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Theory and practice of management of foreign exchange exposure in multinational company (export/import oriented company)

Author:

Bc. Tomáš Janda

Thesis supervisor: doc. Ing. Karel Brůna Ph.D.

Declaration:

I hereby declare that I am the sole author of the thesis entitled "Theory and practice of management of foreign exchange exposure in multinational company (export/import oriented company) ". I duly marked out all citations. The used literature and sources are stated in the attached list of references.

In Prague on

<u>Signature</u> Bc. Tomáš Janda

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Table of abbreviations

ATM	At the money
BOP	Balance of payments
CE	Central Europe
CHF	Swiss Frank
CME	Chicago Mercantile Exchange
CNB	Czech national bank
CZK	Czech crown
ER	Exchange rate
ETD	Exchange traded derivatives
EUR	Euro
FDI	Foreign Direct Investment
FR	Forward rate
FX	Foreign exchange
GBP	British pound sterling
GDP	Gross domestic product
HUF	Hungarian forint
INCOTERMS	International Commercial Terms
IR	Interest rate
ITM	In the money
MNC	Multinational Company
NWR	New World Resources
OKD	Ostravsko-Karvinské doly
OTC	Over-the-counter
OTM	Out the money
PLN	Polish zloty
RAFTD	Revised American Foreign Trade Definition
RUB	Russian ruble
SR	Spot rate
UNCTAD	United Nations Conference on Trade and Development
USD	American dollar
VAR	Value at risk

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Introduction

Our recent world has gone through many phases of globalization. Mankind has experienced large migrations and overcome language barriers, which has triggered cultural enrichment, mutual communication, relative decrease in distances and ultimately led to the continuous liberalization tendencies in terms of international trading. According to the UNCTAD is the current world trade volume estimated at around 23,5 trillion USD in one year (Nicita, 2015). This figure reflects daily international operations on various markets and subjects trading all over the globe all year long. Moreover, as a result of that countries became dependent on international trading. For instance, in case of the Czech Republic, the author's country of origin, the proportion of international trade on the country's GDP is around 150%, which implies that its development and prosperity is very strongly dependent on foreign subjects, above all the ones from European Union (Lízal, 2014).

However, international business does not bring only benefits and advantages, but also presents potential threats in many forms. One of them is foreign exchange exposure. Due to the fact, that there are various currencies, with different supply and demand, circulating in the world, we have to face volatility in currency markets. This volatility can significantly influence international trading, since deals and contracts are denominated in different sorts of currencies all around the globe. Besides, due to the fact that world markets have become highly competitive, trading subjects are nowadays basically forced to provide trade credits, which in other words means – delay in payment. As result, we speak about foreign exchange fluctuations, which can affect companies both positively and negatively in many ways. For countries highly dependent on international trading, such as the Czech Republic, is therefore this topic very important issue, which was at the same time the main source of the author's motivation for exploring this topic.

The goal of this thesis is to present a theoretical background of the FX exposure, explain the fundamental mechanisms within this field and find out, how can firms face and manage this risk in practice. This paper will be further divided into three chapters.

The first one deals with the FX exposure from theoretical perspective. After initial introduction of risks as such, we will differentiate - how many types of FX risk there are, how they can be defined and when do they arise. We will also cover the most common ways of measuring the exposure. Namely we will focus the method of alternative scenarios and three basic approaches to risk quantification through so called Value at Risk, i.e. Historical simulation, Analytic variance-covariance approach and Monte Carlo simulation. Moreover, at the end of the first chapter we will also briefly introduce, the three essential ways of predicting FX development, through fundamental, technical and market based forecasting analysis.

The second chapter will be dedicated to the actual strategies how multinational companies can manage and hedge the currency exposure. These strategies will be further sub- classified into two groups: internal & external hedging methods. The former will focus on currency of invoice, currency diversification, natural hedging, diversification of operations, netting & matching, leading & lagging and contractual alternations such as currency clauses. Compared to that, external hedging strategies will cover instruments such as synthetic and outright forwards, FX futures, options and swaps.

Even though that the first two chapter cover above all theoretical background of the FX exposure management, the theory is for better understanding always directly applied on small explanatory computations and examples from perspective of importing/exporting companies.

Eventually, the last chapter will introduce a practical case study, where we will analyze performance of a real multinational company and introduce how FX fluctuations affect its operations and how much they are reflected in the financial performance. Moreover, we will present the ways, how the company approaches the FX exposure and which methods it uses for its mitigation. With respect to the available data we will try to present some recommendation, what the company could do in the future.

1. Theory of foreign exchange risk management

1.1. Risks in international business

In order to understand the insights of the foreign exchange risk management it is necessary to start step by step. In this subchapter there will be introduced general definition of risk, factors which influence it and the most frequent forms of risks in international business. Risk belongs to the most important factors of financial decisionmaking process and management. It is related to future events and their possible consequences (Torje, 2008). Risk can be generally defined as a danger that initial estimations will differ from the real results, which may occur both in a positive and negative way. The former refers to the results of risks, which are eventually better than anticipated, whereas the latter stands for the situations that prove to be at the end worse than our initial estimations (Marek & team, 2006). Even though risk is rather endemic to our personal as well as professional experiences, there are ways how to manage and minimize it. The field of study, which deals with exploring this area is called *risk management* and can be further defined as a process of identifying risk, assesing risk, choosing and implementing appropriate management strategy and eventually monitoring the whole process (Dr. Wall, 2009).

We may perceive risk as a *matter of uncertainty* while making decisions. Therefore, we should start with focusing on the origins and impacts of that uncertainty. There are two groups of elements that are causing the impossibility of making riskless decisions, namely we speak about internal (endogenous) and external (exogenous) factors. The first category is relatively easier to describe, because these aspects can be explained by the acts and decisions made inside companies and therefore can be influenced solely by firms themselves. Namely, we speak about factors such as impacts of reorganizations, launching new products or investments in human capital. In comparison to that, the external factor can be understood rather as impacts from outside. We can mention e.g. factor prices, taxation, political changes etc. (Marek & team, 2006). Especially the external uncertainty contributes to the existence of risks in business, which are logically even wider concerning international markets and environment. The main risks that occur in international business can be generally grouped into categories illustrated by the Exhibit 1 below:

Exhibit 1 Risks in international business



Source: created by the author based on: (Machková, Černohlávková, Sato, & & collective team, 2010)

Market risk, as the name itself says, represents the uncertainty of the market behavior. We speak about sudden changes in demand and supply, new inventions and technologies and actual market sentiment¹. All these factors have immense impact on the market price of assets and can notably influence bottom line of companies, especially in the long-run.

Commercial risks usually arise from a counterpart's failure to comply a contract's requirements and agreed terms. Other examples might be also: withdrawal of contract, insolvency or bad payment moral of the trading partner and last but not least simply not delivering or taking over the goods. These risks are even more crucial in the international scale, where different legal systems, business custom practice and cultural specifics have to be taken into consideration (Machková, Černohlávková, Sato, & & collective team, 2010). In addition to that, not only the import and export operations but also the accompanying services such as transportation, delivery and insurance may be an object of dissatisfaction (Böhm & Janatka, 2004).

Transportation risks refer to uncertainty when trading tangible goods and facing the risks of loss, damage or delay of the delivery. Transferring the responsibilities and overtaking the goods at certain stages of the transportation are usually stated in the contract. Who, when and to what extent each subject guarantees for the delivery is commonly set by INCOTERMS or RAFTD².

¹ Meaning how optimistic or pessimistic market subjects are towards consumptions.

² Standards and delivery norms stating who and when overtakes the risk arising during the transportation of goods. It is not a precept of law and therefore it becomes binding only when parties make reference to them in the contract. RAFTD deals with the ones used mostly on the American continent (Machková, Černohlávková, Sato, & & collective team, 2010).

As far as *Territorial risks* are considered, we speak above all about the current political stability and the macroeconomic situation in the target area. Thus, transactions may be influenced by the current economic conjuncture, introduction of protectionist measures, military and terroristic conflicts or natural disasters (Machková, Černohlávková, Sato, & & collective team, 2010). These factors are almost impossible to predict and besides classical contracts, it may have a tremendous impact on FDIs and other long-term investments. One way to face it is to use one of the available ratings of the target country.

Companies are facing a *Credit risk* whenever there is a delay between a sale or purchase and its corresponding payment. In that moment are firms providing their counterparts with a trade credits and have to think about the incurred risk, that the other party may be unable to meet the liability on time and to its full extent (Böhm & Janatka, 2004).

Before coming to the most relevant group of risks for this thesis, we should also briefly mention what it is meant by the ambiguous category labeled *Other risks*. This classification corresponds to the other, not that often discussed, risks such as responsibility for eventual harms to customers' health or belongings arising from the defected goods (Machková, Černohlávková, Sato, & & collective team, 2010). Another often underestimated risk is the operational risk, that is created by own employees as a result of human imperfection, low motivation or poor process control.

For the purpose of this thesis, we will closely focus only on the *Exchange rate risks*, which will be in detail described in next subchapter.

1.2. Foreign exchange exposure

After the dissolution of the Bretton-Woods system in 1971, most of currencies in the world became volatile and influenced by the market behavior. Differences between demand and supply for certain currencies had consequently a crucial impact on companies engaged in international trade (Taušer, 2007). The exchange rate changes are caused above all by the macroeconomic impacts such as differences in inflation rates, interest rates or recent economic and political development. Risks arising from changes in exchange rates movements are characterized by *foreign exchange exposure*, which can be defined as a measure of the potential for a firm's profitability, net cash flow, and market value to change because of a change in exchange rates (Eitemann, Stonehil, & Moffett, 2007). Another important aspect of foreign exchange exposure is the time period within a company is exposed to the fluctuations and volatility of exchange rates. General experience is that the longer the time period, the bigger the risk. That can be explained by the fact, that the level of uncertainty is in longer time frames bigger and more difficult to predict. The methods of predictions and its power will be more broadly discussed in the subchapter 1.4.

Foreign exchange exposure can be further divided into three different categories, namely transaction exposure, operating exposure and translation exposure. Each type deals with the foreign exchange exposure from a different perspective of a company's activities. Exhibit 2 summarizes the main categories with respect to the time of their ccurance.

Exhibit 2 Comparison of Transaction, Operating and Translation Foreign Exchange Exposure

Moment in time when exchange rate changes

Translation exposure

Changes in reported owners' equity in consolidated financial statements caused by a change in exchange rates

Operating exposure

Change in expected future cash flows arising from an unexpected change in exchange rates

Transaction exposure

Impact of settling outstanding obligations entered into before change in exchange rates but to be settled after change in exchange rates

Time -

Source: created by the author, based on: (Eiteman, Stonehil, & Moffett, 2007)

1.2.1. Transaction exposure

Impact of the exchange rate risk on the realization of company's international transactions is called transaction exposure, which *measures changes in the value* of outstanding financial obligations incurred prior to a change in exchange rates but not due to be settled unit after the exchange rates change. Thus it deals with changes in cash flows that result from existing contractual obligations (Eiteman, Stonehil, & Moffett, 2007).

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This definition can be for a better understanding explained on an example, where a company A engages in trading with a foreign entity B. The contractual value of the trade is denominated in terms of a foreign, convertible currency. However, for the company A it is surely crucial, what the value will be in its home currency. Thus the value has to be converted by the actual exchange rate. In practice, the company A would issue an invoice with a particular exchange rate relevant usually for the day of the contract, while accounting the account receivable for the correspond value in home currency. Yet, when the invoice is due, it is highly possible that the exchange rate will differ from the one accounted in books at the day of placing order. The Company A is thereby exposed to the exchange rate fluctuation, which can result either in profits or losses.

In order to manage transaction exposure it is always necessary to identify and analyze the current position of a company. In this regard we distinguish between *close* and *open position*. The former refers to a situation when a company's account receivables equal account payables in the particular foreign currency. Furthermore if the obligations have the same maturity we may assume that the company is not exposed to the fluctuations of exchange rates because the claims and liabilities cover mutually one another. Regarding open position, it is exactly the opposite. There is a difference between company's account receivables and account payables denominated in terms of a certain foreign currency. The company is therefore facing transaction exposure. Open positions may be further divided into *long* and *short positions* (Taušer, 2007).

A company is in a *long position* (usually only as e.g. "long in EUR") when its account receivables exceed the amount of account payables with respect to certain time frame and to the particular currency. This position is typical for exporting subjects in international trade, because such companies have usually, production costs denominated in their home currency whereas the revenues are traditionally received in a foreign currency. Nevertheless, it is not a strict rule. Part of the materials used for the production may be already imported from abroad, which means that some of the expenses can be also denominated in terms of the foreign currency.

If we consider possible fluctuations in exchange rates, we will find out that generally an appreciation of home currency will for exporters result in losses, because the real value of receivables after being transferred to the home currency will be lower than accounted initially. On the contrary depreciation is for exporter favorable, because it will analogically lead into an increase in the real value of the receivables.³

Short position is analogically the reverse of the previous one. It occurs in a situation when a company's account payables surpass the amount of account receivables denominated in foreign currency belonging to certain time. Short position is therefore characteristic of importers, whose costs are usually in different currency terms, while revenues come from the home market. As far as fluctuations in exchange rates are concerned, we will observe logically different impacts when the home currency depreciates/appreciates against the foreign currency. In case of the appreciation, a company in short position will be better-off and will benefit from exchange rate change, whereas depreciation will lead to a relative increase of payables and to a consequent exchange rate loss (Taušer, 2007)⁴.

The quantification of transaction exposure, its prediction and strategies and methods of measurement will be discussed in the chapters 1.3., 1.4 and 2 respectively.

1.2.2. Operating exposure

Operating exposure is in financial practice often called differently. It is also known as economic exposure, competitive exposure, or even strategic exposure. Its focus is on *measurement of the changes in the present value of the firm resulting from any change in future operating cash flows of the firm caused by change in exchange rates.* (Eiteman, Stonehil, & Moffett, 2007) The fundamentals of this exposure lie in possible threat of losing competitiveness, because the FX fluctuations may lead to negative changes in the future volumes of sale, variations in prices or increased costs. This may sound similar to the definition of transaction exposure.

