Estimating the size of Romanian shadow economy using Gutmann's simple currency ratio approach

Adriana Ana Maria DAVIDESCU (ALEXANDRU)
The Bucharest University of Economic Studies
adriana.alexandru@csie.ase.ro

Abstract. *Currency is widely assumed to have a comparative advantage over checks for the payment of purchases of goods and services that individuals wish to conceal from the authorities. A rise in currency stocks and payments may be taken as a rough indicator of the extent to which these transactions may not be reported to government authorities.*

The paper aims to estimate the size of subterranean economy using the simple currency ratio method of Gutmann for quarterly data covering the period 2000-2010. Thus, the study analyzes the ratio of currency to demand deposits in order to estimate the amount of economic activity in the subterranean economy.

The empirical results point out that the illegal economic activities are about four billion RON at the middle of 2000; it constitutes 17.4 percent of the official GNP. During the period 2001-2004, illegal economic activities follow a downward path reaching 9.5% of official GNP at the end of 2004. For the period 2004-2006, unofficial economic activities fit a slow upward trend until the second quarter of 2006, for which the size of subterranean economy reaches the value of 12.3% of official GNP.

Beginning with 2007, the amount of illegal activities as % of official GNP begin to decrease until the third quarter of 2008, which is the base year in which no shadow economy is supposed to exist. For the last years, the ratio of subterranean economy to official economy increased slowly, reaching about 9.3% in the second quarter of 2010.

Keywords: shadow economy; currency; deposits; simple currency ratio; monetary aggregates; Romania.

Introduction

It is difficult to gauge the relative size of the underground or informal sector because transactions of participants engaged in tax evasion are not readily observable. The most widely used methodology for estimating the size of the underground economy is the Monetary Aggregates Approach. This method is based on the assumption that cash is the main medium of exchange for transactions in the informal sector because it "leaves no trace"[1].

The monetary approach is based on the assumption that cash is used to make transactions that agents want to keep hidden from official records. Transactions made using cash are difficult to trace, while those made with other assets, registered in financial institutions, can be easily inspected.

Because transactions in currency are anonymous while those involving checks leave an identifiable trace, participants in the underground sector have an incentive to use cash to hide the source of income from tax or police authorities. In this sense, a rise in the currency ratio, other things equal, could signify an increase in underground activity.

If the amount of currency used to make hidden transactions can be estimated, then it could be multiplied by the income-velocity of money to get a measure of the size of the shadow economy.

The main idea of the paper is to analyze of the ratio of currency to demand deposits as a rise in currency stocks and payments is likely a good indicator of transactions which are not reported to the government authorities.

The paper is organized as follows. Section 1 presents some general remarks about the simple currency-ratio method. Section 2 provides the first known attempt to estimate the growth of Romanian subterranean economy. Section 3 presents major conclusions.

1. Simple currency ratio method

In the category of monetary approaches, there are three methods namely simple currency ratio (SCR) method of Gutmann (1977), the transaction method of Feige (1979) and the currency demand method of Tanzi (1983), based on the work of Cagan (1958).

Currency ratio (C/D) method has been so far the most popular methods of estimation of the size of the shadow economy and it is based on the ratio between currency and demand deposits[2].

Currency ratio (C/D) method (Gutmann, 1977, Feige, 1980, 1986, 1989) has been widely applied as a means for obtaining aggregate estimates of the size and growth of unreported and unrecorded income in developed nations and the methods can be readily applied to developing nations as well. The conceptual justification for estimating various types of underground economies employing currency based methods is that currency is regarded as a superior medium of exchange for conducting underground transactions.

Approach was first used by Cagan (1958) in estimating unreported income during World War II. Cagan's method was then developed by Gutmann (1977) who found out that the "subterranean" economy of USA was almost 10 per cent of registered GNP in 1976. Gutmann assumed that over time the increased use of checks and credit cards would cause a relative decline in the demand for currency. Yet, he argued that the ratio of currency to narrow money supply, M_1, has consistently grown in the US since 1961.

By assuming the 1939-1941 level of ratio to be normal and arguing that "the difference between this and recent values of the ratio may be taken as a measure of the amount of currency held for illegal purposes" (Gutmann, 1977) he estimated the amount of currency fuelling the unobserved economy, and on the assumption that the amount of economic activity generated by 1$ was similar in both the legal and subterranean economies, he concluded the subterranean economy was at least 10.4% of recorded GNP (O'Higgins, 1980).

The main idea behind this approach is that a rise in currency stocks and payments is likely a good indicator of transactions which are not reported to the government authorities.

