



Faculty of Economics, University of Niš
18 October 2018

49th International Scientific Conference
**QUANTITATIVE AND QUALITATIVE
ANALYSIS IN ECONOMICS**

THE FUNDAMENTAL AND TECHNICAL MODELS IN DETERMINATION OF EXCHANGE RATE VALUE

Eldin Dobardžić, PhD*

Jelena Petrović, MSc*

Alma Dobardžić, PhD[‡]

***Abstract:** The exchange rate after the fall of Bretton Wood system has become a very powerful weapon in the conduct of various types of economic wars. Nowadays, great economic forces are often liable to various manipulations with exchange rates which, again, force the competition to certain concessions. One of the most important doctrines is the one in which, in a short period of time, a country gets “squeezed” by the depreciation of its currency in order to reach a certain economic agreement. In regard to this, every study of the exchange rate has a particular importance for the understanding of modern international economic relations. This paper has a review character and its aim is to present the basic ways in the formation of exchange rates with a special emphasis on the two most important methods: technical and fundamental.*

***Key words:** exchange rate, economic relations, technical, fundamental*

1. Introduction

In the period from 1973 to 1978, only the United States insisted that developed countries' currencies fluctuated freely without the intervention of central banks. Then United States was blamed by the developed countries with strong currencies to conduct policy of benign neglect dollar exchange rate, to the depreciation of the glass through it's competitive edge in world markets. On the other hand, the US has accused Germany and Japan that through interventions on the foreign exchange markets they did not allow the full extent of the appreciation of the yen. When in October 1979 the US dollar crisis reached its

* Business Economics Academy, Cacak, Serbia; ✉ eldin.dobardzic@gmail.com;

• Business Economics Academy, Cacak, Serbia; ✉ jelena1809976@gmail.com

‡ State University of Novi Pazar, Department of Economics, Novi Pazar, Serbia;

✉ alma.musovic@gmail.com

UDC 339.743

peak, the US was forced to adopt a program of stabilization measures, relying on solid targeting money supply growth. Using the money supply as a nominal anchor, it seemed to increase the level of interest rates in the US financial market. Consequently, in the period 1981-1985 there was a strong appreciation of the dollar in the foreign exchange markets on the basis of a very restrictive monetary policy and high interest rates. This had an impact on a large inflow of short-term capital from abroad in the United States. Moreover, the administration of the US President Reagan in April 1981, proclaimed a policy of non-intervention in the foreign exchange market. The shift in the US policy towards interventionism in the foreign exchange market formed in 1985 in conditions when begins depreciation of the dollar. This was the result of several years' constant appreciation of the US currency, which, as mentioned above had a very positive impact on the inflow of capital, as well as on the anti-inflationary effects. After this drastic change of direction of dollar movement, the bearers of macroeconomic policy in the United States were concerned to avoid a sharp drop in the exchange rate of the US currency, which would have negative effects on inflation. In September 1985 came to an agreement at the conference of representatives of the most developed countries in New York.

The exchange rate, the price that one currency relates to other currencies, is the result of supply and demand in the foreign exchange market. The concentration of supply and demand for foreign currency exchange market is coming from different backgrounds. In the case of intervention of the state, supply and demand of foreign exchange fluctuations express the official foreign exchange reserves. The Basic balance of payment transactions record inflow and outflow of foreign currency and influence the formation of the exchange rate given in the table below (1).

Table 1. Basic balance of payment transactions

Inflow of Foreign Currency	Outflow of Foreign Currency
Exports of goods	Imports of Goods
Services abroad	Services from abroad
Interest and dividends from abroad	Gifts and remittances (transfers) abroad
Remittances by residents, employees abroad	Capital invested abroad
Proceeds from the sale of domestic financial instruments abroad	Dividends and interest paid abroad
Repayment of funds borrowed abroad	
Direct investment from abroad	

Source: Authors

Supply and demand of foreign currency is more often considered from the standpoint of the motives of economic agents, as participants in the foreign exchange market. These motives can be grouped into the following categories (Weisweiler, 1990 p 158):

- Commercially motivated supply and demand for foreign currency resulting from the sale of goods and services, investment, transfer of assets,
- Interest Arbitrage - movement of funds mainly conditioned by the nature of short-term differences in interest rates among different countries, ensuring the foreign currency risk, motivation

The Fundamental and Technical Models in Determination of Exchange Rate Value

- Venture - investing abroad is motivated by profit, but without taking into account an exchange rate risk (search for higher yield with the risk of loss in change in the exchange rate),
- Officially motivate the Central bank intervention in the foreign exchange market, buying or selling foreign currency, in order to maintain the movement rates within the stipulated range, the accumulation of foreign reserves, the impact of exchange rate formation, preventing attacks on the domestic currency from speculative reasons, the elimination of seasonal fluctuations in exchange rates, etc.

