

UNDERGROUND ECONOMY, GDP AND STOCK MARKET

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Economic growth is affected by the size and dynamics of underground economy. Determining this size is a subject of research for many authors. In this paper we present the relationship between underground economy dynamics and the dynamics of stock markets. The observations are based on regression used by Tanzi (1983) and the relationship between GDP and stock market presented in Tudor (2008). The conclusion of this paper is that the dynamics of underground economy is influenced by dynamic of financial markets. Thus, using specific stock market mathematical tools analysis, one can analyze the dynamic of underground economy.

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JEL Classification: *C30, G12*

Introduction

Underground economy size, scourge that touches all the world economies has values that can not be neglected. Therefore, between the fundamental principles underlying fiscal policy there is the one regarding the control and it level reducing. All paperworks that refer underground economy point out two important aspects: its inconsistent definitions and measurement difficulty. In this paper we try to address only the second aspect, which is measuring the size of underground economy. We use the widest definition of underground economy that is one which considers underground economy as all economic activities whose results are not in the GDP.

Emphasize from the beginning, that underground economy can not be measured directly and therefore any method that allows a good approximation of it is welcome. First we provide an overview of the main methods for estimating the size of underground economy (Caus, 2011)

Methods for estimating the size of underground economy

Literature refers mainly to three lines of approach to the process of determining the size of underground economy:

- a) Issuance by the authority of speculative value, taking actions to counter and measuring results;
- b) A second direction is based on logical reasoning and a good knowledge of economic activity (formal and informal). This method calls and international comparisons with countries which have a similar structure in terms of economic, legal and cultural;
- c) A third line is the estimates based on clearly defined evaluation methods, for which calculation methodologies are developed, methods based on the same idea, namely that the economy scars that appear on the labor market, monetary aggregates or as disagreement between income and expenditure form.

In this last way of determining the size of underground economy the following general approaches are known:

- methods based on national accounts system;
- evaluation based on data from fiscal controls and other control methods;
- methods using macro-economic modeling.

Methods based on national accounts system

A way of measuring the underground economy in this group of methods is to compare the results achieved in national accounting records, in the determination of GDP by two approaches: income approach and expenditure approach. In general, calculating national product in terms of providing income figures lower than those obtained by summing costs. "Unexplained residual" set up by the

spread between the two units can serve as a basis for estimating size of underground economy. These methods have several drawbacks, among which most important are (OECD 2002):

- errors in estimating both units;
- errors caused by differences in statistical coverage;
- GDP estimates are not always independent estimates based on income tax (unnoticed revenue by the tax authorities may be absent in the national accounts).

We present some examples where these methods were used:

- in 1965, Ray M. (1965) calculated that 52.44% of income that would have been collected from the tax on goods movement in Italy was stolen from taxation. His method was based on identifying consumption and gross domestic product and estimates the amount that would have paid versus what was actually paid;
- Pissarides and Weber (1989) concluded that the unobserved economy represented 5.5% of GDP in the UK;
- Feige and McGee (1983) find that the underground economy represents 10% of gross domestic product of Sweden.

Evaluation based on data from fiscal controls and other control methods

This evaluation method is based on data obtained from authorities as a result of direct checking, ignoring thus voluntary responses, based on questionnaires. This method emphasizes those professions declaring less income than real one. Fiscal outcomes are applied, by extension, to the entire population.

Methods using macro-economic modeling

a) Monetary transaction method

The existence of the underground economy is closely linked to the monetary area, in particular by strong inclination to liquidity, which shows those working in this field. The reason for this behavior is obvious: cash transactions are less visible than banking.

Monetary transactions method (method of Feige 1979) assumes that there is a constant relationship in time between the volume of cash transactions and total GDP, official and clandestine. The method is based on Fischer's known quantitative relationship:

$$(1) \quad M \cdot V = p \cdot T$$

where M is money supply, V velocity of money circulation, p price level and T the volume of transactions.

Observing the total money supply M , which includes both currency and deposits, total GDP size can be inferred. By deducting from it the official GDP, the informal GDP is obtained, as a residue in terms of GDP. The hypothesis that this assessment is built on is that the speed of money circulation, in the two sectors is equal.

b) Cash-deposits ratio method

Is widely used and is based on the ratio of currency in circulation and sight deposits. According to this, clandestine economy transactions are reflected in changes in the ratio of currency in circulation and sight deposits held in banks.

Gutmann (1977) states that this ratio is only affected by tax changes and regulations issued by the government, causing behavioral changes which are motivated by the desire of people to hide certain economic activities in order to avoid payment of taxes.

c) Liquidity demand method

Starting from the idea that the release of increasing amounts of high value denominations to facilitate payments is a testament of underground activities expansion, the authors try to accredit the idea that they could then determine the size of informal activities. This method, simplifying a very complex reality, gives early indications that show trends in this area, but not relevant informations on the size.

Contrary to statements by Gutmann, Tanzi (1980) assumes that the demand for liquidity is not only affected by tax changes in regulation, but also by other factors. However, Tanzi support Gutmann's idea that excess cash generated only by changing the tax regime is found, in whole, in the underground economy.

