

## **Analysis of the correlation between the real estate loan stock and the average unit value of urban housing**

**Dumitra STANCU**

Technical University of Civil Engineering of Bucharest  
stancudumitra@yahoo.com

**Alexandru OPROIU**

Bucharest University of Economic Studies  
alexoproiu@yahoo.com

**Abstract.** *Both the real estate market and the mortgage sector have had similar evolutions since 1990, with a significant influence on one another. In the first few years of this interval, the term „housing loans” was mostly associated with the state-run financing schemes for the purchase of such assets (the famous CARs), but after 2001 commercial banks entered this market segment. The products they initially offered were poorly adapted to demand, involving short maturities, high interest rates and impossible collateral, but soon the trend shifted and lending pushed up the construction of new buildings and that created an entire bull market. At the same time, personal loans helped fuel the population’s consumption for a significant time, but eventually ended up by being avoided due to the economic incertitude after 2008.*

**Keywords:** real estate market, mortgage sector, housing loans.

**JEL Classification:** E51, E52.

**REL Classification:** 11B.

### **Literature review on housing loans**

In general terms, the credit dynamics and its effect on economic growth is a subject of intense debate. Regarding evolutions in the transition economies, Koivu (2002, p.7) shows that sometimes, due to the specific conditions of such economies, an increase in lending does not necessarily influence in a positive manner the state of national economies. Based on this work, Cristea and Drăcea (2010, pp. 184-190) take a look at the situation in Romania and come to the conclusion that, in the short term, and especially in the context of the financial woes of 2008, the volume of loans, inflation and the exchange rate can adversely affect the growth of GDP.

As research in this field points out, the main determinants for the real estate market are direct stimuli such as demographic pressure, population income, building costs, access to loans (Mashed and Zemcik, 2009), but also more subtle ones such as expectations for price increase (Muellbauer and Murphy, 2008), rigid and heterogeneous supply (Koetter and Poghosyan, 2009), exchange rate dynamics (Alvares-Lois and Nuno-Barrau, 2007) and the level of regulations within the lending/real estate property symbiosis (Quigley, 1999).

In recent papers, several authors have dealt with the links between the real estate market and the economy in its entirety, especially in the context of recent evolutions of the international financial markets. Muellbauer and Murphy (2008) note that, for instance, in recent years changes in institutional approach of the real estate and mortgage markets in the United States have significantly altered both the channels of transmission for the monetary policies and the entire economic cycle. In their opinion, housing prices are determined by the level of population income, existing real estate stock, demographics, availability of credit linked with interest rates levels, as well as expectations for the continual increase of the value of these assets (which held the potential of pushing the prices up to an unhealthy level). As for factors leading to new investment in real estate, this time in the case of Great Britain they found that the main constraints were linked to restrictive urban planning, which reduced the level at which the population found housing affordable.

In their opinion, the main indicators about real estate collateral and the difficulties in getting the amounts necessary for cash advances are the key to understanding the way in which house price variations explain middle term changes in consumption. Institutional changes, as noticed for several countries over time, are responsible for the significant differences found in relationship to the links between the economy and real estate, which brings in discussion the debate about the way in which monetary or other type of policies should react to a change in house prices.

In a similar paper, Mikhed and Zemcik (2009) investigate the motivation between the dramatic price drops in the United States in 2006. They analyze whether the decrease was justified by changes in the fundamentals, such as available income, population number, rent level, stock exchange values, building costs or housing loans interest rates. Their conclusion was that the real estate prices experience important and long-term divergences from the fundamentals, and require a long time – decades even – to return to the correct levels, the most recent correction being the burst of the 2006 bubble.

Bernanke (2007) notices that the interactions between the real estate market, the lending sector and the economic activity are of critical importance to understanding and anticipating the economic trend, while Miles and Pillowcase (2008) take a look at recent evolutions for real estate prices in Europe (Romania not included due to lack of data) in correlation with lending dynamics, developing a conceptual framework for the evaluation of whether fundamentals such as variations in population income or the number of inhabitants lead to increase in prices, while also trying to quantify the rate with which the increases were based on expectations of growth for the real estate assets in portfolio. According to their research, this happened to a significant degree in countries such as Spain, Sweden, Belgium and the United Kingdom.