The relationship between supply and demand for foreign currency exchange rate is formed. If the free foreign exchange market is functioning regularly, the result of mutual relations between supply and demand is the equilibrium exchange rate. The equilibrium exchange rate established in the foreign exchange market is called the nominal rate. This course is normally the result of spontaneous market trends, but it can also reflect the impact of corrective intervention by the central bank. The nominal exchange rate is the official rate, i.e. it applies to all transactions. However, the state may determine the course, and regardless of the market direction, it becomes an administrative official exchange rate. If the official exchange rate is lower than the equilibrium, the ratio of supply and demand for foreign exchange often lead to the formation of the premiums on the official exchange rate that balance supply and demand at a higher level, creating a so-called Black course.

The nominal exchange rate can be applied to all modes (fixed, floating, attached) since the monetary policy is implemented by the Central Bank. The state selects the exchange rate regime with respect to the perception of general economic performance, economic policies and international commitments (Kubarych, 1983). Due to different volumes of foreign trade transactions with certain countries, there is an unequal impact of price levels of different countries on the exchange of one currency. In order to isolate the changes in fluctuation of the nominal exchange rate, that occurs on this basis, the concept of effective exchange rate is created. This is a course that is calculated as a geometric weighted average exchange rate of domestic currency in relation to a range of foreign currencies. To calculate the effective exchange rate, it is used in numerous countries. Every country gets the weight that reflects its importance in trade, as measured, for example, its share in exports, imports or total trade.

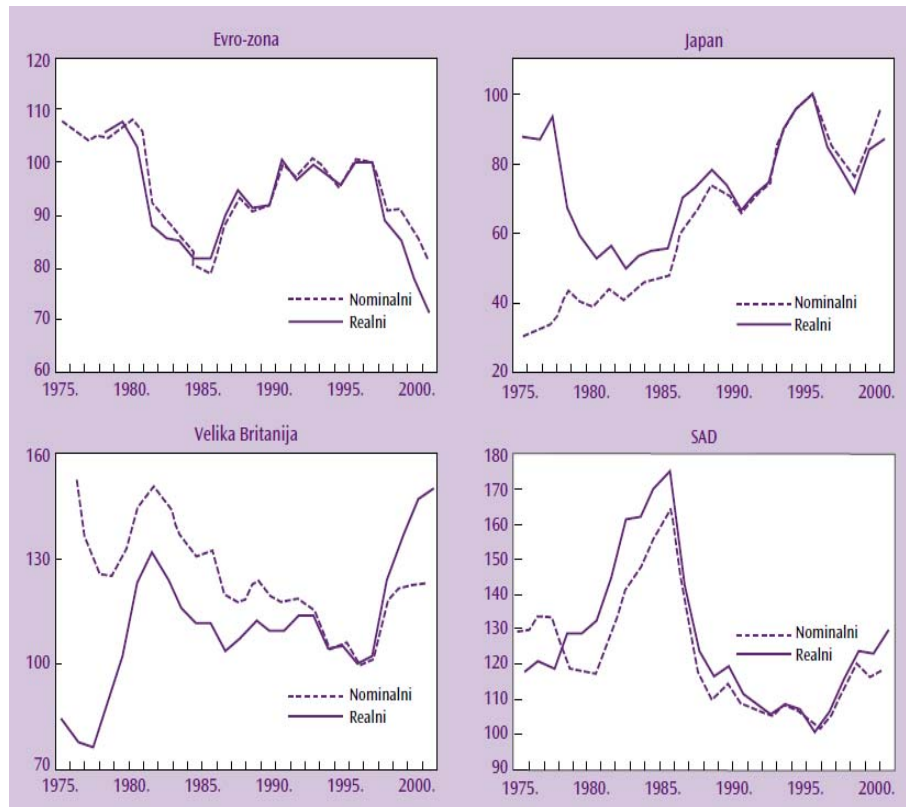
$$\sigma = \left(\frac{S_1 P^{W_1}}{P_1} \right) \left(\frac{S_2 P^{W_2}}{P_2} \right) \left(\frac{S_3 P^{W_3}}{P_3} \right) \dots \left(\frac{S_n P^{W_n}}{P_n} \right) = \frac{SP}{P^*} \quad (1)$$