Following Cagan (1958) and Guttman (1977), the specifications of SCR method can be expressed as below:

$$C = C_u + C_o \tag{1}$$

$$D = D_u + D_o \tag{2}$$

$$k_o = \frac{C_o}{D_o} \tag{3}$$

$$k_u = \frac{C_u}{D_u} \tag{4}$$

$$v_o = \frac{Y_o}{(C_o + D_o)} \tag{5}$$

$$v_u = \frac{Y_u}{(C_u + D_u)} \tag{6}$$

$$\beta = \frac{v_o}{v_u} \tag{7}$$

where:

C - actual currency stock;

D - actual stock of demand deposits;

Y_o - observed income;

u -subscript to denote unobserved sector;

o -subscript to denote observed sector;

k_o - ratio of currency to demand deposits in observed sector;

k_u - ratio of currency to demand deposits in observed sector;

v_u - unobserved sector income velocity;

v_o - observed sector income velocity.

Equations (1) and (2) decompose the actual stocks of currency and demand deposits [3] into their unreported and reported components. Equations (3) and (4) are the definitions of the term k which indicates the ratio of currency holding to demand deposits and in the same way, equations (5) and (6) show income velocity in both economies.

To find out the unregistered economy Y_u by using equation (6) as a function of observable variables Y_o, C, D and the parameters β, k_u and k_o, we utilise the equations from (1) to (7). This repeated substitution yields the following formula:

$$Y_u = \frac{1}{\beta} \times Y_o \times \frac{(k_u + 1)(C - k_o \times D)}{(k_o + 1)(k_u \times D - C)} \tag{8}$$

The SCR method applies the following restrictive assumptions:
1. Unregistered transactions are always paid by currency (i.e. cheques are never used), therefore $k_u \to \infty$, $D_u \to 0$.

2. k_o is constant over time.
3. The amount of unreported income produced by a dollar of currency transacted in the unreported sector is the same as the amount of reported income produced by a dollar of currency transacted in the reported economy ($\beta = 1$).

Having imposed these three restrictions on Equation (8), it provides the restrictive form (or mathematical representation form) of simple currency-ratio method as below:

$$Y_u = Y_o \times \frac{(C - k_o \times D)}{(k_o + 1) \times D} \qquad (9)$$

The estimated size of the underground economic activity can be derived as the product of underground currency (actual currency less that hold in the above-ground sector) and the income velocity of above-ground M_1 [4].

The method has some weakness:

- the assumption that currency is the exclusive medium of exchange in unobserved sector is too rigid. Because the risk of detection is rather low, it seems reasonable that irregular purchases are paid by check. Surveys from Norway (Klovland, 1981) indicate that between one-fifth and one-third of unobserved transactions were paid by check rather than by currency.
- the hypothesis of a base period (reference) in which it is assumed that there isn't informal economy remains an open question, especially because different reference periods lead to different estimates on the size of the shadow economy.
- Gutmann's assumption about the equality of income velocity of money in both sectors (official and unofficial), Feige (1979) suspects that the irregular sector is more integrated than the official one and therefore is likely to have a higher income velocity.
- the most important shadow economy estimates based on Gutmann's method depends crucially on the use of demand deposits as compared to the standard currency in circulation (Bowsher, 1980). Such a choice determines not only estimate the growth of the informal economy, but if there is any increase in the informal economy. Spiro (1996) consider this report cash-deposits held as the most appropriate because both are devoted to trading. The problem with this report is the fact that changes in financial technology may have different effects on the demand for money round demand deposits and there were

substantial changes in the payment system (electronic transfers) that affect deposits, credit cards and cash machines (ATMs) that influenced the use of cash in circulation and interest-bearing accounts (which are not part of category deposits). Even if deposits are close substitutes for deposits and cash in many ways, it is pertinent to relate cash in circulation deposits in transaction analysis because they are the only monetary assets that can be exchanged directly for goods and services, other deposits must first be converted to cash or deposit account before being disbursed.

Although the use of cash as a means of saving helps decreasing the velocity of money in the informal economy, its significance should not be exaggerated. Cash accumulation is predominant in certain specialized sectors such as illegal drug market in which all transactions are cash-based. Most of what is said to be informal economy refers to underreporting sales[5] to businesses and does not require an accumulation of cash means.

2. Estimating the size of shadow economy using Gutmann's method

2.1. Data

The monetary approach is based on the assumption that cash is used to make transactions that agents want to keep hidden from official records. Transactions made using cash are difficult to trace, while those made with other assets, registered in financial institutions, can be easily inspected.