³ An example: Company A is long in EUR 10.000, the current spot rate is $SR_t=27,5$ EUR/CZK, the maturity of the receivable is 1 month. If we considered an appreciation of CZK and the spot rate in one month was let say $SR_{t+1}=27,4$ EUR/CZK, the company A would suffer a loss of 1.000 CZK. Alternatively, depreciation of $SR_{t+1}=27.6$ EUR/CZK would result in 1.000 CZK gain caused by the exchange rate fluctuations.

⁴ An example: if we consider the same figures as in the example above, we will analogically reach an explanation, that in short position 10.000 EUR, the company A would suffer a loss of 1.000 CZK in case of depreciation and in the case of appreciation vice versa.

Transaction and operating exposure both occur due to changes in future cash flows but the impact is somewhat different. Operating exposure is considered to be more crucial for the long-run economic health of a company, than differences induced by a single contract and transaction exposure. (Eiteman, Stonehil, & Moffett, 2007) That is why an operating exposure has an impact on a company's economic position and on the competitiveness of the firm in international environment.⁵ In practice, a company faces operating exposure not only when it engages in international trade and operates as a trading subject on different markets, but also when other international subjects engage in the local market and compete with the home firms. Entering new markets is often connected with an initial investment into new-product development, distribution and suppliers network or production facilities. The company has to afterwards take care of the investment and develop it further. Transaction exposure arises consequently in the moment when the company engages in selling or purchasing denominated in the foreign currency (Shapiro, 2009). Hence, we can observe, that transaction exposure is to a certain extent a subset of the operating exposure.

As far as the origin of a firm's future cash flows is concerned, we can distinguish, between *cash flows generated on the home market* and *internationally*. Both are influenced by fluctuations in exchange rates, which may be especially in the first case little bit surprising. How can a company, operating only on a home market and having costs and revenues solely in the home currency, be influenced by changes in exchange rates? The thread comes in this place from foreign companies trying to gain additional share on this market. If we consider an appreciation of home currency, the foreign importers would benefit from relatively expensive home products and could therefore compete with relatively lower prices. That would consequently lead in the long-run to the above mentioned loss of competitiveness of home producers. These movements are common especially in case of *price elastic goods*, because home products can be easily substituted with cheaper products from abroad (Taušer, 2007).

Thus, based on this observation it is therefore necessary to distinguish between nominal and real exchange rate⁶ and stress the importance of the latter, when speaking about

⁵ That is actually the reason for the alternative names: economic, competitive and strategic exposure

⁶ Nominal exchange rate refers to the amount of foreign currency we can buy with one unit of home currency whereas the Real exchange rate is an extension of the PPP theory and stands for the relative price of two output baskets, which tells us about the overall costs in one country compared with another (Reinert, Rajan, & Glass, 2008).

the impacts on the whole economy. Computing and analyzing real exchange rate is crucial especially because it can reveal a loss in competitiveness of domestic economy, caused either by the above mentioned nominal appreciation, or by the increased growth of prices in the home country, or both. Another benchmark for competitiveness, similar to real exchange rate, is the comparison of unit labor costs. The idea is the same, if the labor costs, used for the creation of one unit of real product, are higher in one country – then this country loses its competitiveness relative to the other one.

Regarding the companies, which are in a direct contact with foreign markets and trade in home currency, there are the changes in exchange rates conceivably even more influential. The impacts are analogical as in the examples of transaction exposure. An appreciation of the home currency against the foreign currency would damage positions of exporters, whereas depreciation would be on the contrary seen as beneficial. On the other hand, importers would suffer from depreciation and profit from appreciation. Hence one can conclude, that operating exposure is in long-term really affecting all subjects on the market, no matter whether they directly engage in international trade or not. (Durčáková & Mandel, 2003)

As we know from the previous discussion, minimizing economic exposure is notably more difficult than in the case of transaction exposure, because it is a long-term issue, which to a certain extent usually includes both exposures together. Therefore it is not possible to manage it as in the case of single transaction. A company must systematically analyze the recent exchange rate development with respect to its business goals and based on that elaborate and follow a strategy plan.

International trade is not always black and white and the companies engaging in international trade do not specialize themselves only as exporters and importers. Especially in case of multinational corporations we encounter companies that are exporting their goods to different markets while simultaneously having suppliers from different countries. In this regard it is rather intuitive, that we cannot generally say which movements in exchange rates are unambiguously beneficial. For measurement of the impacts of operating exposure is in similar cases recommended to financial managers to prepare a set of alternative scenarios of exchange rate fluctuations with respect to the financial performance of the company and possible offsetting of its positions. (Taušer, 2007) This method and other possible strategies of managing operating exposure will be later on discussed above all in the chapter 2.2.

1.2.3. Translation exposure

Translation exposure is a specific form of exchange rate exposure, because it influences only *multinational companies*. It occurs in situations, when financial statements of foreign subsidiaries, which are usually denominated in terms of the certain foreign currency, need to be transferred into the reporting currency of the parent company, in order to be restated in a *consolidated financial statement*. This process does not anyhow affect cash flows of the parent company; it is rather an accounting process, which enables a proper presentation of the corporate's performance. As an example we may consider a Czech company, which has three subsidiaries in Hungary, Poland and Slovakia. Supposing the Czech parent company needs to prepare a consolidated financial statement and therefore needs to restate the three financial statements led in HUF, PLN and EUR into the CZK, so the values could be presented in the parent's balance sheet and income statement which are both denominated in Czech currency. This process is according to accounting terms called *translation*. Translation exposure can be therefore interpreted as a possibility of increasing or decreasing the parent's net worth and reported net income due to fluctuations in exchange rate with respect to the last translation (Eiteman, Stonehil, & Moffett, 2007).

There are two general methods of translation, namely *current rate method* and the *temporal method*. No matter which translation method a firm decides to use, it has to always state not only which exchange rate was used for re-measuring the figures from subsidiary's individual balance sheet and income statement, but also provide information where will be any possible imbalances recorded. The imbalances are thus usually accounted either through current income or through equity reserve account, where the former affects directly parent's income statement⁷ and the latter is reflected through balance sheet (Shapiro, 2009).

The most frequent translation method is the *current rate method*. The reason why is this method nowadays so often preferred is that it simply translates almost all line items of the subsidiary's financial statement at the current exchange rate, thus the one quoted on the day of creating the consolidated statement. Table 1 summarizes how this method treats basic line item categories. The results (gains or losses) of the translation adjustments are then consequently presented separately and accumulated in the consolidated balance sheet, namely

⁷ Therefore this decision may significantly affect the financial results of the parent company

on a separate equity reserve account called *cumulative translation adjustments* (Eiteman, Stonehil, & Moffett, 2007).

Category of line items	Exchange rate
Assets & Liabilities	Current exchange rate
Income statement items	Either <i>current exchange rate</i> (dates when revenues, expenses, gains and losses occurred) or <i>weighted average exchange rate</i> for the period
Distributions (dividends paid)	Exchange rate on the date of payment
Equity items (common stock, paid-in capital	Historical exchange rates
accounts)	

Table 1 Translation exposure -	Current	Rate	Method
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Source: created by the author based on: (Eiteman, Stonehil, & Moffett, 2007)

The biggest benefit of this method is definitely the fact that the translation exposure, or more precisely the gains and losses generated from the translation adjustments, are not reflected in the consolidated income statement and therefore does not hurt the financial results of the company. Furthermore, firms can also benefit from unchanged proportions of individual balance sheet accounts, which is generally seen as positive because the key liquidity ratios (current ration, debt-to-equity ratio) used for financial analysis remain unchanged.

On the other hand the biggest downside of current rate method is that, it can change the value of assets. If a parent company purchases a foreign asset in home currency and afterwards accounts it on a subsidiary's balance sheet at foreign currency historical cost, while preparing consolidating financial statement is the cost translated back at a different rate and therefore represents other values than that the actual costs in the past were (Shapiro, 2009).

The second translation method called temporal method uses for translation different exchange rates based on the timing of the item's creation and usage. In practice it means that line items connected to the operating activities (such as inventory and net plant and equipment⁸) should reflect market value and are therefore be translated at current exchange

⁸ If these line items were instead carried at historical cost we would speak about *monetary/nonmonetary method*, which is not that common, but still preferred in some countries.

rate. On the contrary for translation of non-current assets and liabilities is used generally historical exchange rate. Table 2 distinguishes more in detail how are basic line items categories translated under this method.

Category of line items	Exchange rate
Current assets & current liabilities	Current exchange rate
Noncurrent assets & noncurrent liabilities	Historical costs
Income statement items	Average exchange rate for the period
Distributions (dividends paid)	Exchange rate on the date of payment
Equity items (common stock, paid-in capital	Historical exchange rates
accounts, Year-end retained earnings	
reflecting results of any imbalance from	
translation)	

Table 2 Translation exposure - Temporal method

Source: created by the author based on: (Eiteman, Stonehil, & Moffett, 2007)

The imbalance that results from translation are under this method carried directly to the consolidated income statement of the parent company and to the certain extent affect volatility of consolidated earnings. (Eiteman, Stonehil, & Moffett, 2007)

In order to summarize all three types of foreign exchange exposure, we should underline the main impacts they have on subjects on the market. Concerning transaction exposure, there are fluctuations of exchange rate affecting the value of contracted future cashflows. In case of economic exposure we discussed that expected future cash-flows have an impact on the long-term economic position and development. Finally, in terms of translation exposure we explored the sensibility of consolidated financial statements to the fluctuations in exchange rate.

1.3. Measurement of foreign exchange exposure

In order to successfully *manage the foreign exchange exposure* and decide about a proper hedging strategy, it is not only necessary to identify, but also to proceed with an appropriate *quantification* and find out the value of the exposure. Its measurement is one of the most challenging tasks for a company's financial management. It lies in estimation of expected losses that the company may suffer in their open positions because of negative fluctuations in exchange rates. There are several statistical methods and techniques that may

provide a financial manager with desired formulas for computation and quantification of the foreign exchange exposure.

1.3.1. Method of alternative scenarios

The first method, quantifies the possible exposure losses or gains with help of different possible scenarios of exchange rate changes and the probabilities of their occurrence. In order to calculate the *total value of the expected exposure*, one has to compute a weighted average of results from all particular scenarios, where the weights are probabilities of the certain scenarios exchange rate changes (Taušer, 2007).

For a better understanding we will analyze an example of a Czech importer of supreme whiskey from Scotland. Firstly, we will consider a case when the Czech company does not have any other open positions except one short position of 100.000 GBP, where the actual spot rate amounts to 37 GBP/CZK and the maturity of the account payable is 50 days. Based on the previous experience and the recent market development the financial manager estimates, that with a 20 % probability the CZK will depreciate against GBP at the date of maturity (=SR_{t+50}) to 37,5 GBP/CZK⁹. The probability that the exchange rate remains at the level of actual spot rate is 50 %¹⁰. In addition to that, the appreciation to 36,8 GBP/CZK has according to the management's estimation probability of 30 %¹¹. In order to calculate the total expected exposure we use the following formula:

$$Total expected exposure = (\Delta X_1 * P_1) + (\Delta X_2 * P_2) + (...) + (\Delta X_n * P_n)$$
(1.1.)

Where:

 ΔX = change in the value of receivables/liability, due to the FX fluctuations under particular scenario

P = probability of the corresponding scenario

Based on that we will consider the following computation:

Total expected exposure = (-50000 * 0,2) + (0 * 0,5) + (20000 * 0,3) = -4.000 CZK

¹⁰ Scenario 2: The size of the liability would remain the same

⁹ Scenario 1: The company would suffer a loss, because their liability would increase by 50.000 CZK (= ΔX)

¹¹ Scenario 3: The company would have a gain, because their liability would decrease by 20.000 CZK

However, such situation would be nowadays rather rare, because companies engaging in international trade have usually more than one open position, which are denominated in different currencies. Once again for better imagination, we will examine that with an extended version of the previous example. Beside the short position of 100.000 GBP, we also consider a long position of 500.000 RUB with an identical maturity of 50 days and current spot rate of 0,35 CZK/RUB. Financial manager analogically estimates three scenarios:

- 1.) Depreciation to SR_{t+50} =0,38 RUB/CZK with a probability of 20%
- 2.) Exchange rate remain unchanged with a probability of 35%
- 3.) Appreciation to $SR_{t+50}=0,3$ RUB/CZK with 45% probability

In such case would be necessary to include into the calculation all possible scenarios combined in all variations as is illustrated in the Table 3.

