have correlation as strongly by financial developing. Completion and innovative area have lower underground activity.

Bittencourt et al (2014) checked an article "tax evasion, financial development and inflation by using theoretical model and Panel method in 1980-2009. The article analyzes the relationship between tax evasion as the index of shadow economy and financial development and inflation. The results show that lower (higher) financial development and more (less) inflation lead to smaller (bigger) shadow economy.

Patterns and methods

Latent variable approach allows the researcher to evaluate multiple causes and multiple effects of the underground economy in a model (Nasrallahi, Farzanegan and Tale'i Ardekani, 2011). This model is discussed later.

The model of multiple indicators - multiple causes which is a particular form of structural equation modeling; enables us to use simultaneously multiple causes and multiple indicators for modeling to estimate the latent variable with time-series data. In this method, the underlying causes of the underground economy size and the indicators, that can be used to measure this type of economy, are connected by an econometric model.

This model implies matrix structure of the experimental covariance (based on data) that is compared to the covariance matrix, which is resulted by the selected model after parameters estimation and presents information about the relationships between observed variables and latent variables by minimizing the difference between the sample covariance matrix and the predicted matrix by the model. If the two matrices are stable compared to each other, then the structural equation model can be considered as a presumptive description for relationships between tested variables. MIMIC models (Multip Indicators-Multip Causes) typically consist of two parts of structural equation modeling and measuring model. Structural part of the model reveals the effect of cause variables on latent variables and the measuring part of

the model shows the effect of latent variables on the indicators. Therefore, the mathematical formulation of the multiple indicators- multiple causes model that consists of observed variables of the model, named as causal variables (indicators) and the underground economy latent variable, takes place in the equation in two forms: in the first equation, the consequential relationship between underground economy and its causes are described and how the indicators are influence by the size of the underground economy is explained in the second equation.

If we consider η as latent variable of underground economy, y as a vector ($P \times 1$) of indicators of the underground economy effects in various fields, x as a vector ($q \times 1$) of the underground economy causes, and λ and γ as vectors of the coefficients, respectively ($p \times 1$) and ($q \times 1$) the mentioned pattern will be as follows, respectively (Farzanegan, 2009):

$$\eta = \gamma_1 x_1 + \gamma_2 x_2 + \dots + \gamma_q x_q + \xi \quad (1)$$

$$Y_1 = \lambda_1 \eta + \varepsilon_1, Y_2 = \lambda_2 \eta + \varepsilon_2, \dots, Y_p = \lambda_p \eta + \varepsilon_p \quad (2)$$

Where ξ is structural error and ε is measurement error. Equations (1) and (2) can be written as follows:

$$\eta = \gamma' x + \xi \quad (3)$$

$$y = \lambda \eta + \varepsilon \quad (4)$$

In this equation, random errors ε and ξ are respectively, ($p \times 1$) and scalar and all are normally distributed and expectation hope in all the variables is zero. Therefore, the equations (3) and (4) it is assumed that $E(\xi \varepsilon') = 0$, $E(\varepsilon \varepsilon') = \theta^2$ and $E(\xi) = \sigma^2$. By substituting equation (3) in equation (4), the above pattern is in the form of a regression equation model as follows:

$$y = \lambda(\gamma' x + \xi) + \varepsilon = \pi x + v \quad (5)$$

The summarized coefficients matrix and vector forms and disturbing sentences are as follows, respectively:

$$\pi = \lambda \gamma', v = \lambda \xi + \varepsilon \quad (6)$$

The covariance matrix can be obtained as follows:

$$\Sigma = \text{COV}(v) = E(vv') = E(\lambda \xi + \varepsilon)(\lambda \xi + \varepsilon)' = \lambda \lambda' \sigma^2 + \theta^2 \quad (7)$$

The system of equations is facing to identification problem in order to estimate the model but by constraining a factor of λ to a predetermined value, its coefficients can be estimated and the model parameters are estimated by minimizing the following function (ibid.).

