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HEDGING FX RISK – A RUSSIAN POINT OF VIEW

Master's Thesis

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ABSTRACT

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Title	The development of transaction risk management strategy in the Russian branch of Commerzbank by using derivatives
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The main problem which is considered in the research work is the uncertainty in the Russian market and its influence on the currency risk. The topicality of the chosen topic is explained by the necessity of the modifying the model of currency risk management due to the change in the economic situation in Russia for multinational companies.

The aim of the research work is to find the optimal strategy of using derivatives for reducing currency exchange risk.

The result of the research was the development of hedging strategy by using futures instrument and prediction model, based on three macroeconomic factors and performed in Vensim software. Research key words: currency exchange rate, currency risk, international commercial bank, derivatives, simulation.

The conclusion involves limitations and direction of future research in this field and provides recommendation for users of developed model.

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1 INTRODUCTION

The global political and economic situation appeared to be very unpredictable these days and brings new economic reality to the market. After the start of mutual imposing sanctions and sharp decrease of oil prices caused by oversupply on the market, Russian ruble started to depreciate against leading currencies. At 10th of November 2014, the Central Bank of the Russian Federation changed the monetary policy and left the ruble's exchange rate be free determined by the market factors. This action was made in order to safe its depleting foreign-exchange reserves[1], ensure price stability, contribute to faster adjustment of the economy to changes of external conditions, and enhance its resistance to negative shocks. The shows the historical data of exchange rate RUB/USD and corresponding Brent oil prices. Brief look tells that negative correlation between changes in both appears.

The further depreciation in peaks reached 85 RUB/USD and over 100 RUB/EUR (so-called Black Tuesday December 16, 2014)[2]. The period of unstable FX rate was the most significant during the December 2014 (when the decision of rising key rate from 10,5 to 17% was made) and June 2015 when daily volatility exceeded 25%. Up to now it is still higher 10%.

Concerning the political situation, the sanctions, which have been imposing from the March 6, 2014 until the current days also, frighten off investors and increase instability in the economy. The European Union, USA and other leading countries imposed restrictions on the Russian financial market. For example, the realization of EU-Russia mutual and regional cooperation programs have been suspended (European Union 2014)[3].

Those economic conditions appeared to be harmful for the whole banking system in Russia and especially foreign banks. The policy of Central Bank of sanitation of the financial sector, which was considered as shutting and deprivation banks licenses, which was started in 2013, when the new chief Elvira Nabiullina took her position, lead currently to reduction of number of domestic banks from 956 to 604. During the financial crisis time the pace of shutting down domestic

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[1] Bank of Russia exchange rate policy (2017) // The Central Bank of the Russian Federation https://www.cbr.ru/Eng/DKP/?PrtId=e-r_policy

[2] ЦБ признал отсутствие интервенций в «Черный вторник» (2014) // РБК http://www.rbc.ru/finances/18/12/2014/549286689a7947623bf2ca48?from=materials_on_subject

[3] EU sanctions against Russia over Ukraine crisis (2014) // European Union http://europa.eu/newsroom/highlights/special-coverage/eu-sanctions-against-russia-over-ukraine-crisis_en

banks increased: 2013 – 2017 years with 32, 86, 93, 97 respectively (up to 1th of May from the beginning of 2017 the number is 19[4]. Although criteria of choosing which bank to deprive the license are solid and determined by the Central Bank inner orders these sanctions bring some instability to the market and effect on the banks business strategy.

Concerning foreign banks, some of them have no choice but to exit Russia altogether or at the very least scale back their operations in the country. Global banks have been exiting Russian territories seeking to cut their exposures to the volatile, high-risk region in addition to meeting the rules of the sanctions, which prohibit certain areas of trade and business between Europe and US based businesses with Russia. UK based Barclays has exited Russia and closed all areas of retail-banking operations in the nation. Barclays, a British bank that bought a Russian lender in 2008, announced its plans in February of this year to sell its entire Russian retail operations—a move that involves writing off $393 million worth of goodwill[5]. However, bank executives have argued that this move relates to an overarching global strategy at Barclays to exit less-profitable businesses and should not be perceived as a reflection on Russia. Most recently, KBC Bank, a Belgium based bank, has closed a deal to sell its Russian banking setup and subsidiary to local Russian buyers so that KBC may exit its Russian based business. In addition to Barclays, global banking giants such as HSBC of the UK and Santander of Spain have left Russia and divested their retail-banking setups in the country. With deal flows slowing down substantially, Paris based BNP Paribas has also begun transferring staff to London and plans to continue doing so over the coming months.

The same trend has been followed by Goldman Sachs and Deutsche Bank. Numerous bank employees from US bank workforces have been leaving Russian shores. These workers have been relocated to the financial hub of London for the time being. As the sanctions with Russia restrict business within the region, employees from bulge-bracket US banks, such as JPMorgan Chase and Morgan Stanley, are relocating out of Moscow; even those that directly cover the Russian sector are moving to London, such as JPMorgan's head of Russian research, Alex Kantorovich, and his team. Perhaps unsurprisingly, banking and financial-services sector firms are increasingly receiving applications from candidates based in Moscow with a non-negotiable requirement included that the candidate be relocated to the UK or another European country.

[4]   Отзывы лицензий у российских банков, причины (2017) // banki.ru http://www.banki.ru/news/lenta/?id=7490052

[5]   Fears for Russian rouble as plunging oil price dents markets (2015) // The Guardian https://www.theguardian.com/business/2014/dec/15/fears-russian-rouble-oil-price-markets

All mentioned above brings new environment for the multinational banks which have their subsidiaries in Russia. Changing macro and micro economic realities pushes management teams to look for new ways of adaptation and running their business. Currency exchange rate fluctuations is one of the most important factors for any multinational company and bank as they generate revenues in rubles and report to the parent company in its currency.

The main objective of the study was to determine the key factors which may influence on the exchange rate and effect on the revenue of the international bank.

1.1 Focus and research question

The aim of the research work is to define optimal hedging strategy, based on using derivatives instruments, which would allow minimizing risk of reducing income of considered financial entity.

The case of this research work is German international commercial bank – Commerzbank AG. The hedging strategy should be applicable for the management team for adjusting their financial strategy based on the considering factors.
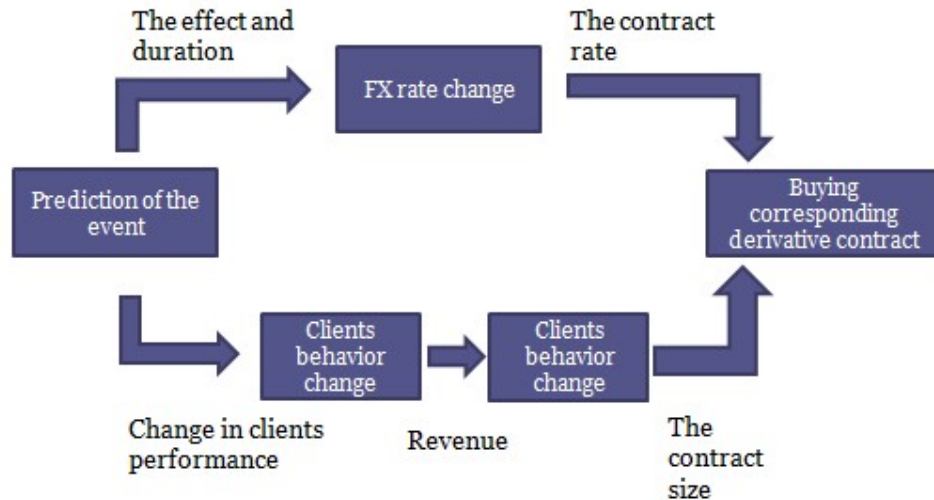
Source: composed by author
Figure 1The draft of the hedging model

To achieve this aim the next four tasks were determined:
1. Defining the most influential variables effecting on the currency exchange rate

The most significant variables can be found by unusual behavior of the currency exchange rate. Unexpected spikes of volatility and FX rate fluctuations are going to be considered as these types of variables.

2. Finding the effect of these variables on the FX rate

How does the defined variables effect on the FX rate in the end of considering period? The period can be any duration and the effect also can be both positive and negative. All defined dependencies are going to be the base for the creation the model of hedging strategy.

3. Creating strategy of hedging

The aim of the hedging strategy is to reduce negative effects of currency fluctuations in future. So based on the results obtained from the previous step it is now important to create the long run model of behavior. There are plenty of different derivatives tools which can be combined in most suitable to the chosen bank way.

4. Testing the model by using System Dynamics software

One of the most significant part of the research is testing the model by using Vensim program to understand how the model will react on different scenarios, is it flexible enough and what are the confident levels for the next couple of years.

System dynamics is a direction in the study of complex systems, exploring their behavior over time and depending on the structure of the elements of the system and the interaction between them. Includes: cause-effect relationships, feedback loops, reaction delays, environmental influences and others. Particular attention is paid to computer modeling of such systems.

The subject is the process of working out the best hedging strategy after identification of variables, which impact on the currency exchange risks in the international commercial bank.

1.2 Methodology used

Methodology of the research mainly consists of quantitative analysis for obtaining data of currency rate fluctuations and main economic variables effected on it. The reliability of obtained data is going to be checked by using statistical methods such as OLS regression and multivariative analysis by using Excel software. The result of testing the hypothesis are described by statistical values (R squared, p-value etc).

The simulation is going to perform the robustness of the model. Then obtained data are going to be collected from opened sources and run through the SAS program for testing the hypothesis

(does these variables effect on the currency exchange rate fluctuations). If it is going to be rejected, the result also will effect on the answering the research issue.

1.3 Layout of the Thesis

Structure of the research work thus divided into five parts. In the introduction the main concepts and limitation of the research work are performed. The second chapter contains theoretical information about the particular instruments of currency fluctuations and hedging strategies. The third chapter uses these theoretical aspects and provides analytical analysis of obtained data prepare it for the modeling. The third chapter also contains the model of hedging and the recommendation for financial managers team. The conclusion summarize the obtained results and provide the future relevance of this work.

The theoretical and practical relevance of the research includes its ability to be implemented into every bank which deals with international transactions and faces with currency risks.

Thesis statement: In order to reduce currency risks international commercial bank may implement the hedging model, which is based on three macroeconomic factors.

2 BACKGROUND THEORY (CURRENCY RISK MANAGEMENT)

In this chapter there would be considered theoretical background of the research. In the first part there is mentioned the theory of currency exchange rates nature, what kind of exposure and risks are connected with it and the current market situation in Russia. The second part describes the variables which influencing on the currency exchange rate. The third part is describing the derivatives tools: its definition, characteristics and what are the most widely used strategies of using them in commercial banks.

### 2.1 Currency exchange rate: regulation and market importance

The exchange rate (also known as the exchange rate, FX rate, ER, currency rate) between the two currencies is the rate at which one currency will be exchanged for another. It is also considered as the value of the currency of one country in relation to another currency. Thus, the exchange rate consists of two components: the national currency and the foreign currency and can be directly or indirectly indicated[6]. In direct quotation, the price of a unit of currency is expressed in national currency. In indirect quotations, the price of a unit of national currency is expressed in foreign currency. The exchange rate, which does not have a national currency as one of the two currency components, is called a cross-rate or cross-rate.

The problem of the functioning of the banking institutions in Russia and Central Eurasia (CEA) in the context of their exposure to the global financial crisis. The crisis has become an integral part of the global economy. As Lubov Borodacheva stated in her research"The impact of the Global Financial Crisis on the Banking system of Russia": the processes of globalization and integration have led to the fact that, originating in one state, in one economy, it is spreading to other countries and regions. Applying the methodology of historical and synchronous cross-country study suggests a mythological nature of the global financial collapse forecasts. But whenever any of the world's geo-economic zones, showed, unlike the others, who are in a state of crisis, high growth dynamics. The core and most dynamic subsystem of economic globalization is financial globalization, which is a qualitatively new stage in the internationalization of the global financial market on the basis of innovative technologies. The essence of this phenomenon is to strengthen communication and integration between the financial sectors of national economies, the world's financial centers and international financial

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[6] Jeff Madura, Roland Fox, International Financial Management, 2011, p.299

institutions, resulting in the formation of a new configuration of the global economy, the formation of its financial architecture. A visible result of these processes became more interdependence and integration of the financial systems of individual countries, which gave rise to the now-functioning global financial system.

Also known as a currency quote, an exchange rate or a FX rate. The exchange rate has a base currency and a counter currency. In direct quotation, foreign currency is the base currency, and the national currency is a counter currency. In indirect quotes, the national currency is the base currency, and the foreign currency is the counter currency. Most exchange rates use the US dollar as the base currency and other currencies as counter currency (Myers 2016). However, there are a few exceptions to this rule, such as the currencies of the euro and the Commonwealth, such as the British pound, the Australian dollar and the New Zealand dollar. Currency rates for most major currencies are usually expressed in four places after the decimal fraction, with the exception of quotations of currencies involving the Japanese yen, which are quoted up to two places after the decimal fraction.
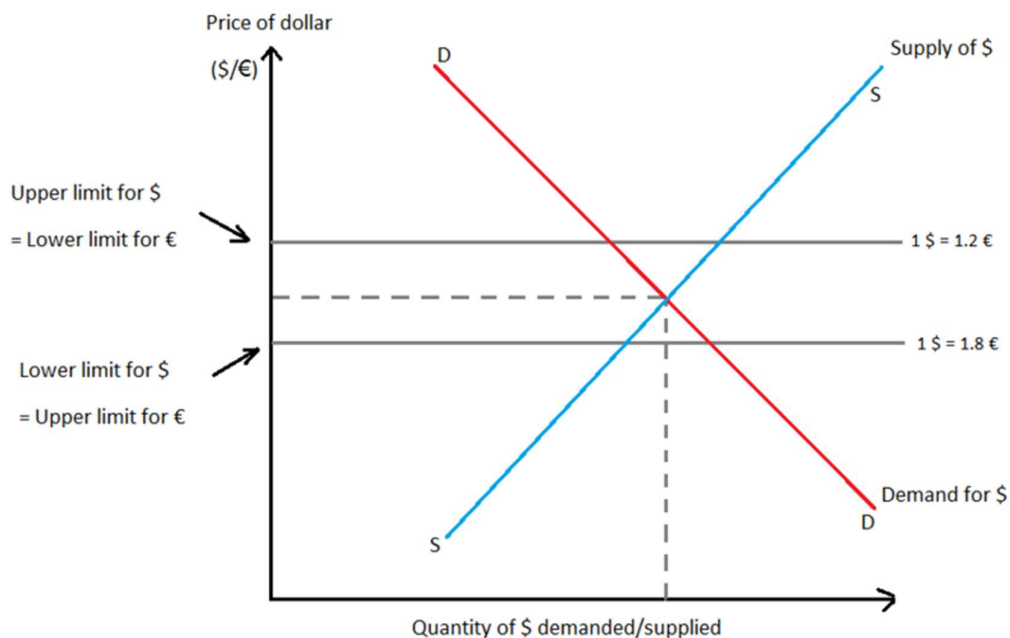
Source: Weston, Financial Theory and Corporate Policy, 4th edition, 2016
Figure 2. Regulation Mechanism of fixed FX rate

The currency for international travel and international payments is mainly purchased from banks, foreign exchange brokers and various forms of currency exchange. These outlets deduce the currency from the interbank markets, which the Bank for International Settlements estimates at

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5.3 trillion US dollars a day. The purchase is made under a spot contract. Retail customers will be charged in the form of a commission or otherwise to cover the costs of the supplier and make a profit. One form of charging is the use of an exchange rate that is less profitable than a wholesale spot rate. The difference between retail and purchase prices is called bid-ask distribution.

Professional depositors use forced tolerations and sometimes even mistakes of commercial banks and monetary policy makers to get bigger yield. Sergey Anureev in his work "Professional Depositors and Interest Rate Risks for Banks: Russian Case of Significant Fluctuation Rate and Federal Fund Rate in 2014-2015" shown that as well as professional buyers dissipate retailers margin by using various special offers, coupons and discounts more often than ordinary people do. Mainly professional depositors are associated with the moral hazard of deposit insurance, and in the crisis of 2008 and 2014 they fixed crisis-high interest rates beyond the crisis peak for several years. They do that expecting quick return of crisis-high interest rates to pre-crisis low figures after the relief of panic and beginning of economic recovery. According to the legislation, commercial banks are not allowed to change the terms of existing deposit contracts, even in cases of significant decrease of interest rates and fixers' significant money depositing beyond minimal deposit required.

Also household deposits are insured by Deposit Insurance Agency (DIA), which equalizes risks of placing savings in Sberbank (the largest state owned and the least risky bank) and in a small risky private bank. So, during the crisis-high interest rates, professional depositors' contract flexi fixed deposits in various private banks with maturity as long as possible. Later when their existing pre-crisis deposits end up, they simply place money to new crisis-high yield deposits, even if market rates decline significantly. In December 2014 CBR raised the federal fund rate from 11,5% to 17% to cope with currency crisis and following high inflation. Private banks had to raise interest rates on household deposits from 10-12% to 20-23% over all deposit periods, including several years' time.

The exchange rate regime is the way in which the government manages its currency in relation to other currencies and the foreign exchange market[7]. This is closely related to monetary policy, and both of them, as a rule, depend on many of the same factors. The main types are the floating

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[7] Copeland, Weston, Financial Theory and Corporate Policy, 4th edition, 2016, p.157

exchange rate, when the market dictates fluctuations in the exchange rate. A fixed float, when the central bank keeps the course too far from the target range or value. As well, a fixed exchange rate, which links the currency to another currency, is mainly reserve currencies, such as the US dollar or the euro, or a basket of currencies.