G		Expected	Exposure	D	Expected
Scenario	Open position	exchange	(loss/goin)	Probability	exposure in
1	100 000 GBP (short)	± 0.50	(1085/gam)	0.2	CZK
1	500 000 RUB (long)	+0.03	+15,000	0,2	-35tsd*0 04-
Combined	500.000 RCD (1011 <u>6</u>)	10,03	-35,000	0.2*0.2=0.04	-55tsu 0.04= -1 400
2	100 000 GBP (short)	0.00	0	0.5	1.100
1	500.000 RUB (long)	+0.03	+15.000	0.2	
Combined	00000001002 (101.8)	. 0,00	+15.000	0.5*0.2=0.1	+1.500
3	100.000 GBP (short)	-0.20	+20.000	0.3	. 1,0 00
1	500.000 RUB (long)	+0.03	+15.000	0.2	
Combined			+35.000	0.3*0.2=0.06	+2.100
1	100.000 GBP (short)	+0.50	-50.000	0.2	
2	500.000 RUB (long)	0.00	0	0.35	
Combined	<u>_</u>		-50.000	0,2*0,35=0,07	-3.500
2	100.000 GBP (short)	0,00	0	0,5	
2	500.000 RUB (long)	0,00	0	0,35	
Combined	· · · · · · · · · · · · · · · · · · ·		0	0,5*0,35=0,175	0
3	100.000 GBP (short)	-0,20	+20.000	0,3	
2	500.000 RUB (long)	0,00	0	0,35	
Combined			+20.000	0,3*0,35=0,105	2.100
1	100.000 GBP (short)	+0,50	-50.000	0,2	
3	500.000 RUB (long)	-0,05	-25.000	0,45	
Combined			-75.000	0,2*0,45=0,09	-6.750
2	100.000 GBP (short)	0,00	0	0,5	
3	500.000 RUB (long)	-0,05	-25.000	0,45	
Combined			-25.000	0,5*0,45=0,225	-5.625
3	100.000 GBP (short)	-0,20	+20.000	0,3	
3	500.000 RUB (long)	-0,05	-25.000	0,45	
Combined			-5.000	0,3*0,45=0,135	-675
Total	1	1	L	1	-12.250

Table 3 Method of Alternative scenarios

Source: created by the author, inspired by (Taušer, 2007)

With this simple calculation we found out that the expected average exposure within the 50 days would be -12.250 CZK. Besides simplicity, one of the advantages of this method is that it provides a financial manager with a *detailed outline of various outcomes from different scenario combinations*. One can therefore simply interpret that e.g. under the most probable scenario combination (22,5%) would be the company suffering a loss of 25.000 CZK. Another possible interpretation could be summarizing the probabilities of expected gains or losses. Hence, the general probability of having a loss is 56% and earning a gain is 26,5%.

1.3.2. Value at risk method

Value at Risk (later on as VaR) is a statistical method that determines the worst level of loss of company's net positions, with a particular level of probability (called confidence level) over a given period of time (Crouhy, Galai, & Mark, 2006). That can be translated into the following statement: "*I am X* % *certain that there will not be a loss of more than V in the next N days*. (Hull, 2008) ¹²" This statistical concept can be used for measuring various types of risk and it is often used in financial and banking sector. VaR is either represented as a particular value from a given quantile (absolute VaR) or as a distance of the certain quantile from the sample's expected value (relative VaR). VaR can be computed with one of the three approaches (Crouhy, Galai, & Mark, 2006):

- 1.) Historical stimulation (nonparametric approach)
- 2.) Analytic variance-covariance approach (parametric approach)
- 3.) Monte Carlo simulation.

1.3.2.1. Historical simulation

Historical simulation approach, as the name itself suggests, is based on historical development of market fluctuation. Calculation of VaR is with help of this approach relatively simple because we do not have to make any analytical assumptions about the sample distribution. Nevertheless, there are some general recommendations about the data set that we will use, so that the calculation could yield authoritative results. Namely, the collected sample should include at least 500 observations or historical values that are spread over period of at least two or three years (Crouhy , Galai, & Mark, 2006).

 $^{^{12}}$ X=confidence level; V = value of the exposure, measured in units of the particular currency; N = time horizon

As an example we consider data set of daily changes in exchange rates in the period from 1.1.2012 to 30.1.2015 from the archive of Czech national bank¹³. Our collected sample consists of 777 observations. First of all we will need to compute the percentage changes between the single observations. We can do these computations with help of a formula:

$$Percentage \ change = \ln * \left(\frac{Exchange \ rate \ in \ time \ t}{Echange \ rate \ in \ time \ t - 1}\right)$$
(1.2.)

Afterwards we will sort the percentage changes in ascending order and plot a histogram (see Exhibit 3).





Source: created by the author based of the data from CNB

We may interpret the histogram that in the given period majority of the percentage changes were in the interval between -0,3% and +0,3% (rather normal distribution), which implies, that the Czech currency was relatively stable. We also see the classic phenomenon of financial time series, illustrated with the extreme values on both sides (in our case e.g. $+4,10\%^{14}$ or -1,90%), called *fat tails*. These outliers are the biggest disadvantage of this method, because our level of confidence does not tell us anything about the magnitude of the

¹³ Accessible through: (ČNB - Devizové kurzy, 2015)

¹⁴ Devaluation of CZK caused by interventions of CNB on 7.11.2013

excess of the VaR. Another downside is that this approach is relatively demanding on the historical data.

With having everything prepared we can now finally compute the VaR. We consider a Czech exporting company, which has a long position of 10.000 EUR, due in two weeks. The actual current exchange rate is 27,795 EUR/CZK. Let's assume that we are interested in the worst possible percentage exchange rate change and choose the 95% level of confidence¹⁵. Now we go and look at the fifth percentile of our sorted sample and get - 0,435%. This figure tells us that on historical basis we have 95% confidence that within one day the exchange rate will not appreciate by more than -0,435%. Calculation of VaR would be in this case as:

$$VaR_{1.95} = (10000 * 27,795) * (-0,00435) = -1.209,08 CZK$$

However, our receivable is due in two weeks, which means we are interested in the value of $VaR_{14,95}$. In this moment we can use statistical approximation¹⁶ and calculate the N-days VaR using the following formula (Hull, 2008):

$$VaR_{N,X} = VaR_{1,X} * \sqrt{N} \tag{1.3.}$$

Where:

 $N = time horizon, measured in days^{17}$

X = confidence level, measured in %

Based on that we will consider the following computation and get the estimated value of the exposure:

$$VaR_{14,95} = -1209,08 * \sqrt{14} = -4.523,96 \ CZK$$

One of the biggest advantages of this model is its relative easiness without necessity for any complicated mathematical models. The estimation is based on historical movements recorded in the corresponding sample, which must be however big enough to ensure a good

¹⁵ The level of confidence is always determined by the user

¹⁶ "This formula is exactly true when the changes in the value on successive days have independent identical normal distributions with mean zero. In other cases it is an approximation. " (Hull, 2008)

¹⁷ with increasing N, the accuracy of VaR goes down

explanatory value. This requirement is also the biggest disadvantage of this approach, because the needed data are not always available in such long historical time span.

1.3.2.2. Analytic variance-covariance approach

Calculation of VaR, using this approach, is based on the assumption that the percentage changes in the exchange rate follow *normal distribution*. Hence, the values are symmetrically distributed around the expected value. The distribution is not skewed anyhow and has the typical *bell shape*, which implies that it reaches the maximum value in its expected value. This approach is often called parametric, because it uses for the VaR calculation two important parameters: *expected value* (μ) and *standard deviation* (σ), where both can be determined from the historical development of the exchange rate (Taušer, 2007).

The biggest advantage is that we do not need to use the statistical tables of standard normal distribution, whenever we want to find a certain probability. Instead we can use an *empirical simplification*, which says that 90 % of all observations are 1,65 times standard deviation far from the expected value (to the both sides)¹⁸. Based on that and thanks to the *symmetry* of normal distribution we know, that 5% of all values will be situated below the value distant 1,65 times standard deviation from the expected value and the other 5% analogically above, as graphically shown by the Exhibit 4.



Exhibit 4 Analytic variance-covariance approach (90% confidence level)

Source: created by the author, based on the information from (Taušer, 2007)

¹⁸ Similarly, 95 % of all observations are distributed within distance of 2 times standard deviation from expected value (to the both sides) and 99,7 % of all values lie 3 times standard deviation from expected value to the both sides (Taušer, 2007).

When applying this approach, we are facing several challenges. Firstly, we have to decide about the size of the historical exchange rates sample, which is crucial for calculating the parameters. While making this decision, we should always try to reflect the future development of exchange rates as precisely as possible. On one hand, if we pick a small time period, the volatility of the exchange rate could be very extensive. On the other, when taking a longer time scale, we may under- or overestimate the volatility. One solution for that might be having a combination of various periods – let's say we want to compute the exposure for the first half of a month, so we take only the values from the first two weeks from every month for some period of time and then compute the standard deviation based on that data.

Another challenge is definitely - choosing a suitable level of confidence. Based on the above mentioned empirical simplification, we can choose from three common levels of confidence, i.e. 90%, 95% and 99,7%. This decision is closely related to the risk aversion of a company and solely depends on the firm's strategy and its attitude towards risk.

Third challenge is to understand the quotation of the exchange rate properly and differentiate between direct and indirect quotation with respect to the perspective of a firm's origin¹⁹. Therefore when speaking about appreciation in terms of the direct quotation, we would observe a decrease in the exchange rate and vice versa when speaking about depreciation (Shapiro, 2009). Furthermore, as the Exhibit 4 shows, there is also a difference in the sign operators for computation of the maximal expected appreciation (= $\mu - 1,65*\sigma$) and depreciation (= $\mu + 1,65*\sigma$), which has to be followed properly.

For a better imagination, to see how this approach works in practice we once again use the same fictive example. We consider the Czech exporting company that has, for the sake of simplicity, only one open position - namely 10.000 EUR long, due in two weeks; while considering the current exchange rate 27,795 EUR/CZK. Based on the same sample²⁰, we take the % changes in ER from the last two weeks and with help of basic excel functions compute *standard deviation*, i.e. $\sigma_{2y} = 0.244\%^{21}$ and an *average % 14-days ER changes*

¹⁹ *Direct quotation* = amount of the units of home currency for one unit of the foreign one (e.g. 27,44 EUR/CZK having the Czech perspective); *Indirect quotation* = amount of the units of foreign currency equal the value of one unit of home currency (e.g. 0.0364 CZK/EUR, having the Czech perspective) (Eiteman, Stonehil, & Moffett, 2007)

²⁰ see historical approach to VaR

 $^{^{21}}$ =*ODMOCNINA*(*VAR*(*C771:C780*)) $\rightarrow \sigma$ = square root of variance (computed within the particular area of the time span of 19.1.2015-30.1.2015)

(*expected value*), i.e. μ_{14d} =0,002%²². When using the Parametric approach, it is always crucial to retain the consistency of entered data, which in other words means, that we should compute both parameters (σ and μ) with the corresponding figures from the same time period – in this case 14 days (Taušer, 2007).

As we are considering a firm having a *long open position* and as we know that the firm would suffer from strengthening of the home currency, we need to find out, what would be the maximal expected appreciation with e.g. 90% level of confidence. With use of the above mentioned formula we calculate:

Maximal expected appreciation = $\mu - 1,65 * \sigma = -0,002 - 1,65 * 0,244 = -0,405\%$

Knowing that, we can consequently compute the desired VaR:

$$VaR_{14.90} = (10.000 * 27,795) * (-0,00405) = -1.125,70 CZK$$

Parametrical approach can be also applicable for computation of VaR for a currency portfolio (VaR^{CP}), i.e. when a company has more than one open position. International trade is usually closely interconnected and various aspects can influence one another. The same holds for currencies. The level of the mutual impacts can be different. This relationship is called *correlation* and it plays a very important role when it comes to the computation of standard deviation of the whole currency portfolio (CP). Its strength is measured with so called *correlation coefficient* (ρ). In some cases we can observe, that the currencies follow similar tendencies and flow in the same direction (positive correlation, with extreme of $\rho = 1$). On the other hand, the effects might be also completely independent (no correlation, $\rho = 0$) or even inverse (negative correlation, with an extreme of $\rho = -1$). Furthermore, the correlation of the currencies describes us, how well is the risk diversified. Generally holds, that the lower the correlation coefficient is, the better diversification we have. The standard deviation of a two currencies portfolio can be calculated as follows (Taušer, 2007):

$$\sigma^{CP} = \sqrt{w^2 * \sigma_A^2 + (1-w)^2 * \sigma_B^2 + 2 * w * (1-w) * \sigma_A * \sigma_B * \rho}$$
(1.4.)

 $^{^{22} =} PR \mathring{U}M\check{E}R(C771:C780) \rightarrow \mu$ = arithmetic average (computed within the particular area of the time span 19.1.2015-30.1.2015)

Where:

w = weight (proportion) of the currency A in the portfolio σ_A = standard deviation of % ER changes of currency A σ_B = standard deviation of % ER changes of currency B ρ = correlation coefficient of % ER changes of currencies A and B

In addition to that we also need to adjust the formula of expected value in terms of the whole CP, where we need to take into account the particular proportion of both currencies:

$$cp^e = w * \mu_A + (1 - w) * \mu_B$$
 (1.5.)

Where:

w = weight (proportion) of the currency A in the portfolio μ_A = average expected % ER changes of home currency to currency A μ_B = average expected % ER changes of home currency to currency B

Consequently we pick a preferable confidence level and finish the computation of VAR^{CP} similarly as in the previous case.

The practical application of the VaR^{CP} is in bulk exactly the same as in the case with the only one open position. The only difference is that now we have to include more variables. In this regard we should be always cautious about the entered data, above all about using the correct time span for the particular parameter computation, since the maturity of the open positions may differ. Another challenge is that this approach is not practical, when we have more than two open positions. In such case, would be the manual computation, without any special software, rather tedious. Moreover, *parametric approach*, or more precisely its empirical simplification, is applicable only for the same types of open positions (long + long or short +short), which may be a problem for its practical usage (Sorin, 2004). Another downside is definitely the assumption of normal distribution, which does not always hold especially due to the existence of the above mentioned fat tails.

On the other hand the biggest advantage of this approach is definitely the fact, that we do not have to make many subjective estimations and the quantification of the maximal exposure is based rather on quantitative basis and historical data.

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1.3.2.3. Monte Carlo simulation

Monte Carlo simulation is based on numerous repeatedly created simulations of market processes that govern market prices and rates. Each of these simulations creates a possible scenario how the value of a portfolio could develop in the particular future horizon²³. The aim of this approach is to create enough of simulated distribution of the portfolio's values, which will eventually converge towards the true, although unknown distribution (Crouhy, Galai, & Mark, 2006).