The connection between the real estate market and the banking system is of significant importance in dealing with the large-scale phenomenon. Housing serves as collateral and is, at the same time, an object of mortgages. Koetter and Poghosyan (2010) note that real estate prices can diverge from their fundamental value due to rigid offer, heterogenous quality and other market imperfections, which has two contrasting effects on the banking sector's stability: on one hand, high prices increase the collateral value and the net worth of debtors, reducing their overall risk of default, but at the same time can lead to adverse selection by banks, accepting investors with an unusual appetite for risk in their search to expand their lending portfolio, thus increasing the chances of turbulence for the themselves.

Similar research (Collins and Senhadji, 2002) on the markets of South East Asia has revealed the strong ties between the two sectors, which manifested during the regional crisis of 1997. They have shown that the financial market cycle manifested itself through a wave of optimism due to the favorable developments in the real economy, which led to an underestimation of risk, over lending, excessive asset price increase, overinvestment in real estate and, eventually, extravagant consumption expenses. Eventually, with the re-alignment of expectations and market values, massive optimism gave way to excessive pessimism, leading to painful shocks both for the financial sector and the

economy in general. In this context, both Bernanke and Gertler (1995) and Kiyotaki and Moore (1997) have shown how the natural economic cycle can be amplified by the procyclical effect of lending. The real estate market plays a central role in such an evolution (Collyns and Senhadji, 2002), because housing price increases lead to an increased appetite for lending by the banks, which in the context of stock market globalization allowed foreign capital to be absorbed and to amplify the effect. The Asian scenario included over-lending on behalf of the local banks, bringing hyper-valued real estate as collateral and a sudden slowdown of the economy, which led to numerous banking and currency crisis in the entire region.

Hue (2008) has run an analysis of the way in which real estate market shocks are transmitted to the rest of Malaysia's economy, a country affected by the crisis of 1997, identifying a series of channels for transmission and also the most battered sectors: construction activity, lending and, in some measure, population consumption.

The reduction or collapse of real estate activities have as a direct effect on banks the increase in cautionary provisions on one side, as well as the strengthening of own capital on the other side, thus slowing down lending.

Also, for the population a change in net worth by increased values of real estate assets affect the consumption. Hue describes this mechanism in the following manner: a higher price for housing indicates a greater wealth, thus signaling the possible increase of future earnings. Moreover, an increase value strengthens the population's balance sheet, in the form of house equity. This capital can be used to contract loans, which will finance bigger consumption. This phenomenon is called by Pang (2004) the „collateral increase effect” or the „balance sheet effect”.

Over the years, financial innovation has led to the creation of lending products which facilitate the home equity withdrawal, such as mortgages, asset based loans, home equity redraw facilities (which allow the anticipated repay of mortgages, acting as an extra fund from which one can make withdrawals in cases of need). Alternately, the population can access such an extraction by refinancing existing mortgages, if the prices are stable and the interest rates low.

In the case of the Chinese economy, Honey, Park and Siqi (2002) have shown how important real estate investment has become for the country's economy, especially in the last decades, with the support of the central government. The numbers have grown in the last years due to complementary measures: the 1998 housing reforms, which allowed for market freedom, as well as the relaxation of lending conditions for developers. Increases for the sector, according to the paper, were of 35.2% for 1998, 26.8% for 1999, 25.5% for 2000 and 27.3% for 2001, the year previous to the study's publication. The Chinese central bank estimated that, in 2001 alone, real estate contributed to a direct or indirect increase of GDP by 30%.

In a newer research paper, prepared for the Hong Kong central bank, Peng, Yiu and Tam (2005) also look into the developments of Mainland China. They show that, after 1998, due to the real estate reforms, increases in urbanization, strong dynamics of the population income and lending by the commercial banks facilitated the acquisition of property. This led to price hikes of 23% on average for 2000 – 2004, with Shanghai as the best performer, with an annual increase of 13 percent.

Regarding consumption, the authors name three possible channels through which real estate price adjustments affect it. The first is related to the increase of one's wealth due to an increase in property value, in reference to the whole life cycle. The second mentions consumption as a variable, which depends on the population's expectations for further income gains. The third is the reduction of lending constraints due to the hike in prices, which manifests itself through refinancing.