In order to estimate the size of shadow economy using currency ratio method, quarterly data covering the period 2000-2010 were used. The study analyzes the ratio of currency to demand deposits in order to estimate the amount of economic activity in the subterranean economy. The main sources used to collect the data were Eurostat, National Bank of Romania and National Institute of Statistics.

It is important to mention that, since January 2007, according to NBR No.13/2006 which regulates the adoption of new methodologies, The European Central Bank, the monetary aggregate M1 consists of currency in circulation outside banks and demand deposits (overnight) includes, in addition to the structure used until December 2006, household savings sight lei and foreign currency deposits of households and companies (previously included in quasi-money), they are considered to have the same degree of liquidity as at sight in domestic businesses.

This increased overnight deposits by household savings sight lei and foreign currency deposits of population and businesses, leading to a reallocation of intermediate monetary components. Narrow monetary aggregate (M_1) and overnight deposits were recalculated for the period 2000-2004 using monthly bulletin of the National Bank of Romania.

2.2. Empirical results

Illicit economic activity generally relies on the use of cash transactions in order to avoid leaving an audit trail. Therefore, by measuring the discrepancy between the amount of cash actually in use and the amount that one would expect to be in use on the basis of income reported to tax authorities, one can make a forensic inference about the volume of hidden income.

Given the difficulties of direct inference, economists have often resorted to simple indirect methods of gauging underground activity[6]. Since work by Cagan (1958), a convenient benchmark for underground activity has been the ratio of currency to demand deposits[7].

Because transactions in currency are anonymous while those involving checks leave an identifiable trace, participants in the underground sector have an incentive to use cash to hide the source of income from tax or police authorities. In this sense, a rise in the currency ratio, other things equal, could signify an increase in underground activity.

Analyzing the currency evolution relative to monetary aggregates M_1 and M_2 it is important to point out if the increase of currency indeed supports a huge and growing amount of unreported economic activity in Romania or instead, the people are not accustomed to make their payments using other instruments (checks, credit or debit cards, travelers checks) and equally the currency increase doesn't necessarily represents an expansion of the unofficial sector.
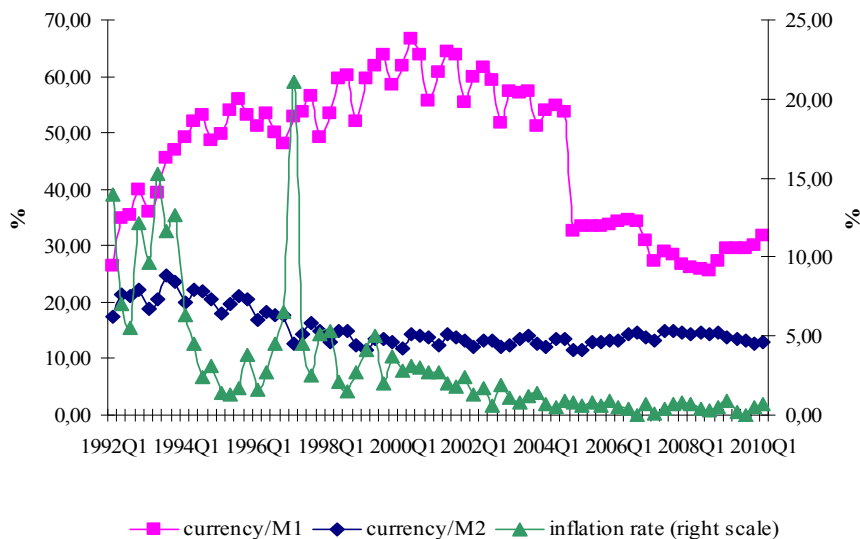
Source: National Institute of Statistics, Tempo database; National Bank of Romania, Monthly Bulletin 2000-2010.

Figure 1. *The inflation rate and the share of currency in M1 and M2*

It is important to mention that, during the first decade of transition, for the general public there was no convincing alternative to use cash for payments. The modern non-cash payment instruments (checks, credit or debit cards, travelers checks) does not yet penetrated the Romanian market.

Starting with the introduction of the first card in July 1995, the modern payment instruments began to gradually replace the cash, whose share declined from year to year.

The decreasing share of currency in M_2, which attests the slowly improvement process of payment system in the economy, continued also in 1997, at the end of which the currency amounted about 14.8% of total money supply. Under conditions of high inflation and high nominal interest rates, economic agents as well as population preferred to preserve available funds in banks, especially in the form of time deposits.