Monte Carlo simulation is usually done in three steps. Firstly, we need to *specify all the relevant risk factors* that determine and influence the value of the particular assets in our portfolio. Monte Carlo simulation is a very complex framework that can be applicable for various fields of risk quantification. In our case the influential elements are fluctuations in exchange rates. Therefore we would need to identify relevant parameters for % changes in ER (correlations, expected values, standard deviations, etc.) based on the historical data. However, once again we are facing the same question – how large should our base sample be. If we consider a data set with a big volatility, we have to count with the fact, that it will be consequently reflected in our scenario paths, whose values will be more variable as well.

The second step is to *construct price paths* with help of a corresponding randomnumber generator²⁴, which produces values with respect to the parameter and to a complexity of the particular portfolio.

Eventually the last step is to *value the portfolio*. Each generated scenario gives us a particular modeled percentage exchange rate change. If we repeat the process and generate enough scenarios (e.g. 10.000 times), then we get a sample of outcomes. Similarly as in the historical method we sort the dataset by size and look at the desired percentile²⁵, where we find the corresponding value, which we consequently use for re-valuating the items in our portfolio. That in other words means, multiplying the open positions with the found percentage ER change resulting in one day VaR (Crouhy, Galai, & Mark, 2006)²⁶.

²³ The time span is not restricted anyhow, but the rule of thumb says once again, that the longer the time period, the less accurate calculation.

²⁴ There is special software (such as Excel or MATLAB) that includes relevant functions with optimized algorithm that can be used for random-number generation.

²⁵ according to our chosen level of confidence

²⁶ Practical example of generation of simulated sample is shown in the attached excel file

This approach is in practice widely used and popular method. It is considered to be the most powerful and flexible approach to computation of Value at Risk. It enables a user to eliminate the phenomenon of "fat tails" In addition, the user can also benefit from the flexibility of the model, since it is adjustable for various types of portfolio valuation, thanks to its practical suitability for working with all probability distributions (Felcman, 2012).

1.4. Prediction of exchange rate development

Forecasting of exchange rates is a very challenging und ungrateful activity. Due to the fact, that many of the impacts (such as governmental interventions, political changes, market behavior, etc.) determining the exchange rate development are rather unpredictable, this issue is often considered as a speculating hazard or gazing into a crystal ball.

Even though, it is undoubtedly a very fascinating topic, which draws lot of attention. Unfortunately, there has not been invented any model, which would be able to reliably predict for hundred percent the future movements in the exchanges rates. Despite that, a lot of experts, financially supported by various institutions, are still widely tempted to explore this field and desire to create new frameworks and theories with higher accuracy and preciseness. Nevertheless the enthusiasm and willingness have not been enough and the search for the perfect model still continues (Shapiro, 2009). Multinational corporations desire to forecast the exchange rate as precisely as possible in to order to have at least some basis for making their decisions whether to hedge their positions or not.

This thesis does not have the ambition to explain all the concepts and frameworks for forecasting. Thus, we will only briefly introduce the three most elementary approaches of exchange rates predictions: Fundamental and Technical analysis and Market based forecasting. We will compare them and look at their importance in the context of multinational companies.

1.4.1. Fundamental analysis

Fundamental analysis stands for the techniques that are based on monitoring and analyzing macroeconomic indicators (such as: GDP, Interest rate, Inflation rate, balance of BOP, money reserves, etc.) and geopolitical news, which are influential for the future development of the exchange rate.

We know from the economic theory that there are mutual parity conditions and relationships among exchange rates, interest rates and inflation. The basis of the fundamental analysis lies in understanding the elementary theories of law of one price. Firstly, there is the Purchase Power Parity (PPP), which tells us, that the currency of the relatively inflated country will depreciate by an amount that reflects that country's inflation differential (Madura, 2008). Secondly, there is the Interest rate parity saying that, if the interest rates were different, for instance - if we were facing a relative increase in home interest rates, then investors would prefer the higher one and invest in another country, which would trigger the equalizing mechanisms and we could expect depreciation of home currency (Shapiro, 2009).

The fundamental analysis is generally suitable for prognosis of mid and long-run development. On the other hand it is not recommended for the short-term. The success of this method is dependent on the accuracy of estimated input fundamental variables (Durčáková & Mandel, 2003). We have to predict these variables on our own (e.g. future interest rates in the desired time period). If we simply took the current market values, it would not be helpful anyhow, because the changes would be most probably already included in the exchange rate movements (Shapiro, 2009).

Technical analysis 1.4.2.

The essence of technical analysis does not lie in examining the impacts of macroeconomic indicators on the exchange rates. It rather focuses on the effects of market movements, than on their causes. It explains the issue with help of the past price and volume *data* and tries to detect some patterns and trends that tend to repeat over and over again.

For the trend identification we can use either graphical or mathematical-statistic approach. The former is often called *charting*, since it uses graphs and charts²⁷ to identify the standardized patterns²⁸ that signalize an impulse for buying or selling. Markets generally do not move in straight lines up or down, they rather look like zig-zags with series of fairly obvious peaks, called resistance levels, and troughs, known as support levels. The former represents an imaginary local ceiling, after which ordinarily follows a decrease in the price.

 ²⁷ Such as Bar chart, Line chart or Candlestick chart
²⁸ For instance: Head&Shoulders, Flags/Triangles, Double peak, Double bottom etc.

The name of the latter is relatively self-explaining and implies that buying interest overcomes the selling pressure and thus we can expect an increase in the price. (Murphy, 1999).

The mathematical-statistic approach is represented by calculation of particular indicator, where the most common one is definitely moving average, which enables the user to smoothen the graph in order to see the trend more clearly.

Compared to the fundamental analysis, is technical analysis easier for understanding and requires neither any profound knowledge of economic mechanisms and frameworks nor any information about the geopolitical events and industrial trends (Durčáková & Mandel, 2003). This approach became relevant first during the last two decades thanks to the vigorous progress in the computer and internet technology, which completely influenced the way of FOREX market. The majority of today's trading is done online, where it is possible to see the real time changes, since the data is updated each millisecond. Technical analysis is generally more suitable for the very short term prediction²⁹, since the longer the time span for forecasting is; the more inaccurate our prediction is going to be (Eiteman, Stonehil, & Moffett, 2007). Therefore the usage of technical analysis is in the context of multinational companies rather limited, since it usually focuses only on the near future. Besides, technical forecasting cannot really prove a proper point estimation of the possible future values, which is crucial for the MNCs, which want to know to what extent they should hedge their positions (Madura, 2008).

1.4.3. Market based forecasting

Alternatively it is possible to obtain the desired prediction by deriving it from the *Forward rate*, which means practically nothing else than, that the forward rate for a particular period should be equal to the expected future spot rate relevant for that date. This concept works rather in the short run³⁰ (Shapiro, 2009). Even though there are forward rates available also for more distant future (2 to 5 year or even longer), the bid/ask spread is then much wider due to the limited trading volume, which limits its explanatory value for forecasting. Furthermore such long term rates are rarely published in financial newspapers and therefore without a consultation with relevant institution rather difficult to obtain (Madura, 2008).

 ²⁹ Such as one day, because the patterns in Exchange rate movements are more systematic over such periods
³⁰ up to one year, but most frequent are 30, 60 and 90 days forward rates (Madura, 2008)

Another way how to predict exchange rates development is to use the services of specialized banks and financial institutions, which are preparing sophisticated outlooks, trends analysis and run economic calendars advising the users about important announcements and impacts on the exchange rate. Even though, most of these services are usually correspondingly charged, there are also some services provided for free by central banks³¹ and some other institutions³².

All these approaches should not be competing, but rather seen as complementary. Many companies and traders combine all of them in order to see the issue from different angles and forecast the development as accurately as possible. To increase the accuracy, MNCs should definitely monitor the success of their predictions. If the forecasted values are in the long run over- or underestimated, the prediction models might be biased and should be therefore adjusted accordingly (Madura, 2008). Even though it is crucial for a MNC to be aware of future trends in exchange rates, forecasting represents lot of ambiguities and should be used rather as a supplement for managing the exchange rate exposures.

³¹ CNB publishes forward points for three and six months

³² For the Czech context we might use e.g. Patria Online, Next Finance or Česká spořitelna; international example might be fxstreet.com

2. Foreign exchange management

In the first chapter we have introduced various aspects of foreign exchange exposure that every financial manager should be definitely aware of. Now we know why this type of risk exists, where it originates from and in which forms it can put a company in jeopardy. Moreover we also learned the basic ways of its measurement, predictions and future development. This chapter will follow with the introduction of the management of foreign exchange exposure, where we will focus on various methods how the risk can be managed, eliminated or used as an advantage.

When we speak about managing currency exposures, we should definitely start with defining the fundamental terminology. One of the essential terms is *hedging*. We often hear that lot of firms approach foreign exchange exposure with various forms of hedging – But what this expression really means? It can be defined as follows: *"Hedging is the taking of a position, acquiring either a cash flow, an asset, or a contract that will rise (fall) in value and offset a fall (rises) in the value of an existing position.* (Eiteman, Stonehil, & Moffett, 2007)" To a certain extent we can compare hedging to insurance, since they both enables us to reduce losses when a negative event happens. It does not prevent the negative event from happening, but it lowers its impacts. We have already cleared up that all subjects on the market, including the ones that do not engage in international trading directly, are exposed to exchange rates fluctuations. The question, which arises is, whether to hedge or not.

Every company is different and perceives the volatility of currency market from different perspective. The risk perception³³ is generally very subjective and therefore the particular strategies towards hedging will differ from case to case. In this regard, we also differentiate between the perception of management and shareholders. *Agency theory* says that financial managers (hired agents) usually tend to be rather risk averse and hedge open positions instead of speculating³⁴. They could easily become a target of criticism for incurring foreign exchange losses, which are usually presented in the income statement as a single line item or as a footnote. Therefore they are highly visible at the first glance. On the contrary the

³³ There are in general three common risk perceptions: risk tolerant, risk neutral, risk averse.

³⁴ Based on the agency theory, the perception of shareholder is usually just the other way around. Shareholders consider hedging usually as unnecessary expense, since they have the choice to diversify their portfolio and manage the currency risk on their own by investing in different companies, exposed by different currency fluctuations (Eiteman, Stonehil, & Moffett, 2007).
costs connected with hedging the risks are accounted as a part of the operating or interest expenses, which makes costs of hedging buried in the total figure. Furthermore it is argued, that the incurred losses are perceived in a much worse light, than the similar or even higher costs spend on avoiding the exchange rate losses (Eiteman, Stonehil, & Moffett, 2007).

Except the context of financial institutions, where is profiting from mispriced securities one of the business activities, it is rather rare to see that a company's hedging objective is to generate profits. In general, we can agree that firms should be making money above all from their core businesses. The key objective of the FX management should be rather understanding – *how* and *why* can hedging enable the firm to make better investment and operating decisions, so it could operate, produce and trade its products more efficiently. In other words currency fluctuations can notably affect the company's earnings, which may consequently lead to lower spending on research and development, which might negatively influence the company's future growth and competitiveness. From this point of view we may say, that FX management should help to produce value, than just being a zero-sum game. However, the benefits of hedging have rather *indirect character* (Sermonia, 2012).

The general approaches to hedging foreign exchange exposure can be grouped into three general strategies (Bragg, 2010):

- To not hedge the exposure
- To hedge selectively (Selective hedging)
- To hedge the exposure through business practices (internal hedging strategies)
- To hedge the exposure with external strategies (derivatives, money market hedge)

Doing nothing and *not hedging* the positions is the simplest strategy. If a company decides to follow the path of accepting the foreign exchange risk, it plainly speculates and can either earn gains or suffer losses. What matters, is generally the size of the company and the size of its open positions. If the expenses, arising from setting up and monitoring a hedge, exceed the eventual loss, it makes sense to leave the position un-hedged (Bragg, 2010)

Moreover, when a company operates on high margin, while the exchange rate remains relatively stable, the willingness to hedge decreases.

Selective hedging is a strategy of hedging only the positions, which are expected to incur a currency loss. On the other hand those positions for which a firm anticipates a currency gain are left un-hedged. A crucial aspect for a successful practicing the selective hedging is effective and conclusive forecasting of the future FX changes (Glaum, 2005).

2.1. Internal hedging strategies

Companies can reduce the currency exposure with its own internal business practices. The efficiency and success of these methods depends on the company's bargaining power and its negotiations skills. That means, the firms do not need to enter any extra contracts which usually lead to increased costs. In this subchapter we will speak about the following strategies: choosing currency of the invoice, currency diversification, natural hedging, diversifying operations, netting, matching, leads & lags and currency clause.

If the position of the company is strong enough and has the power to negotiate the terms of a contract for its own benefit, then it can insist on denominating some of its contracts value in its *home currency*. For instance an exporting company must usually in the foreign markets accept the local currency for invoicing its sales. If the company agrees with its home suppliers on invoicing in the particular foreign currency, the open position can be closed through that. Some smaller companies let their customers to pay in the chosen own currency in order to have a favorable competitive advantage at the expense of exposing themselves to the exchange rate risks (Bragg, 2010).

Currency diversification represents a concept of using currency correlation as a method of hedging. If a company has the side of assets (or liabilities) denominated in more currencies, then the less correlated they are, the less currency risk is the firm facing. In addition, if the company has its assets denominated in one currency and liabilities in another, than more correlated currencies would represent lower exposure as well (Černohlávková, Sato, & Taušer, 2007).

On the internet there are various free FOREX websites³⁵, where we can obtain the real time correlations among different major and minor currencies, which can be easily filtered, with respect to the chosen time frame, scaling from 5 minutes to 1 week. Compared to what we explained earlier, that the range of correlation coefficient is < -1;1 >; in practice it is more frequent to present the scaling in percentages, i.e. < -100%; 100% >. It looks different but the logic remains the same.

Table 4 presents an example of such correlations and we see that e.g. the currency pairs EUR/NOK and EUR/USD are rather negatively correlated and therefore having them together on one side (either assets or liabilities) would not expose the company anyhow. On the contrary having together on one side EUR/USD and EUR/GBP would embody for a company from Eurozone country really high foreign exchange exposure, since the both currencies tend to move in the same direction. Thus, having them rather on different sides of the balance sheet would be almost risk free.