In Turkey's case, Binai and Salman (2008) take a look at the wealth effect, which manifests itself in the context of last decade's economic evolutions. They show that in the industrialized countries, a housing asset is regarded as the most important component of the population's wealth. Price changes of such assets greatly affect the ability to access a loan and the general expenditure. Thus, the main channel through which real estate affects the economy is, in the authors' opinion, the wealth effect correlated with consumption, considering that an increase in housing wealth leads to a higher rate of consumption for the population. The trend is not universally valid, and while in countries such as Australia, Canada, The Netherlands, Great Britain and the United States the wealth effect has a strong correlation with consumption, in others, such as France, Germany, Italy, Japan or Spain it is negligible or non-existent.

The study identifies two channels through which real estate affects consumption, in the case of home owners: on one hand there is the direct effect, which is the case with families which increase their available income for consumption through refinancing existing loans by leveraging higher collateral values, and on the other hand there is the indirect wealth effect, which explains the increase in consumption through the creation of expectations for future wealth increase during the owner's lifetimes. All these can only manifest themselves where a well-developed credit market exists, as pointed out by the authors.

The negative side-effect manifest itself for renters, an increase in home values meaning higher costs with the rent, which, when taking into consideration that a home has a less-than-perfect substitution rate, leads to decreases of consumption for these individuals.

Domestically, the interest shown by researchers for this field has been somewhat modest, although some efforts have been made to investigate the mechanism of real estate lending or the overall quantitative analysis for the entire market. Probably the main barrier has been the lack of official statistical data (or even unofficial data, for that matter) for the evolution of prices in a highly volatile sector.

Also, the interactions of the real estate market have enjoyed little attention. Bauble (2009) has presented an analysis of housing loans evolution in Romania, showing the tendencies for 2007-2009, and also analysing the correlation of several fundamental factors. A synopsis of the main characteristics of national policy regarding the real estate sector has been published by Ion Zilișteanu (2010). Regarding the overall behavior of the real estate market since the crisis onset, Turku, Dima and Saru (2009) have given us a snapshot of 2008 and the beginning of 2009 from the perspective of price variations, lending and the creation of new housing stock.

### **Lending in the general economic context**

Returning to the evolution of lending, the increase in income for an important part of the population meant the possibility of obtaining real loans. Thus, the tendency for loans in the last decade has been one of expansion and opening-up towards the final consumer, the population. Non-government credit has increased to a significant degree, and this figure in the case of the population has soared from 5.68% in 2000 to 49.99% in September 2009 (Bauble, 2009, pp. 47-56).

Real estate lending has also known important advances, correlated on one side with an increase in demand (and prices, implicitly), as well as with the general decrease in interest rates for loans in foreign currency, on the other side, which was a favorite solution for purchasing an asset which was, invariably, priced in foreign currency. The large sums available for non-lei lending was due especially to insufficient internal resources, the foreign-owned banks (constituting a majority in Romania) taking on credit lines from their owners abroad.

As one can gather from the following table, the savings' value relative to GDP has gone through an abrupt downturn after 1991, losing more than two-thirds (down to 11.8%) in 1994. After that, the indicator resumed its slow recovery, reaching the initial levels in 2009-2011. On the other hand, the demand for loans started to increase since 2000, and internal resources became insufficient in 2003, which dictated that financial players contract external credit lines from the main offices.

**Table 1.** *The evolution of bank savings relative to GDP and the credit to deposit ratio in Romania, 1991-2011*

	1991	1992	(...)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bank deposits to GDP ratio	31%	21%	(...)	17%	17%	18%	18%	19%	22%	24%	26%	27%	31%	32%	31%
Loans to deposits ratio	-	-	(...)	36%	44%	49%	71%	71%	80%	94%	114%	131%	120%	120%	121%

**Source:** Čihák et al., 2012.

The significant expansion of the number and value of loans in foreign currency meant that the population accepted several risks. The most important of all, the currency risk, started to become a substantial reality after 2008. The leu/euro exchange rate deteriorated gradually, by approximately 28 percentage points by the end of 2012. Considering the average stock of population credit of 15.1 billion euro, the impact on repay ability has become important.

From a demand point of view, the introduction in 2003 of the first real estate loans by commercial banks signaled the perspectives for housing assets purchase for the population. As we can see, in the value of total household expenditure of Romania, the weight of investment spending has increased from 1.6% in 2003 to 7.1% in 2009 (Stancu, 2011, pp. 257-262). Housing prices had known a sharp increase since January of that year, stimulated by an ever-increasing number of transactions. Another factor, which contributed to the advance, was the „on par” conversion from US dollars to euros for the prices, which happened quite rapidly and was an important psychological catalyst.