A floating exchange rate or a fluctuating exchange, or a flexible exchange rate is one of the types of currency regime in which the currency value can fluctuate in response to the mechanisms of the currency market. A currency that uses a floating exchange rate is called a floating currency. Floating currency is opposed to a fixed currency, the value of which is tied to the currency of another currency, material wealth or a basket of currencies. In today's world most of the world's currencies are floating; Such currencies include the most widely traded currencies: the US dollar, Indian rupee, euro, Norwegian krone, Japanese yen, British pound and Australian dollar. However, central banks often participate in markets to try to influence the value of floating exchange rates.

The Canadian dollar looks more like a pure floating currency, because the Canadian central bank did not interfere with its price, as it officially stopped doing it in 1998. The US dollar ranks second with a very small change in its foreign exchange reserves; On the contrary, Japan and the United Kingdom are more involved, while India faces medium interference from its central bank, the Reserve Bank of India (Madura 2011).

From 1946 until the early 1970s, the Bretton Woods system made fixed currencies the norm. However, in 1971 the US decided not to support the dollar exchange for 1/35 of an ounce of gold, so that the currency would no longer be fixed (Madura 2011). After the 1973 Smithsonian agreement, most of the world's currencies followed suit. However, some countries, such as most of the Persian Gulf states, have fixed their currency to the value of another currency, which has recently been associated with slower growth. When the currency floats, other than the exchange rate is used to manage monetary policy.

There are economists who believe that in most cases floating exchange rates are preferable to fixed exchange rates. Since floating exchange rates are automatically adjusted, they allow the country to mitigate the effects of shocks and external business cycles and to prevent the possibility of balance of payments crises. However, they also generate unpredictability as a result of their dynamism.

However, in certain situations, fixed exchange rates may be preferable to ensure their greater stability and certainty. This may not necessarily be true given the results of countries that are trying to keep their currency prices "strong" or "high" against other countries, such as the United Kingdom or the countries of Southeast Asia, before the Asian currency crisis[8].

The discussion about the choice between fixed-floating and floating-exchange rates is outlined by the Mundell-Fleming model, which argues that the economy (or the government) cannot simultaneously maintain a fixed exchange rate, free capital flow and an independent monetary policy. He must choose any two to control, and the other for market forces.

The main argument in favor of a floating exchange rate is that it allows the use of monetary policy for other purposes. At fixed rates, monetary policy is aimed at achieving a single goal - maintaining the exchange rate at the announced level. Nevertheless, the exchange rate is only one of many macroeconomic variables that monetary policy may affect. The system of floating exchange rates allows developers of monetary policy to freely pursue other goals, such as stabilization of employment or prices.

In cases of extreme increase or depreciation, the central bank usually intervenes to stabilize the currency. Thus, the exchange rate regimes of floating currencies can be more technically known as managed floating positions. For example, the central bank can allow the currency to float freely between the upper and lower limits, the ceiling and the price level. Management of the central bank can take the form of buying or selling large lots in order to provide price support or resistance, or, in the case of some national currencies, penalties for trade outside these borders may be provided (Copeland 2016).

The paper of Guglielmo Maria Caporale, Fabio Spagnolo, "Macro news and exchange rates in BRICS" has examined the effects of newspaper headlines on the exchange rates both the US dollar and the euro for the currencies of the BRICS using daily data over the period 03/1/2000–12/5/2013. The increasingly important role of these countries in the world economy as a result of their rapidly growing share in global trade and the lack of previous empirical evidence concerning them specifically motivate the focus. The estimated model allows for both mean and volatility spillovers as well as for the possible impact of the recent financial crisis. The analysis

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[8] Jeff Madura, Roland Fox, International Financial Management, 2011, p.82

is very comprehensive, since it considers two sets of the exchange rates, the US and the euro zone both being among the main trade partners of the BRICS. The results differ across countries, but provide in a number of cases evidence of significant spillovers, whose strength appears to have increased during the crisis. On the whole, the empirical evidence presented here can be seen as confirming the important role of news as interpreted by the press (and therefore of investor psychology), not only in the case of the developed economies, but also in the case of the BRICS: their increasingly global role appears to have made their FX markets more responsive to foreign news in addition to domestic news as one would have expected.

There are also arguments against free floating rate. One of them is that a free floating rate increases currency volatility. There are economists who believe that this can cause serious problems, especially in emerging economies. In these countries, there is a financial sector with one or more of the following conditions:

1. Dollarization with a high degree of probability
2. Financial fragility
3. Strong balance effects

When liabilities are denominated in foreign currency, while assets are in local currency, unforeseen exchange rate depreciations worsen bank and corporate balances and threaten the stability of the national financial system.

For this reason, emerging economies appear to face greater fear of floating since they have significantly smaller nominal exchange rate fluctuations, but face large shocks and fluctuations in interest rates and reserves. This is a consequence of the frequent reaction of floating countries to fluctuations in the exchange rate with monetary policy and / or intervention in the foreign exchange market.

In other words, the difference between these types of regulation can be described as the following. A fixed exchange rate means a nominal exchange rate that is rigidly fixed by the monetary authority in relation to a foreign currency or a basket of foreign currency. On the contrary, the floating exchange rate is determined in the currency markets, depending on supply and demand, and it usually fluctuates constantly (Myers 2016).

The fixed exchange rate regime reduces the transaction costs associated with the uncertainty of the exchange rate, which can impede international trade and investment and provides a reliable

basis for low-intensity monetary policy. On the other hand, in this mode, an autonomous monetary policy is lost, since the central bank must continue to intervene on the foreign exchange market to maintain the exchange rate at an officially established level. Thus, autonomous monetary policy is a great advantage of a floating exchange rate. If the domestic economy falls into a recession, it is an autonomous monetary policy that will allow the central bank to increase demand, thus "smoothing out" the business cycle, ie, reducing the impact of economic shocks on the domestic market and employment. Both types of exchange rate regime Their advantages and disadvantages and the choice of the correct regime can differ for different countries depending on their specific conditions. In practice, there are a number of exchange rate regimes lying between these two extreme options, which provides a certain trade-off between stability and flexibility.

The exchange rate in the Czech Republic was tied to a basket of currencies before the beginning of 1996, then the binding was effectively eliminated by significantly widening the range of fluctuations, and now the Czech economy operates in the so-called managed float mode, ie. the exchange rate floats, but the central bank can address interventions if there are any extreme fluctuations (Madura 2011).

2.2 Exchange rates fluctuations: reasons, consequences

In addition to such factors as interest rates and inflation, the exchange rate is one of the most important determinants of the relative level of the country's economic health. Exchange rates play a vital role in the level of the country's trade, which is crucial for most market economies in the world. For this reason, exchange rates are one of the most frequently viewed, analyzed and managed by the state economic measures. However, exchange rates are important on a smaller scale: they affect the real return of the investor's portfolio. Here are described some of the main factors underlying exchange rate fluctuations.

1. Difference in inflation rates

As a rule, a country with a consistently lower inflation rate demonstrates an increase in the value of the currency, as its purchasing power increases with respect to other currencies. During the last half of the 20th century, countries with low inflation were Japan, Germany and Switzerland, while the US and Canada achieved low inflation only later[9]. In countries with higher inflation, as a rule, there is a depreciation of the national currency against the currencies of their trading partners. This also sometimes accompanied by higher interest rates.

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[9] Ross, Westerfield, Jaffie, Corporate finance, 8th edition, 2016, p.101

2. Difference in interest rates

Interest rates, inflation and exchange rates are all closely interrelated. Managing interest rates, central banks have an impact on both inflation and exchange rates, and changes in interest rates affect inflation and currency values. Higher interest rates offer lenders in the economy a higher income relative to other countries. Therefore, higher interest rates attract foreign capital and increase the exchange rate. However, the effect of higher interest rates is moderate if inflation in the country is much higher than in others, or if additional factors contribute to currency depreciation. Opposite relations exist to lower interest rates, that is, lower interest rates tend to lower exchange rates.

3. Current-account deficit

The current account is the balance of trade between the country and its trading partners, reflecting all payments between countries for goods, services, interest and dividends. The current account deficit shows that the country spends more on foreign trade than it earns, and that it borrows capital from foreign sources to fill the deficit. In other words, a country requires more foreign currency than it receives through export sales, and it delivers more of its currency than foreigners demand for their products. Excess demand for foreign currency reduces the exchange rate of the country until domestic goods and services become cheap enough for foreigners, and foreign assets are too expensive to produce sales for internal interests.

4. Public debt

Countries will participate in large-scale financing of the deficit to pay for public sector projects and public funding. Although such activities stimulate the domestic economy, countries with large government deficits and debts are less attractive to foreign investors. The cause was a large debt contributes to inflation, and if inflation is high, the debt will be serviced and ultimately will pay off by cheaper real dollars in the future. In the worst case, the government can print money to pay part of a large debt, but the increase in the money supply inevitably causes inflation. Moreover, if the government is unable to service its deficit with domestic funds (selling domestic bonds, increasing the money supply), then it should increase the supply of securities for sale to foreigners, thereby reducing their prices. Finally, a large debt can cause concern among foreigners if they believe that a country risks not fulfilling its obligations. Foreigners will be less likely to own securities denominated in that currency if the risk of default is great. For this reason, the country's debt rating (such as Moody's or Standard & Poor's) is the determining factor of its exchange rate.

5. Terms of trade

The ratio of export prices and import prices, terms of trade are linked to current accounts and balance of payments. If the price of a country's exports rises at a higher rate than the price of its imports, its terms of trade improve favorably. The increase in terms of trade indicates an increase in demand for the country's exports. This, in turn, leads to an increase in export earnings, which provides an increased demand for the country's currency (and an increase in the value of the currency). If the export price increases at a slower rate than the price of its imports, the value of the currency will decrease relative to its trading partners.

6. Political stability and economic conditions

Foreign investors are constantly looking for stable countries with high economic indicators, which will enable them to invest their capital. A country with such positive qualities will attract investment funds from other countries that believed to have more political and economic risks. For example, political instability can lead to a loss of confidence in the currency and the movement of capital towards the currencies of more stable countries.

Exchange rate fluctuations are a natural result of a floating exchange rate system, which is the norm for most large economies. The exchange rate of one currency against another influenced by numerous fundamental and technical factors. These include the relative supply and demand of the two currencies, economic indicators, inflation prospects, interest rate differentials, capital flows, technical support and resistance levels, etc. As these factors tend to be in a state of constant change, currency values range from Moment to moment. However, although the level of the currency should mostly be determined by the underlying economy, the tables often turn, as huge movements in the currency can dictate the state of the economy. In this situation, the currency becomes a tail that wags the dog, in a manner to speak.

Although the impact of currency fluctuations on the economy has far-reaching consequences, most people do not pay close attention to exchange rates, since most of their business and operations are carried out in their national currency. For a typical consumer, exchange rates only focus on random actions or transactions, such as overseas trips, import payments or foreign transfers.

The common mistake of most people is that a strong national currency is good, because it is cheaper to travel to Europe, for example, or pay for an imported product. In reality, however, an excessively strong currency can have a significant impact on the underlying economy in the long

run, since entire industries are not competitive, and thousands of jobs are lost. Moreover, while consumers may despise a weaker national currency, because it makes purchases abroad and overseas trips are more expensive, a weak currency can actually bring more economic benefits.

The value of the national currency in the foreign exchange market is an important tool in the central bank instrument package, as well as a key determinant of monetary policy. Thus, directly or indirectly, currency levels affect a number of key economic variables. They can play a role in the interest rate that you pay on mortgages, income from the investment portfolio, the price of products in local supermarket and even the prospects of your work.

The impact of currency on the economy

The level of currency has a direct impact on the following aspects of the economy:

1. Trading goods

This concerns the country's international trade or its exports and imports. In general, a weaker currency will stimulate exports and make imports more expensive, thus reducing the country's trade deficit (or increasing the surplus) over time. The example below describes how this effect works. Assume that an U.S. exporter sold a million commodities at $10 each to a buyer in Europe two years ago, when the exchange rate was EUR 1=1.25 USD. The cost to European buyer was therefore EUR 8 per commodity. European buyer is now negotiating a better price for a large order, and because the dollar has depreciated to 1.35 per euro, the seller can give the buyer a price break while still clearing at least $10 per commodity. Even if the new price were EUR 7.50, which amounts to a 6.25% discount from the previous price, the price in USD would be $10.13 at the current exchange rate. The depreciation in American currency is the primary reason why the export business has remained competitive in international markets.

Conversely, a significantly stronger currency can reduce export competitiveness and make imports cheaper, which can cause the trade deficit to widen further, eventually weakening the currency in a self-adjusting mechanism. However, before this happens, industry sectors, which are highly export-oriented, can be decimated by an unduly strong currency.

2. Economic growth

$$GDP = C + I + G + (X - M) \qquad (1)$$

where:

- C – consumers spending
- I – capital investment by households and business
- G – government spending and X – M is net difference between exports and imports, the more export the higher is the gross domestic product of a country
- Capital flows

Foreign capital will seek to enter countries with strong governments, a sensitive economy and a stable currency. A country must have a relatively stable currency to attract investment capital from foreign investors. Otherwise, the prospect of currency losses caused by depreciation of the currency may deter foreign investors.

Capital flows can be divided into two main types - foreign direct investment (FDI), in which foreign investors participate in existing companies or build new facilities abroad; And foreign portfolio investment, when foreign investors invest in foreign securities. FDI is an important source of financing for such growing economies as China and India, whose growth will be difficult if the capital is not available.

Governments very much prefer FDI for foreign portfolio investment, as the latter are often akin to "hot money" that can leave the country when the situation becomes tough. This phenomenon, called "capital outflow," can be caused by any negative event, including the expected or expected devaluation of the currency.

3. Inflation

The depreciated currency can lead to "imported" inflation for countries that are significant importers. A sudden drop of 20% in national currency could lead to a 25% increase in imports, as a 20% decrease means an increase of 25% to return to the initial starting point.

4. Interest rate

As it was mentioned earlier, the level of exchange rates is a key factor for most central banks in determining monetary policy. For example, Central Bank of Russia decided to target inflation by changing the monetary policy and performing the floating exchange rate regime in November 2014[10]. Before this transitional period, the Bank of Russia for many years gradually increased the flexibility of the exchange rate and consistently reduced its intervention in the domestic

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[10] On the parameters of Bank of Russia exchange (2014)// The Central Bank of the Russian Federation https://www.cbr.ru/eng/press/PR.aspx?file=10112014_122958eng_dkp2014-11-10T12_26_04.htm

foreign exchange market. The transition to the floating exchange rate regime was phased in order to facilitate the adaptation of market participants to fluctuations in the exchange rate due to a more flexible exchange rate.

A strong domestic currency is resisting the economy, achieving the same end result as tightening monetary policy (that is, higher interest rates). In addition, further tightening of monetary policy at a time when the national currency is already too strong can exacerbate the problem by attracting more hot money from foreign investors who are looking for more profitable investments (which will further increase the national currency).

2.3 Derivatives for hedging purposes

Description, aim, characteristics

A derivative is a security whose value depends on one or more underlying assets or is dependent on them. The derivative itself is a contract between two or more parties on the basis of an asset or assets. Its value is determined by the fluctuations in the underlying asset. The most common underlying assets include stocks, bonds, commodities, currencies, interest rates and market indices.

Derivatives are either sold over-the-counter (OTC), or on the exchange. OTC derivatives represent the majority of existing derivatives and are not regulated, while derivatives traded on exchanges are standardized. OTC derivatives generally have a greater risk for the counterparty than the standard derivatives[11].

Originally, derivatives were used to provide a balanced exchange rate for goods traded internationally. With different values of different national currencies, international traders needed a system for accounting for these differences. Today, derivatives are based on a variety of transactions and have many other uses. There are even derivatives based on meteorological data, such as the amount of rain or the number of sunny days in a certain region.

Since the derivative is a safety category, and not a specific species, there are several different kinds of derivatives. As such, derivatives also have many functions and applications based on the type of derivative. Certain types of derivative instruments can be used for hedging or insurance

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[11] Джон К. Халл. Опционы, фьючерсы и другие производные финансовые инструменты. М.: Альпина Бизнес Букс, 2015, p. 54

against asset risk. Derivatives can also be used for speculation at rates on the future price of an asset or bypassing exchange rate issues. For example, a European investor buying shares of an American company outside the US exchange (using US dollars for this) will be exposed to the risk of exchange rate changes while holding this stock. To hedge this risk, an investor could buy currency futures to fix the indicated exchange rate for future sale of shares and conversion of currency back to euro. In addition, many derivatives are characterized by a high level of debt burden.

There are different types and combinations of derivative instruments. Each of them has its own purpose and aim.

Future contracts

A futures contract is a legal agreement usually made on the trading floor of a futures exchange, for the purchase or sale of a specific commodity or financial instrument at a predetermined price at a certain time in the future. Futures contracts are standardized to facilitate trading on the futures exchange and, depending on the underlying asset traded, describe in detail the quality and quantity of the goods.

Some futures contracts may require physical delivery of the asset (hedging from price volatility), while other are made only in cash (speculation purpose only). The terms "futures contract" and "futures" mean, in fact, the same thing. Futures contracts are used by two categories of market participants: hedgers and speculators. Producers or buyers of the underlying asset hedge or guarantee the price at which the goods are sold or bought, while portfolio managers or traders can also bet on the price changes of the underlying asset using futures.

There are various futures contracts. Futures contracts are traded on dozens of various major stock indexes around the world, as well as futures for major currency pairs and major interest rates. As for the goods, for each manufactured product there is a large number of contracts. For example, industrial metals, precious metals, oil, natural gas and other energy carriers, oils, seeds, grains, livestock and even carbon credits have commercial futures contracts.