In 1998, the non-cash payment instruments have continued to expand, but however the cash payments remained an important component of transfers in economy, especially in relations with the population. Relative to gross domestic product, the currency outside the banking system was at the end of 1998 approximately 3.4 % (compared with 3.7% in the previous year). This has been an

encouraging development, suggesting the restriction of cash payments in the Romanian economy.

Currency outside banks has increased by 27.9%, with an average monthly rise (2.1%) below that of money supply, leading to a decline in its share from 13.2% in December 2001 to 12.2% in the same month of 2002.

In 2004, currency in circulation had a higher growth rate than in previous years (28.7%), but by bringing forward its monetary dynamics (39.9%) on the remonetisation process of national economy, led to decreases in the share of currency holdings in M_2 to about 11.6%.

However, in 2005-2006 the share of currency in M1 tended to decrease from 50% in early 2005 to about 42.7% at the end of 2006. The share of cash in total money supply (M2) shows a slight increase, reaching value of 13.5% at end of 2006.

The analysis of currency in circulation outside the banking system reported to the money supply M1 shows the existence of a break in the series due to the adoption of the National Bank (BNR), in January 2007 of European System of Central Banks standards. Thus, with the changes brought by cash to the balance sheet reporting, implementation of NBR No.13/2006 (reporting statistical data for planning monetary balance sheet) entailed among other things, major changes of substance and form of monetary situation, the most significant regarding definitions of monetary aggregates and their counterparts (Antohi et al., 2007).

Following the implementation of these regulations, the share of cash outside the banking system in M1 declines dramatically from 42.7% at end of 2006 to 27% in the first quarter of 2007, due to the artificial increase in narrow money supply (M1) and to the simultaneous decrease (M2) by including in overnight deposits in domestic household savings and sight deposits in foreign currency with residents, part of quasi-money until December 2006 that formed along the M1 money supply M2. For the past years, there is an increasing trend of cash, reaching, in the second quarter of 2010, 32.4% of the value of M1.

As Gutmann (1977) pointed out, we can estimate the size of shadow economy by examining the composition of the stock of money, M1. M1 has two components-currency and demand deposits. As an economy develops, ever more transactions are typically carried out with checking accounts, and demand deposits grow more rapidly than currency.

In terms of currency holdings in Romania, there haven't been significant fluctuations in the last period. According to the Monthly Bulletin of National

Bank, in the first quarter of 2010 were approximately 24.2 billion RON in circulation. Although cash is losing ground in Romania, it remains a topical subject, given that most payments are made in cash.
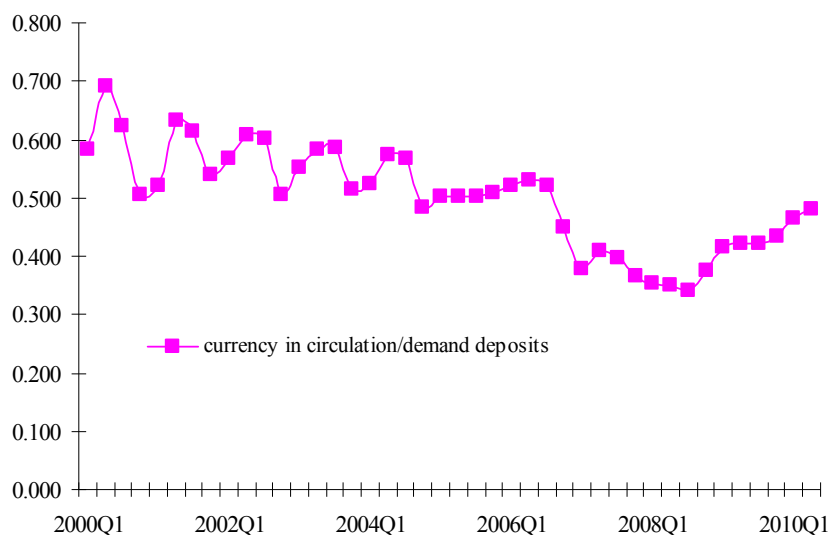
Source: National Institute of Statistics, Tempo database; National Bank of Romania, Monthly Bulletins 2000-2010.

Figure 2. *Evolution of currency ratio in Romania during the period 2000-2010*

At the beginning of 2000 the share of cash in overnight deposits was 0.58, it gradually decreases reaching a value of 0.48 at the end of 2004. During the period 2000-2004, the currency ratio was on a gradual downward path reaching the value of 0.48, meaning that currency in circulation in demand deposits doubled during the period.