Currency	EURCHF	EURCZK	EURGBP	EURNOK	EURUSD
EURCHF	100.0%	57.5%	91.7%	-27.3%	90.4%
EURCZK	57.5%	100.0%	73.0%	-10.5%	61.0%
EURGBP	91.7%	73.0%	100.0%	-27.4%	93.3%
EURNOK	-27.3%	-10.5%	-27.4%	100.0%	-43.9%
EURUSD	90.4%	61.0%	93.3%	-43.9%	100.0%

Table 4 Currency correlations (1 week)

Source: created by the author based on (MyFXbook - Correlation, 2015) (7.7. – 14.7. 2015)

Natural hedging represents relatively simple and powerful concept of hedging, where a company generates closed positions through having its expenses and revenues in the same currency³⁶. Of course we have to take into consideration that the positions would be completely closed only if their values as well as their due dates were always identical. However, even a partial closing of the position can make a difference and represent notable benefit for the company. According to the working paper of CNB, about hedging behavior of Czech exporting companies from 2011, almost 60% of Czech hedged exports were secured

³⁵e.g. https://www.mataf.net/en/tools/01-01-correlation or http://www.myfxbook.com/forex-market/correlation

³⁶e.g. inputs for production as well as outputs would be denominated in EUR

with this method. (Čadek, Rottová, & Saxa, 2011). Natural hedging is the fundamental idea and desired outcome for some of the following hedging methods.

Funding is an internal method based on the principle of natural hedging, where a company uses different foreign capital markets for borrowing/lending funds in particular currency to offset open position.

Diversifying operation is a method with a strategic function. If there is a large volume of cash flows denominated in foreign currency coming from a particular country, we should take into consideration hedging them with shifting some of our costs into that country and spend the incoming currency right over there. We could namely start to use local suppliers or transfer there a part of our production. This activity is also called *creating chains*, since firms diversify their production chains. They are less exposed to the FX risk because if certain supply becomes through FX movements relatively riskier, the firm can use another supplier from a country with more favorable and stable exchange rate. The same holds for customer side, which can be diversified similarly.

Nevertheless as far as the diversified sourcing is concerned, we should keep in mind, that such decision is relevant only if it would not interrupt our supply chain and limit the smoothness of production. More long-term and binding decision would be to either buy or establish a production plant in that country, which would of course require not only the initial capital, but also more detailed investment plan (Bragg, 2010).

There are companies regularly trading in multiple countries and conducting considerable amount of transactions, which can take not only lot of time but requires repeatedly buying and selling the same currencies over and over again. *Netting* is an internal business practice that helps to solve such troubles. Its basis lies in the mutual inclusion of the transactions, which are, so to say, netted and result in smaller residual balance that is at the end physically shifted. The simplest version is *bilateral netting*, where we consider only two subjects located in different countries. Besides improving efficiency with lowering the volume of the transactions we also have lower value (the residual balance), that is at the end exposed to exchange rate fluctuations (Bragg, 2010).

If we consider more than two subjects, than we speak about *multilateral netting*. In such cases we need to include another subject into the process, namely: a *re-invoicing cente*³⁷, which is usually a separate corporate subsidiary or department that serves as a middle man that centralizes as of a certain date all the intra-firm foreign currency transactions and converts them into one common currency (usually reporting currency of the parent company). Consequently it notifies each subject about the final receivable or payable that has to be transferred. For a better understanding we will consider a Czech based MNC having subsidiaries in Poland and Slovakia. Their mutual receivables and payables are graphically illustrated in the Exhibit 5.



Exhibit 5 Structure of intra-firm transactions without netting

Source: created by the author, inspired by (Černohlávková, Sato, & Taušer, 2007)

The Exhibit 6 shows the structure of mutual cash flows, after applying the multilateral netting and introducing Reinvoicing center. With this method we were able to decrease the number of transactions from six to three and decreased the total exposures of each subject. In the case of Polish subsidiary was the risk reduced from the initial exposure of 200.000 CZK and 15.000 EUR (which is together 608.150 CZK)³⁸ to final 379.841,5 CZK³⁹. Concerning the Czech Headquarters, we eliminated the foreign currency risk completely. In practice it is however, more often for the foreign subsidiaries to receive/issue bills in their local currency,

³⁷ Sometimes called a *currency vehicle*

 $^{^{38}}$ together $\rightarrow 200.000 + 15.000 * 27,210 = 608.150$ CZK

³⁹ similarly in the case of Slovak subsidiary, from the initial 350.000 CZK and 30.000 PLN (≈545.693 CZK) to 52.927 CZK

which leads to the fact, that the exchange rate exposure is ultimately transferred to the headquarters.

Czech Headquarters 326.914.5 CZK Reinvoicing center 52.927 CZK Slovak subsidiary				
Subject	Without netting	With r	netting (residual balance)	
Czech	Receivables: 550.000CZK	550.000 - 5.000 * 6,5231 - 7.000		
HQ	Payables: 5.000 PLN + 7.000 EUR	*27,210 = 326.914,5 CZK (REC)		
Polish	Receivables: 35.000 PLN	35.000 *	6,5231 - 15.000 * 27,210 -	
sub.	Payables: 15.000 EUR + 200.000 CZK	200.000 :	= - 379.841,5 CZK (PAY)	
Slovak	Receivables: 22.000 EUR	22.000 * 27,210 - 30.000 * 6,5231 -		
sub.	Payables: 30.000 PLN + 350.000 CZK	350.000 = 52.927 CZK (REC)		
		Total	0 CZK	

Exhibit 6 Structure of intra-firm transactions with use of multilateral netting

Source: created by the author, own calculations, inspired by (Černohlávková, Sato, & Taušer, 2007)

Matching follows the same principle as multilateral netting and uses services of reinvoicing center, which is responsible for matching the foreign currency transactions with respect to their size and maturity. This explanation sounds very much the same as the process of multilateral netting, which may lead to confusion. What is the difference then? Matching can be used not only for intra-firm purposes, but also above this scale and include external subjects (Durčáková & Mandel, 2003). For instance when a company is long in PLN, then it might offset this position with transferring some of its costs to Poland and find let say a Polish supplier. If the sizes and maturities of both contracts were the same, then we would successfully close the exposed position. The company would benefit even if the two positions did not match perfectly, since the exposed position would be closed at least partially.

Leading & Lagging stand for changing the timing of payments that have to be made or received in another currency. In the first case we speak about accelerating the payments. For example, firms prefer to pay their payables earlier, because they anticipate weakening of the home currency, which would otherwise at the time of regular maturity result in higher costs that the companies want to eliminate. Concerning *lagging* it is just the other way around and firms want to delay their payments (Černohlávková, Sato, & Taušer, 2007).

The whole concept of Leading & Lagging requires profound knowledge of currency forecasting and willingness of counterparts to negotiate. First requirement is rather self-explaining, since without any relevant currency prediction, we would not be able to reveal the possibility of changing the timing of payments. Second argument refers to the fact that the counterpart has to be flexible and willing to accept the change. Such consensus could be reached for example in exchange for offering something extra⁴⁰, but that would anyway in the end result in increased expenses as well. These methods are used rather between companies that have been doing business with each other for some time and trust one another.

Currency clauses are part of contracts, where both parties agreed on risk-sharing. This commitment bonds them to either share or split the currency movement impacts on their mutual transactions. Similarly as in the previous method, this practice is suitable rather for firms interested in long-term relationship (Eiteman, Stonehil, & Moffett, 2007).

Table 5 summarizes all above mentioned internal strategies by presenting their corresponding suitability for hedging particular types of foreign exchange exposure. Based on this composition we can observe that most of the internal hedging methods are used especially for reducing operating exposure, since their effect can be visible rather in the long term.

⁴⁰ more favorable terms, such as discounts or extra services

Strategy	Type of foreign exchange exposure
Currency of invoice	Transaction, Operating
Currency diversification	Operating
Natural hedging	Transaction, Operating
Diversifying operations	Operating
Netting	Operating
Matching	Operating
Leading & Lagging	Transaction, Operating
Currency clause	Operating

Table 5 Internal hedging strategies suitable for particular types of foreign exchange exposure

Source: created by the author

2.2. External hedging strategies

When a management has exploited all the internal strategies for hedging and the company still faces a substantial exchange rate exposure it should start considering external hedging methods. These types of hedging strategies are based on entering additional contracts, which offset the exposed positions. External hedging can be done either through *Money market hedge* or *Currency derivatives*. (Černohlávková, Sato, & Taušer, 2007).

2.2.1. Money market hedge (synthetic forward)

We mentioned that external hedging methods involve an additional contract, which is in the case of money market hedge a *loan agreement*. In addition to that a firm also needs for this strategy a *source of funds to fulfill that contract*. The fundamental of *money market hedge* idea lies once again in matching the future cash-flows denominated in foreign currencies. In order to close an exposed position, we open a counter position with help of the money market (taking loan or depositing the money) in the same currency, size and having the same maturity (Eiteman, Stonehil, & Moffett, 2007).

This technique is more understandable and easier to explain with help of a practical example⁴¹. Let's consider Czech company that is 100.000 PLN long with a maturity of 4 months. The company is therefore afraid of future appreciation of home currency. The

⁴¹ inspired by (Černohlávková, Sato, & Taušer, 2007)

position can be closed by opening a counter position denominated in PLN. The company can therefore take a loan from a Polish bank due in 4 months. The polish bank will of course charge us an interest for its service; let's consider for this example a lending interest rate of 2% p.a.. This interest will be of course reflected in the obtained amount, which means we do not receive exactly 100.000 PLN. It has to be discounted to the present value and since the loan will not be provided for the whole year, we will pay only a partial amount of the interest, namely one third⁴². Therefore:

$$PV = \frac{100.000}{\left[1 + (0.02 * \frac{1}{3})\right]^{1}} = 99.337,75 PLN$$

When are both contracts due, we will simply take the money from our customer and return them to the Polish bank, which eliminates the potential losses caused by the forecasted appreciation of CZK. Meanwhile we transfer the amount with today's spot rate into CZK and can either use the money for the company's operations or more presumably deposit it in the home bank and generate four month interest over there. For our example we consider the following data: $SR_t=6,5231$ PLN/CZK; $IR_{H, D}=1,2\%$. We will get the CZK amount at the date of maturity with computation of future value:

$$FV_{t+4m} = 99.337,75 * 6,5231 * \left[1 + \left(0,012 * \frac{1}{3}\right)\right]^{1} = 650.582,04 \ CZK$$

Money market hedge can be evaluated by the calculation of so called *effective exchange rate*⁴³, which is in this case an exchange rate that includes the today's exchange rate, the current home interest rate and the foreign lending interest rate. Effective exchange rate can be computed by dividing the final value in home currency (650.582,04 CZK) by the initial amount of open position in the foreign currency (100.000 PLN). Therefore the effective exchange rate of our example would be 6,5058. Later on can be according to SR_{t+4m} compared and analyzed how effective the hedging was.

Money Market hedge can be similarly used also for hedging short positions. The whole process would be logically just the other way around. Taking the same example - in

⁴² often expressed in days (with approximation: year = 360days; month = 30 days) \rightarrow 120/360 = 1/3

⁴³ Effective exchange rate is an Exchange rate, which we at the end pay for the realization of our hedging transaction

order to close the position we would convert the desired value⁴⁴ at today's spot rate and deposit it in Polish bank for 4 month with agreed FV_{4m} =100.000 PLN. Four months later we would use that money for covering our payables.

Sometimes is this strategy called synthetic forward, because it enables a company to artificially fix the future exchange rate and completely close an open position. The biggest advantage of this strategy lies in its flexibility, since the deposits or borrowings can be arranged exactly at the needed size, which makes it a suitable instrument for covering transaction risk. Moreover, a company can also combine this technique with solving the financing of its activities⁴⁵. (Černohlávková, Sato, & Taušer, 2007).

2.2.2. Currency Derivatives

The term *derivatives*, as the name itself suggests, stand for financial instruments, whose *values are derived from an underlying asset like stock or a currency* (Eiteman, Stonehil, & Moffett, 2007). The currency derivative's value is therefore dependent on development of the chosen underlying currency. Derivatives are term contracts, whose conditions are agreed today but their realization will take place in the future. That implies we can use them either for speculation or for hedging, which will be point of our discussion in this subchapter. In nutshell, the ability to hedge means, that we negotiate a contract, which will enable us to use a specific exchange rate.

Derivatives can be further divided into *obligatory* and *conditional* derivatives, according to the nature of their fulfillment. Regarding the former, their future realization is strictly given by the contract and both sides are obliged to realize its terms. On the other hand conditional derivatives give preferential treatment to one side, which has a choice, whether it executes the contract or not. If it decides to take advantage of that deal, than for the other party is the realization always mandatory. Examples of obligatory derivatives are forwards, futures and swaps, whereas conditional derivatives are represented by options (Černohlávková, Sato, & Taušer, 2007).

⁴⁴ The CZK equivalent of PLN needed to yield us 100.000 PLN at the end of maturity, with respect to the current borrowing interest rate in Poland.

⁴⁵ Borrowed money does not have to be deposited and it can be used for the needs of the business instead. However, the final effective exchange rate would be then different.

Derivatives are traded either on exchanges⁴⁶ or in the over-the-counter market (OTC). The biggest difference between these two is that derivative exchanges standardize the traded products in terms of pricing, maturity, quantity etc. On the contrary OTC markets enable the traders to customize and negotiate any mutually attractive deal (Hull, 2008). Even though that the size of both markets is huge, the OTC market is much larger. Bank for International Settlements (BIS) reports following traded volumes (turnovers) of global foreign exchange contracts: ETD ≈ 8.281 bil USD (quarterly! turnover from Q1 2015)⁴⁷, OTC ≈ 5.345 bil USD (daily! turnover from April 2013)⁴⁸. The Exhibit 7 presents more detailed structure of both markets with respect to the traded instruments.