The mechanism of futures contract is simple. If the oil producer plans to produce 1 million barrels of oil, ready for delivery exactly in 365 days. Suppose that the current price is $ 50 per barrel. The manufacturer can take on the gamble, produce the oil, and then sell it at current market prices a year from today, so-called spot price. Given the volatility of oil prices, the

market price at that time could be at any level. Rather than risk, the oil producer could fix the guaranteed sale price by concluding a futures contract. The mathematical model is used to determine the futures price, which takes into account the current spot price, risk-free rate of return, time to maturity, storage costs, dividends, dividend yield and profitability on convenience. Suppose that the annual futures contracts for oil are valued at $ 53 per barrel. Having concluded this contract, within one year the manufacturer is obliged to deliver 1 million barrels of oil and is guaranteed to receive 53 million dollars. The price per barrel is 53 US dollars, regardless of where the spot market prices are at that time.

Forward contracts

A relatively simple derivative is a forward contract. It is an agreement to buy or sell an asset at a certain future time for a certain price. It can be contrasted with a spot contract, which is an agreement to buy or sell an asset today. A forward contract is traded in the over-the-counter market—usually between two financial institutions or between a financial institution and one of its clients. One of the parties to a forward contract assumes a long position and agrees to buy the underlying asset on a certain specified future date for a certain specified price. The other party assumes a short position and agrees to sell the asset on the same date for the same price. Forward contracts on foreign exchange are very popular. Most large banks employ both spot and forward foreign-exchange traders. Spot traders are trading a foreign currency for almost immediate delivery. Forward traders are trading for delivery at a future time.

A forward contract is an individual contract between two parties to buy or sell an asset at a certain price in the future. A forward contract can be used for hedging or speculation, although its non-standardized nature makes it particularly suitable for hedging. Unlike standard futures contracts, a forward contract can be configured for any product, amount and delivery date. Settlement of a forward contract can occur on the basis of cash or delivery. Forward contracts are not traded on a centralized exchange and therefore are considered over-the-counter instruments. Despite the fact that their over-the-counter nature simplifies the adjustment of terms, the absence of a centralized information exchange center also increases the risk of default. As a result, forward contracts are not as easily available to a retail investor as futures contracts.

The forward contracts market is big enough, as many of the world's largest corporations use it for hedging currency and interest risks. However, since the details of forward contracts are limited to the buyer and seller and are not known to the general public, the size of this market is difficult to assess. The large size and unregulated nature of the forward contracts market means that it can

be subject to a cascading series of defaults in the worst-case scenario. Although banks and financial corporations mitigate this risk, being very cautious in choosing a counterparty, there is the possibility of a large-scale default.

Another risk that happens from the non-standardized nature of forward contracts is that they are calculated only on the settlement date and do not refer to the market as futures. What if the forward rate specified in the contract differs significantly from the spot rate at the time of settlement? In this case, the financial institution that created the forward contract is exposed to a higher degree of risk in the event of the client failing or failing to fulfill its obligations, than in case of regular registration of the contract for the market.

Options contracts

Options are traded both on exchanges and in the over-the-counter market. There are two types of option. A call option gives the holder the right to buy the underlying asset by a certain date for a certain price. A put option gives the holder the right to sell the underlying asset by a certain date for a certain price. The price in the contract is known as the exercise price or strike price; the date in the contract is known as the expiration date or maturity. American options can be exercised at any time up to the expiration date. European options can be exercised only on the expiration date itself. Most of the options that are traded on exchanges are American[12]. In the exchange-traded equity option market, one contract is usually an agreement to buy or sell 100 shares. European options are generally easier to analyze than American options, and some of the properties of an American option are frequently deduced from those of its European counterpart.

It should be emphasized that an option gives the holder the right to do something. The holder does not have to exercise this right. This is what distinguishes options from forwards and futures, where the holder is obligated to buy or sell the underlying asset. Whereas it costs nothing to enter into a forward or futures contract, there is a cost to acquiring an option.

Hedging using derivatives contracts

Hedge funds have become major users of derivatives for hedging, speculation, and arbitrage. They are similar to mutual funds in that they invest funds on behalf of clients. However, they accept funds only from financially sophisticated individuals and do not publicly offer their securities. Mutual funds are subject to regulations requiring that the shares be redeemable at any time, that investment policies be disclosed, that the use of leverage be limited, that no short

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[12] Hull, Options, Futures and other derivatives, 8th edition, 2012, p.91

positions be taken, and so on. Hedge funds are relatively free of these regulations. This gives them a great deal of freedom to develop sophisticated, unconventional, and proprietary investment strategies. The fees charged by hedge fund managers are dependent on the fund's performance and are relatively high—typically 1 to 2% of the amount invested plus 20% of the profits. Hedge funds have grown in popularity, with about $1 trillion being invested in them throughout the world. "Funds of funds" have been set up to invest in a portfolio of hedge funds.

The investment strategy followed by a hedge fund manager often involves using derivatives to set up a speculative or arbitrage position. Once the strategy has been defined, the hedge fund manager must:

1. Evaluate the risks to which the fund is exposed

2. Decide which risks are acceptable and which will be hedged

3. Devise strategies (usually involving derivatives) to hedge the unacceptable risks.

   Here are some examples of the labels used for hedge funds together with the trading strategies followed:

1. Long/Short Equities: Purchase securities considered to be undervalued and short those considered to be overvalued in such a way that the exposure to the overall direction of the market is small.

2. Convertible Arbitrage: Take a long position in a convertible bond combined with an actively managed short position in the underlying equity.

3. Distressed Securities: Buy securities issued by companies in or close to bankruptcy.

4. Emerging Markets: Invest in debt and equity of companies in developing or emerging countries and in the debt of the countries themselves.

5. Global Macro: Carry out trades that reflect anticipated global macroeconomic trends.

6. Merger Arbitrage: Trade after a merger or acquisition is announced so that a profit is made if the announced deal takes place.

There is a fundamental difference between the use of forward contracts and options for hedging. Forward contracts are designed to neutralize risk by fixing the price that the hedger will pay or receive for the underlying asset. Option contracts, by contrast, provide insurance. They offer a way for investors to protect themselves against adverse price movements in the future while still allowing them to benefit from favorable price movements. Unlike forwards, options involve the payment of an up-front fee.

2.4 Prediction of exchange rate techniques

The numerous methods available for forecasting exchange rates can be categorized into four general groups: technical, fundamental, market-based, and mixed. The concept of market efficiency puts these methods in context.

Market efficiency

The efficiency of the foreign exchange market has implications for the approach to predicting movements as the efficient markets hypothesis attempts to answer the question: why do prices change? The hypothesis is divided into three parts, weak, semi strong and strong form efficiency. If the foreign exchange market is weak-form efficient, the price reflects estimates of the future value of the currency. All known information about the future is discounted into the current price. This implies that historical information has no role to play in the value of a currency. This has three implications.

First, technical analysis has no role to play in estimating changes in the exchange rate. Technical forecasting attempts to find patterns in exchange rates and movements in the past determine a pattern over time by its very definition as the pattern unfolds. A head and shoulder pattern predicts a fall when past movements indicate that the exchange rate has reached the top of the head and so on. So a pattern is inherently backward looking.

The second implication is that the movement of the exchange rate should be random as there can by definition be no pattern. The semi strong and strong form suggest that information is the cause of the change and it is reasonable to equate information with the unexpected and hence without a pattern. We do not know if the value of the dollar will go up or down the next trading day. But the weak form confines itself to establishing that the movements are random and without a pattern.

The third implication is that if the movement is random, the changes should be normally distributed. If there is an equal chance of a rise or fall over successive days the probabilities of the price changes over time should be normally distributed. Demonstrations from repeated lots of two flips of a coin (with heads as a rise and tails as a fall) will show that on average two flips will result in a 25% chance of two rises, 25% of two falls in value and a 50% chance of a rise and a fall. Alternatively the finding can be worked out using combinatorial maths or Pascal's triangle. Suffice to say that the normal distribution is taken as the most reasonable model of randomness.

If the foreign exchange market is semi strong-form efficient, then the exchange rate reacts in an immediate and unbiased way to all publicly available information. This builds on the notion of news being a possible explanation in the weak form. With a semi strong test the piece of news is identified and attempts are made to gauge the effect, if any, on the exchange rate. In the case of currencies a typical piece of news would be the announcement of the balance of payments. If it is unexpected does the exchange rate react immediately? It would be very unusual if it did not, one does not have to look far to see that the exchange rate is constantly being scrutinized in the press. If foreign exchange markets are strong-form efficient, then all relevant public and private information is already reflected in today's exchange rates. This form of efficiency is difficult to test with regard to exchange rates as it is difficult to clearly define private information, unlike say shares where private information becomes public on specified announcement dates.

It should be understood that the efficient markets hypothesis is just that, a hypothesis and not a law or a fact. It is how academics think that the market should behave. Markets should display a normal distribution of random movements reacting immediately to all published news or unexpected information in an unbiased way. The latter point simply means that the market may be wrong in its estimation of the effect of any piece of news but it is not wrong in any consistent way, it does not consistently underestimate the value of any particular currency – that would create a pattern. Practice and observation of what actually happens, as we shall see, does not fully support the efficient markets hypothesis. The academic's understanding of the real world market place is imperfect.

Technical analysis

Technical forecasting involves the use of historical exchange rate data to predict future values based on patterns in past prices. Academics in general do not support this approach to forecasting. Prices move in reaction to information and not past price movements. Yet in the press there are often comments that appear to support the view that prices are following a pattern of sorts. For example a comment such as: 'the exchange rate has fallen back as a result of three days' increases' suggests that it has done so because it has risen for three days in a row. The movement of the next day's exchange rate is not known and a pattern that suggests that after every three days of increases a reduction is more likely can be tested and is almost certainly not present. However, there is no doubt that technical forecasting is popular in practice. More

recently many skeptics have reconsidered their position in the face of unexplained apparent patterns over the longer term, particularly in the share price market[13].

As statistics cannot prove that there are absolutely no patterns, the existence of patterns as sought by technical forecasting cannot totally be denied.

Corporations tend to make only limited use of technical forecasting because it typically focuses on the near future, which is not very helpful for developing corporate policies. Most technical forecasts apply to very short-term periods such as one day or one week. A short-term forecast obviously yields quicker returns and more limited losses and is therefore attractive to potential clients. Both skeptics and proponents would agree that even if technical forecasting cannot provide accurate predictions of the exchange rate itself, it can give some idea of the range of possible future rates. Random price movements can move within a predictable range of prices. For example, spinning a coin yields an outcome that one cannot predict with certainty; but one can predict that the outcome will be either heads or tails (barring some freak accident of physics). Because technical analysis typically cannot estimate future exchange rates in precise terms, it is not, by itself, an adequate forecasting tool for financial managers of MNCs.

As noted above, technical factors are often cited in the financial press as the main reason for changing speculative positions that cause an adjustment in a currency's value. For example, headlines often attribute a change in the value of a currency to technical factors, typical examples are:

1. Technical factors overwhelmed economic news
2. Technical factors triggered sales of rubles
3. Technical factors indicated that euros had been recently oversold thus signaling for purchasing them back

As these examples suggest, technical forecasting appears to be widely used by speculators who attempt to capitalize on day-to-day exchange rate movements.

Technical forecasting models have helped some speculators in the foreign exchange market at various times. However, a model that has worked well in one particular period will not

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[13] Ross, Westerfield, Jaffie, Corporate finance, 8th edition, 2016, p.461

necessarily work well in another. With the abundance of technical models existing today, some are bound to generate speculative profits in any given period. If the pattern of currency values over time appears to be random, then technical forecasting is not appropriate. Unless historical trends in exchange rate movements can be identified, examination of past movements will not be useful for indicating future movements.

Many foreign exchange participants argue that even if a particular technical forecasting model is shown to lead consistently to speculative profits, it will no longer be useful once other participants begin to use it. Trading based on the model's recommendation will push the currency value to a position that negates the profit. For example, if a method identifies that the prices always rise on a Tuesday, the extra demand on a Monday that is seeking to exploit the pattern will, of itself, push up the price and destroy the very pattern it is seeking to exploit. The notion that something as public and valuable as a pattern in prices can remain undetected by all but the few is rather fanciful. Technical forecasting nevertheless remains popular in practice. Perhaps like gambling, its justification is behavioral rather than logical.

Fundamental analysis

Fundamental analysis consists of an analysis of the economic and political causes of currency movements. Often includes the interpretation of micro- and macroeconomic indicators for the country of the currency in order to determine the relative value of the currency compared to another currency. Fundamental analysis may be better for forecasting long-term exchange rates.

One of the dominant debates among financial analysts is the relative validity of the two main approaches to analyzing markets: fundamental and technical analysis. There are several points of difference between the fundamental and the technical, but it is true that they study the causes of the market movement and try to predict the price action and market trends. The fundamentals, our main subject in this chapter, focus on financial and economic theories, as well as on political events to determine the forces of supply and demand.

In general, the exchange rate of the currency in relation to other currencies is a reflection of the state of the economy of this country in comparison with the economy of other countries. This assumption is based on the belief that exchange is determined by the basic health of the two countries participating in this pair.

Assessing the currency of one nation in relation to another, the fundamental analysis is based on a broad understanding of multinational macroeconomic statistics and events. Usually, he analyzes the basic elements that affect the economy of a particular currency. They can include, on the one hand, economic indicators such as interest rates, inflation, unemployment, money supply and growth rates. On the other hand, it also examines socio-political conditions that could affect the level of trust in the national government and affect the climate of stability.

The purchasing power parity model is based on the theory that exchange rates between currencies are in equilibrium when their purchasing power is the same in each of the two countries. Increasing the domestic price level of the country means changing the level of inflation. When this happens, it is expected that the inflation rate will be compensated by an equivalent, but opposite, change in the exchange rate. In the absence of transport and other transaction costs, such as tariffs or taxes, competitive markets should theoretically equalize the price of the same product in two countries (with prices expressed in one currency). But in fact, such costs exist and affect the cost of goods and services, and therefore they should be taken into account when weighing prices. Unfortunately, the purchasing power parity model does not reflect these costs in determining exchange rates, which is its main weakness. Another weakness is that the model only applies to goods and ignores services.

The interest rate parity model is based on the concept that when currency expansion estimates or amortizes another currency, this imbalance should be balanced by changing the interest rate differential.

Parity is necessary to avoid the condition of arbitration without risk without a return. Theoretically it works like this: you borrow money in one currency, and then exchange that currency for another currency to invest in interest-bearing instruments. At the same time, you buy futures contracts for currency conversion at the end of the holding period. The amount should be equal to the profit from the purchase and storage of similar interest-bearing instruments of the first currency. Arbitrage will arise if the yield of both transactions is different, which will lead to a return without risk.

The basic idea of the theory of arbitrage pricing is the law of one price, which states that 2 identical items will be sold at the same price, and if not, then risk-free profit can be obtained by arbitration: buying goods in a cheaper market, then selling it on a more expensive one market.

But, contrary to theory, arbitrage opportunities of this magnitude are disappearing very quickly, because some of the following events are happening and restores the ratio: US interest rates may rise, direct exchange rates may fall, spot exchange rates may go up or Australian interest rates may fall.

International Balance of Payments Model

Until the 1990s, the theory of the balance of payments focused mainly on the balance of trade, the sub-account of the current account. This was due to the fact that capital flows were not as significant as now, and the trade balance was the main part of the balance of payments for most of the world's economies.

According to this model, a country with a trade deficit will experience a reduction in its foreign exchange reserves, which it used to pay for imported goods. The country must change its currency for the currency of exporters to pay for the goods - this causes its own currency to depreciate. In turn, a cheaper currency makes the country's exports and services less expensive on the world market, making imports more expensive. In the simplified model of the balance of payments, it is said that after the interim period imports are constrained, and exports are increasing, thereby stabilizing the trade balance and the currency to equilibrium.

3 CASE: COMMERZBANK RISK MANAGEMENT

In this chapter, there will be collected information for the analysis required for the third chapter. The information about the most influential variables which effected on the ruble exchange rate is obtained from open sources, conducted analysis of these data based on the econometric tools (by using Excel Data Analysis tool pack) and created a ranged list of these variables. The other important part will be analyzing the revenue of Commerzbank according to these variables. It is supposed that chosen macro and micro economic and political factors can effect on clients behavior as well. The obtained information will be used in the subchapter for creation the hedging strategy and running simulation model.

As the Moscow's branch of German Commerzbank AG, the chosen bank has to report its performance and send back to the parent company some part of its income the exchange rate fluctuations may affect very harmful consequences. Thus, it is possible to use derivatives as hedging strategy.

To develop the model of derivative strategy analytics have to keep in mind two things:

1. To understand what kind of derivatives managers need for reducing the transaction risk they need to properly estimate the direction of the currency movement in a particular period
2. The amount of derivatives contract should be based on the revenue clients bring in rubles

Futures as the easiest and comparing to futures standardized instrument was chosen to be the hedging instrument.

The futures contract has three major components: volume of contract, date of maturity and current exchange rate by entering into an offsetting currency futures position that expires on the date of the cashflow. As the model considers bringing stable situation in exchange risk up to the date of reporting and revenue sharing, the maturity date is chosen to be December 2017. The contract volumes are fixed – 125000 euro per contract with the corresponding futures exchange rate equals to 65,245 on the Moscow Stock Exchange. The number of contracts, which financial managers should obtain, should cover the volume of revenue, which they want to hedge. As it was mentioned above, the risk appetite in German banks can be used for determine the amount of revenue which should be covered by futures.

3.1 Forecasting: the aim and analysis

As a rule, a country with a stable low inflation rate demonstrates growing currency value, as its purchasing power increases compared to other currencies. During the last half of the 20th century, countries with low inflation included Japan, Germany and Switzerland, while the US and Canada achieved low inflation only later. Countries with higher inflation tend to see depreciation in their currency relative to the currencies of their trading partners. This is also usually accompanied by higher interest rates.