For the period 2004-2006, the currency ratio was slowly increased reaching the value of 0.53 at the middle of 2006. Beginning with 2007 the currency ratio declines dramatically to its minimum in third quarter of 2008 (0.342). From 2009 the currency ratio begins to increase slowly reaching the value of 0.48 in the second quarter of 2010.

The decrease of demand deposits noticed during the last period has of course to do with the more than severe recession engulfing the Romanian economy on the background of the world economic downturn. As such the fall in deposits signals a clear syndrome of "balance sheet recession" (Koo, 2009) with all available resources mobilized to pay for outstanding debts. It also shows that both

companies as well as households are increasingly drawing on their amassed savings throughout the boom years 2004-2008 to cope with falling incomes starting with the first quarter of 2009. In effect this thoroughly shows the severity of the crisis in the economy and bodes bad for the future as savings are simply burned out to cater for current liabilities thus leaving little for future investment which in turn means that when it will back eventually, growth will be sluggish at the beginning.

In order to quantify the dimension of shadow economy as % of official GDP[8] using Gutmann method it is important to determine the minimum value of the ratio of currency in circulation to deposits(C/D), and thus the third quarter of 2008 is selected as the base moment of time in order to estimate the size of the shadow economy. The choice of the base year is a crucial subject in this approach, since the results are fairly sensitive to the choice. Different base year selections result in various conclusions.

Subsequently, we drop the currency ratio from the reference period from actual currency ratio of each quarter in order to obtain the currency excess that is assigned to shadow economy. Then, we multiply the demand deposits with this currency excess and we determine the "illegal currency" used in shadow activities. Finally, we multiply this illegal currency with the income velocity of money and thus we obtain the absolute dimension of the informal economy expressed in monetary terms.

During the third quarter of 2008, currency measured 342 RON per 1000 RON of demand deposits. The difference between this and recent values of the ratio may be taken as a measure of the amount of currency held for illegal purposes. In the second quarter of 2010, the currency measured 480 RON per 1,000 RON of demand deposits. On this basis, of the 26.1 billion RON in circulation outside banks in 2010Q2 about 7.48 billion were held for illegal and 18.6 billion for legal purposes. Hence, from the total 80.49 billion money supply, 73 billion represented legal and 7.48 billion – or 9.29% – illegal purposes. The 72.71 billion held for legal purposes were needed to produce the 104.05 billion legal GNP in 2010Q2, while the 7.48 billion held for illegal purposes were needed to produce an estimated 10.66 billion illegal GNP. The empirical results of subterranean economy based on simple currency ratio are presented in Table 2.

Table 1. *Measuring the shadow economy in Romania*

		2008Q3 (%)	2010Q2 (%)	M_1 (billions)	= % =	GNP (billions)
Currency	Illegal	0	13.75[b]	7.48	9.29	10.66[c]
	Legal	34.2	34.2[a]	18.62	90.71	104.05
Demand deposits		100	100	54.39		
Total				80.49	100	114.71

Notes:

[a]The amount of currency required for legal transactions in 2010 is assumed the same percentage of demand deposits as in 2008. The amount of currency required for illegal transactions is obtained by subtraction.

[b] The percentage of illegal currency is obtained reporting the illegal currency to demand deposits.

[c] The amount of GNP lubricated by one RON of M1 – whether currency or demand deposits – is assumed the same for both legal and illegal activities.

Table 2. *Simple currency ratio approach between 2000-2010 (base period= 2008Q3)*

