Determinants of the exchange rate in Romania

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Abstract

Exchange rate - although at first glance most people do not grant great importance to this factor, by using appropriate monetary policy, exchange rate and its determinant factors can influence a country's economy.

Indirectly through the exchange rate you may attract foreign investment in a country by encouraging foreign investors; you can encourage the export of Romanian products thus stimulating the production of goods, if the import has a large share in a country’s economy the respective countries tends to decrease their production because it can’t handle the competition from imported goods prices (to maintain a high exchange rate may discourage importers).

In my paper I’ve tried to identify the main macroeconomic factors that can determine the exchange rate, namely the inflation rate, the unemployment rate and, the National Bank of Romania reference interest rate. I used monthly data from January 2001 to December 2011, and to learn to what extent these factors influence the exchange rate I’ve chosen to use a multiple linear regression using the least squares method.

The main objective of the present working paper is to verify what correlations can be found between the exchange rate and the inflation rate, the unemployment rate and NBR reference interest rate.

The dissertation paper consists of four chapters, during the preparation of which, I was directed towards the following objectives:
- approach the theoretical and practical aspects of the exchange rate, the inflation rate, the unemployment rate and NBR reference interest rate;
- presentation on existing theories regarding the exchange rate and it’s determinants;
- presentation of representative indicators and their interpretation in the case study,
- measuring the representativeness and intensity of the link between these indicators.

In the first chapter I talked about the exchange rate.
The exchange rate is the price of a currency expressed in relation to the currency of another country. Like any price, the exchange rate is formed in a particular market (currency market), by confronting the forces of this market: demand and supply (currency). Analysis of factors determining the exchange rate allow the development of theoretical models of the price formation process.

The exchange rate is one of the most important economic variables, it’s evolution affects the economy, the price level, the international trade, balance of firms, but also each person’s individual property.

The exchange rate reflects the expression of a general equilibrium realized on the real market, the money market and capital market. The exchange rate’s evolution is influenced by economic growth, changes in market prices of goods and services (inflation), the sectorial structure of national economies, the external competitiveness and international degree of openness, political stability or the ability of governments to resolve their internal crisis that an economy may face at a time.

In the second chapter I’ve made a short overview of the existing theories regarding the exchange rate and its determinants.

In this section I will provide a critical analysis of the most relevant theories, from the classical to the modern approaches, also presenting the theoretical concepts of the studied field, the definition of the main variables, as the main theories and researches relating the relationship between the exchange rate and its determinants.

The first theory that I’ve approached was the relationship between the inflation rate and the exchange rate. According to this theory if the purchasing power of the RON degrades itself relative to the EUR (otherwise said the inflation in Romania is greater than the inflation in the EU area), the value of the RON relative to the EUR, sooner or later will readjust so as to restore the purchasing power of both currencies.

Theoretically, the magnitude of this readjustment is equal with the difference of inflation rates.

Another theory that I’ve approached was the Purchasing Power Parity, which is one of the one of the earliest theories on the formation of exchange rates. A first version of this theory was formulated by the school of Salamanca in the sixteenth century in Spain, and by writer Gerard de Malynes, in the early seventeenth century in England. Its elements are also found in the writings of many authors in the eighteenth and nineteenth centuries: D. Hume, R. Cantillon, A. Smith, D. Ricardo, R. Thornton, T. Malthus, etc..
In its modern form, the purchasing power parity theory was developed by Swedish economist G. Cassel. The main concern of the governments of that time was to stabilize their currencies which were affected by inflation during the First World War and, therefore, Cassel's work, published in 1918, tried to provide a solution to this problem.

Purchasing power parity theory states, in essence, that there is a direct comparison between the evolution rates of two currencies in the forex market, on the one hand, and the difference between inflation rates in countries of origin of these currencies, on the other. In particular, the exchange rate evolves according to the respective purchasing powers of the two currencies that are dependent, in their turn, of the inflation rate in each of the two countries.

One of the important factors that cause deviations from the principles of the relative purchasing power parity theory is the Ricardo-Balassa-Samuelson effect. This concept refers to changes in the evolution of productivity developments in various countries, which makes - in terms of fixed rates - the rapid growth of emerging market economies lead to a higher inflation rate than in developed countries. B. Balassa recommends the use of specific indicators, such as industrial products price index. The method has the advantage that specific indices are highly correlated with the exchange rate than the general index, but the disadvantage that particular indices only partially reflects the evolution of the purchasing power of the currency. It would be ideal to work with indices that reflect the evolution of prices of goods subject to foreign trade (tradable Goods), but the structure of the latter property differs from country to country.

Forward exchange rate is important because a number of the international market participants made various currency transactions which are closed in the present, but are liquidated at a later date: exporters and importers of goods and services using forward market to protect against currency risk (hedging), some portfolio managers are paying arbitrage exchange rates combined with interest arbitration to protect against currency risk (risk lovers), other administrators assume this risk, taking open positions (long) in various foreign currencies (risk averters), etc..

