

## ASSESSMENT OF THE SHADOW ECONOMY AND TAX EVASION IN RA

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**Abstract:** This article aimed to assess the shadow economy and tax evasion in Armenia applying the indirect method of Currency Demand Approach (CDA). As the macroeconomic indicators in our analysis are not stationary at the same degree, we have used the autoregressive distributed lag (ARDL) models and the co-integration test showed that there exists a co-integration between the model variables, therefore it is possible to use the CDA. In the model have been used monthly data during the 2013-2023 period. We can conclude that the CDA method can be considered to be an appropriate method for measuring the shadow economy and tax evasion in the RA's economy. The results of the research show that during the observed years the level of the shadow economy and tax evasion are decreasing, which means that government is increasingly recognizes the importance to constrain the shadow economy given its connection to issues such as loss of tax revenues.

**Key words:** *shadow economy, tax evasion, currency demand approach, distributed autogression model, long-term effects*

### Introduction

Currently, proper analysis and evaluation of the shadow economy, tax evasion, or tax burdens (tax/gdp) are essential for a number of countries. Obviously, the shadow economy cannot be completely eliminated, but it can be reduced by improving legislation and developing more effective methods. Researches by the different authors suggest that the tax burden is the factor that can be used to represent and explain informal actions in the economies because it can be measured in quantitative terms.

We can mention that there are two groups of methods concerning the assessment of the shadow economy: direct and indirect. Generally direct methods are private and public inquiries that target non-formal busy people to discover their shadowy incomes. At the analytical level, indirect methods based on macroeconomic modeling are of the greatest interest. More common indirect methods are Multiple indicators, multiple causes (MIMIC) (Frey B., Weck-Hanneman H., 1983, 23-44) and Currency Demand Approach (CDA) (Tanzi V., 1980, 427-453). This method has been used by Cagan for the first time, who assessed the shadow economy of the USA between 1919-1955. He calculated

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Received: 07.05.2024

Revised: 22.05.2024

Accepted: 28.06.2024

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the correlation for the currency demand and the ratio of tax on gdp. He concluded that if the ratio of tax/gdp gets higher then the currency demand relation to broad money also increases (Cagan, P., 1958, 302-328).

In the basis of the Currency Demand Approach is the demand for money in circulation, where it is assumed that the demand for money in circulation can be an indicator of the underground economy. When there are rates for the taxes, people tend to go into the underground economic activities and as a result of which the volume of tax evasion increases. According to this approach the taxpayers who are involved in the underground economy use cash in their transactions to evade taxes on their underground economic activities (Amoh J., Babonyire A., 2019., 626-645).

As for the evaluation of the shadow economy in Armenia, then IMF represents the following: the size of shadow economy using the PMM (Predictive Mean Matching) method has been equal to 19.5% and 42.6% by MIMIC method over the 1991-2015 (Medina L, Schneider F., 2021, 11-70). By another assessment the shadow economy's size relative to official GDP in Armenia (Eilat Y., Zinnes C., 2000, 28-30) using the modified total electricity (MTE) approach was 31-65 % in 1990 -1997 (Eilat Y., Zinnes C., 2002, 1233-1254). As specified by to the estimates of the World Bank's Structural equation model's MIMIC Method during 1999-2007 period the shadow economy's size has been equal to 44% in average (Schneider F., Buebn A., & Montenegro C., 2010, 17-22). According to the Luys foundation the shadow economy from the perspective of the tax system over the period 2001-2009 was characterized by a tangible shadow economy of 55 -65 percent of GDP, after which the average size rapidly decreased to 28 percent in 2018 ("LUYS" foundation., 2020, 32-34).

### ***The econometric model***

The aim of our study is to try to estimate tax evasion from the size of the shadow economy on the basis of the currency demand model, which has been developed by Tanzi (1980, 1983). In reality this method has been used in 1976 to estimate underground economy in the US (Tanzi V., 1979, 283-305).

In his study Tanzi assumed that the income tax rate, proportion of wages and salaries in national income, the interest paid on saving deposits and the per capita income can influence on the ratio of the currency in circulation to money supply. The equation is:

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

where,  $C/M_2$  is the ratio of currency in circulation to broad money supply,  $TW$  is the weighted average income 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 and  $\ln$  denotes the natural logarithms.