	Currency in circu-lation (C)[*]	Demand deposits (D)[*]	k = C/D	GNP [a*]	Legal currency[*]	Illegal currency[*]	Income velocity of money v[b]	Shadow economy[*]	Ratio of shadow economy (% of GNP)
2000Q1	1607	2,762.7	0.582	13,358.2	945.900	661.100	3.1	2,020.986	15.13
2000Q2	2146	3,103.95	0.691	17,264.8	1,062.738	1,083.262	3.3	3,562.377	20.63
2000Q3	2277	3,645.07	0.625	22,960.3	1,248.008	1,028.492	3.9	3,987.875	17.37
2000Q4	2574	5,090.49	0.506	26,725.9	1,742.895	831.105	3.5	2,898.045	10.84
2001Q1	2378	4,564.89	0.521	20,238.7	1,562.938	814.462	2.9	2,374.381	11.73
2001Q2	2964	4,684.32	0.633	26,023.8	1,603.829	1,360.671	3.4	4,629.449	17.79
2001Q3	3264	5,311.88	0.615	3,2760	1,818.695	1,445.805	3.8	5,522.677	16.86
2001Q4	3564	6,595.78	0.540	38,031.4	2,258.280	1,305.220	3.7	4,886.110	12.85
2002Q1	3341	5,892.46	0.567	25,986.4	2,017.475	1,324.125	2.8	3,726.339	14.34
2002Q2	3962	6,521.18	0.607	33,971.8	2,232.738	1,728.762	3.2	5,602.495	16.49
2002Q3	4234	7,040.16	0.601	41,659.3	2,410.428	1,822.972	3.7	6,736.448	16.17
2002Q4	4557	9,014.17	0.506	48,796.7	3,086.294	1,471.406	3.6	5,290.336	10.84
2003Q1	4587	8,317.33	0.551	33,509.3	2,847.708	1,738.992	2.6	4,515.829	13.48
2003Q2	5254	9,001.5	0.584	42,722.8	3,081.956	2,171.544	3.0	6,508.203	15.23
2003Q3	5814	9,940.78	0.585	53,542.6	3,403.549	2,410.751	3.4	8,192.778	15.30
2003Q4	5798	11,277.77	0.514	63,081.6	3,861.311	1,936.489	3.7	7,153.894	11.34
2004Q1	5777	11,016	0.524	40,903.5	3,771.686	2,005.614	2.4	4,885.082	11.94
2004Q2	6890	12,039.33	0.572	52,291	4,122.056	2,768.344	2.8	7,647.203	14.62
2004Q3	7670	13,530.5	0.567	65,868.5	4,632.606	3,037.394	3.1	9,436.974	14.33
2004Q4	7464	15,441.6	0.483	77,938.8	5,286.934	2,177.666	3.4	7,409.553	9.51
2005Q1	7785.9	15,510.7	0.502	50,391.7	5,310.592	2,475.308	2.2	5,354.213	10.63
2005Q2	9,581.5	19,059.8	0.503	62,292.7	6,525.742	3,055.758	2.2	6,646.047	10.67
2005Q3	10,341.2	20,557.4	0.503	76,007.8	7,038.494	3,302.706	2.5	8,124.362	10.69
2005Q4	11,385.5	22,374.6	0.509	91,771.6	7,660.672	3,724.828	2.7	10,125.369	11.03
2006Q1	11,479.9	22,008.7	0.522	59,612.5	7,535.394	3,944.606	1.8	7,021.707	11.78
2006Q2	13,557.3	25,509.9	0.531	72,560.5	8,734.143	4,823.157	1.9	8,958.171	12.35
2006Q3	14,423.1	27,726.8	0.520	90,098.3	9,493.171	4,929.829	2.1	10,537.872	11.70
2006Q4	15,130.1	3,3596	0.450	110,843.2	11,502.683	3,627.417	2.3	8,251.729	7.44
2007Q1	14,985.6	39,767.8	0.377	72,087.3	13,615.799	1,369.801	1.3	1,803.455	2.50

	Currency in circu- lation (C)*	Demand deposits (D)*	k = C/D	GNP a*	Legal currency*	Illegal currency*	Income velocity of money vb	Shadow economy*	Ratio of shadow economy (% of GNP)
2007Q2	17,305.4	42,422.4	0.408	88,039.3	14,524.687	2,780.713	1.5	4,098.795	4.66
2007Q3	18,907.3	47,759.8	0.396	107,875.,4	16,352.120	2,555.180	1.6	4,134.589	3.83
2007Q4	21,441.7	58,472.5	0.367	133,079.4	20,019.961	1,421.739	1.7	2,367.589	1.78
2008Q1	21,558.9	61,069.7	0.353	91,285.5	20,909.197	649.703	1.1	717.772	0.79
2008Q2	23,598.2	67,335.4	0.350	108,623.6	23,054.463	543.737	1.2	649.515	0.60
2008Q3	**23,610.8**	**68,960.3**	**0.342**	**139,207**	**23,610.800**	**0.000**	**1.5**	**0.000**	**0.00**
2008Q4	25,286.8	67,261.7	0.376	16,0562.6	23,029.229	2,257.571	1.7	3,916.665	2.44
2009Q1	23,943.8	57,512.6	0.416	93,813.7	19,691.308	4,252.492	1.2	4,897.614	5.22
2009Q2	24,221.2	57,484.2	0.421	109,208.3	19,681.584	4,539.616	1.3	6,067.698	5.56
2009Q3	23,878.7	56,699.8	0.421	129,937.4	19,413.019	4,465.681	1.6	7,201.163	5.54
2009Q4	23,967.6	55,393.9	0.433	150,041.1	18,965.902	5,001.698	1.9	9,456.226	6.30
2010Q1	24,246.3	52,214.2	0.464	96,707.4	17,877.228	6,369.072	1.3	8,055.626	8.33
2010Q2	2,6103	54,388.2	0.480	114,707.4	18,621.568	7,481.432	1.4	10,661.732	9.29

Note: [a] Nominal gross national income; [b] Income velocity of money is computed as nominal GNP under M_1; * millions RON.
Source: National Bank of Romania, Monthly Bulletins; Eurostat (Quarterly Monetary and Financial Statistics).