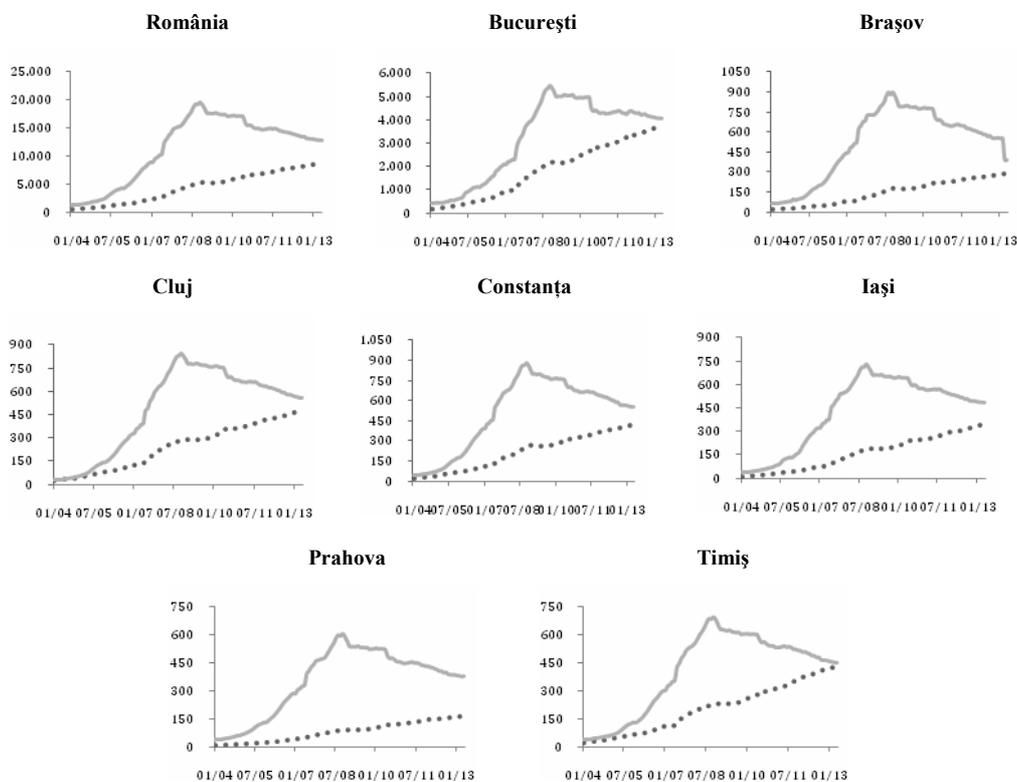
The immediate effect of these evolutions was the diversification of products offered by the financial market, the first loans with maturities of twenty, twenty five or thirty years making an appearance. The difference between interest rates of loans in lei and foreign currency became very high, in favor of the latter, leading to a substantial increase in credit denominated in euro or even Swiss francs, a currency perceived by many clients as being more stable.

In March 2007 the No. 3 Regulation regarding limitation of the risk for the population was issued, as a reaction by the National Bank to recent market evolutions. This allowed commercial banks to be more flexible, to a degree, regarding the conditions for loans qualification, adopting measures such as the scrapping of a minimal 25% minimum advance or the maximum debt ceiling of 40% of the person (or family) being granted the loan.

In parallel with the housing loan, the consumption lending has known an even more accelerated dynamic, with a fourteen and a half-fold increase during 2004 to 2008 for the entire country, up to a maximum value of 19.7 billion euro (calculated by using the NBR official exchange rate), while the housing loans have increased by an order of ten and a half, countrywide.

### Regional evolutions

In a territorial snapshot, the consumption lending has known a relatively homogeneous evolution for the entire decade which we analyzed, mirroring in a large degree the overall economic development, allowing us to point out virtually the same levels of maximum and minimum values for all the regions taken into consideration, and for the whole country overall. Between 2004 and 2013, the total consumption loans increased in value by over eight-fold nationally, currently reaching 12.9 billion euros, a 7.7 billion decrease from the maximum values reached in August 2008.



Source: NBR, own calculations.