The main explanation of the determinants of forward exchange rate is the interest rate parity theory. This theory was developed by Keynes, who isolated the purely financial aspects of the training process of the exchange rate. Thus, it bases its analysis on the study of investment decisions that businesses adopt by comparing the return on investment made in different currencies, not business decisions taken by comparing the prices of goods and services.
Interest Rate Parity (IPR) theory is used to analyze the relationship between at the spot rate and a corresponding forward (future) rate of currencies.

The IPR theory states interest rate differentials between two different currencies will be reflected in the premium or discount for the forward exchange rate on the foreign currency if there is no arbitrage - the activity of buying shares or currency in one financial market and selling it at a profit in another.

The theory further states that the size of the forward premium or discount on a foreign currency should be equal to the interest rate differentials between the countries in comparison.

In a floating exchange system, observing the interest rates on money markets is essential to understand and explain the evolution of the exchange rate, because their variations have an almost immediate impact over the exchange rates.

Taking into account the interest rates allows a better understanding of exchange rate on demand. If purchasing power parity theory is an explanation of significant long-term evolution of the exchange rate is not the case for short-term variations. Temporary deviations of exchange rates relative to their parity value are common. Fluctuations in interest rates are an explanatory factor for these deviations. Their impact completes the influence exerted by the inflation differential.

The unemployment rate is another factor that can influence the exchange rate. A relation that can reveal a connection between the unemployment rate and the exchange rate is given by the number of available workplaces. If the number of available workplaces is consistent, then this represents a signal of the economic growth, thus the companies need to hire more personnel to handle the consumer needs. This being said we can draw the next conclusion:

If the number of new workplaces creates ↑ then the currency ↑ and if
The unemployment rate ↓ then the currency ↑.

In Romania, in the last three years we can observe a correlation between the unemployment rate and the exchange rate, both being in the same intervals:

- 7 -7.6% for the unemployment rate;
- 4-4.40 RON/EUR for the exchange rate.

This might suggest that a decisive move in the unemployment rate below 7%, would mean a strengthening of the Romanian economy and could bring appreciation to the RON. Being an election year, the risk of skidding is still high. A lower unemployment rate would bring inflationary pressures, but the National Bank through proactive monetary policy rate could temper these pressures.
In the third chapter I’ve made a presentation of representative indicators and their interpretation in the case study.

For my econometric model I have used monthly data from January 2001 to December 2011 for the next variables:
- The RON/EUR exchange rate;
- The unemployment rate in Romania;
- The inflation rate in Romania;
- The National Bank of Romania reference interest rate.

As we can observe all this factors are time series.

In Romania the exchange rate had an increasing trend during January 2001 to September 2004, followed by a period of almost three years the course had a downward trend until July 2007 and from then until now has one upward trend, without too large fluctuations from one period to another, recording the maximum value in November 2011 and that is 4.353641 RON / EUR.

The appreciation of the national currency during 2004 -2007 is explained by the fact that since 2004 there have been increased inflows of foreign capital in Romania, the effects of capital inflows occurred immediately thus the monetization of the economy increased from 25.6% to 34.5%.

The exchange rate appreciated both in real and nominal terms. In nominal terms, from about 4.1 lei / euro in January 2004, the national currency has reached 3.1 lei / euro in July 2007 (approximately 24 percent).

The unemployment rate in the analyzed period is around 7%, reaching the maximum in January 2004, namely 8.8%, then we can see a slight decrease, the minimum recorded in November 2008, 5.6% . Since then the unemployment rate began to increase slightly over the past three years its value stabilizing at between 7 to 7.6%.

The National Bank of Romania reference interest was introduced on February 1, 2002, when it replaced the rate of the discount. These rates are related to operations in national currency. From 01.01.2000 – 01.02.2002 rate of the discount was 35% per year and since September 1, 2011, the reference interest rate by National Bank of Romania is the monetary policy rate, established by decision of the Council Directors of National Bank of Romania. As we can see in the analyzed period the interest’s rate trend is downward, from 35% in January 2002 to 6% in December 2011.

The inflation rate in the analyzed period dropped very much, from 35% in 2001 to 5.79% in 2011. The lowest inflation rate was reached in 2007, namely 4.84%.
This was achieved with the help of inflation targeting which the National Bank of Romania started in August 2005.

Inflation targeting has been proved correct and effective. NBR should continue efforts to reduce inflation in a realistic pace, is necessary to apply "direct inflation targeting" method, NBR policies must be aligned with the euro area monetary policy to avoid shocks caused by sudden changes in orientation of monetary policy.

In the **fourth chapter** I’ve measured the representativeness and intensity of the link between these indicators.

The first step that I’ve made was to logarithm the data series. To check the stationarity of the series, I’ve used the Augmented Dickey-Fuller test. The curs, doblei, somaj series are all integrated of order 1 - I (1). Rinf series in integrated of order 0 – I(0).

For all the series I have selected a confidence level of 5%.