Interest rates, inflation and exchange rates are completely correlated. Managing interest rates, central banks have an impact on both inflation and exchange rates, and changes in interest rates affect inflation and currency values. Higher interest rates offer lenders in the economy a higher yield than other countries. Thus, higher interest rates attract foreign capital and lead to an increase in the exchange rate. However, the effect of higher interest rates is mitigated if inflation in the country is much higher than in others, or if additional factors serve to reduce the exchange rate. The opposite link exists to lower interest rates, that is, lower interest rates tend to reduce exchange rates.

The current account is the balance of trade between the country and its trading partners, reflecting all payments between countries for goods, services, interest and dividends. The current account deficit shows that the country spends more on foreign trade than it earns, and that it borrows capital from foreign sources to fill the deficit. In other words, a country requires more foreign currency than it receives through export sales, and it delivers more of its currency than foreigners requiring its products. Excess demand for foreign exchange reduces the exchange rate of the country until domestic goods and services are cheap enough for foreigners, and foreign assets are too expensive to generate sales for internal interests.

Countries will participate in large-scale financing of the deficit to pay for public sector projects and public funding. Although such activities stimulate the domestic economy, countries with large public deficits and debts are less attractive to foreign investors. A large debt stimulates inflation, and if inflation is high, the debt will be serviced and ultimately will pay off by cheaper real dollars in the future.

In the worst case, the government can print money to pay part of a large debt, but the increase in the money supply inevitably causes inflation. Moreover, if the government is unable to service its deficit through internal funds (selling domestic bonds, increasing the money supply), then it

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should increase the supply of securities for sale to foreigners, thereby reducing their prices. Finally, a large debt can be dangerous for foreigners if they believe that a country risks not fulfilling its obligations. Foreigners will be less likely to own securities denominated in that currency if the risk of default is high. For this reason, the country's debt rating (as defined, for example, by Moody's or Standard & Poor's) is the decisive factor of its exchange rate.

The ratio between export prices and import prices, terms of trade are related to current accounts and balance of payments. If the price of a country's exports increases at a higher rate than its imports, its terms of trade have improved favorably. The growth of terms of trade shows a higher demand for the country's exports. This, in turn, leads to an increase in export earnings, which provides an increase in demand for the country's currency (and an increase in the value of the currency). If the price of exports increases at a lower rate than the cost of its imports, the value of the currency will decrease relative to its trading partners.

Foreign investors are inevitably looking for stable countries with high economic indicators, in which one can invest their capital. A country with such positive attributes will attract investment funds from other countries that are considered to have more political and economic risks. For example, political instability can lead to a loss of confidence in the currency and the movement of capital towards the currencies of more stable countries. All mentioned above would be considered in current chapter.

3.1.1 Technical forecasting of Russian currency FX rate

Technical analysis of exchange rates is a method that is used to predict future trends in exchange rates in the foreign exchange market by analyzing past market data, mainly data related to volume and price.

Technical analysis in the forecasting of exchange rates FX focuses on the recognition of models of rates and trends and tries to explore these trends. There are various tools used by technical specialists, but the main tools are the study of price schedules.

In forecasting the exchange rate with technical analysis, experts are particularly looking for recurring models, such as models with double top reversal, candlesticks, head and shoulder patterns or study indicators, such as moving averages. Indicators that are mathematical transformations of historical market data relating to volume and price are widely used for technical analysis at exchange rates.

Investors in the FX market are considering technical analysis for forecasting the exchange rate as one of the key tools. As we know, technical analysis in the forecasting of exchange rates gives us a clear picture of the movement of prices in the future, taking into account the analysis of historical market prices and consists of mathematical equations along with other technical aspects applied to market prices. To get fruitful results, you need to learn the methods of technical analysis of FX. In the technical analysis of FX exchange rates, one should always remember that the theoretical knowledge added to a thoughtful strategy gives the key to good results and positive trading. You should never use methods that you do not understand. There is always a choice of several suggested methods, so you can use the one you are good at, and adequately invest in successful FX trading.

By analyzing sample of 1442 observation for the five year period (from 1st of January 2012 to 5th of May 2017) for euro/ruble currency pair the next statistical information was obtained (with spot price by 5th of May as 63,69):

<div align="right">**Table 1.**</div>

<div align="center">**Technical analysis results**</div>

FORECASTING (30 days)		FORECASTING (90 days)		FORECASTING (360 days)	
Mean monthly	61,13	Mean 90 days	62,12	Mean 360 days	71,23
St. Dev monthly	1,30	St. Dev 90 days	1,40	St. Dev 90 days	7,30
Expected stdev	2,14	Expected St. Dev	3,00	Expected St. Dev	12,00
Lower Value	62,33	Lower Value	61,78	Lower Value	56,05
Higher Value	65,05	Higher Value	65,60	Higher Value	71,33

Source: composed by author

Graphically the result may be interpreted as confidence level for next year exchange rate.
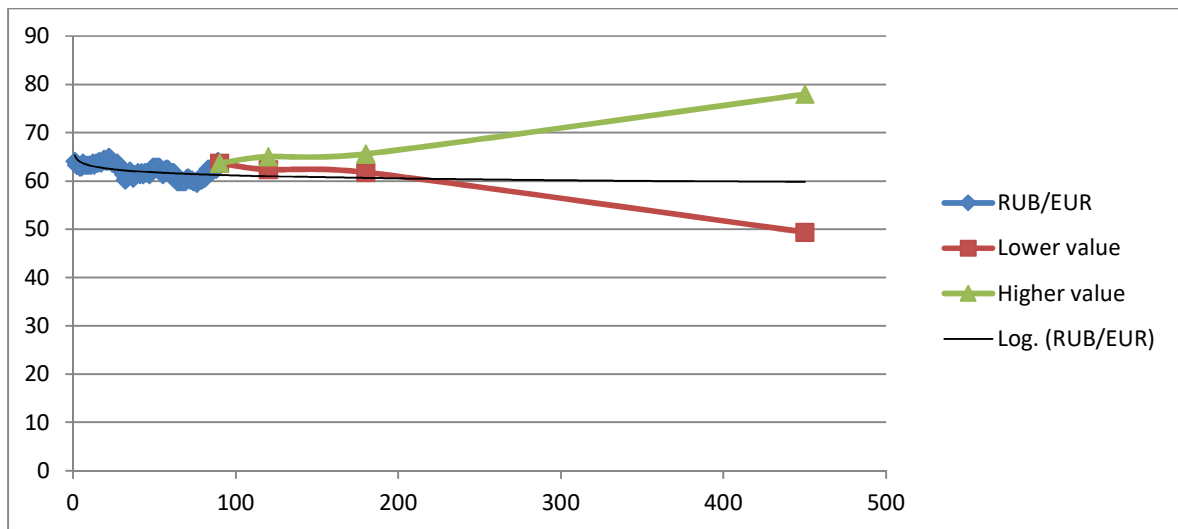
Source: composed by author
Figure 3. Technical Forecast FX rate limits

Many experts believe that the following reasons why the exchange rate forecasting with technical analysis is gradually acquiring a more prominent and important role in forecasting exchange rates:

1. The foreign exchange market FX, in fact, tends to a short-term period.
2. The vast majority of them consists of speculative market participants, and it is for this reason that currency transactions occur that do not have a major investment transaction behind them.
3. Participants in the FX market have to trade something, regardless of whether there have been any changes in the macroeconomic principles.
4. Traditional methods of forecasting are not so effective for forecasting short-term market movements; Therefore, some other analytical method is required that can help in obtaining better results.
5. Models created by supply and demand at the exchange rate create price models that can be used for technical analysis at exchange rates.
6. Technical analysis is used only by investors or solely with fundamental analysis.

There are various methods along with technical analysis that can be used in forecasting, but the fact is that they all rely on price movements of the past. Technical analysis requires several different forms and many methods of use. There is an ever-growing community of investors and traders who trade solely on the basis of signals from technical analysis. In a nutshell, one can say that technical analysis in forecasting exchange rates works to the extent that it gives results consistently for market participants who are trying to predict short-term changes in the exchange rate. Therefore, this is the most preferred tool for forecasting FX courses among FX traders.

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3.1.2 Fundamental forecasting of Russian currency FX rate

Fundamental forecasting is based on fundamental relationships between economic variables and exchange rates. Recall from Chapter 4 that a change in a currency's spot rate is influenced by the following factors:

$$e = f(\Delta INF + \Delta INT + \Delta INC + \Delta GC + \Delta EXT) \qquad (2)$$

where:

1. e – exchange rate
2. ΔINF – difference between nominal inflation of home and foreign country
3. ΔINT – difference between interest rate
4. ΔINC – difference between income
5. ΔGC – change in government control
6. ΔEXT – expectation of future exchange rate

According to the Purchasing Power Parity by comparing expected inflation rates in Europe and Russian Federation it is possible to forecast the spot exchange rate for the end of considering period. The target inflation rate for the end of 2017 is going to be 4%[14]. For the European countries, the target inflation rates are going to be close but a bit less than 2%[15] (European Central Bank, 2017).

As the Purchasing Power Parity theory main formula says that:

$$Future\ Spot = Spot\ Price * \frac{(1 + Inf_{European})}{(1 + Inf_{Russian})} \qquad (3)$$

where:

1. future spot = the spot exchange rate at the end of period
2. $Inf_{European}$ = expected inflation in Euro zone
3. Inf_{Russia} = expected inflation in Russian Federation

thus $63,69 * \frac{1,02}{1,04} = 62,46$ by the end of 2017. This result shows appreciation of Russian currency.

By using International Fisher Effect, it is possible to evaluate the change in future spot exchange rate by using difference in interest rates:

$$E = \frac{Int_{Russia} - Int_{Europe}}{1 + Int_{Europe}} \qquad (4)$$

[14] Bank of Russia exchange rate policy (2017) // The Central Bank of the Russian Federation https://www.cbr.ru/Eng/DKP/?PrtId=e-r_policy

[15] Inflation Rates by month (2017) // The Central Bank of Europe https://www.ecb.europa.eu/mopo/html/index.en.html

where:

1. E = difference in currency exchange rate
2. Int_{Russia} = interest rate in Russian Federation
3. Int_{Europe} = interest rate in Euro zone

Russian key interest rate is 9,25%[16], in European zone this ration equals to 0,25%[17] (ECB interest rates, 2017). Assuming that the interest rate in Russian Federation continue to be close to 9-10 point in 2017 the exchange rate can be forecasted as following: $(\frac{9}{1,25}/100 + 1) * 63,69 = 68,27$. By using this technique the Russian currency is assumed to depreciate against euro.

These different ratios show that there should be find one particular measure which may tell the researcher with high accuracy the exchange rate in near future. That is why the next step is going to be determine the outer influential factors.

Fundamental analysis in the foreign exchange market usually includes accounting for the main economic and political factors for one country in relation to another. These factors may include the following:

1. Measures of overall economic power, such as growth and employment levels
2. Interest rates and return on investments
3. Current account balance
4. Political stability

Fundamental forecasts for exchange rates are usually most useful for long-term time frames, and not for short-term trading. Nevertheless, some basic trading strategies have been developed that operate during the volatility period, which often immediately follows important economic data releases.

Some traders prefer technical analysis and take on problems with fundamental analysis on the basis that:

1. His information has been largely evaluated in the market

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[16] Key interest rate (2017) // Central Bank of Russian Federation
https://www.cbr.ru/press/pr.aspx?file=16062017_133001keyrate2017-06-16T13_21_27.htm (Accessed 16 May 2016)
[17] Interest Rates by month (2017) // The Central Bank of Europe (Accessed 16 May)
https://www.ecb.europa.eu/mopo/html/index.en.html

2. It is time consuming and difficult to perform
3. This often requires an economic background
4. It does not give objective trading signals

3.1.3 Economic and Political risk affecting currency exchange rates

Because no single forecasting technique has been found to be consistently superior to the others, some MNCs prefer to use a combination of forecasting techniques. This method is referred to as mixed forecasting. Various forecasts for a particular currency value are developed using several forecasting techniques. The techniques used are assigned weights in such a way that the weights total 100%, with the techniques considered more reliable being assigned higher weights. The actual forecast of the currency is a weighted average of the various forecasts developed.

Economic and political causes impact on Russian ruble

The Russian economy was the eighth largest nominal gross domestic product in the world with the amount of $ 2.1 trillion in 2013[18]. In the period from 2000 to 2012, the country experienced a rapid growth in its economy due to rising energy prices and increased arms exports, International investors were confident that Russia is turning the corner, and foreign direct investment has flown into the country.

By the end of 2014, the Russian economy was on the edge of a crisis, and the ruble fell to a record depreciation against euro and dollar.

The decision of the central bank of Russia to raise interest rates by 6.5% could not stop the wave, as investors lost confidence in the currency. As oil prices remain low in early 2015, international investors remain concerned about the future of the country.

Failing of oil prices

The Russian economy has always depended on the price of oil and natural gas, as raw materials account for a significant part of the economy. In 2013, the export of crude oil and related products accounted for more than two thirds of the country's total exports and more than half of total government revenue, which means that lower prices could have a huge impact on the economy.

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[18] Russia's Banking Crisis (2015) // The Banker https://internationalbanker.com/banking/russias-banking-crisis/ (Accessed 21 May 2017)

From 2010 to mid-2014, world oil prices were fairly stable and amounted to about 110 dollars per barrel. But since June, prices have more than doubled. Brent crude oil fell for the first time below $ 50 a barrel for the first time since May 2009, and US oil fell below $ 48 per barrel[19].

The reasons for this change are twofold: weak demand in many countries due to bleak economic growth combined with growing production in the US.
As the addition to this is the fact that the oil cartel "OPEC" was not set to reduce production, but to maintain prices in 2015.

On November 30, 2016, the Organization of Petroleum Exporting Countries (OPEC) decided to strengthen oil prices by announcing an agreement to restrain production during the first six months of 2017. The price of WTI oil immediately jumped to $ 8 / Barr. In addition, moved to the range of 50 to 55 US dollars, where he seemed to have stabilized. Speculators have long thought about oil, expecting that the cartel's actions will manifest quickly in records of storage in the US.
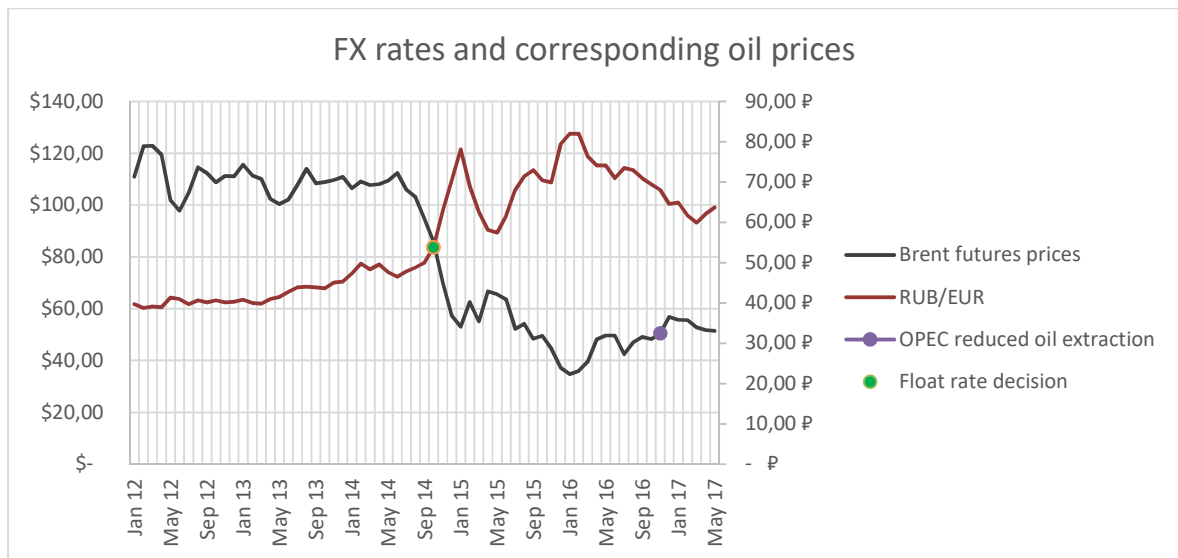
Source: investing.com
Figure 4. FX rate and oil prices (month)

Instead of the stocks of crude oil in the US declining in the first quarter, they increased. The production of shale oil in the United States is growing, but the main reasons for the construction are an increase in imports and processors, which consume less crude oil during the period of

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[19] Fears for Russian rouble as plunging oil price dents markets (2015) // The Guardian https://www.theguardian.com/business/2014/dec/15/fears-russian-rouble-oil-price-markets (Accessed 21 May 2017)

annual maintenance. Most of the US imports in the first quarter were just oil stored on the shelf in tankers moving on land. According to the US Energy Information Administration ("EIA"), US crude oil imports increased by 53,000 barrels per day from eight weeks before OPEC announced its consent for eight weeks after the announcement.

At the end of April, the long position holders were tired of waiting for the reduction in the production of the cartel to tighten the oil market, and they began to close their positions. In commodity traders there is a "mentality of the herd," so the WTI flew from $ 53 / Barr. up to $ 45 / Barr[20].

Political crisis

The second problem of Russian economy is connected with its foreign policy. After the crisis situation with Ukraine in late February 2014, United States and European Union imposed a number of financial sanctions, which made it difficult to attract Russian companies abroad.

These sanctions could get worse in the coming months, as pressure on the country will strengthen control over part of Ukraine. As the possible solution for this situation two years ago was conducted a meeting in Minsk, Belarus, and the so-called Minsk-II agreement was settled to enable Russia meet the requirements of ending foreign sanctions. However, up to current moment not all of the point of the agreement are reached.

In response to the foreign sanctions Russia government run its own strategy of anti-sanctions and also strengthening the so-called foreign agent law. On June 4, 2014, an amendment to the law of "foreign agents" came into force, authorizing the Ministry of Justice to register independent groups as "foreign agents" without their consent if the ministry considers organizations as engaged in "political activities" and if the organization receives foreign funding[21].