The underlying assumption of the method application for cash is: assuming that the speed of movement of currency is the same in the underground economy and official economy, any increase in demand for liquidity may indicate an expansion of underground activities. Using this method, Gutmann (1977) estimated that the informal economy represents 10% of legal activity measured.

Tanzi regression used is as follows:

$$(2) \quad \ln\left(\frac{C}{M_2}\right) = \beta_0 + \beta_1 \ln(T) + \beta_2 \ln\left(\frac{WS}{NI}\right) + \beta_3 \ln R + \beta_4 \ln(Y) + \mu,$$

where C/M_2 the ratio of cash and money supply, T is the taxation level, WS/NI is the ratio of total wages paid in cash and national income, R is the annual interest rate and Y is per capita income.

d) Latent variables method

Unlike the first three methods using macro-economic modeling, latent variables method developed by Frey and Weck (1983) uses a much larger number of variables. Underground economy is estimated starting from variables changes which, on the one hand, affect the size and growth rate and, on the other hand, represents the traces which it leaves in the real economy. This method uses a technique (known as **LISREL** - **L**inear **S**tructural **REL**ations) which allows cross-comparisons of the relationship between unobserved dependent variables and explanatory variables.

The critiques on the monetary methods refer to the assumptions on which research is built:

- involves choosing a base year, which requires a certain level of underground economy, the most often considered void;
- cash transactions, even in this sector are increasingly being regulated by using checks and other modern means of payment;
- speed of circulation of money, considered the same in the two sectors is very difficult to see even in the official economy.

e) DYMIMIC method

A method different from the above is **DYMIMIC** method (Schneider 2002) (dynamic multiple-indicators multiple-causes), dynamic version of the **MIMIC** method (multiple-indicators multiple-causes). It takes into account multiple causes that determine the expansion of underground economy, and its multiple effects over time. The method is based on statistical theory of observable variables. In this case a single unobserved variable, underground economy size is used. It starts with a set of causes and a set of indicators that are influenced by the size of underground economy in order to identify the structurally dependency between these variables and the underground economy. This dependence is used to predict future changes in underground economy size.

f) Method based on electricity consumption (physical input method)

It is one of the most popular methods using global indicators and one of the few methods based on the measurement of physical data. To measure all activities (formal and informal) in an economy, Kaufmann and Kaliberda (1996) considers electricity consumption as the single and best physical indicator for measuring activity throughout the economy. The study suggests that the increase of overall electricity consumption is an indicator for increased representation of official and unofficial GDP. Thus, the difference between the growth rate of official GDP and the growth rate of total electricity consumption is attributed to the growth of underground economy.

The main criticism of the Kaufmann-Kaliberda method is that not all economic activities require electricity consumption and, moreover, other energy sources can be used, therefore this method can not cover the entire underground economy.

GDP and stock market

In Cristiana Tudor's paper (2008) the following regression was tested, regression that links economic growth (expressed by increasing GDP / capita) and the stock market (BSE), in the case of Romania (note that we have adapted the notation to the notations of this paper and we take into account the fact that the author has specified that the logarithmic increase of the variables were used):

$$(3) \quad \ln(Y_t) = \alpha_t + \gamma_1 \ln(X_{t-2}) + \gamma_2 \ln(Z_{t-2}) + \gamma_3 \ln(Q_{t-2}) + \gamma_4 \ln(W_{t-2}) + \hat{\eta}_{it},$$

where

X = volume of transactions on the BSE in year $t-2$;

Z = value of transactions on the BSE in year $t-2$;

Q = capitalization trading on BSE in year $t-2$;

W = number of issuers on BVB in year $t-2$;

Y_t is the indicator in year t (GDP growth/capita).

Gamma coefficients are the slopes of the regression equation and express the linear relationship of the four indicators to capital market development.

According to the article there is a positive link between capital market development and macro-economic development (with a time-lag of two years).

Underground economy and stock market

Relations (2) and (3) allow us to express C/M_2 ratios which (in Tanzi's view) is an indicator of the underground economy level, by the following regression:

$$(4) \quad \ln\left(\frac{C}{M_2}\right)_t = \beta_0 + \beta_1 \ln(T_t) + \beta_2 \ln\left(\frac{WS}{NI}\right)_t + \beta_3 \ln R_t + \\ + \beta_4 \ln(X_{t-2}) + \beta_5 \ln(Z_{t-2}) + \beta_6 \ln(Q_{t-2}) + \beta_7 \ln(W_{t-2}) + \omega$$

Equation (4) establishes a link between underground economy and major stock market indicators. According to this relationship the underground economy dynamic (which is found in the dynamic of C/M_2 ratio) is influenced by the level of taxation, the ratio of total wages paid in cash, the national income, the annual interest rate and the dynamic of stock market activities.

Conclusions

Given that regression (4) will be tested and may establish a relationship between volume of the underground economy and, among other things, stock markets dynamic there is a possibility to use finer mathematical tools to determine underground economy size. Wavelet analysis, which has applications in studying the behavior of stock markets, is one such tool.

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