Based on the currency demand approach (Tanzi (1980, 1983)) we can represent the procedure of the calculation of the shadow economy and tax evasion by the following steps:

- It is used the (2) equation for deriving the predicted values for currency demand with tax/gdp ratio as a variable in the model,  $\ln(C/M_2)_t$
- Then it is necessary to calculate the ratio of currency in circulation to broad money supply without tax/gdp ratio, by setting  $\ln(tax/gdp)_t=0$ , taking the other variables constant,  $\ln(C/M_2)'_t$
- To estimate the volume of the illegal money in the economy we should have this

difference:  $(\ln(C/M_2)_t - \ln(C/M_2)'_t)$

- In this step we compute the illegal money in the economy by multiplying the difference by the expanded money supply:  $IM_t = (\ln(C/M_2)_t - \ln(C/M_2)'_t) \times M_2$ . This is done as in the currency demand approach it is thought that additional money in cash will be demanded for the illegal activities since tax duties have been increased.

- Now it is calculated the demand for legal money:  $LM_t = M_t - IM_t$ .

- Here we need to compute the velocity of money in circulation, which is done by dividing nominal GDP by the value of legal money:  $V_t = GDP_t/LM_t$

- As it is considered that the velocity of money in the shadow economy is equal to the velocity of money in legal economy, the size of the shadow economy is obtained by multiplying the velocity with illegal money:  $SHE_t = V_t \times IM_t$ .

- Finally, it was assumed that we have the same ratio of  $tax/gdp$  in the shadow economy as in the legal economy. Therefore, we have multiplied  $tax/gdp$  by the estimated size of the shadow economy for finding an assessment for the tax evasion (TE) during the study period.

To obtain an evaluation with the methodology described, we first need to evaluate the ARDL (distributed autogression model), because the observed series becomes standardized after using an I(1) and an I(0) operator. ARDL models are models of time series in which both dependent and independent variables are interconnected not only during the appropriate period but also in historical values (Nkoro E., Aham U.,2016, 63-91).

### Results and findings

We have used monthly data for 2013-2023 period to study shadow economy and tax evasion in Armenia as the dates has been available for the mentioned period. The data have been taken from the Central Bank of Armenia, Statistical Committee of Armenia and State Revenue Committee of the RA. After a number of modifications, we've adapted this approach and specified the following econometric model:

$$\ln(C/M_2)_t = \beta_0 + \beta_1 \ln(el)_t + \beta_2 \ln(fs)_t + \beta_3 \ln(tax/gdp)_t + \beta_4 \ln(rex)_t + \ln(trade)_t + \beta_6 d\_Cd + \mu_t \quad (1)$$

where  $C/M_2$  is the ratio of currency in circulation to broad money supply,  $el$  is the volume of the electricity consumption cost for the population,  $fs$  is the ratio of normative total capital to risk-weighted assets,  $tax/gdp$  is the ratio of taxes on gdp,  $rex$  is the effective real exchange rate,  $trade$  is the volume of the trade in gdp,  $d\_Cd$  is the first difference of the currency in circulation, and  $\ln$  is the natural logarithms of the indexes.

We have test the stationarity of variables through the Augmented Dickey–Fuller (ADF) test, which results are presented in Table 1, it was found that some of them were stationary at level I(0), and some were stationary on the first difference I(1), so we should assess the ARDL.

Table 1

The results of the ADF Unit Root Test

Variable	Calculated value	Critical value	Degree of stationarity	Level of significance
Ln (C/M)	-10.4	-3.5	I (1) **	1%
Ln (el)	-3.8	-3.5	I (1) **	1%
Ln (fs)	-9.5	-3.5	I (1) **	1%
Ln(tax/gdp)	-6.5	-2.9	I (1) *	5%
Ln (rex)	-10	-2.9	I (1) *	5%
Ln (trade)	-2	-1.6	I (1) *	10%
D_cd	-12	-3.5	I (0) *	1%

\*without intercept and trend; \*\*with intercept.

Source: Developed by the author.