SP - nominal exchange rate

P* - effective level of foreign price

The nominal exchange rate may not be the real exchange rate (Figure 1). It expresses the relationship between the real exchange value of domestic currency against the foreign, which meets the requirements of the long-term economic equilibrium between the two economies.

Figure 1. The nominal and real exchange rates in the Euro zone, Japan, UK and USA in the period 1975-2000



Source: Nenad Vunjak, Financial management, Faculty of Economics, Subotica, 2010, Financial management, 2010

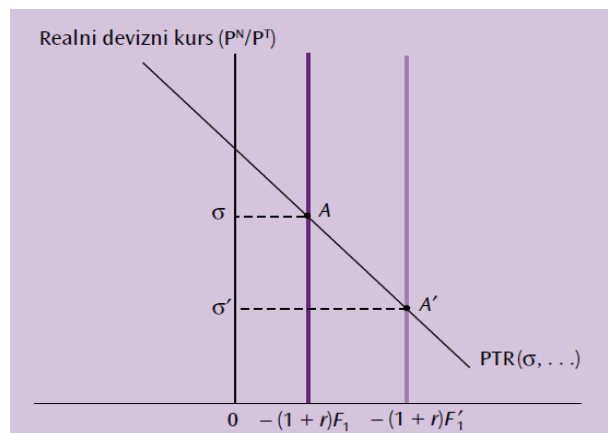
The equilibrium or long-term level of real exchange rate is defined by the condition that the balance of the primary current account must be consistent with the external budget constraint.

Since it is a long time in question, there is little likelihood that the equilibrium exchange rate will correspond to its actual value at any time. When the real exchange rate is above the equilibrium point on the overrated, otherwise, it is underrated. In order for the budget constraints not to be violated, the exchange rate in the long run has to reach its equilibrium level. The result, according to which the equilibrium real exchange rate depends on the net foreign assets, is very important. This means that, ultimately, the market leads the real exchange rate to the point where it should be. However, they can take a long time, several years or even longer. Misguided policy or exchange rate implies that the country is living beyond its means (which will be possible to continue until the debt) or that the country invests and spends less than it could (which may continue until its households,

The Fundamental and Tehnical Models in Determination of Exchange Rate Value

companies and the state agree to save much of the income). The concept of equilibrium real exchange rate is above the nature of these transient phases and points to its stable position quite clearly, the net foreign assets of the country is a fundamental determinant of exchange rates. What is more, its value, the equilibrium exchange rate will be overrated. Similarly, the equilibrium exchange rate in the indebted countries will be depressed to generate funds for repayment of debt. In Figure (2) it is shown this second case: if the debt increases from $F1$ to $F'1$, net foreign assets are shifted to the right and the equilibrium real exchange rate depreciates. In order to budgetary constraint was fulfilled, that is the purpose of repayment of debt, the country needs to generate surpluses on the primary current account. Production resources must be converted into the tradable sector, and local demand must be reduced. The depreciation of the real exchange rate will create the motivation that will lead to the target changes.

Figure 2. The equilibrium of real exchange rate



Source: Nenad Vunjak, Financial management, Faculty of Economics, Subotica, 2010

Note: To create a balance in the long run, it is necessary that the primary current account balance equals the net foreign assets, including interest $-(1+r)F1$. Point A corresponds to the equilibrium real exchange rate σ . If the country has less favorable net foreign assets $F'1 < F1$ it will have to make fewer deficits (or increasing surpluses) in the primary current account. Vertical scheme moves to the right. When the $F1 < 0$ lower real exchange rate will generate a growing surplus for debt repayment, and declining deficit will be consistent with a reduction in payments, when the $F1 > 0$.