Political risk increase uncertainty and stress. The fact that political turmoil is a fact that can strongly affect the exchange rate in the short, medium and long term. The main reason is that it is difficult to assess what will happen in the country with political unrest.

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[20] Fears for Russian rouble as plunging oil price dents markets (2015) // The Guardian
https://www.theguardian.com/business/2014/dec/15/fears-russian-rouble-oil-price-markets (Accessed 21 May 2017)
[21] Government vs. Rights Groups (2017) // The Human Rights Watch, Russia https://www.hrw.org/russia-government-against-rights-groups-battle-chronicle (Accessed 27 May 2017)

He also gives questions about how the economic policy will look in the future. As investors, you probably should pay for such concerns, which can be reflected in the exchange rate and foreign investment in the country.

Political uncertainty makes it difficult to assess assets in the future, as unexpected policy decisions can quickly change the currency's valuation. In such situations, exchange rates tend to be weakened and become more volatile. At the same time, the desire of investors to invest their money in the country falls sharply, because you do not know exactly what policy will be carried out in the future.

As an example of political unrest, we are talking about Venezuela talking about the nationalization of certain assets, and then also did it. In such situations, investors are forced to sell their assets, which is below market prices. The only legitimate buyer is the state. In such situations, many investors avoid, thereby reducing the demand for currency and weakening the exchange rate of the country.

Other examples of political preoccupation are when a country changes its government too often and, therefore, does not agree with their choices. This creates political uncertainty, because you do not know exactly when and how the new government will lead the country.

Approximately in election year there can be political unrest, especially in countries where the results are very uncertain. This, of course, can lead to an unstable exchange rate.

There are also political riots that are global, such as the war in Iraq, Sept. 11, etc. In such cases, smaller currencies tend to be adversely affected, as all investors are looking for strong and stable currencies for investment, and in some cases also Country with strong military force. The reason is that investors believe that such countries provide good asset protection.

Such safe and belligerent strong countries are known as "Safe Heavens". One of the best examples is the United States. You can see that in situations of political unrest, the US dollar tends to increase in value. The Swiss franc is also considered a "safe heaven" not because of its military strength, but because of its neutrality, which in a sense ensures that it will be a neutral and safe haven in political and military disputes in the future.

Other possible causes

As Russian way of running business was admitted to be highly corrupted and was described as crony-capitalism it is clear that some of foreign investors may be afraid of possible unstable situation for their capital. As well as there is noticed displeasure of Russians with the government by enhancing cases of rallies and retaliation from the government by strengthen the control of assembly[22]. According to a Russian law introduced in 2014, a fine or detention of up to 15 days may be given for holding a demonstration without the permission of authorities and prison sentences of up to five years may be given for three breaches. Single-person pickets have resulted in fines and a three-year prison sentence.

Determine particular variables

By focusing on the areas mentioned above, it is possible to look through the history of rubles changes and pick up exact variables or trends, which influenced on the ruble performance. The variables are going to be revised during the past year.

For better result, it is possible to divide these variables into four parts: macro-economic, foreign policy and domestic policy. The duration of the effect was considered to be daily, weekly or monthly. The power of influence was compared with the exchange rate. The map of variables is shown below. The detailed list of variables is given in Appendix 1.
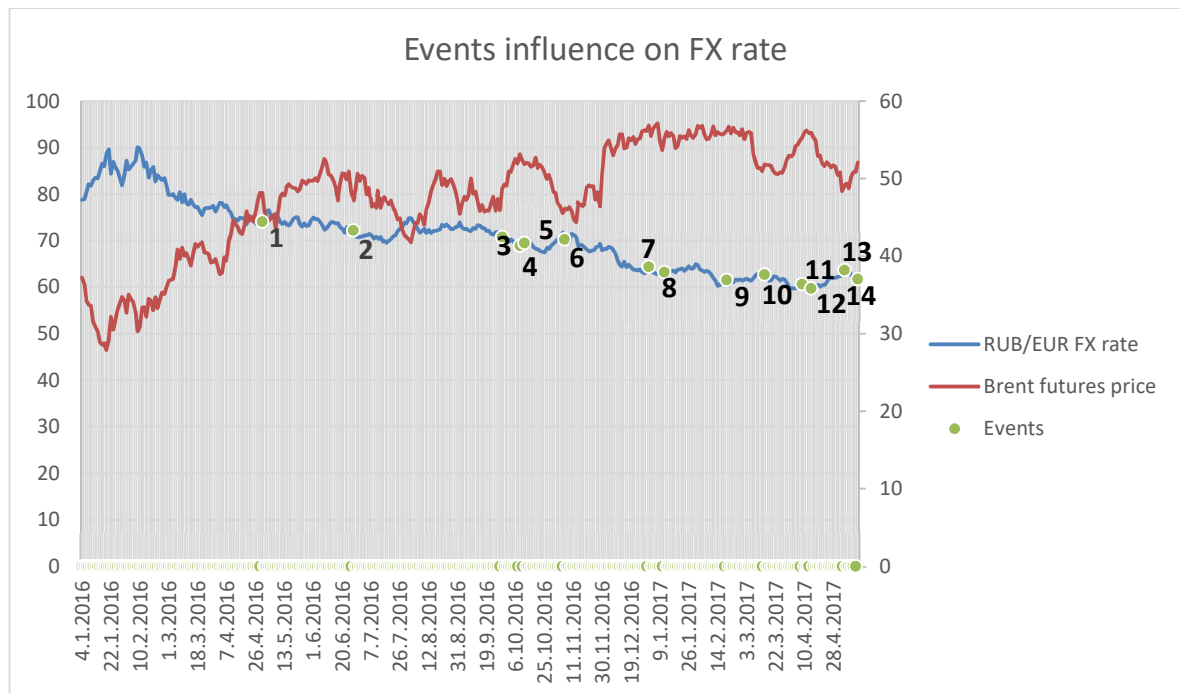
Source: composed by author
Figure 5. Variables influence on FX rate in 2016-2017

[22] Government vs. Rights Groups (2017) // The Human Rights Watch, Russia https://www.hrw.org/russia-government-against-rights-groups-battle-chronicle (Accessed 30 May 2017)

The volatility of the exchange rate in the middle and end of 2016 was connected with firstly hope of oil price stabilization and secondly with the election process in USA. Because of the revision of most influential variables, it is clear that most of them have effect on the oil price and thus, as Russian ruble continue to be oil-dependent country, on Russian currency. Other factors appeared to have only adjusting effects without real changing the trend. The correlation analysis should be conducted to confirm the assumption.

The data for the correlation analysis was obtained from investing.com source for the Brent futures prices and Russian currency. As well it was assumed that the amount of monthly OPEC oil production is important that this data was included in the analysis. The monthly amount oil extraction was obtained from the OPEC official source[23].

Table 2.

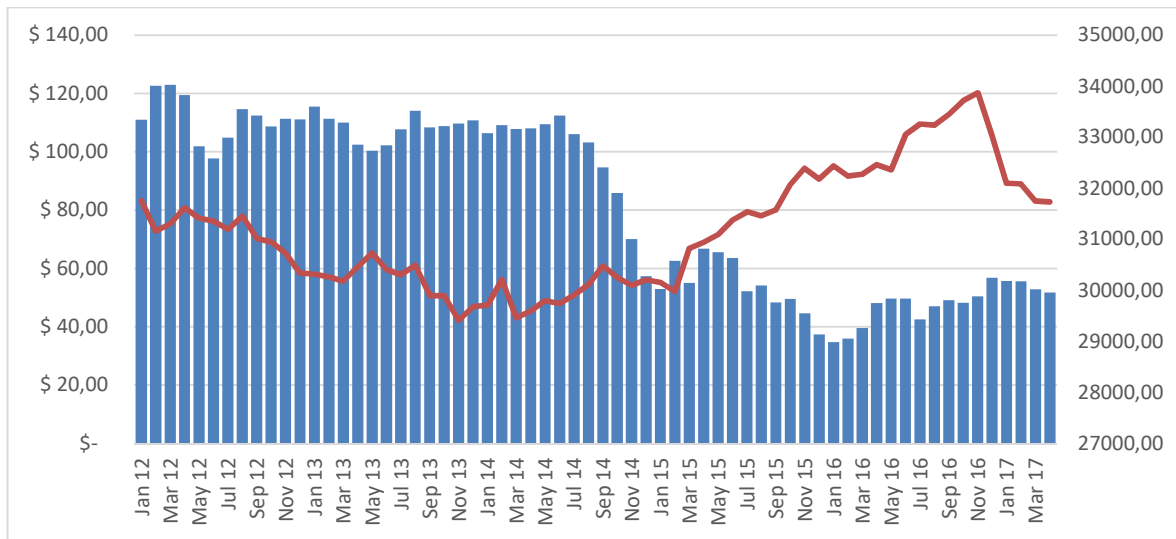**Regression analysis of oil prices and amount extracted**

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,957498
R Square	0,916802
Adjusted R Square	0,916741
Standard Error	4,100792
Observations	1383

ANOVA

	df	SS	MS	F	Significance F
Regression	1	255911	255911	15217,86	0
Residual	1381	23223,58	16,81649		
Total	1382	279134,6			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	92,93276	0,322818	287,8799	0	92,29949	93,56603
Brent oilfutures	-0,45765	0,00371	-123,361	0	-0,46492	-0,45037

Source: composed by author

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[23] Historical Production Data (2017) // OPEC organization http://www.opec.org/opec_web/en/data_graphs/335.htm (Accessed 17 May 2017)

The regression model shows very robust result as R square (0,91), the ratio of how much of the sample follow the correlation regression $FX\ rate = 92{,}93 - 0{,}4576(Brent\ futures)$ and the P-value, the indicator of the possibility of the mistake is equal to zero[24].

Comparing the amount of oil produced and the oil prices it is noticed that there is negative correlation.

Source: opec.org
Figure 6. The oil price comparing to the OPEC oil production amount

However, the regression analysis show quite moderate correlation between changing in amount of oil production and oil future prices.

The R square is a little below 50% and the P-value is very low, which tells that the model can be lean on in future analysis[25].

In the short term, the Organization of Petroleum Exporting Countries (OPEC) has a significant impact on oil prices. In the long term, its ability to influence the price of oil is very limited, primarily because individual countries have different incentives than OPEC in general.

For example, if the OPEC and OPEC countries are not satisfied with the price of oil, it is in their interests to reduce the volumes of oil supplies so that prices rise. However, no single country really wants to cut the offer, as this will mean a reduction in revenues. Ideally, they want the

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[24] Brooks, Chris, Introductory to econometrics for finance. Cambridge, 2013, p.66
[25] Brooks, Chris, Introductory to econometrics for finance. Cambridge, 2013, p.66

price of oil to rise, while they raise their income. This problem often arises, because OPEC undertakes to reduce the supply, which caused an immediate surge in oil prices.

Table 3.

Regression analysis between oil supply and oil market price

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,706542
R Square	0,499201
Adjusted R Square	0,490991
Standard Error	21,13173
Observations	63

ANOVA

	df	SS	MS	F	Significance F
Regression	1	27152,65	27152,65	60,80541	9,8E-11
Residual	61	27239,54	446,5498		
Total	62	54392,18			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	641,9791	71,95598	8,921831	1,16E-12	498,0942	785,864
	-0,018	0,002308	-7,79778	9,8E-11	-0,02261	-0,01338

Source: composed by author

However, over time, the price migrates lower, because the offer does not weaken. In the end, the forces of supply and demand determine the equilibrium price. OPEC announcements can temporarily affect the price, changing expectations. In recent years, OPEC's share in world oil production has declined, especially in the production of new products from the US and Canada.

Oil prices on average for the period from 2007 to 2014 were more than $ 100 per barrel due to geopolitical tensions, increased demand and tight supply. This increased price for oil has created tremendous incentives for innovation in new production technologies, which led to oil production and more efficient drilling methods. As a result, the excess supply led to the collapse of crude oil, which led to a decrease in prices by 40-50 dollars per barrel.

This led to the emergence of new supplies that are not related to OPEC, which weakened OPEC's ability to influence oil prices, which caused an excessive supply and a subsequent drop in prices to $ 37 per barrel.

3.1.4 The Commerzbank revenue analysis

The data for revenue was obtained from Commerzbank source and by the ask of managers was depersonalized and rounded. As soon as the revenue information was only available for year-time period, the calculation of robustness should be considered as non-comprehensive.The number of Commerzbank clients during three years were adjusted to one figure according to the clients who presented in 2014, 2015 and 2016. Then they were divided by sectors of economy they have their business. As in general the amount of clients of the bank did not change (only + 4% in 2015 and + 5% in 2016) this deduction of the new companies did not influence on the calculations much.

Table 4.

Allocation of Commerzbank revenue

	2014	2015	2016
Operation income (thousands rub)	239119	207953	297684
Foreign exchange rate (31.12)	72,337	80,673	64,3
Industry (Share of revenue)			
Energy supply	15,89 %	14,63 %	16,82 %
Technology	11,21 %	12,20 %	11,21 %
Transport/Tourism	8,41 %	11,38 %	10,28 %
Wholesale	11,21 %	9,76 %	9,35 %
Metals	10,28 %	8,94 %	9,35 %
Chemical/Plastics	9,35 %	8,94 %	8,41 %
Mechanical engineering	11,21 %	8,13 %	6,54 %
Service/Media	5,61 %	8,13 %	6,54 %
Automative	4,67 %	7,32 %	8,41 %
Healthcare	3,74 %	5,69 %	4,67 %
Construction	2,80 %	2,44 %	4,67 %
Other	5,61 %	2,44 %	3,74 %

Source: composed by author

The information for the revenue was compared to the financial statements posted in Central Bank of Russia[26]. The result of this ranging is performed in Table 4. Allocation of Commerzbank revenue:

It is interesting to conduct an analysis of the change in the revenue during the change in oil prices and exchange rate. As soon as the regression between them both appeared to be very high, it is acceptable to take of them. For the next calculations the oil futures prices are going to be used.

The analysis obtained shows that there is very weak correlation between oil prices and revenue, which was obtained by groups of clients. In case even if the R square is high enough the P-value shows that the result's mistake may appear with very high percent probability.

3.1.5 Commerzbank risk appetite assessment

As the commercial organization the chosen bank has its revenue plan ratios and the deviation of fact revenue can be vulnerable for the company. That is why as one of the instrument of risk monitoring it is necessary to include the limits losses which management team may accept.

Cash-Flow-at-Risk (CFaR) measures, with a given probability, the unfavourable move of the cash flow value over a specific time period.

CFaR in terms of currencies relates to the currency risk on already fixed payments with the worst-case scenario being the least favourable movements in the portfolio currencies. The worst-case scenario is determined with a 95% probability. Statistically the cash flow will in 1 out of 20 instances reach a level below that of the worst-case scenario, corresponding to a 5% probability.

The strengths of CFaR are that the currency risk on payments is quantified and that the risk varying with the payment date is taken into account. Moreover, the portfolio as a whole is taken into consideration as are correlations between currencies.

The calculations are based on historical data (volatility), which may change over time, thus affecting the current risk simulation. For each payment 10,000 cash flow simulations based on

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[26] Disclosure of Commerzbank Eurazija AO (2017) // The Central Bank of the Russian Federation https://www.cbr.ru/credit/coinfo.asp?id=450037016 (Accessed 30 May 2017)

the spot rate, volatility and correlation are performed. The results of the 10,000 simulations generate a probability distribution on the basis of which CFaR is determined.

The real management codex concerning the risk appetite is hidden from outer analysis. However according to the Annual reports of Commerzbank GMbH and Deutsche Bank it is assumed that in average the risk appetite in commercial banks include standard thresholds for. Risk appetite expresses the level of risk that we are willing to accept as part of our risk appetite to achieve our business goals, as defined by a set of minimum quantitative indicators and quality standards. Risk capacity is defined as the maximum level of risk that we can take in both normal and problematic situations, before breaking regulatory restrictions and our obligations to stakeholders.

Risk appetite is an integral part of our business planning processes in accordance with our Risk and Capital Risk Plan, which aims to promote proper coordination of risks, capital investments and performance indicators, while at the same time taking into account the risk appetite and appetite limitations Financial, and non-financial risks. We use the process of stress testing to verify that the plan is also in a tight market. Appetite with the least risk serves as a limit for taking risks for planning from the bottom up from business functions.

The Board reviews and approves our appetite and risk potential on an annual basis or more often in the event of unforeseen changes in the risk environment in order to ensure that they are consistent with our group's strategy, business and regulatory environment and stakeholders' requirements.

To determine our appetite and potential for risk, we set triggers and group-level thresholds on a prospective basis and determine the requirements for escalation for further action. We assign risk indicators that are sensitive to the material risks that we are exposed to and that can function as key indicators of financial health. In addition, we will contact our risk management and management recovery system with a risk appetite framework. In detail, we assess the set of indicators under stress (CRR / CRD 4), the fully loaded common equity ratio of level 1 (CET 1), the internal capital adequacy ratio ("ICA") and the net liquidity position ("SNLP")) Tests and more severe stress tests for the whole group and compare them with the Red-Amber-Green ("RAG") levels, as defined in the table below.

Table 5.

Risk appetite thresholds

Level	Unpredictable losses (%)	Unpredictable losses (€)
Crisis	>8,5%	>5 bln
Critical	8,5 – 5%	5 bln – 0 bln
Normal	<5%	0 bln

Source: Commerzbank GMBH Annual Report 2016

Reports relating to our risk profile, compared to our appetite and risk strategy and our monitoring, are regularly submitted to the Board. Throughout 2015, our actual risk profile remained at a normal level, as defined in the table above. In the event that our desired risk appetite is violated in normal or stressful scenarios, a predetermined escalation management matrix is applied so that these violations are allocated to the relevant committees and, ultimately, the Chief Risk Manager and the Management Board.