**Figure 1.** Total values of housing and consumption loans, millions of euro, 2004-2013

This being said, the level of consumption loans reported by the NBR is not entirely relevant in the context of the real estate market developments. Anecdotic evidence suggests a practice of „reallocation” of funds, which were granted as personal needs loans, and the utilization of these amounts for the financing of the down-payment requested by the bank, thus the final purpose being the purchase of housing as well. This means that the true dimension of real estate loans can be much larger than the periodic reports of the central bank suggest.

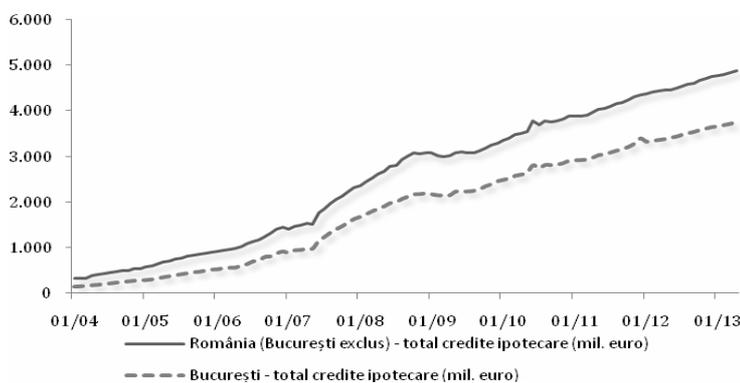
A reversal of the market trend has begun to manifest itself with the first months of 2008, a moment in which we can see a down-shifting for the overall real estate loans' value, as the maximum price values have been reached. After a relative stagnation of prices, these have eventually started to go down, pushed by the so-called market blockage, which had started to manifest in January, but also by a worsening of lending conditions.

In May 2009 a new program was launched by the Romanian government, called „The first home”, in reality a publicly-run guarantee scheme with the purpose of facilitating home purchases for young families, on one side, and the stimulation of new real estate investment on the other. In 2009 a guarantee ceiling sufficient for granting 495 million euros worth of credit was set in place. In 2010, that value had reached 935 million euros following a decision by authorities to reduce the degree of guarantee to a half, down from 100%. In 2011 and 2012 loans worth 740 million and 1.01 billion respectively were granted, and for 2013 (May) that amount was 410 million euros. This counts loans of up to 3.59 billion euros for the four years of the program.

The total number of loans granted was a little over 92 thousand, and the average value was approximately 39 thousand euros. Out of these, approximately 51% have been directed towards the purchase of two-rooms apartments, at a national level.

The first semester of 2013 marked a return of housing market values to mid-2006 levels, resulting in a 50 to 55% loss of their historical maximum values of March 2008. In this context, housing loans' values have continued to increase at a moderate pace, fueling current transactions.

With this analysis we aim at drawing attention to the significant discrepancies at the territorial level of credit distribution for housing purchases. Therefore, as we show below, in 2013 the Bucharest region had gathered approximately 43% of the country-wide values. The total amount, of 3.74 billion euros, which is contracted in the capital, represents no less than 76% of the entire value of the rest of the country combined.



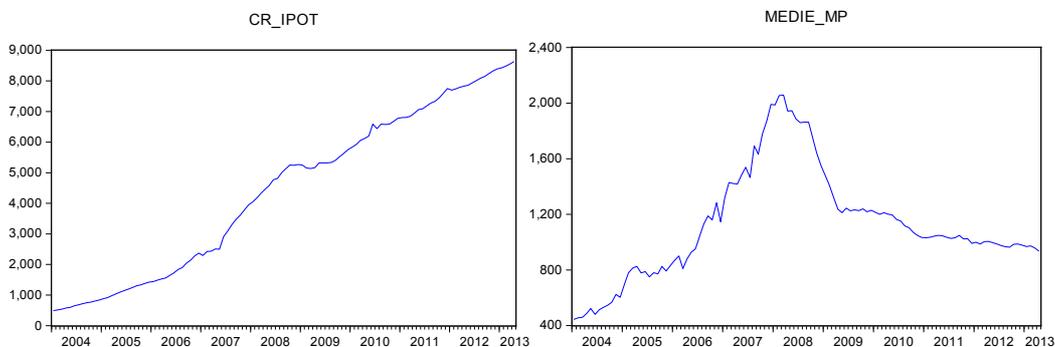
Source: NBR, own calculations.