$$F_{ML} = \ln|\Sigma| - \ln|s| + \text{tr}[(s)(\Sigma^{-1})] - k \quad (8)$$

To identify the model by software, the value of one of the elements must be predetermined. However, in this case only the relative value of the coefficient is estimated. Therefore using vector estimation and above- mentioned eq. (3), a time series of ranked

numbers (Ordinal Numbers) can be obtained for the size of underground economy. If we use other subsidiary information to estimate the size of underground economy in one or more points of the sample, the cardinal time series of the size of underground economy in the studied period can be estimated with the help of the mentioned time series. In the present study, the maximum likelihood method, multiple causes- multiple effects model and Amos graphics software package has been used to estimate the mentioned model.

Causes and indicators of the underground economy

In the model described in the previous section, now we introduce the determinants of the size of the underground economy in Iran and also the indicators of underground economy that reflect the impact of this phenomenon and its trend on different sectors and processes.

The causes of the underground economy

The effective tax rate

In the economic literature, the most common indicators of tax evasion are tax rates. In the proposed model it is expected that increased tax rates have a significantly positive effect on the underground economy. With the increase in the effective tax rates, the tax evasion rate and the size of the underground economy is further increased (Khajavi et al., 2010). In the presented model, the ratio of tax revenues to GROSS DOMESTIC PRODUCT is used to calculate the effective tax rate.

Degree of urbanization

With increasing rural to urban migration, marginalization is increased and since people are not able to be interested in formal economy, they entered the informal economy. Thus by increasing the degree of urbanization, the underground economy increases. In the presented pattern, logarithm of the variable proportion of the urban population to rural population has been proposed as a measure to indicate the degree of urbanization.

Human Development Index

Human Development Index (HDI) is an indicator of the level of development of countries. The higher the index indicates that the country has grown in terms of education, health and income growth which implicitly causes the people proceed to live in a more modern and professional business space. As a result, the rates of people household production and self-consumption process get more modern and the underground economy related to household sector will decrease (Shakibaei & Shademani, 2012).

Government regulation index

Increase in the intensity of regulations (often measured by the number of laws and regulations) are a major cause of loss of freedom and individual choices in the formal economy. Labor market regulations,

trade restrictions and other limitations can be considered as examples of regulatory intensity. Excessive regulation may lead to significant increases in the costs of working in the informal economy. Since most of these costs are passed to employees and workers, it would increase the incentive to work in the underground sector (Bouev, 2002). In this study, the ratio of government consumptive costs to GROSS DOMESTIC PRODUCT is used to calculate the degree of government regulation index.

Unemployment

Growing unemployment increases the motivation to act in the illegal and prohibited areas. But in the black economy literature this variable is predicted ambiguous, because the unemployment rate is also an indicator of macroeconomic performance and its increment can be considered as an entry to the economic recession period and reduced labor demand, whether for official and permitted activities or the prohibited and illegal activities (Arab Mazar Yazdi, 2011).

Effects of underground economy

Energy Consumption

Increased or decreased production of goods and services in the whole economy (official and underground) affects the rate of means consumption, given the requirements of production means (including energy input) and is reflected in the related information. The reason that this index is used as an indicator of increased or decreased size of the underground economy is the fact that since manufacturing and service firms profit by the raw material and production means to produce goods and services, an increase in the use of energy is considered as production means to increase the production of goods and services in the informal and underground economy. Therefore, increased energy consumption may show an increased production of goods and services in the underground economy (Sameti, and Sameti & Delaei Milan, 2009).

Demand for money

The basis of using this variable is the monetary estimating methods of the underground economy. The cash ratio method supposed that all transactions in the informal economy are in cash. Therefore it is undeniable that due to the low risk in cash transactions, these are done in cash exchanges at high volume. Accordingly, the demand for money is expected to increase by increasing underground economy (Nasrollahi and Tale'ei Ardekani, 2012).