Amendments to appetite and risk appetite should be approved by the Chief Risk Officer or the full Board depending on their significance. In November 2015, as part of our annual program of calving the appetite risk thresholds, we adjusted our normal and crisis level CRR / CRD 4 of the fully loaded CET 1 ratio to> 10% and <7.25% respectively. In addition, we upgraded the key indicators, including the liquidity ratio (LCR) and the leverage ratio (LR) with the normal level and risk level of LCR set at> 105% and <100%, and LR (CRR / CRD 4 level fully loaded) In> 3.2% and <3.1% respectively. All these changes come into force on January 1, 2016[27].

To sum up**,** the obtained data in this chapter is going to be used in the third chapter for the creation the hedging model. It is clear now that currency exchange rate is highly dependent on the futures oil price as Russian economy is still resource-orientated. However, the three year revenue data shows that there probably was not any connection with the change of structure in revenue by industries. The first point is that probably the increase in observation can smooth the analysis outcome. The second conclusion which can be made is that probably the structure of client's revenue just do not have any strong relation with the oil prices and thus exchange rate. The next researches can possibly find out the decision for this problem

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[27] Commerzbank GMBH Annual Report 2016

3.2 Creating a hedging strategy

The real exchange rate should be able to forecast by using described above techniques. The multivariative analysis should show in which proportion described above International Fisher Effect, Purchasing Power Parity and change in oil price together picture the change in exchange rate.

3.2.1 Specific of Commerzbank risk

The data was obtained for monthly inflation and interest rate for both Russian Federation and European Union for 4 year time period and shown in the Attachment 3 as the change comparing to the previous month.

Foreign exchange rate fluctuations affect banks both directly and indirectly. The direct effect comes from banks' holdings of assets (or liabilities) with net payment streams denominated in a foreign currency. Foreign exchange rate fluctuations alter the domestic currency values of such assets. This explicit source of foreign exchange risk is the easiest to identify, and it is the most easily hedged.

The indirect sources of risk are more subtle but just as important. A bank without foreign assets or liabilities can be exposed to currency risk because the exchange rate can affect the profitability of its domestic banking operations.

For example, consider the value of a bank's loan to a U.S. exporter. An appreciation of the dollar might make it more difficult for the U.S. exporter to compete against foreign firms. If the appreciation thereby diminishes the exporter's profitability, it also diminishes the probability of timely loan repayment and, correspondingly, the profitability of the bank. In this case, the bank is exposed to foreign exchange risk: a stronger dollar decreases its profitability. In essence, the bank is "short" dollars against foreign currency. Any time the value of the exchange rate is linked to foreign competition, to the demand for loans, or to other aspects of banking conditions, it will affect even "domestic" banks.

Foreign exchange risk also may be linked to other types of market risk, such as interest rate risk. Interest rates and exchange rates often move simultaneously. So, a bank's interest rate position indirectly affects its overall foreign exchange exposure. The foreign exchange rate sensitivity of a bank with an open interest rate position typically will differ from that of a bank with no interest rate exposure, even if the two banks have the same actual holdings of assets denominated in

foreign currencies. Again, the vulnerability of the bank as a whole to foreign exchange fluctuations depends on more than just its holdings of foreign exchange.

Measures of foreign exchange risk

The direct sources of foreign exchange risk can be gauged by tallying up the net positions on a bank's assets and liabilities that are denominated in foreign currencies. By itself, this gauge of direct exposure can provide only a narrow assessment of the bank's exchange rate sensitivity since — as described above — the value of the bank's domestic assets also will vary with the exchange rate. Narrow as it is, this gauge provides the "standardized method" for assessing a bank's overall foreign exchange exposure; specifically, under the aegis of the Basel Committee on Banking Supervision, central bankers from Europe, Japan, and North America proposed in 1993 the use of such methods in assessing the exposure to a variety of market risks, including foreign exchange risk.

The example of the bank's loan to the exporter shows the limitations of the narrow, standardized method most clearly. While the exporter's loan by itself leaves the bank short in dollars, the standardized method captures none of this indirect exposure. Further, if the bank were to use the foreign currency market to hedge the short dollar position, then the standardized method, having missed the original exposure, would mistakenly treat the hedge as if it added to exposure. In general, if a bank chooses its foreign exchange holdings to offset open positions arising from its other activities, then its holdings serve to reduce its overall foreign exchange risk. Under such circumstances, treating the bank's foreign exchange holdings as though they contribute to risk — as the standardized approach does — is inappropriate.

Responding in part to such limitations, the Basle Committee ultimately allowed for a more flexible approach to evaluating foreign exchange and other market risks (Basle Committee 1996). By 1997, bank regulators in all of the represented countries may choose to assess exposure (against which they must hold a cushion of capital) either by using the standardized method or by using banks' own proprietary in-house models. Use of the latter option, known as the "internal models" approach, is subject to several requirements for prudence, transparency and consistency. When used appropriately, it can provide a significant improvement over the standardized method.

The internal models approach enables banks to take a broader view of their foreign exchange risk than does the standardized method. As described in the Basle Committee's "Amendment to the

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Capital Accord to Incorporate Market Risks," released in January of this year, the internal models approach focuses on evaluating the risks arising from banks' trading activities. The approach is well-suited to incorporating the correlation between, say, the value of interest rate instruments and the value of foreign exchange. In principle, the internal models approach allows each bank to gauge its exposure carefully enough to incorporate the relationships among even its non-trading operations. However, even at its best, the internal models approach is limited in its range of coverage.

An even broader approach to assessing banks' foreign exchange risks can be obtained from an analysis of banks' equity returns. Equity returns reflect changes in the value of the firm as a whole. So, if the value of a bank as a whole is sensitive to changes in the exchange rate, the bank's equity returns will mirror that sensitivity. Whether from direct or indirect sources, foreign exchange exposure will be reflected in the behavior of returns. Thus, the exchange rate sensitivity of a bank's equity returns provides a comprehensive measure of its foreign exchange exposure.

One drawback of this equity approach is that it is not useful for evaluating the riskiness of a particular action. The approach is not linked to an explicit model of the determinants of foreign exchange exposure, so it cannot be used to trace out the implications of specific decisions. However, the approach is useful for bankers and regulators as a tool to evaluate the success of past management of foreign exchange risk. It is especially suitable for comparing the exposure of an assortment of banks because it can be applied consistently across banks and because it does not require access to their detailed internal models. Moreover, its comprehensiveness makes it a good benchmark for evaluating other gauges of exposure.

Table 6.

Multivariative regression results

Regression statistics					
Multiple R	0,7382				
R Square	0,54494				
Adjusted R Square	0,509935				
Standard Error	0,042106				
Observations	43				

ANOVA					
	df	SS	MS	F	F significance
Regression	3	0,082799	0,0276	15,56766	8,22E-07
Residual	39	0,069143	0,001773		
Total	42	0,151942			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0,070268	0,059626	1,178474	0,245748	-0,05034	0,190873
Oil change	-0,34654	0,074507	-4,65116	3,74E-05	-0,49725	-0,19584
Interest rate change	-0,02164	0,042978	-0,50343	0,617496	-0,10857	0,065295
Inflation rate change	-0,05418	0,020769	-2,60895	0,012811	-0,09619	-0,01218

Source: composed by author

Obtained coefficients are going to be implemented in the hedging model. Currency risk arises when a bank owns assets or liabilities in a foreign currency and affects the income and capital of the bank due to fluctuations in the Exchange rates. No one can predict what course will be in the next Period, it can move in the up or down direction no matter what Estimates and forecasts. This uncertain movement creates a threat to the the profit and capital of the bank, if such movement is undesirable and Unforeseen direction. Currency risk can be either transactional or broadcast. When the exchange rate adversely changes, it causes Transaction risk, because the name is implied by transactions in foreign currencies, it can be hedged Using different methods. Another transfer risk is the risk of accounting the arising from the transfer of assets that are in foreign currency or abroad.

Commercial banks are actively engaged in currency transactions with assets and Liabilities in foreign currency are constantly exposed to foreign Exchange risk. Currency risk The commercial bank proceeds from its Very trade and non-trading services. Foreign exchange trading (Saunders & Cornett 2003) includes:

1. Purchase and sale of foreign currency, allowing customers to participate and to carry out international commercial transactions

2. Purchase and sale of foreign currency, allowing customers (or the financial institution) to hold positions in foreign real and financial attachments

3. Purchase and sale of foreign currency for hedging purposes for compensation customer in any currency

4. To buy and sell foreign currency for speculative purposes on forecasting or expecting future fluctuations in the exchange rate of foreign currency.

The above-mentioned commercial activities do not provide commercial banks Currency risk as a result of all of the above. Commercial Bank is exposed to currency risk only in that degree in which it did not hedge or he closed his position. Wherever there is any uncertainty about the future of the exchange the rates will affect the value of financial instruments, there is a currency the risk of a commercial bank. Currency risk does not lie where the future the exchange rate is predetermined with the use of the bank of various instruments and instruments.

3.2.2 Vensim software

Vensim is modeling software developed by Ventana Systems. It primarily supports continuous modeling (system dynamics), with some capabilities of a discrete event and agents. It is available commercially and is a free "Personal Training Release".

Vensim is used for developing, analyzing, and packaging dynamic feedback models. We emphasize:

1. High quality, with dimensional consistency and Reality Check
2. Connections to data and sophisticated calibration methods
3. Instant output with continuous simulation in SyntheSim
4. Flexible model publication
5. Model analysis, including optimization and Monte Carlo simulation

Vensim's optimizer provides fast calibration of models and discovery of optimal solutions.

Model Calibration

Validation of the integrity of a model rests in part on comparing model behavior to time series data collected in the "real world." When a model is structurally complete and simulates properly, calibration of the model can proceed to fit the model to this observed data. Dynamic models are often very sensitive to the values of constant parameters. If you want to calibrate your parameters so the model behavior matches observed data, you may need to experiment with thousands of combinations of different parameter values. Vensim calibration makes this procedure automatic. You specify which data series you want to fit and which parameters you want to adjust, then Vensim automatically adjust parameters to get the best match between model behavior and the data. There are no limits on the numbers of parameters to adjust or data series to fit.

Policy Optimization

Vensim's optimizing engine can search through a large space of parameter values looking for optimal solutions. You define the payoff variables you want to adjust. An efficient Powell hill climbing algorithm searches through the parameter space looking for the largest cumulative payoff. There are no limits on the numbers of payoff variables or policy parameters to search over. Advanced sensitivity analysis is available from optimization simulations.

Causal Tracing enables fast and accurate analysis of model dynamics

During construction of a model and while analyzing an existing model, it is useful to discover what things are causing other things to change. Looking in one direction, you can discover which variables cause a particular variable to change. Looking in the other direction, you can discover which variables are changed (or used) by a particular variable. The variable under study is called the "workbench variable."
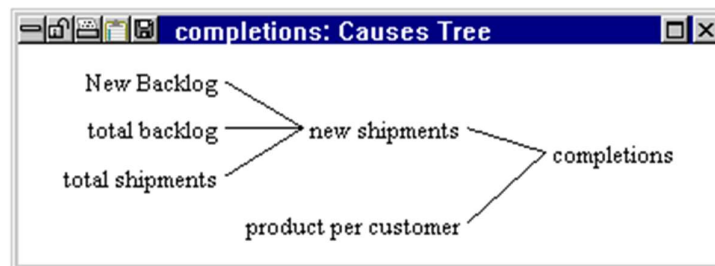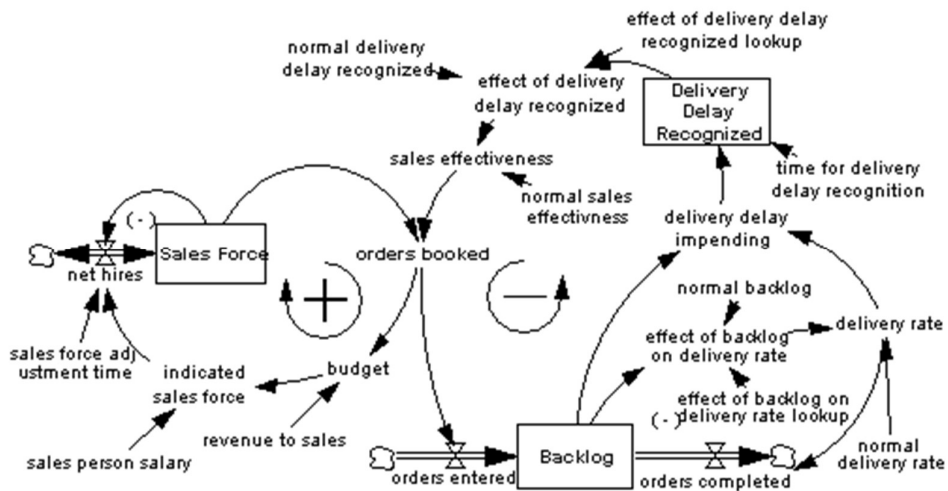

Source: Vensim website
Figure 7. Tree diagram

The Tree Diagram analysis tool creates output windows showing a tree of causes branching off the workbench variable. The Causes Tree Diagram shows the causes of a variable; the Uses Tree Diagram shows the uses of a variable. Tree Diagrams show causes and uses up to two variables distant (the default setting). You can continue to trace the causes (or uses) of a variable throughout a model by selecting a new workbench variable to trace (such as net hires in the diagram above) and again clicking on the Causes Tree analysis tool.
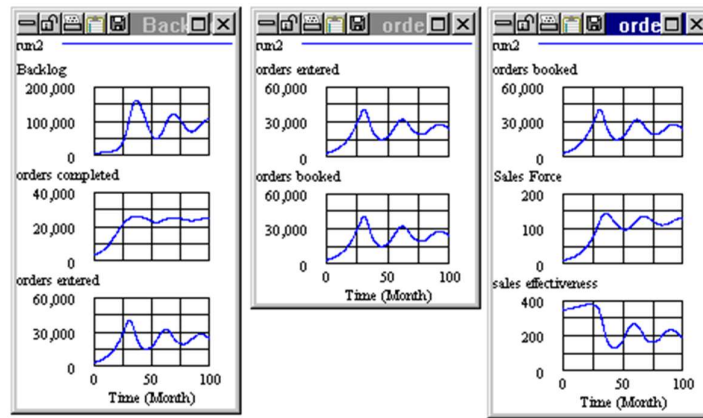
Tracing Behavior

Model behavior can be difficult to analyze quickly, especially when trying to discover exactly which variables and feedback loops are contributing certain components of behavior to a particular variable. Consider the model below. The model contains a number of interacting feedback loops which produce oscillating behavior for the variable Backlog. Why is Backlog oscillating?

Source: Vensim website
**Figure 8. Tracing example**

First, Backlog is selected as the workbench variable. Next, the Causes Strip graph analysis tool is clicked producing the first strip graph in the set below.

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Source: Vensim website
Figure 9. Tracing loops

Note how the two variables that cause Backlog to change have somewhat different behaviors. Orders completed increases then gently oscillates, while orders entered grows and oscillates dramatically. Orders entered is playing the major part in causing Backlog to oscillate. Let us examine why orders entered oscillates.

Selecting orders entered as the workbench variable, we create a Causes Strip graph and discover that the only variable causing orders entered is orders booked. Selecting orders booked as the workbench variable, we create a Causes Strip graph and discover that two variables cause orders booked: Sales Force and sales effectiveness. Sales Force is oscillating gently, while sales effectiveness is oscillating with greater amplitude.
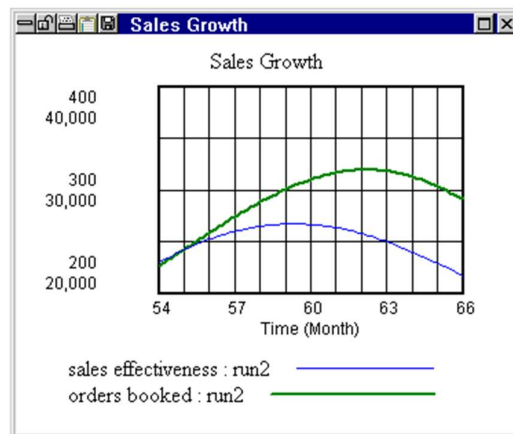
Source: Vensim website
**Figure 10. Positive (dominate) feedback loop**

If you carefully examine the timing of the oscillations, you see that the peaks (or troughs) in sales effectiveness occurs before the peaks (or troughs) in orders booked (or Sales Force). This tells us that the oscillations in the feedback loop containing sales effectiveness are driving the

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oscillations in the variables in the other feedback loop. Actually, because of potentially large phase shifts, it is the first peak in sales effectiveness (and the negative feedback loop) that should be compared to the first peak in orders booked (and Sales Force) (which you can see on the set of causes strip graphs above).

Looking at the causal loop diagram above, we see that the two major feedback loops converge at the variable orders booked, and it is the negative feedback loop through sales effectiveness that creates the major oscillations which are carried over into the positive feedback loop through Sales Force.