To analyze the correlation between the exchange rate and its determinants, I used the multiple linear regression with the least squares method.

The least-squares method was first described by Carl Friedrich Gauss around 1794. Least squares corresponds to the maximum likelihood criterion if the experimental errors have a normal distribution and can also be derived as a method of moments estimator.

The method of **least squares** is a standard approach to the approximate solution of overdetermined systems, i.e., sets of equations in which there are more equations than unknowns. "Least squares" means that the overall solution minimizes the sum of the squares of the errors made in the results of every single equation.

The most important application is in data fitting. The best fit in the least-squares sense minimizes the sum of squared residuals, a residual being the difference between an observed value and the fitted value provided by a model. When the problem has substantial uncertainties in the independent variable (the 'x' variable), then simple regression and least squares methods have problems; in such cases, the methodology required for fitting errors-in-variables models may be considered instead of that for least squares.

For the least squares method I used the following series: dl_curs; dl_somaj; dl_doblei and rinf. The output of the method revealed an R² value of 12% and an adjusted R² value of 10% and also that the dl_doblei and C series are irrelevant for our study because they have a very high associated probability, thus I’ve eliminated the series and I’ve runed the program again, this time with just the dl_curs, dl_somaj and rinf series. This time the result was similar, the only difference was at the associated probability which allowed us to use a
confidence level of 5%, smaller than the first time in which we could use a confidence level of 10%.

This method has shown us that in Romania the exchange rate is determined in proportion of 11.8% by the unemployment rate and the inflation rate.

For the same data series i’ve runed two methods to analyze the cointegration between the variables, to reveal if there are any cointegration relations between the series.

Two time series show cointegration when they are integrated by the same order (other than 0), and admit a linear combination which is integrated of an lower order (or zero). In other words, two time series with common trends (evolving alike) are cointegrated.

Cointegration can lead to what is called "spurious regression", meaning a model that validates the relationship between two random variables that have a similar evolution, although in reality are independent.

First I’ll apply the **Engle-Granger methodology** to study cointegration between two variables.

The first step I must do is to study the stationarity of the series to determine the degree of cointegration. To do this I’ve used the ADF test for the curs, doblei and somaj series; rinf being a stationary series - integrated series of order 0 - I (0).

All three series are not stationary, therefore to them stationarise them I applied the first difference, the result was that all the three series are integrated by the same order 1 – I(1).

The next step that I’ve done was to estimate regression parameters between curs and doblei; curs and somaj; doblei and somaj to check if there are any cointegration relations between the series.

In the curs and somaj and curs and doblei regression series we can observe that the null hypothesis is rejected therefore at least one of the coefficients is semnificative. For this series I will keep residcursdob and residcurssomaj series which are the residual values of the regressions estimated above, and then I’ll test this series for stationarity using the ADF test.

The result of the ADF test on residcurssomaj and residcursdobseries revealed that both series are nonstationary, so between the curs, doblei and somaj series there are no cointegration relationships.

The second method that I’ve applied was the Johansen Cointegration Test. Within this test I’ve used the same series that I’ve used in the first test namely curs, doblei and somaj, rinf being a integrated series of order 0 – I (0) was excluded from the test. The test revealed that both for Trace test and Max-eigenvalue test between the used variables there are no cointegration relationships.
Therefore we can state that between our data series there are no cointegration relationships as it resulted from running the two tests.

Also for our series I’ve used a simple correlation matrix to observe the intensity of the links between all pairs of variables which shower to us that there is a high positive correlation between inflation and interest rate reference, with a coefficient of 0.68 and two cases of high inverse correlation between the exchange rate and the reference interest rate and between the exchange rate and inflation rate respectively -0.68 and -0.55.

Conclusions

In our case, although theoretically the chosen determinants are some of the most important in the determination of the exchange rate, the test result revealed that the exchange rate is determined in proportion of 11.80% by the inflation rate, the unemployment rate.

The correlation matrix has revealed that there is a high positive correlation between inflation and interest rate reference, with a coefficient of 0.68 and two cases of high inverse correlation between the exchange rate and the reference interest rate and between the exchange rate and inflation rate respectively -0.68 and -0.55.

The Engle-Granger method to test for cointegration has revealed that between curs, doblei and somaj series there are no cointegration relationships.

The Johansen Cointegration test revealed that both for Trace test and Max-eigenvalue test between the used variables there are no cointegration relationships.

Therefore we can state that between our data series there are no cointegration relationships.

Other factors which can influence the exchange rate evolution therefore the explaining the low R-squared results are:

- Political instability. It is well known that periods of political instability affects the currency exchange rate. This instability leads to the loss of confiance from foreign investors in the Romanian economy;
- Repeated changes to the economic and fiscal legislation has led to the upheaval of foreign investors, which can’t make long term projections of the business plan;
- The “popular methods” during the election years influence the exchange rate by increasing the money mass available on the currency marker, thus increasing inflation;
- Speculative attacks on the national currency;
- Austerity measures imposed by the IMF.

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