2. Fundamental models of exchange rate determination

Swedish economist Gustav Cassel in *The Theory of Social Economy* (San Diego, 1933), explains the relations between the currencies of certain purchasing power parity. The exchange rate is established at a level which equates to purchasing power at home and abroad. If the sources of foreign currency can buy more goods in the domestic market (domestic currency), the demand and supply of domestic currency will be increased. The price of foreign currency will rise to that level where it will establish parity in purchasing power at home and abroad. If the base period exchange rate is at a level that ensures

purchasing power parity, then it will be changed in subsequent periods in accordance with the inflation rates at home and abroad. This can be expressed by the following formula:

$$K_i = \frac{K_0 P_{ai}}{P_{bi}}$$

K_i = new exchange rate (direct quotation) in the year, and

K_0 = exchange rate in the base period,

P_{ai} = price index in the country p.a.,

P_{bi} = price index in a foreign country in one year.

Because, according to this theory, the exchange rate changes in with the relative price changes correspondingly, this theory of the formation is called the exchange rate and inflation theory. Purchasing power parity is the most rational economic basis for the formation of exchange rates. However, there are many reasons why this criterion does not play the important role in defining the level of exchange rates as it should be. There are very marked differences in the relationship of prices of certain products and services from one country to another. These differences arise from the level of development, stages of development in which individual countries are at a particular time, the structure of the economy, supply of natural resources, historical heritage, customs and habits, concepts and instruments of economic policy, social relations, strategic needs and the like. In some countries, economic policy measures may reflect the relatively low prices of basic foods, housing, schooling, health care or some other form of consumption, and raise the prices of luxury goods. Because of the desire to create conditions for the development of new industries, to diversify the production structure and ensure strategic independence, it is possible that the prices of some products, in a shorter or longer period, maintain a relatively high level.

In some countries (it was typical of the socialist countries in particular), much of the cost of the health care, education, housing and so on was covered from public funds, while the prices of services and products in these categories are sometimes only symbolic. The economic literature points out that the formation of the national currency exchange rate present all important prices in the country, but only those that apply to so-called international goods (tradable goods), i.e. for those types of products and services that can be subjected to international trade and international division of labor and specialization. So, those which circulate only in the internal market should not be called domestic goods.

Significant differences¹ in the relationships of each price exist even between countries that do not differ much in terms of development levels, economic structure, socio-economic systems, historical development, etc. Other models and methods of forming the exchange rate, take into account the fundamental relationships in national economies, but to some extent rely on the theory of purchasing power are the monetary model, Demand model (Mundell-Fleming model and Durnbušov), equilibrium and portfolio balance model of rational expectations.

¹ For example, translating the data on purchasing power parity obtained in phase II of the project known ICP (United Nations International Comparison Project) it can be concluded that the 1973, in Germany, the price of coffee, tea and cocoa have been relatively three times less than in the U.S. as much in construction for about 30% (Kravis, 1984).

The Fundamental and Technical Models in Determination of Exchange Rate Value

Mundell-Fleming model assumes that aggregate supply has a passive role in determining the price level and changes in aggregate demand caused by changes in economic activity. Therefore, the basis for determining the exchange rate changes in demand induced by monetary and fiscal measures. The growth of money supply leads to depreciation, a fiscal expansion in the appreciation of the exchange rate regime of fluctuating exchange rates. Regarding the fixed exchange rate regime in the short run, money supply growth leads worsening balance of payments and exchange rate depreciation. In the long run, the monetary expansion leads to loss of foreign reserves, but does not affect the balance of payments. Fiscal expansion in the short term results in a surplus balance of payments (increase) and an appreciating exchange rate, while in the longer term causes deficit in balance of payments and exchange rate depreciation.

Dornbusch model is a combination of monetary models and models of demand. In the short run, exchange rates are determined by trends in the financial markets (especially the difference in interest rates between countries) as the real product market is relatively stable (the level shows a relatively stable price movements). If the economic policy measures affect the creating of demand or supply, there will appear the liquidity effect that leads to a decrease or increase of interest rates. It could be compensated later by the expected decline in growth or exchange rate, in order to prevent uncovered interest arbitrage. When domestic prices start to show a delayed response to changes in money market interest rates, aggregate demand and real exchange rates are reset to their original equilibrium level. As a result of this process, the value of the real exchange rate will match the level that corresponds to the tendency of price fluctuations, a nominal value of the exchange rate will be at a level that reflects changes in the money supply.