Exhibit 7 Structure of OTC and ETD market with FX contracts (globally)

Source: created by the author, based on (Triennial Central Bank Survey, 2014) and (BIS Quarterly Review, 2015)

2.2.2.1. Foreign currency forwards (Outrights)

The foreign exchange forwards are the simplest FX derivatives. These agreements are closed usually between a bank and a company, to buy or sell *a fixed amount of a foreign currency on a specific date, and at a predetermined rate* (Bragg, 2010). Such contract enables the company to lock the exchange rate for a future settlement and completely close the

⁴⁶ so called ETD markets = exchange traded derivatives markets; the biggest ETD market is CME Group (Chicago Mercantile Exchange; http://www.cmegroup.com/)

⁴⁷ Q1 2015 ((BIS Quarterly Review, 2015); Q1 2013 \approx 9.104 bil USD (BIS Quarterly Review, 2014)

⁴⁸ (Triennial Central Bank Survey, 2014) - the most recent available survey

exposed position. Therefore companies with long (short) positions would eliminate the risk by arranging a FX contract for selling (buying) foreign currency.

FX Forwards are usually traded in OTC market, since every single transaction is mostly customized directly between the two parties (Bragg, 2010). The terms of particular contracts will therefore vary from case to case, because not only clients' demands vary, but also each bank offers different conditions and have diverse requirements. Banks usually set a minimum contract value for arranging such contract and limit the minimum maturity of the forward⁴⁹. Sometimes they even require a refundable deposit. Thus, we may notice, that there are some limitations in the OTC market as well (Černohlávková, Sato, & Taušer, 2007). On the other hand such precaution is logical, because if one side does not fulfill the terms of contract, then the other party suffers a loss (credit risk).

Another problem might be a situation, when firm hedges an open position, which is, however, for whatever reason canceled (e.g. sales/purchases were aborted). As the forward contract has been customized it would be really impossible to find a buyer for such contract. A solution for that might be to enter into another FX forward contract in order to offset and negate the hedge (Bragg, 2010).

The pricing of such instrument is determined by the current spot rate, demanded time frame, transaction fees and interest rate differential⁵⁰ between the two chosen currencies. Forward rate calculation originates from the covered interest rate parity and hence comes from the same formula. However, we have to take into consideration, whether we calculate a forward rate for short or long position. For that, we need to understand that banks always quote two values for Spot and Forward rates – *bid* and *ask*.

Bid rate (under direct quotation) is used when selling the base currency⁵¹. That in other words means how much the dealer is willing to give us, when we want to sell the base currency. On the other hand the Ask rate says how much we get, if we want to buy the base

⁴⁹ e.g. Czech subsidiary of UniCredit Bank requires a minimum volume of 15.000 EUR and minimum maturity of three days (UniCredit - Měnový forward, 2015)

 $^{^{50}}$ The currency of the country having a higher IR trades at a "discount" and the one with lower IR at a

[&]quot;premium" (Bragg, 2010). ⁵¹ E.g.: In case of the direct quotation EUR/CZK \rightarrow EUR would be the *base currency* (the currency that is being traded as "goods"), while CZK would be the quoted currency (price for the "goods). This differentiation is extremely important, if the currency pair does not include the home currency, let say if we had in the Czech market a currency pair CHF/EUR, we could not call either of the currencies home.

currency. That implies, for hedging a short position we would use FR(ask), while in case of long position we would go for FR(bid). Forward rates are in practice often quoted as so called forward points, which is nothing else than the differential between forward and spot rates multiplied by $1.000 \text{ or } 10.000^{52}$.

2.2.2.2. Foreign currency futures

A foreign currency futures contract follows the same principle as forwards, except that they are traded on an exchange⁵³. That implies that futures are standardized contracts having uniform size, expiry date and settlement rules. They are usually handled through a broker, who charges for his/her service a corresponding commission. In addition, the purchaser is obliged to deposit an initial margin or collateral. Besides, the buyer may be also asked to submit an additional sum, in case the underlying asset of futures contract negatively changes its value. That is ensured by the fact that futures are *marked to market on daily basis*. If the underlying margin accounts are credited or debited too much, then the contract buyer must deposit additional funds. If he does not do it, the position is usually closed out (Bragg, 2010). Another difference compared to forward contracts is the existence of clearing houses. These subjects act as common counterparties for all the customers, which eliminates the risk somebody would not honor an agreement (Eiteman, Stonehil, & Moffett, 2007).

However, the biggest problem of currency futures, in the context of hedging FX exposure, is the above mentioned standardization of size and expiry dates, which complicates matching the open position that needs to be closed. If we consider futures contracts of the major currency pair EUR/USD (American quotation), which is issued in the full-size contract of 125.000 EUR (so called *lot*) it would be difficult to hedge a position of 300.000 EUR. The company would then need to buy two or three contracts, where neither would perfectly match the position. The same problem occurs with the desired maturity, which will most probably vary from the standard futures contract expiry date (third Wednesday of the contract month⁵⁴). This led to the emergence of so called mini and micro-future contacts, which enable trading with smaller standardized amounts and are also more affordable for smaller traders and speculators, who form an ever more important group of customers. In terms of FX exposure hedging, these smaller contract amounts could allow us to get closer to the complete closing

⁵² Depending on how many decimals the quotations of the rates have.

⁵³ More detailed comparison of FX Forwards vs. FX Futures is provided in the Appendix 1.

⁵⁴ Contract months are: March, June, September, December

the exposed position. Nevertheless, the mini and e-micro contracts are usually available only for the major currency pairs (Spaulding, 2014). FX future contracts for all major pairs⁵⁵ are traded at the CME in three standard sizes as shown in the Table 6:

Table 6 Three standard FX future contracts sizes

FX futures	Units of currency
Standard full-size contract	100.000 to 125.000
Mini-contract	1/2 of the standard
E-micro	1/10 of the standard

Source: created by the author, inspired by (Spaulding, 2014)

The standardization and high transparency ensured by the exchanges not only eliminates the counterparty risk, but also gives the future contracts huge liquidity, which makes them suitable especially for speculating purposes.

Regarding their use for FX exposure hedging, we need to take into consideration so called *basis risk*, which means that the changes in price of the underlying currency on the spot market does not match the changes of term futures contract $(\Delta FP \neq \Delta SR)^{56}$. Due to the changes in the value of the underlying currency and the daily settlement of the losses and gains, we are facing the continuous additional cash flows, which create the mismatch in the prices. Another downside is that FX futures are not that liquid for minor currencies, or more precisely, are not traded in mini and micro sizes, which complicates its practical use for hedging.

Foreign currency options 2.2.2.3.

A foreign currency option is a contract giving the option purchaser (the buyer) the right, but not the obligation, to buy or sell a given amount of foreign exchange at a fixed price per unit for a specified time period (until the maturity date) (Eiteman, Stonehil, & Moffett, 2007). The important aspect of this definition is that the buyer has the choice a can decide whether to take advantage of using the right of the option or not, which makes it a really powerful tool.

 ⁵⁵ Except GBP/USD, which is traded in size of 62.500
⁵⁶ (ČAB - Bankovní pojmy, 2015)

At the beginning we should introduce the general terminology of the option theory. A *call option* enables the buyer to purchase the underlying currency in *notional contract amount* (amount of currency), on the *expiration* date (option's maturity) for the *strike price*. Regarding the *put option* it is just the other way around, and it refers to selling the underlying currency. The two contract parties are called *writer* (grantor) and *holder*. The former refers to the seller/provider of the option, whereas the latter stands for its buyer.

What is actually the price/cost of an option itself? Writer charges for his service so called *premium*, which holder has to pay up-front (in advance) regardless he uses the option or not. The size of the premium is usually derived from the negotiated strike price, expiration date and volatility of the underlying currency. In case of the option writer are the costs unlimited, since they depend on the future FX fluctuations. Generally holds the more volatile a currency is the more expensive the option will be (Bragg, 2010).

We further differentiate between American and European options. The first one provides the holder with the right to exercise the option any time up to expiration, whereas the second one is exercisable first at the date of maturity (Eiteman, Stonehil, & Moffett, 2007).

Currency options can be seen as a special type of currency derivatives, because they are traded both in ETD and OTC markets. In the first case we speak about standardized currency options, sometimes called listed options, which are settled through a clearing house with guaranteed fulfillment. Standardized options are appealing above all to those, who do not have an access to OTC markets. Another subjects trading options on exchanges are banks, which use them as one of the opportunities, how to offset the risk arising from the options, which they have, as an option writer, provided their clients or other banks with (Eiteman, Stonehil, & Moffett, 2007). On the other hand OTC options are thanks to the custom-tailored nature more suitable rather for business purposes. A typical process of negotiating terms for an OTC option is placing a call to the chosen bank and after being redirected to the currency option desk we specify desired propositions of demanded option (currency, maturity, strike price⁵⁷) and ask for an *indication* (bid-offer quote). The next step will take usually from few minutes to couple hours until the bank prices the particular quote and calls us back (Eiteman, Stonehil, & Moffett, 2007).

⁵⁷ once again we have to take into consideration the minimal requirements for closing a currency option contract, e.g. Unicredit bank requires minimum amount of 100.000 EUR (UniCredit - Měnové opce, 2015)

Let's have a look at how hedging with currency options works in practice. Holder opens a *long* position by buying the option, whereas writer enters a *short* position by selling the option (Černohlávková, Sato, & Taušer, 2007). We will focus only on the long position, which is usually more relevant for the perspective of a company⁵⁸. However, here should be definitely stressed, that these two positions used in the context of options should not be confused with the long (receivables) and short (payables) positions of foreign exchange exposure. To put it straight, the long position (receivables exposed to FX changes) can be hedged by purchasing the put option (=long put position), whereas the short position (payables exposed to FX changes) can be hedged by purchasing call option (=long call position) (Hull, 2008).

The positions *Long call* and *Long put* are graphically illustrated in the Exhibit 8. It explains their profitability with respect to the option premium (P), the strike price (SP) and the spot rate (SR) changes. The left panel demonstrates that a rational holder, in long call position, exercises the option if the spot rate at the expiration date⁵⁹ is exceeding the strike price. On the other hand, if the spot rate at the expiration date is lower than the strike price, the holder would not exercise the option and would buy the currency on the spot market for more favorable SR. At that moment his costs would be only the amount of the premium. That implies the maximum costs of buying an option equal the size of the premium⁶⁰ while the writer's costs are unlimited. Furthermore, the holder can even speculate on the FX fluctuation - if the SR was at the expiration date higher than the break-even price, than the holder could make even profit on exercising the option, because it would cover the costs of the premium. The long put position follows the same principle but the effect is analogically the opposite, i.e. exercising when SR<SP and using rather the spot market when SR>SP (Černohlávková, Sato, & Taušer, 2007).

These relations are also illustrated by the terms at-the-money (ATM), in-the-money (INM) and out-the-money (OTM). Providing the option is ATM, than the holder can exercise the option at the exactly same current spot rate, while it is considered to be ITM (OTM) if the buyer can use the option at better (worse) price than the current exchange rate (Bragg, 2010).

 ⁵⁸ short position is therefore typical for banks
⁵⁹ we consider European options in this case

⁶⁰ Nevertheless it is important to stress that the premium can be a huge amount

Exhibit 8 Profitability of long call and long put positions



Source: created by the author, inspired by (Eiteman, Stonehil, & Moffett, 2007)

Compared to forwards, options offer more convenience, since a firm can decide – not to exercise the option, when the spot market prices are more favorable. That would be in case of forwards impossible, because the exchange rate has been fixed and the company, tied into a forward exchange contract and has to buy/sell the amount, even if the spot rate was better.

In addition, options can be really useful, when a company is bidding on contracts quoted in foreign currency, where no settlement has been confirmed yet. At that point is the firm already anticipating the FX exposure and can therefore hedge such position with using currency option. If it wins the bid, they can benefit from the exchange rate, which was already locked before. On the other hand if they lose the bid, they simply let the option expire and pay only the option premium. Compared to that, being already hedged by a forward and losing the bid or having a contract canceled would be more complicated., especially in moment when we could not enter a forward counter position, because the FR has meanwhile changed negatively.

However, a downside of option contracts might be seen in the requirement of paying the premium in advance. It is generally not a problem when is the option exercised and the gain from currency changes offsets the fee. Nevertheless, if the option is not used, than the premium is an outright loss. This problem can be partly solved by applying so called foreign exchange collar (zero-cost option strategy), which is a method using combination of options. Its fundamentals lie in simultaneously closing two inverse options contracts⁶¹ in the same currency with the same exercise date, currency, and notional contract amount, but with different strike price. The inversion of the options means, that we are buying an option contract but also selling an option contract. In addition, if we are hedging a long position we would need to buy a put option (long put position) and sell a call option (short call position)⁶². The position of a writer ensures us having the possibility to adjust option's strike price. This move enables us to set the strike price to same level, where our worst acceptable effective exchange rate is. The bought option will be than adjusted accordingly by the bank to fit the same values and above all the same premium, which basically brings our potential costs to equilibrium. More importantly it helps us to establish a *collar* (range) for the exchange rate oscillation. A *cap* is made by the sold option, whereas a *floor* is provided by the bought options expire (Bragg, 2010). Premiums will offset one another and we will be able to use the acceptable exchange rate free of charge. Nevertheless the end-result of using the zero-cost option would not be the same as when using only one option.

2.2.2.4. Swaps

A swap is an agreement between two companies to exchange cash flows in the future (Hull, 2008). Swaps are usually traded on OTC markets in inexhaustible variations and also in combination with other financial derivatives. Therefore, swaps relevant for our hedging foreign exchange exposure; are FX swaps and currency swaps.