Distribution of income

The informal activities influence on income distribution is the most important issues that should be considered. Income distribution is affected by underlying factors of household income, social and economic conditions in a country and government

policies in the field of income distribution. It may be argued that the growth of informal activities will have a negative effect by reducing government revenues (failure to pay tax) for redistribution, and by creating a class distinction between the formal and informal factors on income distribution (Bakhtiari & Khoobkhahit, 2011).

A list of variables used in the model, their definition and references are provided in the Appendix table (5).

Introduction of the studied pattern

The assumed model of underground economy is shown in the following figure.

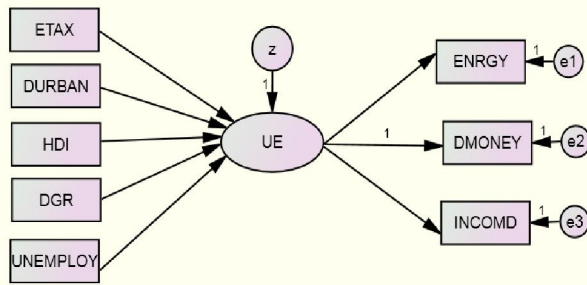


Figure (1). Track chart of the underground economy model

The tests of unit root and co-integration variables used in the model.

Using econometric methods is based on the stationary assumption of time series variables in the model. In the present study, the test Zandrews and Stata 10 software is used to investigate the stasis of variables in the model.

According to the above table, all variables are not at stable level. There is a long-term approach to prevent the loss of data, using the Johansen co-integration in econometrics.

Co-integration test

According to the Johansen co-integration test, the existence of co-integration vector between a set of economic variables used in the model has been verified. The test results are provided in Appendix Table (4).

The results of estimating the model

Table (1). The results of unit root test and structural break

Results	Lag No.	Critical value: 5%	Critical value: 1%	t-statistic	Structural break point	Symbol
I (1)	0	-5/08	-5/57	-3/33	1375	Effective tax rate
I (0)	1	-5/08	-5/57	-5/34	1366	Degree of urbanization
I (0)	0	-5/08	-5/57	-6/39	1370	Human development index
I (0)	0	-5/08	-5/57	-6/58	1383	Degree of government regulation
I (1)	0	-5/08	-5/57	-2/47	1367	Unemployment
I (1)	2	-5/08	-5/57	-4	1374	Energy consumption
I (1)	2	-5/08	-5/57	-1/72	1382	Demand for money
I (0)	0	-5/08	-5/57	-5/78	1379	Income distribution

Source: research calculations by StataSE 10 software

Table (2). The estimated values of the structural equation

Prob	Standard estimation	Non-standard estimation		Variable
***	0/73	0/59	Underground Economy ←	Effective tax rate
***	0/54	0/43	Underground Economy ←	Degree of urbanization
***	0/24	-0/20	Underground Economy ←	Human development index
***	0/04	0/03	Underground Economy ←	Degree of government regulation
***	-0/10	-0/08	Underground Economy ←	Unemployment
***	1/04	1/22	Energy Consumption ←	Underground Economy
***	0/83	1/00	Demand for money ←	Underground Economy
***	-0/39	-0/48	Income Distribution ←	Underground Economy

Source: research calculations by Amos Graphic software

According to the results of model estimation, the signs of the variables coefficients the in the studied

model is consistent with the expected predictions and the variables are statistically significant. As in Table 2,

in the studied model the variables effective tax rate, degree of urbanization, human development index, degree of government regulation, unemployment are statistically significant and the signs of the coefficients are consistent with theoretical predictions.

The estimated value of the parameters in the studied model showed that among the mentioned indicators, the effect of underground economy is positive on the energy consumption and money demand and negative on income distribution (consistent with theoretical predictions).

A researcher always needs criteria to evaluate the model developed based on the theoretical framework and the empirical literature by interpreting them.

These criteria, often called as fit indexes, can be divided into two general groups of goodness of fit indexes (the higher the amount of which, the more support and stronger data from the developed model) and badness of fit indexes (the less the amount of which, the more support and stronger data from the developed model) (Ghasemi, 2010).