The theory of equilibrium portfolio balance is created in the 18th century, and it experienced the great development after the collapse of the gold standard system and the transition from fixed to floating exchange rates. According to portfolio theory, equilibrium exchange rate in the short run is determined by oscillations in the money market and the behavior of the owners of assets in terms of optimizing their portfolios. Portfolio composition is the property that its owner possesses. According to portfolio theory, the main factor in forming the exchange rate is the financial market's state. Short-term financial market equilibrium is achieved if the exchange rate and domestic interest rates are at a level appropriate to balance supply and demand, at least the two segments of the financial assets (domestic currency, domestic and foreign bonds). The imbalance of supply and demand of any segment of the assets results in a change in the balance of payments, i.e. inflow / outflow of capital on the capital account. This leads to the increase / decrease in capital account balance. Accordingly, the exchange rate will appreciate or depreciate. The interaction between the real sector and financial markets leads to the formation of long-term equilibrium. This and previous model explain the formation and exchange rate fluctuation in the long run, because the analysis includes the effects of real economic factors that determine the exchange rate (the rate of inflation, productivity, investment, etc..).

3. Technical models of exchange rate determination

Technical models of exchange rate are trying to explain trends of exchange rates for the purposes of modeling the process of trading. Those models are mostly personal, as each of the tools of the trade participants in the foreign exchange market.

In technical analysis, time plots occupy a prominent place, as the main instrument used in the study. A special attention is paid to the selection of appropriate types of diagrams in the analysis, because of which they depend heavily on the results of technical analysis. Technical analysis defines three basic price trends - the declining trend, the equilibrium trend and the increasing trend. The basic idea of technical analysis is to identify these trends and determine the moment of their changes. Thus, the investors who use technical analysis try to take the advantage of these favorable growing trends, and to avoid the unfavorable downward trend and the equilibrium and thus optimize profitability (Dobromirov, 2010). A special attention in the technical analysis is devoted to signal trend changes and most of the individual methods to the efforts of determination. A diagrammatic representation of exchange rate movements may reveal a number of special pieces that express the distribution of exchange rate movements. Data models can serve not only as an illustration of exchange rate movement, but can also be used to analyze the change of the course, forces and trends, developments and analysis of deviations from the prevailing trend of courses. These analyzes can provide a signal to buy or sell foreign exchange. One of the most widely used methods is the so-called technical analysis filter rule, which provides automatic buy and sell signals. Automaticity filter signals based on the application of the parameter f , which indicates the size of the filter expressed in %. Filter size is small and is typically 1%, 2%, 3%, and the like. When the exchange rate increases by f % above the last level (lowest level), the filter rule automatically indicates buying signals. When the exchange rate falls to f % below the top peak (the highest level), the filter rule provides sales signal. Another widely accepted method of technical analysis is the rule of moving the average exchange rate for a specified time period.

This method has two moving averages: a short moving average (PPK) and the long moving average (PPD). Moving average rule is defined as follows: If the $PPK > PPD$, the signal for the purchase of foreign currency, otherwise is the signal to sell foreign currency. If $PPK = PPD$ then you should not enter into speculative transactions. The weakness of this approach in determining the movement of the courses is the fact that it cannot have the power of prediction, because it cannot be integrated into the theory of market efficiency. Fluctuations, caused by unexpected information may not be predictable. In order to better understand the turning points in exchange rate trends, we use the impulse line - momentum lines, which measure the rate of exchange rate changes. It is also used by oscillators in terms of assessing whether the course is right to stop the movement in one direction - only a temporary phenomenon or a signal that there is a trend reversal (Bishop and Dixon, 1992).

4. Conclusion

While some fundamental analysts compare technical analysis to reading tea leaves or palms, technical analysis, however, provides one of the best and most objective tools available for quickly and accurately assessing a market and then trading it profitably.

One of the potential benefits of technical trading consists of the fact that the same data is also being watched by millions of other traders.

This phenomenon can lead to a herd effect in some cases, when classic chart patterns can be clearly observed. In essence, many traders who see the pattern and trade accordingly can help the pattern's measured moves materialize.