FX swaps represent usually a combination of an operation on the spot market and using a forward contract for exchanging two currencies. This practice is easier to explain on a small example. Let's consider a Czech company that receives 1 million PLN from its customer. The company already knows, that in 2 month it will have to pay its Polish supplier the same amount -1 million PLN. In this moment could the Czech company simply convert the incoming 1 million PLN into CZK with today's SR and enter into Forward contract to eliminate the exposure from the short position. However, FX swaps offers a little bit more efficient solution, where the two transactions are basically transferred a carried by a bank into a single one. That enables the company to save money on transaction costs.

⁶¹ usually European-style

⁶² Hedging short position would be vice versa \rightarrow buying call option (long call position) and selling put option (short call position)

Let's consider an opposite scenario, i.e. the Czech company has to pay 1 million PLN to the supplier now and will receive 1 million PLN from its customer in 2 months. If the company does not have own money for the payment it would need to use the service of money market. Lending directly in PLN would be probably too expensive or could colide with some regulations for foreign currency loans. The company could therefore take a loan in CZK, exchange them on the spot market for the equivalent of 1 million PLN and pay with it the supplier. At the same time, the long position (2 months receivables) would be exposed to FX fluctuations a should be hedged with a forward contract. This process can be as whole solved by the FX swap, where a bank would cover all these steps on behalf of the company.

FX swaps can be a suitable instrument for solving the earlier mentioned problem of dealing with delayed receivables, which have been unfortunately already hedged by a forward contract that has to be realized. However, if the company did not have the funds for realization of the forward contract, it would need to take a loan, convert it into PLN, and pay. Beside that, the delayed long position would be still exposed by the FX changes. If the company used FX swaps instead, than the loan, converting and hedging would be included by the bank into one contract, which would be, more convenient and presumably more efficient solution for hedging the transaction exposure (Černohlávková, Sato, & Taušer, 2007).

The fundamental of *currency swaps* lie in exchanging principal and interest payments in one currency for principal and interest payments in another (Hull, 2008). Therefore instead of one spot transaction and one forward transaction we have to take into consideration the exchange of cash flows arising from the principles (interests) – hence many additional forward contracts. On one side of the contract there is typically a company that wants to invest and expand its activities in different country and is therefore expecting future cash flows in foreign currency. The company is aware of the FX risk that could continuously expose the cash flows and therefore wants to hedge them. To do so, the firm can contact a swap dealer or a swap bank and negotiates an agreement about exchanging equivalent amounts of two foreign currencies during the chosen time span, without exchanging the initial principles⁶³. The role of the swap bank or swap dealer is a role of a middleman, who sets up the swap contract and finds a corresponding counterparty. The counterparty is usually another

⁶³ Currency swaps can be arranged in various sizes and maturities (up to at least 10 years). Moreover, if the funds are more expensive in one market, compared to the second country, the swap bank may charge a fee to compensate the interest differential.

firm having the same problem, i.e. wants to invest abroad and is interested in hedging its future cash-flows denominated in the currency of the first country. Such contract requires two parties, where each of them can borrow funds in different markets (Eiteman, Stonehil, & Moffett, 2007). Let say a Czech company would usually borrow CZK from the home subjects in the Czech market, while a German firm would typically borrow EUR in the German market.

This method can be explained in three steps, which are illustrated in the Exhibit 9. In the first phase, the both parties, take a loan in the home markets and through the swap dealer exchange the nominal funds for the initial investment. In the second step both sides exchange the interest cash-flows originating from the corresponding loans. The interest payments should be covered by the sales from abroad generated by the subsidiary in the other country⁶⁴. In the third phase, after the maturity of both loans, the nominal principals⁶⁵ are swapped back and the swap deal is over.



Exhibit 9 The process of currency swap

Source: created by the author

 ⁶⁴ which regularly closes the exposed long positions
⁶⁵ quoted in the same exchange rate as in the first phase

The long term nature of the currency swaps enables companies using this technique to reduce operation exposure. In addition e.g. in the U.S. accounting system are currency swaps treated as a foreign exchange transaction rather than as debt. Moreover, they are often treated as altered forward exchange contract. In accounting term, *forward contracts can be matched against assets, but they are entered in a firm's footnotes rather than as balance sheet items. The result is that both translation and operating exposures are avoided* (Eiteman, Stonehil, & Moffett, 2007).

Table 7 summarizes external strategies with respect to their application for hedging particular types of FX exposures.

Strategy	Type of foreign exchange exposure	
Money Market Hedge	Transaction	
FX Forwards	Transaction	
FX Futures	Transaction (but not ideal)	
Currency Options	Transaction	
FX Swaps	Transaction	
Currency Swaps	Operation, (Translation)	

Table 7 External hedging strategies suitable for particular types of foreign exchange exposure

Source: created by the author

3.Case study NWR Plc.

In this chapter we will try to show, how changes of exchange rates can influence operations of a real company and how well is the firm able to manage the incurred FX exposures. For this purpose will be applied an analysis of the company New World Resources Plc, since the exchange rates fluctuations represent in their operations huge issue. The firm is under a direct influence of exchange rate changes of USD, CZK, PLN towards its functional currency - EUR. Author's personal motivation for choosing exactly this company was also driven by the fact, that NWR owns and controls the biggest Czech mining company OKD, which has been recently a target of many economic and political discussions in the Czech Republic. Hence, exploring the company's financial performance and various impacts influencing its functions could also reveal lot of interesting information. Another aspect that makes analysis of this particular company interesting is that it has been in the last few years on a downward sloping performance trend and it would be interesting to find out to which extent were changes of exchange rates on blame and which steps the firm underwent to mitigate this risk. The company analysis will be based on publicly provided information from NWR's annual reports and other materials. However, it will be limited to the extent of published documents, since the representatives of the company did not react to any of author's queries. Hence, this analysis will be focused above all on the operating exposure and its management.

3.1. New World Resources Plc. at glance

New World Resources Plc⁶⁶ (later as: NWR, the group or the company) is a British Central European producer of hard coal, registered in Great Britain, having its headquarters located in Amsterdam and listed on the Stock Exchanges in London, Prague and Warsaw. NWR is an employer for more than 14.000 people (including contractors).

The structure of the company might be at the first glance little bit confusing. NWR is owned by Dutch based investment group CERCL Holdings Limited, or more precisely by CERCL Mining B.V., which owns approximately 50,54% of A shares and has therefore an

⁶⁶ Plc. (public limited company) = British Public limited company

effective control of NWR. NWR Plc. further fully owns NWR N.V.⁶⁷, which has been established with a goal to operate as a holding company for the coal mining operations, coking business and other related activities. Compared to that, NWR Plc. is responsible for the oversight of Group's strategy and for reviewing its management & financial performance. NWR N.V. further fully owns OKD, a.s.⁶⁸ and NWR KARBONIA S.A.⁶⁹. The former is the Czech largest and the only hard coal mining company operating in the Upper Silesian and Northern Moravian coal basin with currently four active coal mines⁷⁰: Karviná mine, the ČSM mine, the Darkov mine and the Paskov mine. On the other hand NWR KARBONIA S.A. works as a coordinator overseeing development projects in southern Poland (Dębieńsko and Morcinek). The Exhibit 10 illustrates the group's structure relations graphically.



Exhibit 10: Structure of the company

Source: re-created by the author, based on the NWR Annual Report 2014

Through OKD, a.s. NWR produces quality (coking⁷¹ and thermal) coal and supplies the steel and energy industries in the region of the Central Europe. Coking coal is fundamental material for manufacturing, blast-furnace coke and foundry coke, which is essential for production of steel. Thermal coal is, as the name itself suggests, a resource for generation of energy and heat.

⁶⁷ N.V. (Naamloze Vennootschap) = Dutch Public limited company

 $^{^{68}}$ a. c. (akciová společnost) = Czech Public limited company

⁶⁹ S.A. (Spolka akcyjna) = Polish Public limited company

⁷⁰ Geographical illustration of mine sites is stated in the Appendix 2

 $^{^{71}}$ + PCI coking coal = "full name Pulverised Coal Injection. PCI coking coal is injected into a blast furnace as a supplementary fuel to reduce the amount of coke consumed, having a knock-on effect on reducing operating costs in the production of pig iron, and ultimately crude steel." (NWR - Coking coal, 2015)

Concerning coking coal, among the crucial customers belong blue chip steel and energy producers such as⁷²: ArcelorMittal (CZ+POL), U.S. Steel Košice (SK), Voestalpine (AU), Moravia Steel (CZ), Metalimex (CZ) and DBK (HU). As far as the thermal coal is concerned, the key customers are: ČEZ (CZ), Veolia Energie (CZ), Elektrarna Detmarovice (CZ), SWM Services (DE), Verbund (AU), TAMEH Czech (CZ) and Novscom (POL). The group widely depends on trading with small number of key customers. For instance in 2014, 71% of thermal coal sales and 95% of coking coal sales were traded with 6 major customers. This structure of customers may be certainly seen as very risky and dangerous, because dependence on small number of customers may create significant difficulties. If NWR lost one of them, it would mean a substantial decrease in sales, since finding quickly a substitute-customer in the coal market would be rather troublesome.

Regarding the Coal reserves available in NWR's active mines were in the end of the year 2014 estimated at 83 million tonnes out of which on beneficiation should predictably yield 58 Mt of Marketable Coal Reserves. Considering NWR's strategy plans to become Europe's leading miner and marketer of coal (above all focus on coking coal)⁷³, and to retain production level around 8 Mt/year (see Exhibit 11), we could argue that under the actual resources it would not be obviously sustainable business in the long term. Furthermore, it is estimated that the coal production might continuously decrease considerably further down. The production level might in several years even hit the level of 4 Mt/year.



Exhibit 11: Total coal sales in Mt

Source: created by the author, based on the Annual Reports (2011-2014)

⁷² Geographical location of some of the key customers is stated in Appendix 3

⁷³ For a description of the company's strategy see Appendix 4

Therefore NWR continuously undergoes various researches for new mining possibilities, as well as new plans for optimization of the existing operations. For instance, in the case of the development project Dębieńsko in Poland, a pre-feasibility study proved that there are potential resources for coal mining estimated at approximately 186 Mt (on beneficiation Marketable Coal Reserves). Nevertheless the development project Debieńsko had to be due to the adverse market conditions suspended. Even though the company was already in that case granted a 50 year mining license, such project would require substantial capital investment, which the company cannot in current financial and economic situation afford. NWR is therefore now searching for a strategic partner/s, who would be interested in a joint participation on the finalization and consequent realization of the mining project. Development projects in Morcinek (Poland) and Frenštát (the Czech Republic) are currently still in the exploration phase. However, there is a big issue that has to be seriously taken into consideration – despite having all relevant permits for the mining, if NWR does not accomplish its developments projects during the particular deadlines allowed by the licenses, the precious permits for mining in these areas might be lost.

Exhibit 12 shows the market position (2013) of NWR in the Central European coking coal market is with its 19% not that strong, despite the ambitious strategy plan aspiring to become a Central European leading coking coal producer and marketer until 2017. Compared to the year 2011, where the company had 25% market share, we can clearly see the downward-sloping trend in the NWR's performance and therefore lower probability of fulfilling the set strategy in this regard.





Source: created by the author, based on the Annual report 2013

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As far as the financial performance of NWR is concerned, there has been a continuous decline in many financial parameters of the company's operations. The Exhibit 13 shows the development of the costs and sales.



Exhibit 13: Development of Revenues/Costs of sale + Revenue by location

Source: created by the author, based on the Annual Reports (2011-2014)

From the graph can be seen that there has been a significant drop, which started in 2011 and continued until today. According to the official reports is that explained by unfavorable pricing environment for both thermal and especially for coking coal. In addition to that demand for coking coal and charged prices essentially depend on the tight interconnection with steel industry and consequently following up industries (such as automotive industry). Therefore decrease in the global steel prices may ultimately end up in downward pressure on the coking coal prices as well.

The world coking coal pricing is tightly dependent on the development and performance of Chinese coal market and on the Chinese biggest coking coal supplier – Australia, where the prices are in fact determined. These prices are consequently transferred to the Central Europe, where marketers and producers take them over and add their margin. As a result of an economic downturn and slowdown of China's growth, the demand for coking coal decresed, Australia has accumulated big inventories of this commodity, which pushes the prices of coking coal down in terms of the global supply side. The international benchmark price for the hard coking coal has been continuously decreasing and resulting in

65% drop between the years 2011 and 2014. These changes and the overall development of both World market prices and the realized prices of NWR are shown in the Exhibit 14. According to the Q1 2015 Results report, should 74% of expected production in 2015 be priced with agreed price of 93 EUR/t.





Furthermore, the financial performance was also caused by the lower sales volumes of thermal coal, which were caused by relatively mild winters reflected in lower demand on the thermal coal markets. That led to oversupply on the market and increased inventories. Besides, the lower demand for thermal coal in the energy market was even more decreased by large increase in the US natural gas (shale gas) production. New unconventional methods of mining shale gas drove down its prices, which afterwards led to increased demand for this commodity and simultaneous decline in the demand for thermal coal in the US. Stockpiles of the unsold US thermal coal are consequently exported to the European market for cheaper price, where it negatively influences the local market prices of thermal coal.

In addition, the European thermal coal prices are affected by the strong position of Polish thermal coal producers (strongly subsidized by Polish government), which

Source: (Q1 2015 Results , 2015)

⁷⁴PHCC = premium hard coking coal, MVHCC = mid-volatility hard coking coal, SSCC = semi-soft coking coal

unexpectedly influenced prices of the thermal coal. Similarly as in the case of the coking coal, the prices of thermal coal have fallen down between the years 2011 and 2014 by 50%.

Eventually, the decreasing prices force NWR to re-valuate and write down its coal reserves, which result in an impairment of the assets' value. This impact is really substantial and the company had to at the end of 2013 due to the unfavorable pricing environment report impairment charges of 807 million EUR, which were significantly reflected in the firm's key performance indicator EBITDA.

The upper panel of the Exhibit 15 presents the consolidated net cash flows of NWR.