According to simple currency ratio approach, illegal economic activities are about four billions RON at the middle of 2000; it constitutes 17.4 percent of the official GNP. During the period 2001-2004, illegal economic activities follow a downward path reaching 9.5% of official GNP at the end of 2004.
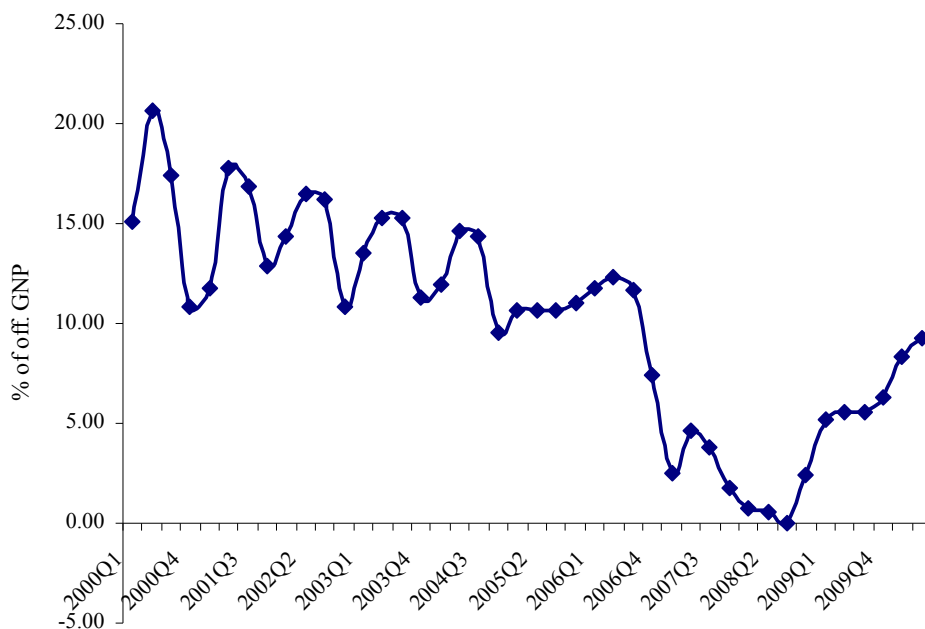

Figure 3. *The ratio of shadow economy to official economy for the period 2000-2010*

For the period 2004-2006, unofficial economic activities fit a slow upward trend until the second quarter of 2006, for which the size of subterranean economy reaches the value of 12.3% of official GNP.

Beginning with 2007, the amount of illegal activities as % of official GNP begin to decrease until the third quarter of 2008, which is the base year in which no shadow economy is supposed to exist. For the last years, the ratio of subterranean economy to official economy increased slowly, reaching about 9.29% in the second quarter of 2010.

Conclusions

The rise in currency in the past decade has fostered a controversy over whether it reflected a growth in unrecorded activities or actually the Romanian people are not accustomed to make their payments using other instruments (checks, credit or debit cards, traveler's checks).

Starting with the introduction of the first card in July 1995, the modern payment instruments began to gradually replace the cash, whose share declined from year to year.

Although cash is losing ground in Romania, it remains a topical subject, given that most payments are made in cash.

The paper estimated the size of underground economy during the period 2000-2010, using the simple currency ratio monetary approach of Guttmann. The results reveal that the ratio of shadow economy to official economy decreased from 21% to about 12% of official GNP during the period 2000-2006. At the end of 2006, the size of subterranean economy decreased until the third quarter of 2008, for which we have supposed that the subterranean economy does not exist. In the last years, the size of shadow economy as ratio of official GNP begin to increase slowly, reaching the value of 9.29% in the second quarter of 2010.

Notes

[1]   Currency is widely assumed to have a comparative advantage over checks for the payment of purchases of goods and services that individuals wish to conceal from the authorities. A rise in currency stocks and payments may be taken as a rough indicator of the extent to which these transactions may not be reported to government authorities.