Accepted scientific criteria to verify the theoretical model developed using the collected data forms the primary focus in the model's fit indexes which are sometimes called goodness of fit and sometimes referred to as badness of fit indexes. More than 30 fit indexes are reported in Amos Output. Some of them are presented in Table (3):

Table (3). Fit Indexes of model

Developed Model	Index			Type of Index
	Accepted range	English	Abbreviation	
0/94	0/9-1	Comparative Fit Index	CFI	Comparative
0/92	0/9-1	Tucker-Lewis Index	TLI	
0/66	0/5-1	Parsimonious Normed Fit Index	PNFI	Parsimonious
0/67	0/5-1	Parsimonious Comparative Fit Index	PCFI	
0/05	-0/08	The Root Mean Square Error of the Approximation	RMSEA	
4/4	< 5	Chi-square Normed	CMIN/DF	
0/22	Approximately Zero	The second Root Mean square Residual	RMR	Absolute

Source: research calculations by Amos Graphic software

Of available comparative indexes, the comparative fit index and Tucker-Lewis index have been selected. The indexes presented were Goodness of Fit Index (the higher the value, must be interpreted as a sign of the more supporting and stronger data from the developed model). In the studied pattern, values of CFI and TLI were 0.94 and 0.92, respectively which indicates that the model is acceptable. Among the Parsimonious indexes, PCFI and PNFI were goodness of fit indexes and RMSEA and CMIN / DF indexes were badness of fit indexes

(the less the value, must be interpreted as a sign of the more supporting and stronger data from the developed model) which in studied model PNFI and PCFI were 0.66 and 0.67, respectively and RMSEA and CMIN / DF were 0.05 and 4.4, respectively which indicates that the model is acceptable. The RMR index of absolute fit index were also of badness fit indexes and its lower values indicated a better fit to the data.

As you can see, the selected model fits well in terms of fit criteria. The proposed approach is a form of regression model as below:

$$UE=0.59ETAX+0.43DURBAN-0.20HDI+0.03DGR- 0.08UNEMPLOY (9)$$

In this model, the variables effective tax rate, degree of urbanization, human development index, degree of government regulation and unemployment are present as cause variables of the underground economy.

Estimating the size of the underground economy

Now in order to obtain the size index of the underground economy of each year, numerical values of the explanatory variables must be placed in

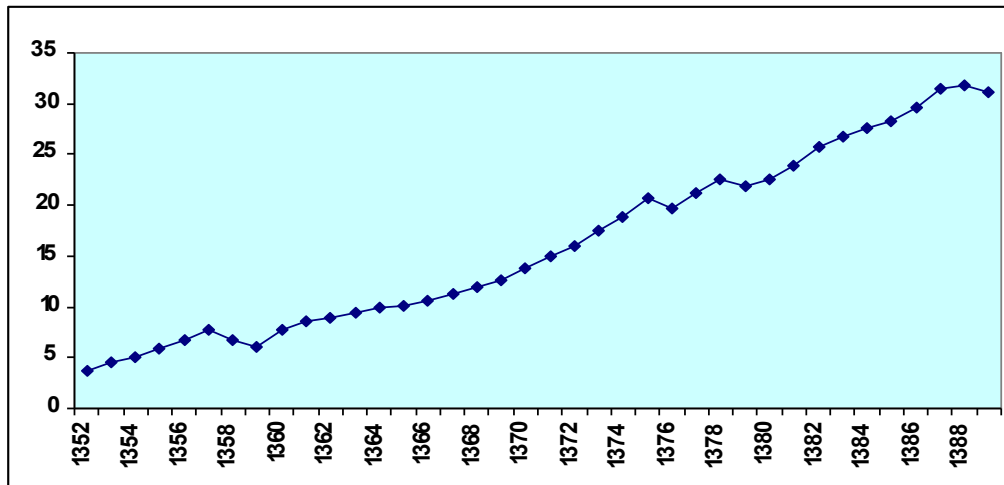
equation (9) to obtain the numerical values for the size of the underground economy in that year. In this way, the time series of underground economy size can be found.