How does the model works

The Model Reader appears similar to Venism PLE but contains no sketch tools or ability to change or save the model. The Model Reader does contain a Game interface to allow models with games to simulate properly.
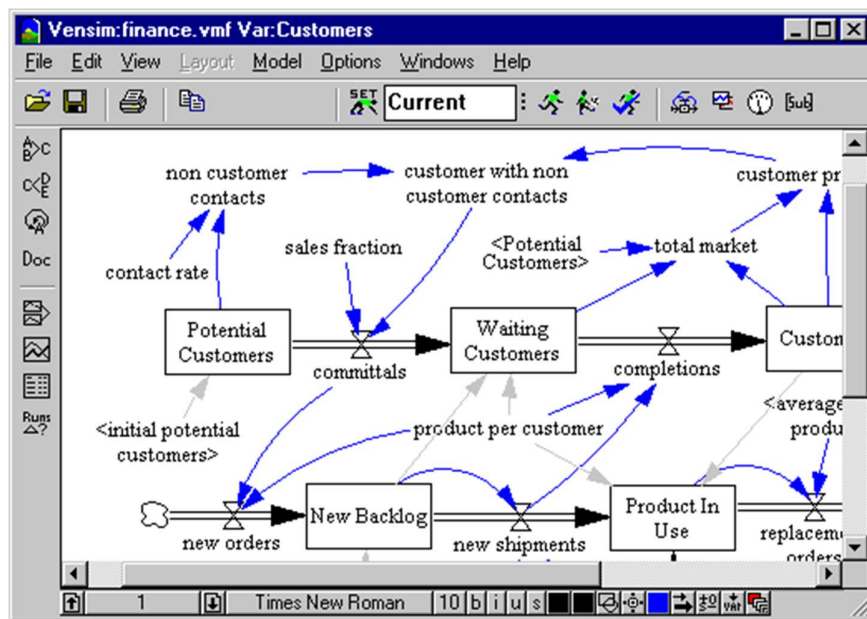
Source: Vensim website
Figure 11. Example of Vensim model

3.2.3 Designing the hedging model

Modeling and Simulating (M & S) refers to the use of models - the mathematical or other logical representation of a system or process - as a basis for modeling - methods for implementing a model (statically or over time) - Develop data as Basis for making managerial or technical decisions. M & S supports analysis, experimentation and training. Thus, M & S can make it easier to understand the behavior of the system without actually testing the system in the real

world. For example, to determine which type of spoiler will improve traction, when designing a race car, computer-based car modeling can be used to assess the effect of different spoiler shapes on the friction coefficient in a turn. Useful information about various solutions in the design could be obtained without actually creating a car. In addition, simulation can support experiments that occur entirely in software or in a man-in-the-loop environment, where simulation is a system or generates the data necessary to achieve the objectives of the experiment. In addition, the simulation can be used to train people using a virtual environment, which otherwise would be difficult or expensive to produce.

In the Vensim Software the model was created considering all mentioned above and shown at the picture Figure 11. Vensim simulation model.

The model than was tested for robustness and run a simulation. The robustness showed quite small deviation in the 1 year time period. However, the longer the considering period, the higher the allocation of confidence level.

Simulation showed that by the end of the year the spot price of RUB/EUR pair was 73,81, meaning that comparing to current moment ruble will depreciate.
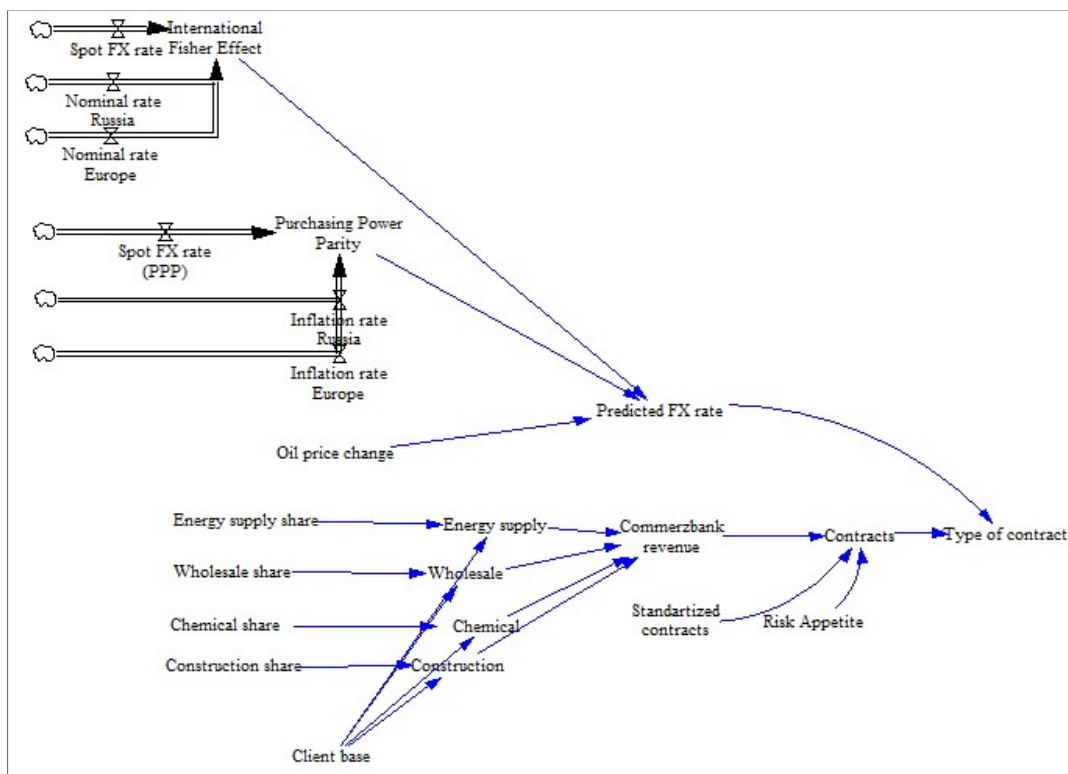
Source: Vensim simulation model, composed by author
Figure 22. Vensim model for hedging

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The model was based according to the chosen free factors: interest rate difference, inflation rate difference in Euro zone and dynamics in changing the prices for oil futures. The forecasted rate was then used as the measure of:

1. If there is a necessity of hedging
2. How exactly the hedging model should be build

The dependence of the revenue and the allocation of client base was also mentioned in the model: it should be noticed that during the time considering in the Table 5 results of correlation would continue to be stable. For the most significant client areas were chosen Energy supply, Wholesale, Chemical and Construction engineering companies as they have good ratio of revenue and R square correlation. These four sectors of clients generate the cash-flow for the company in the model and considered to be hedged.

3.2.4 Testing the hedging model

Foreign currency hedging (also referred to as a FOREX hedge) is a method used by companies to eliminate or "hedge" their currency risk as a result of foreign currency transactions (see Derivative Currency). This is done using a cash flow hedge or a fair value method. Accounting rules for this are considered both International Financial Reporting Standards (IFRS) and generally accepted accounting principles of the United States (US GAAP), as well as other national accounting standards.

A currency hedge transfers currency risk from a trading or investment company to a business that carries a risk, for example, in a bank. For the company, there is a cost to create a hedge. Creating a hedge, the company also does not receive any profit, if the movement at the exchange rate will be beneficial to it.
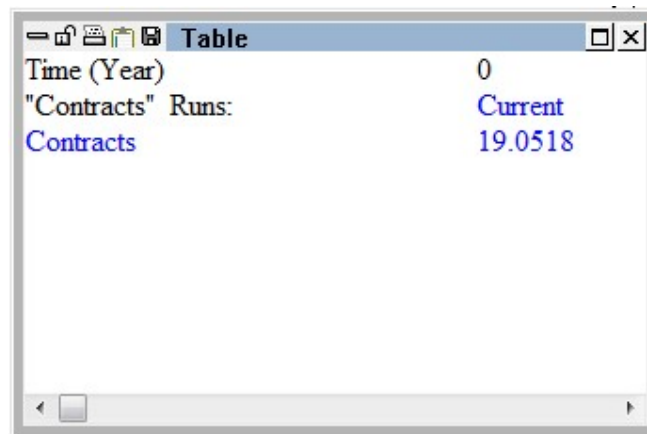
When companies conduct business across borders, they must deal in foreign currencies. Companies must exchange foreign currencies for home currencies when dealing with receivables, and vice versa for payables. This is done at the current exchange rate between the two countries. Foreign exchange risk is the risk that the exchange rate will change unfavorably before payment is made or received in the currency.

A hedge is a type of derivative, or a financial instrument, that derives its value from an underlying asset. Hedging is a way for a company to minimize or eliminate foreign exchange risk. Two common hedges are forward contracts and options. A forward contract will lock in an

exchange rate today at which the currency transaction will occur at the future date. An option sets an exchange rate at which the company may choose to exchange currencies. If the current exchange rate is more favorable, then the company will not exercise this option.

The main difference between the hedge methods is who derives the benefit of a favorable movement in the exchange rate. With a forward contract the other party derives the benefit, while with an option the company retains the benefit by choosing not to exercise the option if the exchange rate moves in its favor.

According to the model, the number of contract depend on the amount of revenue the four sectors of clients bring to the company in 2017. This amount should be divided by number of standardized contracts for EUR/RUB contracts on the Moscow Exchange. The predicted FX rate is used as the limit for the contract.

Source: Vensim modeling results, composed by author
Figure 33. Number of contracts according to the inputs

Future contracts are also agreements between two parties in which the buyer agrees to buy the underlying asset from the other party (the seller). Delivery of the asset occurs later, but the price is determined at the time of purchase.

1. The conditions are standardized. Trade is carried out on official exchange, in which the exchange provides a place for participation in these transactions and establishes a mechanism for the parties to trade in these contracts.
2. There is no default risk, because the exchange acts as a counterparty, guaranteeing delivery and payment using the clearing house.

3. The information center protects itself from default by requiring its counterparties to pay off profits and losses or to note that they sell their positions on a daily basis. Futures are very standardized, have deep liquidity in their markets and are traded on the stock exchange.
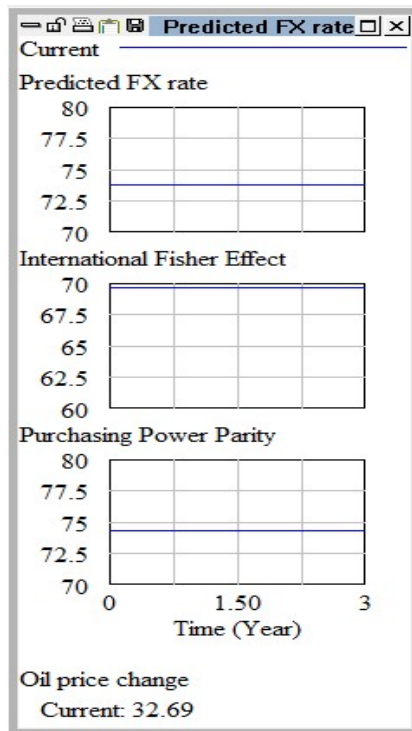
Source: Vensim modeling result, composed by author
Figure 44. FX rate causes factors

The FX rate prediction was based on mentioned above factors. The Pic.13 shows the particular result of each of factors which influenced on the resulting 73,81 exchange rate. According to the Tab. 7 the coefficient of the multivariative analysis were used as weights for obtaining the future exchange rate.

The hedging model advice to buy 19 contracts (rounding to 20), for euro futures for meeting the 8,5% Risk Appetite threshold (Critical level of losses). By using this recommendation, it is theoretically assumed that Commerzbank would safe potential (73,81-65,245)*125000*20 = 21412 thousands rubles. Considering that it is only 7,2% of 2016 revenue, if the forecast was not correct, the loss is going to be in the limits of risk appetite.
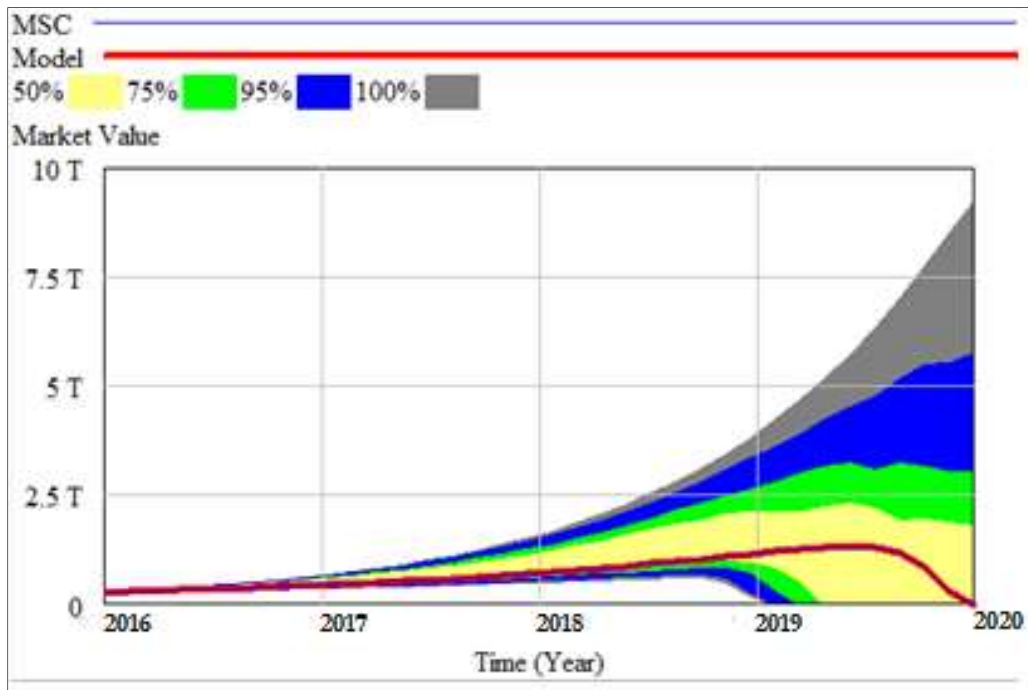
Source: Vensim simulating result, composed by author
Figure 55. Monte-Carlo Simulation

As the management team consider to contribute changes in the model every day, the accuracy would be more and more high and the prediction model can perform better result.

3.2.5 Not included factors

Of course, there could be mentioned other factors, which could possibly affect on the exchange rate. Some authors consider changes in gas, gold MICEX Index (capitalization weight composite index calculated based on price of Russian of the 50 most liquid stocks of the largest and dynamically developing issuers presented on the Moscow Exchange).

The idea behind using natural gas as the measure of the Russian currency change is similar to the idea of oil prices – in 2014 crude oil, oil products and gas (including liquefied natural gas) represented 68 percent of total export revenues.

In the case of gold, if the price is increasing, gold becomes more attractive for investors, therefore they should get rid of the rubble (not only the ruble, it should be valid for all currencies) in order to purchase gold and other valuable metals thus causing rubble depreciation.

Another potential factor behind the change in value of the ruble is stosk market development, which reflects the market mood. The relationship between the exchange rate and stock market development has been examined in Śmiech & Papiez (2013). Rise in the stock market should

attract foreign capital and cause appreciation of ruble. But there can exist another effect working from the other side – rise in the stock market makes stocks more attractive, therefore domestic investors are buying stocks in exchange for money and this money is flooding the money and foreign exchange market and making the ruble fall.

The last factor taken into consideration is USD exchange rate. From the basic theory of international finance comes the following statement – when one currency is appreciating, the other should express depreciating tendencies. If we apply this contemplation to our situation, when the USD is appreciating, the ruble should depreciate and vice versa.

However, the aim of this research work was to create simple instrument which can be easily managed by financial managers. Such a big amount of data could be firstly difficult to use and secondly could mislead to false result. The simplest the model, the less it is possible to make a mistake and more easy it is to follow.

4 CONCLUSION

All economists interested in global economic and financial variables must have detected current turbulence in the Russian economy. There is no doubt that one of the main sources of this economic downturn is Russian currency depreciation. In the presented research, possible factors behind the current ruble depreciation were investigated.

4.1 Answer to the research question

After brief theoretical insight into this issue, data and the methodology used in subsequent analysis were introduced. Several facts have been found in the empirical part of the research.

1. Defining the most influential variables effecting on the currency exchange rate

According to the findings, oil price, inflation rate and interest rate both European and Russian are strongly correlated with the ruble exchange rate.

2. Finding the effect of these variables on the FX rate

Each of mentioned above factors according to the multifactor analysis have negative correlation with Russian currency exchange rate. It is in compliance with the theoretical assumption – that the ruble is depreciating if oil price is going down or if interest rates and inflation drops. Russian interest rates are also strongly positively correlated with value of ruble, which indicates that unnatural increase in interest rate intensifies investor's mistrust of ruble. An increase in a stock index value leads to depreciation of the ruble on the grounds of rising interest in stocks, which leads to formation of money excess on the markets.

3. Creating strategy of hedging

To sum up, the created model possibly can perform a good forecasting result. The predicted value does not change much from the future prices on the market, which tells that at least the model is adequate and maybe mistakes, but not much. The two main parameters: foreign exchange rate and the bank's revenue should be adjusted everytime time when such inputs as: oil future prices, interest rates and nominal inflation rates changes. As figures were obtained by using statistics based on the past data, this database should always be renewed by new values and thus adjusting the final ratios

4. Testing model by using System Dynamics software

Monte-Carlo simulation showed that if the current inputs continue to be stable with only 5% of volatility, the deviation of the model would exceed 2,5 times only at the middle of 2018. After

this period the deviation would exceed this first threshold and acquire chaotic pace. That means that even though the model could be robust in the first two and a half of year, the further application requires high attention.

Considering the model by itself, as the Vensim software is free to download and the fact, that there were not required any special knowledge for building it, it is assumed that it is not difficult to implement this model for any computer and any corporation. Together with the financial managers the result will be improved.

4.2 Recommendations
The recommendations for the international commercial bank are the following:

1. Implement the observed hedging strategy and consider it while the financial decision making process is developed
2. Always be aware about the change in macroeconomic factors which can effect on the currency exchange rate and timely adjust inputs for the model
3. Do not include any other factors in the model. This may seems very presumptuously, however the simple logic is that this model is based on particular factors and the relationship between each of them could be different if a person include even one more variable

The positive part of the model is that the software used in the research work is free to install and thus can be introduced in any business. The relations which were performed in the model are simple and evident which even makes it easy to transform into other software platforms which particular enterprise use. For example, the easiest way is to create the same model by using Excel software, which is build by default in any of personal computers in corporations.

4.3 Future research directions and observed limitations of the research
The aims of the Master Thesis were obtained by this research work. The limitations however should not be neglected: the model does not operate with political risks and other macroeconomical factors. The only robust correlation was noticed only between currency exchange rate and oil future prices. That is not enough and requires further development.