[2]   Overnight deposits are considered to be as liquid as currency.

[3]   Demand deposits and other checkable deposits (Feige, 1989).

(4) The income velocity of money is determined reporting the official GDP to monetary aggregate M_1 (Schneider, Enste, 2000).

(5) If we consider the case of a seller, it may underreport its annual sales by 10%, making his income appear substantially smaller than in reality. All that he needs to do is to ensure that 10% of its sales are form of cash. The rest can be in the form of checks or credit cards whose proceeds are deposited in the bank.

(6) National income accounts traditionally have attempted to measure legal underground activity but not illegal activity.

(7) Originally, the denominator in Cagan's currency ratio consisted only of demand deposits. However, Porter(1999) shows that that usage has become dubious in light of the growing popularity of interest-bearing NOW accounts in the 1970s and 1980s in the US, which are identical to demand deposits in terms of their transaction properties. Thus, both demand deposits and NOW accounts should be included in the denominator. More recent research using currency ratios includes Feige (1997, 1996) and Gutmann (1977).

(8) Gutmann (1977) and Ogunc and Yilmaz (2000) uses gross national income or national product. Since national income (GNI) at market prices equals GDP minus primary income payable by resident units and increased primary income received from the rest of the world by resident units, we use gross domestic product especially that between the two statistical series the differences are negligible.

References

Alexandru, A.A., Dobre, I., Ghinararu, C. (2009). Estimating the size of the Romanian shadow economy using the currency demand approach, *Conferința internațională - Integrarea Europeană – noi provocări pentru economia României*, ediția a V-a, 29-30 mai, 2009, Oradea, Analele Universității din Oradea, seria Științe Economice, Tom XVIII, Vol. II, pp. 623-631

Antohi, D., Stere, T., Udrea, I., Bistriceanu, G., Botezatu, A.(1997). „Evoluții monetare în economia românească. Determinanți și implicații", *Caiet de studii* Nr.21, Banca Națională a României

Atkins, F. (1999). "Macroeconomic time series and the monetary aggregates approach to estimating the underground economy", *Applied Economics Letters*, 6, pp. 609-611

Bowsher, N. (1980). *The Demand for Currency: Is the Underground economy underdetermining monetary policy?,* Federal Reserve Bank of St. Louis

Cagan, P. (1958). "The Demand for Currency Relative to the Total Money Supply", *Journal of Political Economy*, pp. 303-328

Feige, E. (1979). "How big is the irregular economy?", *The other economy*, pp. 5-13

Feige, E. (1980). "A new perspective on macroeconomic phenomena. The theory and measurement of the unobserved economy of the United States", *American Economic Association*, pp.1-63

Feige, E. (1986). *The Role of Cash payments in the US economy. The currency enigma*, University of Wisconsin, Madison.F.

Feige, E. (1989). *The underground economies*, Cambridge University Press

Gutmann, P.M. (1977). *"The Subterranean Economy", Financial Analysts Journal,* 33, pp. 24-27

Isarescu, M. (2006). *Reflecții economice. Politici ale Băncii Naționale a României*, Academia Română, București

Laurent, R.D. (1979). *Currency and the Subterranean Economy*, Economic Perspectives, Federal Reserve Bank of Chicago, pp. 3-6

Klovland, J.T. (1980). *In the search of the hidden economy: tax evasion and the demand for currency in Norway and Sweden*, Norwegian School of Economics and Business Administration

Öğünç, F., Yılmaz, G.(2000). "Estimating underground economy in Turkey", *Discussion Paper,* No. 15, Central Bank of the Republic Turkey

O'Higgins, M. (1980). *Measuring the hidden economy: A review of evidence and methodologies*, Outer Circle Policy Unit, London

Porter, R.D., Weinbach, G.C. (1999). „Currency ratios and US underground economic activity", *Economics Letters*, 63, pp. 355-361

Porter, R.D., Bayer, A. (1989). *Monetary approaches to estimating underground economic activity,* in: Feige, E. (ed.), *The Underground Economies: Tax evasion and Information Distortion*, Cambridge University Press, Cambridge, pp. 129-157

Spiro, P. (1994). "Estimating the Underground Economy: A Critical Evaluation of the Monetary Approach", *Canadian Tax Journal*, Vol. 42, No. 4, pp. 1059-1081

Tanzi, V. (1983). "The Underground Economy in the United States: Annual Estimates", 1930-1980, *International Monetary Fund Staff Papers,* 30, pp. 283-305

*** National Institute of Statistics

*** National Bank of Romania

*** Eurostat Statistic databases