As mentioned in the pattern description and methodology in order to convert ordinal time series of underground economy to Cardinal time-series, other subsidiary information should be used. Therefore in this paper, the data from Sameti et al. (2009) have

been used. According to the mentioned study results, the average size of the underground economy during the period 1965-2005 has been 42339.07 billion Rials. This value is very close to the one calculated as the size of the underground economy for the year 1993. Based on the results of this study, the size of the underground economy in 1993 was equivalent to 15.98% of GROSS DOMESTIC PRODUCT. This

value was used as the basis for estimating the size of the underground economy in the years 1973-2010 in the present thesis. Obviously, choosing a different basis results in a different time series but the trend of computational series developments will be the same.

Chart 1. Underground economy to GROSS DOMESTIC PRODUCT (GDP) ratio (percent)



Source: Research Calculation

Checking the relationship between underground economy and financial development

We have estimated underground economy and we are going to checking the relationship between underground economy and financial development. So, in this part, we examine theoretical effect financial development on underground economy by using the data in 1973-2009. The analyzing of econometric have done by MICROFIT software and have used Autoregressive Distributed Lag (ARDL) and the variables are used as natural logarithm.

General formula is following as:

$$UE = C_0 + C_1 FD + C_2 INF + C_3 GDP + U_t$$

UE; underground economy (Milliards Rial)

FD; financial development

INF; inflation

GDP; gross domestic product (milliards Rial)

U_t ; disorder

Examination of the static variables

Econometrics modeling by using of temporal serial based on temporal serial stable variables hypothesis. Autoregressive pattern by distribution stops are the methods that aren't necessary we use same degree of reliability variables and we can select nice model by determination of suitable stops for

variables (Noferesti. 1998). The results of stable test are represented in temporary in Table (8).

Model estimation and hypothesis test

Analyze is based on ARDL based on active, long time, and error correction equations. At the first, active or short time equation will estimate for the model. After that, long time variables coefficient will evaluate. In the next step, error correction model with balance relationship long time will evaluate by using of ARDL method. Finally, we will show the strength of supplementary topics model.

Model estimation by using ARDL

Because we use ARDL, it isn't necessary we same position variables and we could estimate the model through different accumulation variables. In the next step, we must select one of four standards are including: determination adjusted coefficient, Akaiik, Shoartz-Bizin, and Henan Quin. Selection standards for estimation is Shoartz-Bizin. We use it because of estimation coefficient possibility by the lowest stop.

The model estimate the underground economy as dependent variable and other variables as explanatory variable.

The results of active equation estimation are showed as summary in Table (3).

Table (3). Short time pattern Variables coefficient for Estimated Model

Variable	Factor	sig	t
(1-) UE	/43	0/006	3
FD	-0/12	0/066	1/91
(1-)INF	0/49	0/028	2/31
(1-) GDP	-0/64	0/014	2/63
C	-1/22	0/008	2/58
TREND	0/01	0/003	3/28
² R	0/99	² \bar{R}	0/99
F-Stat.F (7,28)	08(0)/1510	D.W-Statistic	1/97
Serial correlation	0/32(0/572) = (1) ² x	Normality	1/566(0/151) = (2) ² x
Heteroscedactisity	2/75(/150) = (1) ² x		

The results of short time estimation show that financial development has negative and significant effect on underground economy, positive effect on inflation, GDP has negative effect on UE, also. Amount of determination coefficient and Watson statistics are showing no self-dependency in model.

Also, F static surveys the pattern as significant and shows the high explanatory in pattern. LM shows no self-dependency serial and dissimilarity variances in sentences. The sentences have normal distribution.

Existing the relationship between variables in ARDL Model (boys test)

Table (4). Existing of relationship between variables in ARDL model

The lower limit of the 90%	Upper limit at 95%	The lower limit of the 95%	Upper limit at 95%	F
3/77	4/87	4/51	5/78	6/19

If F static is higher than the value, zero hypothesis will be fail. Vice versa, if F static is lower than critical value, zero hypothesis or no long time existence won't be fail. Finally, if F be between higher and lower critical value, the result will be unsure.