The Fundamental and Tehnical Models in Determination of Exchange Rate Value

Nevertheless, the disadvantage of this is that minded technical traders tend to position their stops at the same levels. This could magnify a decline or prompt a stronger rally, and might even allow large players to intentionally trigger such stops, which they can reasonably anticipate based on their own reading of the charts. Fundamental analysis in the forex market typically involves taking into account basic economic and political factors for one country relative to another. These factors might include the following:

- Measures of overall economic strength like growth and employment rates
- Interest rates and investment yields
- Trade and current account balances
- Political stability

Fundamental forecasts for exchange rates are typically most useful for longer term time frames and not so much for a short term trading. Nevertheless, some fundamental trading strategies have been developed during the volatile period that often immediately follows important economic data releases.

References

- Aghion, P., Bacchetta, P., Ranci re, R. & Rogoff, K. (2009). Exchange rate volatility and productivity growth: The role of financial development. *Journal of Monetary Economics*, 56(4), 494-513.
- Bishop, P. & Dixon, D. (1992). *Foreign exchange handbook*. New York: McGraw-Hill
- Dobromirov, D. (2010). Razvoj modela za obradu signala u finansijskom inženjeringu, Doktorska disertacija. Fakultet tehničkih nauka, Univerzitet u Novom Sadu.
- Gustav, C (1933). *Theory of Social Economy*. Harcourt Brace, Revised edition, San Diego, California.
- Juhn, G., Mauro, P. (2002). *Long-run determinants of exchange rate regimes: a simple sensitivity analysis*. IMF Working Paper No. 02/104.
- Kindleberger, C. (1962). *Foreign Trade and the National Economy*. Yale university.
- Krugman P. i Obstfeld M. (2009). *Međunarodna ekonomija*. Data status. Beograd.
- Kravis, I. (1984). Comparative Studies of National Incomes and Prices. *Journal of Economic Literature*, 22 (1), 1-39.
- Kovač, O. (2003). *Međunarodne finansije*. Ekonomski fakultet, Beograd
- Kubarych, R., M. (1983). *Foreign Exchange Markets in the United States*. Federal Reserve Bank of New York.
- Melvin, M. (1985). The choice of an exchange rate system and macroeconomic stability. *Journal of Money, Credit, and Banking*, 17 (4), 467-478
- Mussa, M. (1986). *Nominal Exchange Rate Regimes and the Behaviour of Real Exchange Rates: Evidence and Implications*. Carnegie-Rochester Conference Series on Public Policy, North-Holland, 117-214.
- Taylor M. & Allen H. (1992). The Use if Technical Analysis in the Foreign Exchange Market. *Journal of International Money and Finance*, 12 (2), 121-136.
- Sarno L., & Taylor M.P. (2002). *The Economics of Exchange Rates*. Cambridge University Press.
- Vunjak, N. (2010). *Finnansijski menadžment*, Ekonomski fakultet: Subotica, 6. izdanje.
- Weisweiller, R. (1990). *How the Foreign Exchange Market Works*. New York Institute of Finance.

FUNDAMENTALNI I TEHNIČKI MODELI U ODREĐIVANJU VREDNOSTI DEVIZNOG KURSA

Rezime: Nakon sloma Breton Vud sistema, devizni kurs je postao veoma moćno oružje u vođenju različitih vrsta ekonomskih ratova. U današnjoj dominaciji velikih ekonomskih sila često se pribegava različitim manipulacijama sa deviznim kursovima koje primoravaju konkurenciju na određene ustupke. Posebno je važna doktrina u kojoj se u veoma kratkom vremenu zemlja "pritisne" depresijacijom svoje valute u cilju postizanja određenih ekonomskih sporazuma. S tim u vezi, svako proučavanje deviznog kursa ima posebnu važnost za razumevanje savremenih međunarodnih ekonomskih odnosa. Ovaj rad ima svoj recenzijski karakter i njegovi ciljevi su predstavljanje osnovnih načina formiranja deviznih kurseva sa posebnim naglaskom na dva najvažnija metoda: tehnički i fundamentalni.

Ključne reči: devizni kurs, ekonomski odnosi, tehnički, fundamentalni