Figure 2. Housing loans in Bucharest and the rest of the country, 2004 to 2013

Compared to the other seven regions, which combined have a loans stock of 2.13 billion euros, Bucharest has a 75 percentage points advance. We cannot help but point out the polarization of housing lending in two national distinct markets, the capital and the rest of the country, with the two segments virtually equal.

### Empirical results

The data series show the evolutions of monthly real estate lending (in millions of euros) and that of the average value per square meter for housing (in euro) for Romania, during 2004 to 2013.



**Figure 3.** Graphical evolution of the monthly real estate lending value and the average value of housing per square meter between 2004 and 2013

For the entire 2004 to 2013 period, the monthly stock of housing loans has had a growing evolution, which continued during the recession years as a result of previously, contracted loans with very long maturities (20 to 30 years). On the contrary, the average price per square meter reflects in a good manner the effects of the financial crisis, which was in turn determined by a crisis of the real estate prices.

From a statistical analysis point of view, the evolution of the real estate loans stock in the period analyzed shows a definitive trend. For the regression analysis, this temporal series must be turned into a stationary set (by first and second differentiations), thus reflecting the monthly variations of this indicator. The same can be said of the series of prices, which at first shows an ascending trend (2004 – mid 2008) and afterwards a descending trend, for the remainder. For the stationarity we will proceed, as well, with the differentiation for the monthly changes in this average price indicator.

**Table 2.** *Descriptive statistics*

	CR_IPOT	MEDIE_MP
Mean	4412.473	1128.500
Median	5067.500	1043.000
Maximum	8632.000	2058.000
Minimum	493.0000	444.0000
Std. Dev.	2653.808	390.8787
Skewness	-0.047727	0.589669
Kurtosis	1.571047	2.963499
Jarque-Bera	9.571415	6.496804
Probability	0.008348	0.038836

Given the previously revealed trends, the mean and median values are not very revealing. The maximum and minimum values better reflect the extreme evolution of these variables. The skewness and kurtosis values indicate a distribution which is a little asymmetrical, compared to the frequency of the median. The Jarque-Bera indicator shows a very small probability (of 0.8% and 3.9% respectively) for us to consider that the two variables have a normal distribution. We can state that the frequency distribution of the average price series is a somewhat close to the normal distribution.

**Table 3.** *The correlation matrix between the real estate loans stock and the average value per square meter*

	CR_IPOT	MEDIE_MP
CR_IPOT	1.000000	0.261339
MEDIE_MP	0.261339	1.000000

We note the poor correlation (of 0.26) between the lending value and the price per square meter value. The regression analysis real estate loan – average price will have a determination coefficient ( $R^2$ ) of little intensity.

Within the stationary test, a high probability indicates the fact that time variations of the median and dispersion of the data sets do exist, variations, which invalidate the potential regression model. For the monthly data series of loans, the probability of having a unit root and, therefore, of non-stationarity is very high (95.4%). Neither is the case for the average price time series for having stationarity (the probability for non-stationarity is 15.4%). After the first differentiation (D(CR\_IPOC and D(MEDIE\_MP)) we eliminate the non-stationary, unfortunately, only for the loans time series (a zero probability for non-stationarity). The average price series has, still, a probability of 32.7% for non-stationarity after the first differentiation. After the second differentiation we get a stationary series for the average prices.

### Regression analysis: housing loans – average price per square meter

The purpose of our paper is to identify the most adequate model for explaining the evolution of housing loans related to the evolution of per square meter price for homes in Romania. Implicitly, we started with the hypothesis that the evolution of the average price leads to an inclination of the population towards purchasing housing assets. The first model attempts to show a regression between the absolute values of the two variables. Being warned from the beginning that the absolute data series are non-stationary, we are cautioned that the model does not meet the stationary criterion for median and dispersion of the series we analyzed. Even though the sensitivity coefficient for the real estate credit (1.77) is statistically significant (zero probability of having values close to 0), the determination coefficient  $R^2$  is very low (0.06).