Long time estimation coefficient the evaluation model by using ARDL

After active equation estimation, we should test existing of longtime relationship as sure. For doing this, we must deduct 1 from total factor by stopping of dependent variable and divide them on standard

deviation coefficient. If absolute value t is higher than critical amount by Benerji, Dolado, and Mester (1992), we will fail zero hypothesis and we will accept longtime relation. By doing this test, t calculated is 4.07 and it is higher than t absolute value (-3.46) corresponding with Benerji, Dolado, and Mester critical amount. Zero hypothesis based on no existing longtime relation is fail and convergence relation between variables is accepted.

After the existing longtime relation confidence, we can analyze longtime relation.

Table (5). The result of longtime relation (dependent variable-underground economy)

sig	t	Factor	Variable
0/025	2/38	-0/21	FD
0/02	2/47	0/15	INF
0	8/92	1/18	GDP
0/003	3/2	-2/14	C
0	11/61	0/021	TREND

The result of longtime relation show that all of variables are significant and coefficients marks are compatible with theoretical predictions. By longtime coefficient, we can say:

Increasing in FD as a one unit will decrease 0.21 underground economy mass.

Increasing in inflation will enhance 0.15 underground economy mass.

Increasing in GDP will enhance 1.18 underground economy unit.

Error correcting test for selection model by using ARDL method

ECM show the information about long time and short time properties in model by unbalancing in process. Gernjer approved that stability idea in long time is accumulation static. When there are no accumulation, any stress can cause imbalance. Active balance process will delete this imbalance for accessing to long time balance as shortly. Accumulation between the selections of economy

variables provide the base of error correction pattern. ECM relates short time variable changes to long time balance. Also, this pattern relate dependent variable changes to prior balance. It means relate dependent variable changes to balance error in previous step (Jafari Samimi et al., 2009).

For considering of how we moderate short time imbalances in production toward long time balances,

we use error correction mechanism (ECM). The coefficient show that in every step how many percent moderate for long time balance. On the other words, how much long the production come back into long time process. We hope this sign be negative and between 0 and -1. The estimation of error correction results are showed in Table (6).

Table (6). The result of error correction in the equation

sig	t	Factor	Variable
0/065	1/91	-0/12	dFD
0/11	1/64	0/34	dINF
0	8/75	1/31	dGDP
0/003	3/28	0/01	dTREND
0/00	3/95	-0/57	(1-) ECM

Error correction coefficient in this model is 0.57. It means at every step 57 percent of imbalances in production will be moderate and approach to long time process.

The results of model stability by using of CUSUM and CUSUMSQ

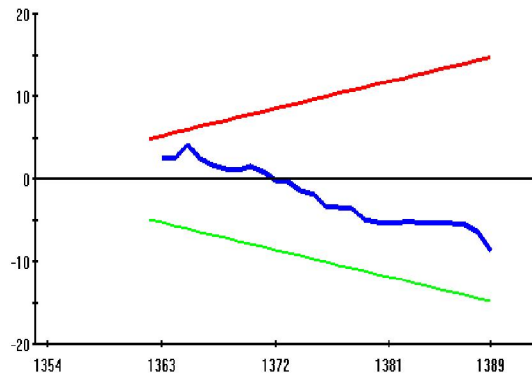
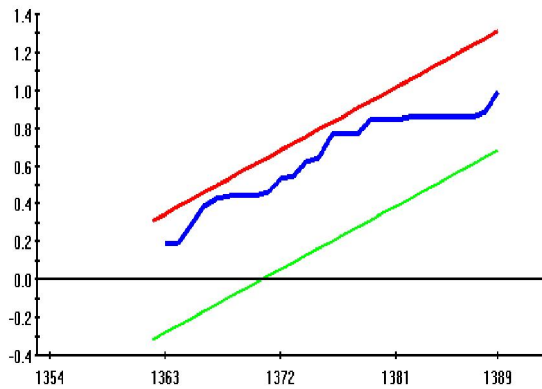
By estimation of active pattern in autoregressive distributed lag, we can say estimated model have suitable strength because of confidence interval in the

desired curve test. The results are showed in (2) and (3) diagrams.