Table 2

ARDL Bounds - test for cointegration

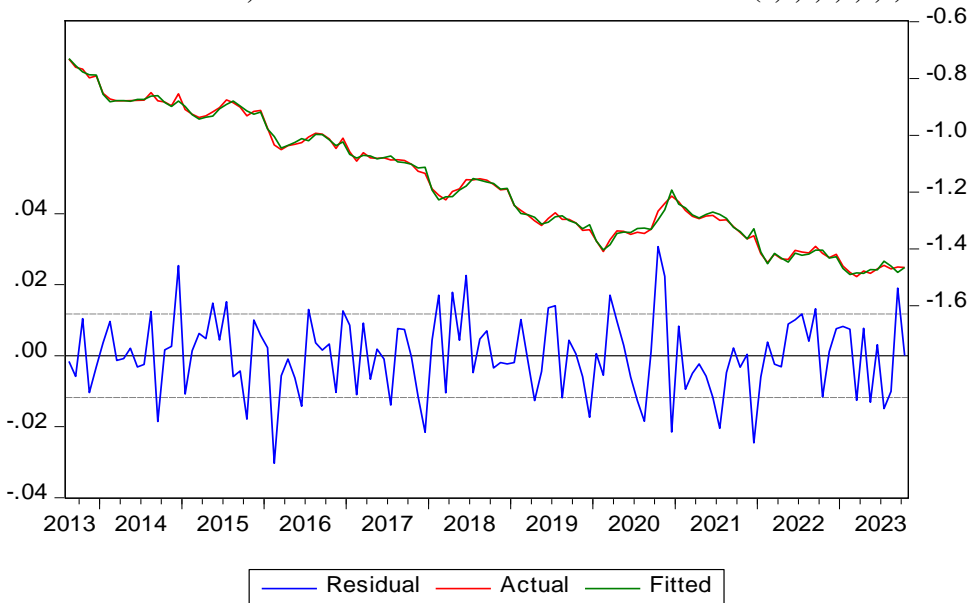
F-Bounds Test				
Test Statistic	Value	Significance	I (0)	I (1)
F-statistic	31.396	10%	1.99	2.94
-	-	5%	2.27	3.28

Source: Developed by the author.

The ARDL models evaluate the short-term interactions between variables. We have assessed ARDL(1,0,1,0,3,7,0) for the described CDA and the residuals, actual and fitted values are presented in the Figure 1.

Figure 1

The residuals, actual and fitted values of estimated ARDL(1,0,1,0,3,7,0)



Source: Developed by the author.

After verifying the appropriate hypotheses of the evaluated model's errors, to evaluate the size of the shadow economy and tax evasion, it is also necessary to evaluate the long-term effects through the following cointegration equation:

$$\ln(C/M_2) = -0.249 * \ln(el) - 2.039 * \ln(fs) + 0.347 * \ln(\text{tax}/\text{gdp}) + 1.352 * \ln(\text{rex}) - 1.728 * \ln(\text{trade}) - 21.794 \quad (2)$$

The evaluations of independent variables used in (2) are given in the Table 3, where beside the electricity all the variables are significant because the probabilities are smaller than 0.05, so variables are essential to the dependent variable in the long-term.

The tax/gdp coefficient is positive, which shows that when the tax burden increases it leads to an higher demand for currency for the purpose of carrying out commercial transactions in cash and to avoid registered banking transactions for the purpose of tax evasion. The coefficient of the financial stability (fs) is negative, which means that improving financial stability can reduce the demand for cash and expand the commercial operations through banks. The effective real exchange rate has a positive effect on the demand for money as an increase in the exchange rate shows a need for a greater amount of money for different transactions. As about trade then the relation is negative, which may be of the fact that in the last years, the large-scale trade in RA is done by the non-cash methods. Like the trade in recent years population pay for the electricity consumption mostly by the non-cash methods. Finally, the effect of the variables that we have not included in the assessment is negative.

Table 3

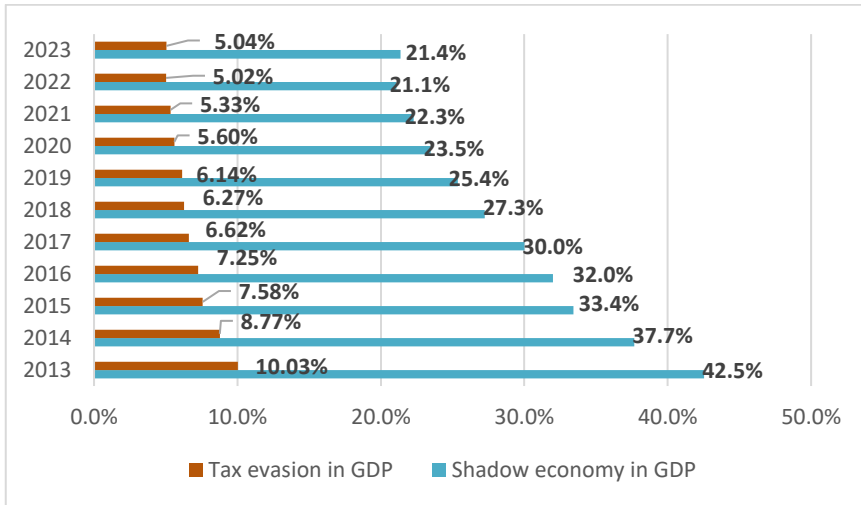
**Estimated long-run elasticities using ARDL**