#### Regression Model nr. 1: $CR\_IPOT = 2410.15 + 1.77 * MEDIE\_MP$

Dependent Variable: CR_IPOT				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2410.151	745.8768	3.231300	<b>0.0016</b>
MEDIE_MP	1.774322	0.624841	2.839636	<b>0.0054</b>
R-squared	0.068298	Mean dependent var		4412.473
Adjusted R-squared	<b>0.059828</b>	S.D. dependent var		2653.808
S.E. of regression	2573.198	Akaike info criterion		18.56138
Sum squared resid	7.28E+08	Schwarz criterion		18.60993
Log likelihood	-1037.437	Hannan-Quinn criter.		18.58108
F-statistic	8.063532	Durbin-Watson stat		<b>0.002789</b>
Prob(F-statistic)	<b>0.005381</b>			

The Durbin-Watson statistic is very weak ( $=0.0028$ ), which signifies the existence of residual autocorrelation within the model. We hope this can be eliminated by differentiation.

#### Regression Model nr. 2: $DCR\_IPOT = 50.28 + 0.18 * D2MEDIE\_MP(-1) + 0.3267 * DCR\_IPOT(-2)$

Dependent Variable: DCR_IPOT				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	50.28043	9.438295	5.327278	<b>0.0000</b>
D2MEDIE_MP(-1)	0.179803	0.086278	2.083984	<b>0.0396</b>
DCR_IPOT(-2)	0.326738	0.090174	3.623421	<b>0.0004</b>
R-squared	0.135257	Mean dependent var		74.19266
Adjusted R-squared	0.118941	S.D. dependent var		74.93200
S.E. of regression	70.33473	Akaike info criterion		11.37155
Sum squared resid	524379.2	Schwarz criterion		11.44562
Log likelihood	-616.7492	Hannan-Quinn criter.		11.40159
F-statistic	8.289892	Durbin-Watson stat		1.842848
Prob(F-statistic)	0.000452			

While attempting to find the most adequate model to explain the evolution of housing loans in Romania, we have used as regressors, in the second model, the series we obtained through the second differentiation of the average price per square meter for the previous month  $\{d2medie\_mp(-1)\}$ , as well as the first differentiation of real estate loans for the second previous month  $\{dcr\_ipot(-2)\}$ . Model nr. 2 is the one which satisfies best the conditions for regression validity between the housing loans and the average price value. Still, the determination coefficient adjusted  $R^2$  is low (about 12%), which shows that there are other variables which explain the evolution of the real estate loans' dynamic. The model has a very good statistical significance (close to 0% probability that the model, overall, has coefficients close to zero, and a less than 5% probability that the coefficients of the two explanatory variables are non-significant). The Durbin-Watson statistic is close to the ideal value of 2 ( $=1.84$ ), which signals the inexistence of autocorrelation between the residuals.

The model identifies the fact that the monthly variation of the housing loans stock is explained in a low proportion (unfortunately only 12%) by the dynamics of the previous month's price per square meter of urban dwelling, but also by the two months-old variation of the housing loans stock. It is clear that our model explains in little measure the evolution of housing loans in Romania, and we set out to identify other explanatory variables in a subsequent paper.

## Conclusions

The macroeconomic context for the bank lending over the decade between 2004 and 2013 has imposed a specific dynamic to the population's behavior regarding accessing loans. The stock of real estate lending towards the population has known a significant increase on a monthly basis up to 2008, the moment of financial incertitude and the subsequent reduction in appetite for this kind of credit. In parallel, the housing loans were crucial to the evolution of the real estate market, both during the boom years, but especially during the decline after 2009, the „First home” programmed holding an essential place. We notice also the great polarization in regional terms, among which Bucharest stands out, the increased economic activity being a direct determinant with accessing loans, the two fueling each other.

Regarding the statistical explanation of the evolution of real estate lending in Romania, we have synthesized the second model of regression for the monthly variation of the loans with the increase rhythm of the average price per square meter in the previous month  $\{d2medie\_mp(-1)\}$ , as well as with the variation of real estate lending in the second previous month  $\{dcr\_ipot(-2)\}$ . The second model is the one which satisfies the validation conditions best for the regression between

the loans stock and the average per square meter value. The determination coefficient, adjusted  $R^2$  show a low correlation (of about 12%), which signals the fact that there are other variables which explain the credit's evolution. The model has a very good statistical significance (close to 0% probability that the model, overall, has coefficients close to zero, and a less than 5% probability that the coefficients of the two explanatory variables are non-significant). The Durbin-Watson statistic is close to the ideal value of 2 ( $=1.84$ ), which signals the inexistence of autocorrelation between the residuals.

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