Diagram (2). The result of model strength by using of CUSUM test static.

Diagram (3). The result of model strength by using of CUSUMSQ test static.

As we can see in above diagrams, the diagrams between critical lines are posed in 5 percent and this result express that stability long time is verification.



Conclusion

Financial development is the factor that causes the reduction in underground economy. When the people or companies do underground activity, their abilities and inclinations in revelation incomes and assets and also accessibility to financial resources low-cost through formal resource is less. So, credit costs increases. When financial markets develop, accessibility to financial inductor reduction in accessibility costs to credit financial resources and chance costs for continuity in underground activity enhances. On the other words, attempt at financial development building can reduce underground activity and induce advantages of financial development.

Reference:

1. Bakhtiari, s and Khubkhahi, kh (2011),” employment in the informal labor market and its influential factors in Iran (2006-2001)”, Journal of Economic Essays, Vol. VIII, No. XV, spring and summer, 138-117.
2. Bittencourt, M; Gupta, R; Stander, L;2014. Tax evasion, financial development and inflation: Theory and empirical Evidence. Journal of Banking & Finance 41,194-208.
3. Blackburn, K., Bose, N., Capasso, S., 2012. Tax evasion, the underground economy and financial development. Journal of Economic Behavior and Organization 83,243-253.

4. Bose, N; Capasso, S; Wurm, M; (2012) The Impact of Banking Development on the Size of the Shadow Economy. *Journal of Economic Studies* 39 (6), 620–628.
5. Capasso, S & Jappelli, T. (2013). Financial development and the underground economy, *Journal of Development Economics*, 167-178.
6. Calderon, C. & L. Liu. (2003). The Direction of Causality between Financial Development and Economic Growth. *Journal of Development Economics*, 72: 321-334.
7. Dabla-Norris, E; Gradstein, M; Inchauste, G; (2008) What causes firms to hide output? The determinants of informality. *Journal of Development Economics* 85, 1–27.
8. Jafari samimi, A., Farhang, safar, Rostamzadeh, Mehdi Zadeh, M. (2009) “The impact of trade liberalization on financial development and economic growth in the country”, *Economic Research Journal*, Vol. IX, No. IV, winter, 21-1.
9. Heshmati Molaei, H. (2004) “Factors affecting the banking system's financial development”. *Economic Bulletin*, No. 13, Summer, 88-55.
10. Esfandiari, A and Jmalmanesh, A. (2002) “The underground economy and its impact on the national economy”. *Journal of Planning and Budget*. Year XIX, No. 77, 118-81.
11. Ellul, A., Jappelli, T., Pagano, M., Panunzi, F., 2012. Transparency, Tax Pressure and Access to Finance. CEPR Discussion Papers 8939.
12. Farzanegan. M.R. (2009) Illegal Trade in the Iranian economy: evidence from structural equation model; *European Journal of Political Economy*, 25(4): 489-507.
13. Gatti, R; Honorati, M; (2008) Informality among Formal Firms: Firm-Level, Cross-
Country Evidence on Tax Compliance and Access to Credit. *World Bank Policy Research Working Paper N. 4476*.
15. Khajavi, Maliha, Rezaei, Abraham and Khodaveisi, H. (2010)” estimated the underground economy and the tax gap in approach multiple causes”, *Economic Journal*, Vol. XI, No. III, Fall, 1390.
16. Nasrollahi, Z., talei ardekani, S. (2012)” estimate the shadow economy and its effects on air pollution: A Case Study of Iran's economy”. *Quarterly Journal of Economic Research (sustainable development)*, year XII, Number Four, Winter, 54-27.
17. Pant, M., Chowdhury, P.R., Singh, G., 2009. Financial intermediation and employment. *Review of Market Integration* 1, 61–82.

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