Levels Equation Selected model ARDL (1,0,1,0,3,7,0) Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Ln(el)	-0.249113	0.368923	-1.67524	0.08
Ln(fs)	-2.039386	0.741172	-2.75156	0.00
Ln(tax/gdp)	0.346994	0.297204	2.167526	0.04
Ln(rex)	1.352714	0.558529	2.421921	0.02
Ln(trade)	-1.728280	0.432175	-3.99902	0.00
D_cd	0.00000	1.25E-05	2.665799	0.01
C	21.79348	6.542598	3.331013	0.00

After assessing (2), we take the appropriate steps to calculate the size of the shadow economy and tax avoidance. As we see from the chart, we have a decrease in the volume of the grades during 2013-2023, the volume of the shadow economy was 42.5 percent of GDP in 2013, by 2023, 21.4 percent, it is remarkable that in 2022 it was 21.1 percent and tax evasion volume was 10.03 percent and 5.33 percent respectively. Noticeably. Just in case, we can say that this is the result of good tax administration and the appropriate institutions have been able to effectively manage tax compliance in the economy.

Figure 2

## Shadow economy in GDP and Tax evasion in GDP in 2013-2023



Source: Developed by the author.

### Conclusion

As we have already seen in our study the CDA method can be considered to be one of the most effective approaches for measuring the shadow economy and tax evasion in the RA's economy. Also, it takes into the account the nature of its assumptions which gives an opportunity to make the model framework more useful and to represent real economic relations.

Based on the results of the research we found out that during the 2013-2023 years the size of the shadow economy and tax evasion in our economy has been decreased, which is the evidence of the improvement of the tax administration and many activities of government. Moreover, we can observe that the persistent problem of loss of the tax revenues and the shadow economy is in the process of the research and analyzing for the government. Therefore, the appropriate institutions are able to find different ways to achieve optimal and effective results concerning this problem, which face many developing countries.

### References

- Amoh J., Babonyire A., (2019), "An estimation of the underground economy and tax evasion Empirical analysis from an emerging economy.", *Journal of Money Laundering Control* Vol.22, No.4, pp. 626-645.
- Cagan, P. (1958), "The demand for currency relative to the total money supply.", *Journal of Political Economy*, Vol.66, No.4, pp.302-328.
- Eilat Y., Zinnes C., (2000), "The Evolution of the Shadow Economy in Transition Countries: Consequences for Economic Growth and Donor Assistance.", *CAER II Discussion Paper No. 83*, 70p.
- Eilat Y., Zinnes C., (2002), "The Shadow Economy in Transition Countries: Friend or Foe?"

A Policy Perspective, *World Development*, 30 (7), pp. 1233-1254.

*Frey B., Weck-Hanneman H., (1983), "Estimating the Shadow Economy: A 'Naive' Approach.", Oxford Economic Papers, vol. 35, pp. 23-44.*

*Frey B., Weck-Hanneman H., (1984), "The hidden economy as an "unobserved" variable.", European Economic Review, 26/1, pp.33-53.*

*"LUYS" foundation., (2020), "Estimating the size of the shadow economy of the RA from the perspective of the tax system.", 50 p.*

*Medina L, Schneider F., (2021), "The Evolution of Shadow Economies through the 21st Century.", IMF library pp 11-70.*

*Nkoro E., Aham U., (2016), "Autoregressive Distributed Lag (ARDL) cointegration technique: application and interpretation", Journal of Statistical and Econometric Methods, Vol.5, No.4, pp 63-91.*

*Schneider F., Buebn A., & Montenegro C., (2010), "Shadow Economies All over the World New Estimates for 162 Countries from 1999 to 2007"., Policy Research Working Paper 5356., The World Bank Development Research Group Poverty and Inequality Team & Europe and Central Asia Region Human Development Economics Unit.,52p.*

*Tanzi V., (1980), "The underground economy in the United States: estimates and implications.", Banca National eel Labor Quarterly Review, Vol.135, pp.427-453.*

*Tanzi V., (1979), "Underground Economy, Income Tax Evasion, and the Demand for Currency in the United States, 1929–76.", unpublished, International Monetary Fund, pp 283-305.*