The practical relevance of performed work actually can be promoted even further than by using this model only in banks. The mechanism of forecasting foreign exchange rate can be implemented in different international organizations whether it is bank, FMCG company, energy producing or any other multinational corporation. The problem of currency fluctuation arise in

any business which deals with international transactions and has risks of depreciation of one of the currency it has its cash-flows.

Thesis limitation was to understand how to implement the hedging model only to a particular multinational bank. The currency pair to be considered was EUR/RUB only. The model was based on the three years revenue changes of the bank. Thus the future research can illuminate this gap by providing more complicated analysis including more factors and using more efficient tools.

There were neglected a lot of factors which take place in Russian Federation. Most of them can be determined as political. For the international investors the instability of Russian legislation and the system of business regulation threatens them and this creates fluctuations of currency exchange rate in a short run when some event happens. These factors of course should not be neglected, however it is very difficult to evaluate it. Using mathematical models can describe these variables as errors in the equations. For example, the next most valuable variables, which may effect on the ruble positions are presidential elections 2018 and suspicions of Russian trace in elections in other countries in 2017. As well, the macropolitical changes may have an effect on Russian currency. In China would reject Russian supply of oil Russian economy would lose very strong partner in the future.

To summarize the research achieved the stated aims and tasks. The hypothesis was proved and the main research issue – to develop the hedging strategy based on using derivatives instruments to reduce negative factors of currency fluctuations, was accomplished. Main assumption that there is correlation between currency fluctuations and market variables and this correlation will continue to be stable considered to be reliable and future researches can develop the model and bring some new positive contribution.

References

1. Efimova, K. 2013. Финансовый менеджмент. Moscow: Urait

2. Limitovskij M. & Lobanova E. 2016. Корпоративный финансовый менеджмент. Moscow: Urait

3. John K. 2015. Опционы, фьючерсы и производные финансовые инструменты. Moscow: Alpina Publisher

4. Madura J & Fox R. 2011. International Financial Management. 11th edition. London: Cengage Learning

5. Ross S & Westerfield R. 2016. Corporate finance. 8th edition:New York: McGraw-Hill Education

6. Copeland & Weston. 2005. Financial Theory and Corporate Policy. 4th edition. California: Pearson Addison Wesley

7. Myers S & Brealey R. 2007. Principles of Corporate finance. 9th edition. New York: McGraw-Hill

8. Sterman J. 2000. Business Dynamics – System thinking and Modeling for a Complex world. New York: McGraw-Hill

9. Brooks C. 2014. Introductory to econometrics for finance. Cambridge: Cambridge University Press

10. Cornell P. 2005. Beginning Excel What-If Data Analysis Tools - Getting Started with Goal Seek, Data Tables, Scenarios, and Solver. New York: Apress

11. Hull J. 2014. Options, Futures and other derivatives. 8th edition. London: Pearson

12. Urbanovsky T. 2015. Factors behind the Russian Ruble Depreciation. *ScienceDirect*, p. 244.

13. Shleifer A. & Robert W. 2015. Stock market driven depreciation. *Journal of Financial Economics*. vol. 70, pp. 295-311.

14. Gorelova A. 2016. Горелова А.А. Девальвация рубля: причины снижения курса национальной валюты и предпосылки укрепления. *Novaja Nauka*, vol 3, pp. 113-115

15. RBC. 2016. Эксперты назвали четыре причины обвала рубля [online article].[Accessed 5 June 2017]. Available at http://www.rbc.ru/finances/21/01/2016/56a0cbe59a7947e5b299eaa9

16. Banki.ru. 2016. ЦБ назвал дату запуска механизма санации банков [online article]. [Accessed 1 May 2017]. Available at http://www.banki.ru/news/lenta/?id=9792766

17. Kommersant. 2016. Евросоюз расширяет санкции против России [online article]. [Accessed 1 May 2017]. Available at https://www.kommersant.ru/doc/3136828

18. RBC. 2015. Сбили с курса. [online article]. [Accessed 11 May 2017]. Available at http://www.rbc.ru/economics/09/02/2015/54d7cccf9a79471f9f83f9dd

19. Banki.ru. 2014. Черный вторник. Причины обвала рубля [online article]. [Accessed 20 May 2017]. Available at http://www.banki.ru/news/lenta/?id=7490052

20. Forbes Russia. 2016. Ожидаемый обвал: акции, валюты и сырье могут рухнуть в следующем году [online article]. [Accessed 1 May 2017]. Available at http://www.forbes.ru/mneniya-column/329847-ozhidaemyi-obval-aktsii-valyuty-i-syre-mogut-rukhnut-v-sleduyushchem-godu

21. Banki.ru. 2017. Регулярный дайджест №5. ЦБ переходит к жесткому контролю за деловой репутацией банков [online article]. [Accessed 01 June 2017]. Available at http://bankir.ru/publikacii/20170227/regulyatornyi-daidzhest-no5-tsb-perekhodit-k-zhestkomu-kontrolyu-za-delovoi-reputatsiei-vladeltsev-bankov-10008627/

22. Lenta.ru. 2013. Уже страшно, еще не паника [online article]. [Accessed 17 June 2017]. Available at https://lenta.ru/articles/2013/11/29/devaluation/

23. BBC Russia. 2014. Четыре вопроса про перспективы российского рубля [online article]. [Accessed 18 May 2017]. Available at http://www.bbc.com/russian/business/2014/12/141216_rouble_f_a_q

24. Inosmi.ru. 2014. Глобальные последствия кризиса рубля [online article]. [Accessed at 21 June 2017]. Available at http://inosmi.ru/russia/20141217/225001316.html

25. RBC. 2014. ЦБ признал отсутствие интервенций в «Черный вторник» [online article]. [Accessed 15 June 2017]. Available at http://www.rbc.ru/finances/18/12/2014/549286689a7947623bf2ca48?from=materials_on_subject

26. Banki.ru. 2017. S&P считает слабым банковский надзор в России [online article]. [Accessed at 29 June 2017]. Available at http://www.banki.ru/news/lenta/?id=9824045

27. Finanz.ru. 2016. События недели: ставки ЦБР и ФРС, возможная встреча РФ и ОПЕК [online article]. [Accessed 22 May 2017]. Available at http://www.finanz.ru/novosti/aktsii/sobytiya-nedeli-stavki-cbr-i-frs;-vozmozhnaya-vstrecha-rf-i-opek-1001097597

28. RBC. 2016. «Вам не нужна нефть по $120»: западные экономисты о кризисе в России [online article]. [Accessed 19 June 2017]. Available at http://www.rbc.ru/photoreport/14/01/2016/569787809a7947d64f836e43

29. RBC. 2014. Банк России назвал основные причины обвала рубля [online article]. [Accessed 5 June 2017]. Available at http://www.rbc.ru/finances/15/12/2014/548f16c32ae5964f117fc581

30. Izvestia. 2016. Глобальный финансовый кризис или волнение на биржах? [online article]. [Accessed 19 June 2017]. Available at http://iz.ru/news/601246?page=1

31. RBC. 2015. Эксперты назвали причины обвала рубля [online article]. [Accessed 28 May 2017]. Available at http://www.bbc.com/russian/business/2014/01/140130_russia_currency_rouble

32. Kiberleninka. 2015. Девальвация рубля: возможные преимущества и последствия для российской экономики [online article]. [Accessed 17 June 2017]. Available at https://cyberleninka.ru/article/n/vliyanie-tsen-na-rynke-nefti-na-vnutrennyuyu-ekonomiku-rossii

33. Central Bank of Russian Federation. 2014. Центральный Банк Российской Федерации, Пресс Релиз: О мерах по финансовому выздоровлению НБ «ТРАСТ» [online article]. [Accessed 7 May 2017]. Available at http://www.cbr.ru/press/PR/?file=22122014_130340ik2014-12-22T13_01_52.htm

34. BBC UK. 2014. Russian ruble falls to new low against US dollar [online article]. [Accessed 29 April 2017]. Available at http://www.bbc.com/news/business-30475236

35. Central Bank of Russian Feseration. 2014. On the parameters of Bank of Russia exchange [online article]. [Accessed 8 May 2017]. Available at https://www.cbr.ru/eng/press/PR.aspx?file=10112014_122958eng_dkp2014-11-10T12_26_04.htm

36. The Economist. 2014. Russia's Black Tuesday [online article]. [Accessed 29 April 2017]. Available at http://www.economist.com/blogs/buttonwood/2014/12/market-turmoil

37. European Union web-site. 2014. EU sanctions against Russia over Ukraine crisis [online article]. [Accessed 18 June 2017]. Available at http://europa.eu/newsroom/highlights/special-coverage/eu-sanctions-against-russia-over-ukraine-crisis_en

38. Central Bank of Russain Federation. 2016. Information about Registration and Liquidation of banks in 2016 [online article]. [Accessed 18 June 2017]. Available at http://www.cbr.ru/statistics/print.aspx?file=bank_system/inform_16.htm&pid=lic&sid=itm_43766

39. The Banker. 2015. Russia's Banking Crisis [online article]. [Accessed 29 June 2017]. Available at https://internationalbanker.com/banking/russias-banking-crisis/

40. Central Bank of Russian Federation. 2017. Bank of Russia exchange rate policy [online article]. [Accessed 01 May 2017]. Available at https://www.cbr.ru/Eng/DKP/?PrtId=e-r_policy

41. The Guardian. 2015. Fears for Russian rouble as plunging oil price dents markets [online article]. [Accessed 24 May 2017]. Available at https://www.theguardian.com/business/2014/dec/15/fears-russian-rouble-oil-price-markets

42. BBC UK. 2014. Russian rouble in free-fall despite shock 17% rate rise [online article]. [Accessed 28 May 2017]. Available at http://www.bbc.com/news/business-30492518

43. The Human Rights Watch. 2017. Government vs. Rights Groups [online article]. [Accessed at 29 May 2017]. Available at https://www.hrw.org/russia-government-against-rights-groups-battle-chronicle

44. BBC UK. 2015. Falling oil prices: who are the winners and who are the losers [online article]. [Accessed 2 May 2017]. Available at http://www.bbc.com/news/business-29643612

45. The Economist. 2014. Planet Plutocrat [online article]. [Accessed 1 May 2017]. Available at http://www.economist.com/news/international/21599041-countries-where-politically-connected-businessmen-are-most-likely-prosper-planet

46. The Guardian. 2014. Rouble crashes as Russian economy teeters on brink of recession [online article]. [Accessed 19 June 2017]. Available at https://www.theguardian.com/world/2014/nov/07/rouble-crashes-russian-economy-brink-recession-currency

47. The Atlantic. 2017. Anti-Corruption protests Across Russia [online article]. [Accessed 20 April 2017]. Available at https://www.theatlantic.com/photo/2017/03/anti-corruption-protests-across-russia/520902/

48. Federal Law N54-FZ. 2004. About rallies, demonstrations, processions, picketing [online law]. [Accessed 27 May 2017]. Available at http://www.consultant.ru/document/cons_doc_LAW_48103/

49. OPEC organization. 2017. Historical Production Data [online data]. [Accessed 15 May 2017]. Available at http://www.opec.org/opec_web/en/data_graphs/335.htm

50. The Commerzbank of the Russian Federation. 2017. Disclosure of Commerzbank Eurazija AO [online statement]. [Accessed 9 May 2017]. Available at https://www.cbr.ru/credit/coinfo.asp?id=450037016

51. The Central Bank of Europe. 2017. Interest Rates by month [online data]. [Accessed 1 May 2017]. Available at https://www.ecb.europa.eu/mopo/html/index.en.html

52. The Central Bank of Europe. 2017. The Inflation rates by months [online data]. [Accessed 2 May 2017]. Available at http://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

53. The Guardian. 2014. Russian Central bank rises interest rate up to 17% to prevent rouble's collapse [online article]. [Accessed 19 June 2017]. Available at https://www.theguardian.com/world/2014/dec/15/russia-interest-rate-rise-17pc-rouble-collapse-oil-price

54. BBC UK. 2014. Watchdog raps Japan's UFJ bank [online article]. [Accessed 6 June 2017]. Available at http://news.bbc.co.uk/2/hi/business/3818573.stm

55. Wall Street Journal. 2012. Wells Fargo Discovers Hedging Is Hard to Do [online article]. [Accessed 19 May 2017]. Available at http://www.wsj.com/articles/SB869442371249244500

56. Bloomberg. 2016. China offers Russia help with currency suggestions [online article]. [Accessed 15 June 2017]. Available at https://www.bloomberg.com/news/articles/2014-12-22/china-offers-russia-help-with-suggestion-of-wider-currency-swap

57. The Economist. 2015. Russia crushed [online article]. [Accessed 6 June 2017]. Available at http://www.economist.com/blogs/graphicdetail/2014/12/daily-chart-5

58. Bloomberg. 2014. How Putin stopped ruble collapse [online article]. [Accessed 29 April 2017]. Available at https://www.bloomberg.com/view/articles/2014-12-23/how-putin-stopped-the-rubles-collapse

59. Russia Behind The Headlines. 2014. What is behind plummeting ruble? [online article]. [Accessed 19 June 2017]. Available at https://www.rbth.com/amp/490417

60. The Guardian. 2015. The falling of the Russian currency: all you need to know [online article]. [Accessed 28 June 2017]. Available at https://www.theguardian.com/business/2014/dec/16/falling-rouble-all-you-need-to-know

Appendix 1. News influenced on the ruble exchange rate

List of news and their influence

№	News	Date	Type	Reaction (RUB)	Duration of reaction
1	CBR decision to keep key iterest rate as 11%	29.4.2016	Economic	-0,4	week
2	Brexitdecision	27.6.2016	Foreignpolicy	-1,3	week
3	OPEC agreed to reduce oil extraction	28.9.2016	Economic	-1,8	month
4	Russia-US argues during Syria conflict (oil rised)	10.10.2016	Economic	-1,5	week
5	Oilreducedfrom 53,5 to 52 (2%)	12.10.2016	Economic	+0,16	day
6	The leading position of Donald Trump on US election (Oil reduced)	7.11.2016	Economic	+1	week
7	The decision of OPEC countries to reduce oil extraction	30.12.2016	Economic	-4,8	month
8	Verbal intervention of vice-premier I.Shuvalov	11.1.2017	Domesticpolicy	+1,96	week
9	Oil price stabilisation appreciated ruble	19.2.2017	Economic	-2	week
10	FED rised the interest rate to 0,75-1%	15.3.2017	Economic	-2	week
11	USA stike Syrian position (change in oil price +1,2%)	7.4.2017	Foreignpolicy	+0,6	1 day
12	CBR decision of bying currency	13.4.2017	Economic	+3	month
13	Change in oilprice -3,5%	5.5.2017	Economic	+1,51	1 day
14	Verbal intervention of Ministry of Finance about possible depreciation of ruble	15.5.2017	Domesticpolicy	-0,5	?

Source: composed by author

Appendix 2. Changes in oil prices and chosen factors

changes in oil prices and three factors

Aug 13	Currency	Oil	Interest rate	Inflation rate
Sep 13	-0,00439	-0,04947	1,055	1,157025
Oct 13	-0,00437	0,004337	1,055	0,592357
Nov 13	0,031532	0,00781	1,073333	0,589744
Dec 13	0,004525	0,010119	1,073333	0,887417
Jan 14	0,047393	-0,03971	1,073333	0,069182
Feb 14	0,049751	0,025094	1,073333	0,776471
Mar 14	-0,02899	-0,01201	1,093333	0,846535
Apr 14	0,024752	0,002877	1,1	0,621053
May 14	-0,0381	0,012399	1,1	0,478947
Jun 14	-0,02326	0,026963	1,1875	0,679012
Jul 14	0,028708	-0,05643	1,2	0,322148
Aug 14	0,019512	-0,02669	1,2	0,895161
Sep 14	0,025	-0,08257	1,266667	0,793939
Oct 14	0,075269	-0,09306	1,266667	0,538462
Nov 14	0,169811	-0,18297	1,316667	0,350877
Dec 14	0,119718	-0,18275	1,566667	0,248619
Jan 15	0,109375	-0,0757	1,566667	-0,05567
Feb 15	-0,11724	0,180978	1,566667	0,475155
Mar 15	-0,09375	-0,11937	1,466667	0,850679
Apr 15	-0,06977	0,211758	1,466667	0,863014
May 15	-0,01149	-0,01827	1,416667	0,903704
Jun 15	0,074074	-0,03005	1,416667	0,798319
Jul 15	0,102041	-0,17896	1,383333	0,283333
Aug 15	0,05	0,037158	1,366667	0,733333

Sep 15	0,021898	-0,10674	1,366667	0,719745
Oct 15	-0,03521	0,024602	1,366667	0,649425
Nov 15	-0,00699	-0,09988	1,366667	0,497143
Dec 15	0,134921	-0,16431	1,366667	0,559322
Jan 16	0,032787	-0,06813	1,366667	-0,08673
Feb 16	0	0,035406	1,366667	0,699387
Mar 16	-0,0687	0,100917	1,44	1,342466
Apr 16	-0,02963	0,215404	1,44	0,743056
May 16	0	0,032412	1,44	0,93617
Jun 16	-0,04255	-0,0002	1,42	0,852941
Jul 16	0,036765	-0,14533	1,42	0,376623
Aug 16	-0,0073	0,107866	1,42	1,069307
Sep 16	-0,02837	0,042942	1,4	1,111111
Oct 16	-0,02083	-0,01549	1,4	0,874126
Nov 16	-0,02041	0,044928	1,4	0,673611
Dec 16	-0,05161	0,125817	1,4	1,078571
Jan 17	0,006494	-0,01971	1,4	0,222222
Feb 17	-0,04938	-0,00197	1,4	1,172131
Mar 17	-0,02994	-0,04965	1,4	1,433628

Source: investing.com