Exhibit 15: Consolidated net cash flows + development of cash and working capital

Common indicator of financial health of a company is positive Cash flows from operating activity. From general point of view, this variable should not be in the long term continuously negative, since repeatedly negative values would suggest that the core business activity is not profitable and paying off. This is however, the issue of NWR, which has been since 2013 having negative values of this indicator. Here should be stressed that hand in hand with the continuous negative cash flow results in operating activities, NWR was during the last decade substantially indebted and became less and less liquid. That can be visible from the lower panel of the Exhibit 14, which presents company's rapid decline in its cash (+ cash equivalents) and the overall drop in NWR's working capital⁷⁵, which both illustrate the decreasing liquidity of the firm and increasing threat of being unable to cover its short term liabilities.

Continuous negative CF from investing activity reflects the efforts to invest in development projects, which would secure desired mining potential for the business's future. Nevertheless we may observe that as a consequence of bad financial performance of the company, this item was significantly tightened up in the last years. However, coal business is in general very capital intensive field and investments are necessary for retaining/increasing the mining volumes. That leads to a rather pessimistic implication, that with declining investments will NWR have to face decreasing production volumes and ultimately worse financial performance.

Negative CF from financing activity is usually a sign of healthy companies, which are able to pay back their debts. Paying down the debt should be however connected to the funds generated from operating activity, which is not the case of NWR. The rather neutral value of the CF from financing activity from 2014 is an effect of a complex balance sheet restructuring process that enabled NWR to raise new funds (assuring better liquidity). The successful shakeout was even at the end of 2014 reflected by an upgrade in company's rating to Caa3 from Ca⁷⁶.

⁷⁵ Working capital = current assets – current liabilities

⁷⁶ Moody's investors service - (Migliavacca, 2014)

3.2. FX exposure & risk management

The subject responsible for a complex establishment and oversight of the NWR's risk management framework⁷⁷ is its Board of Directors. The Board reviews and sets particular written policies and principles for managing the key exposures (such as rules for application derivative/non-derivative financial instruments, etc.). The crucial fields of exposures for the group are: credit risk, liquidity risk and market risk (currency & interest rate risk). For execution of the risk management duties are responsible a *central treasury* (also called Group treasury) and *risk departments*. Central treasury department is in charge of identification, evaluation and hedging of the above mentioned financial exposures in close co-operation with the particular local business units within the NWR group.

Implementation of policies and practices for monitoring possible changes in the value of assets and liabilities caused by the fluctuation of the exchange rate risks are in NWR a big issue, since the company is widely international and its activities require inclusion of trading in various countries. This results in significant transactional FX exposures that the company has to face and manage.

3.2.1. Structure of outputs (sales) and inputs (costs)

To get a better overview about the impacts of the foreign exchange fluctuations on the company's operations, we will need to have a closer look at the structure of its outputs and inputs. Beginning with the outputs, the question is which currencies are for the operations of NWR with respect to its sales important. The core business and the only sales generating unit of NWR is OKD, which is based in the Czech Republic and where the functional currency is CZK. NWR reports that in 2014 approximately 46% of the revenues of OKD were invoiced in different currencies than is the unit's functional one. The *Exhibit 16* illustrates the latest percentage development of OKD's sales denominated in other currencies than CZK. We may observe that the proportion of non-CZK sales is relative to CZK sales on upward-sloping trend.

⁷⁷ Official risk management Framework is provided in Appendix 5



Exhibit 16 Percentage of OKD's sales denominated in non-functional currency (not CZK)

Source: created by the author, based on the Annual Reports (2011-2014)

This information above is supplemented by the Exhibit 17, which illustrates the structure of revenues by the customer's country of origin. According to both the information above and also the structure of sales mentioned below it is clear that majority of sales are still denominated in CZK and the Czech Crown is therefore in this regard the most important foreign currency. This also reflects the fact that lot of customers (as illustrated in the Appendix 4) come from the Czech Republic and prefer CZK as invoicing currency.



Exhibit 17 Revenue by location of customers

Source: created by the author, based on the Annual Reports (2011-2014)

Despite the fact, that the company earns its revenues also in countries outside Eurozone (such as Poland and Hungary), NWR does not report any financial flows, originating from sales, in currencies other than CZK and EUR. NWR's coal is usually priced and sold in either of these two currencies.

The most important variable that has been currently influencing coal sales is price of coal. Here should be stressed, that international market prices of this commodity (both coking & thermal coal) are typically quoted in USD. Coking coal prices are usually globally traded with respect to the *international benchmark prices* (The International Hard Coking Coal Benchmark).

According to the NWR's strategy⁷⁸ is *coking coal* the key product that the company wants to focus on, at expense of stagnating *thermal* coal production. This motion is driven by the promising trading potential in the region. NWR reports that the area of European Union and its states are structurally short of coking coal. The annual supply gap is estimated to 4 million tonnes within Central Europe and more than 50 million tonnes in terms of the whole Europe. This strategic move can be supported by the higher panel of the Exhibit 18, which illustrates the proportion of the two coal products with respect to the company's sale revenues.

NWR prepares its deals based on the benchmark prices, where contracts of sale of coking coal with the major customers are designed for supplies during the whole year, where the prices are adjusted on quarterly basis. According to the official reporting, NWR has fixed the coal prices for most of its anticipated sales in the year 2015. Nevertheless, where it is possible, NWR approaches its customers seeking local parity prices instead of taking the consensus market benchmark prices.

From the lower panel of Exhibit 18, we can clearly see the continuous downfall in the prices of both coal products. As mentioned already above, the prices were influenced by various aspects (coking coal demand, follow-up performance of steel industry, steel prices, automotive industry etc.). However, indispensable role plays here also fluctuations of the exchange rates of USD/EUR and USD/CZK, which directly influence the transfer of international benchmark prices into EUR or CZK equivalents. NWR's concern, as a seller of coal, is to be able to charge as highest prices as possible. Long-term appreciation of the USD

⁷⁸ See Appendix 4

against the two currencies could relatively increase the Group's EUR (CZK) price of coal products, which would follow up as an increase in its revenue.





Source: created by the author, based on the Annual Reports (2011-2014)

As we see from the Exhibit 19, there has been a continuous appreciation of USD against both CZK and EUR⁷⁹ since the second half of the year 2014. The exchange rate of USD/EUR has increased since that time by more than 25%. If this trend holds in the long term, NWR could benefit from relatively higher EUR prices. According to the official reporting, the firm does not manage impacts of USD fluctuations anyhow, which under recent situation is of course understandable.

⁷⁹ The similar development of USD/EUR and USD/CZK is given by high correlation of these two pairs, where CZK and EUR are extremely interconnected



Exhibit 19: Exchange rate fluctuations of USD/EUR and USD/CZK

Source: created by the author, based on (Quandl - Currency Exchange Rates - USD vs EUR, 2015) and (Quandl - Currency Exchange Rates - USD vs CZK, 2015)

Now let's have a look at the company's inputs, their development and impacts of the FX changes on the cost operations. Similarly as in the case of revenue, the company has been forced during the last seasons to react to plummeting coal prices and therefore had to optimize its costs. Coal industry is a business, which has in general relatively high fixed cost operations. As a matter of the declining coal prices many high cost mines all over the world had to reduce or even close their production. In order to lower the mining cost (per tonne) and keeping their coal on the market, lot of mining companies had to introduce complex cost-cutting measures. Cost reduction is therefore the current aim for all mining companies, while they still wait for an improvement in the pricing environment and market balance.

Influenced by the continuous adverse impacts, NWR has been driving costs down wherever possible. The total costs of sales were down by 27 per cent in comparison to the 2013, these cuts affected among others mainly the mining unit cash costs (down by 14%), selling and administrative expenses (in 2014 down by 18%, together with savings from 2013 down by 40%). Nevertheless, there is still big threat of further decline in coal prices. If they shrank under the level of production costs for a longer period, the Group would not be able to continue mining at some of its high-costs coalmines, since it would not be economically feasible. The cost per mined tonne development is graphically illustrated in the Exhibit 20.

Exhibit 20 Mining costs per tonne



Source: created by the author, based on the Annual Reports (2011-2014)

During the last years, NWR had to solve such troubles with its mine Paskov, where it produces very high quality coking coal, for which there is unfulfilled great demand. Nevertheless, mining at this site is technically very difficult and therefore very costly, because of mining at substantial depth and due to the narrowness of the coal seams. Paskov mine turned to be unprofitable and NWR was in the year 2013 determined to close the production there. This decision raised huge protests among the public, because NWR would lay-off about 3.000 employees. That of course drew attention of trade unions and it turned into a political issue. In 2014 Czech government negotiated with NWR a prolongation of mining in Paskov mine, while providing the company with additional subsidies. With all the changes was this particular mine able to outperform its 2014 production targets, even though the costs per tonne decreased by more than 30%.

NWR's main direct production expenses are: personnel costs, service costs, raw materials and energy. These costs are mostly denominated in Czech Crowns. An exception is costs connected to interest expenses, since the NWR's, or more precisely OKD's debt is denominated largely in EUR (including small amount of CZK).

Another aspect in costs, where could potential future FX fluctuation incur considerable FX exposure, is the investment in Poland and local development projects. However, these projects have been currently suspended and will be therefore a subject to FX exposure rather in the distant future.

3.2.2. Hedging the FX exposure

NWR was through its sales generating subsidiary OKD exposed to changes in the FX rate of EUR/CZK. Due to the fact, that OKD's functional currency is CZK and the substantial part of its EUR sales has to be transferred back to the CZK to cover the operation costs, because the revenues denominated in CZK cover only approximately one half of them. From the point of view of OKD, and ultimately also from the perspective of the whole group, is therefore the threat hidden in the potential appreciation of the Czech Crown against EUR, which tends to end up in decline in the NWR's sales revenues relative to its costs.

On the other hand with a weakening of CZK, the group could theoretically face troubles while repaying its EUR denominated debts. However, this should not be for NWR a real threat, since the company generates enough sales denominated in EUR, which should be sufficient to cover the debt payments.

Exhibit 21 presents the impacts of exchange rate fluctuations on the company's bottom line during the last five years. The graph illustrates namely the realized and unrealized foreign exchange gains. Realized FX gains/losses are accounted when the transaction exposure comes true and there are real incurred losses or gains. On the other hand, unrealized FX gains/losses are accounted, if at the end of an economic year we still have an unpaid open position with a transaction exposure. The difference between the invoiced value in terms of home currency and the actual value calculated with the current exchange rate at that day, gives us either gain of loss (unrealized FX gain/loss). Even though that this unrealized FX gain/loss is more or less fictive impact, it is used together with realized FX gains/losses for computation of tax base (Sladkovský, 2014).


Exhibit 21 Realized + unrealized foreign Exchange gains & losses

Source: created by the author, based on the Annual Reports (2011-2014)

With help of the Exhibit 21 above and the Exhibit 22, presenting below the fluctuations of currency pair EUR/CZK, we may observe how were changes in the FX reflected in terms of the realized/unrealized FX gains/losses. An interesting implication can be drawn from the development in the year 2013. According to what we mentioned above, NWR should in general profit from depreciation of CZK against EUR, which was exactly the situation during the year 2013, where was CZK sharply devaluated in the end of the year as a result of the unexpected interventions of the Czech national bank. Based on that development we would ultimately expect NWR's EUR sales to yield higher CZK value and therefore FX gains. Contrary is the case as illustrated in the graph above, NWR's reported in that year the highest realized/unrealized FX loss (over 18 million EUR) in the recent times.



Exhibit 22 Exchange rate fluctuations of EUR/CZK

Source: created by the author, based on (Quandl - Currency Exchange Rates - EUR vs CZK, 2015)

This issue could be explained from various viewpoints. Firstly, the company might have hedged its EUR long positions with FX forward contracts by which means it could have conceivably fixed the exchange rate to certain level, which however, after the devaluation of CZK would have been significantly lower than the current spot rate at the date of maturity, which would have led to realized FX loss. If the FX forward contracts over reached to 2014, the FX loss would be accounted in income statement as unrealized FX loss. Based on the annual reports it is unfortunately not possible to differentiate the volumes of realized and unrealized FX losses/gains, since NWR reports them only as one line item. According to the company's books, the company reported at the end of 2012 only small amount of FX Forward contract (≈ 1.9 million EUR), while in the end of 2013 there were reported none. This implies that most of the losses could have been caused by the realized FX losses. In other words the FX Forward contracts used during the year would not be at the end of 2013 accounted in the books anymore. This implication would be logical especially from the viewpoint that at the turn of New Year there are regularly negotiations about setting new prices going on. Hence, forward contracts about hedging the expected exposures can be therefore entered into only after knowing the particular prices.

Second explanation could be that NWR was a party to some sales contracts, where forward contracts were already incorporated inside (so called *incorporated forward contract*). How does it work? It may be a contract denominated in EUR for supplying coal to customer, where the CZK price will be determined by an agreed EUR/CZK exchange rate. Such contract would be then later on carried as a subject for re-valuation, where fluctuations in the exchange rates might incur gains or losses. Nevertheless it would not be accounted as a term-contract like currency derivatives. Unfortunately, since the company does not provide enough information in this regard, these two explanations are only assumptions and we cannot explain this issue with any supporting underlying evidence.

The exchange rate of EUR/CZK was relatively stable during the year 2014. That was reflected also in rather lower realized/unrealized foreign exchange loss/gains, where NWR reported relatively small loss of 401 thousands EUR. From the up-to-date development of the FX rate we have seen after a short-term depreciation of CZK in the beginning of 2015 continuous appreciation, which ended up at the level around 27 EUR/CZK. According to the announcement of the Czech national bank from the end of June 2015, it intends to hold the exchange rate around this level until the mid of 2016.

3.2.2.1. Transaction exposure

Regarding the Group's transaction exposure, NWR was managing this risk until the year 2013 with help of financial instruments. They were namely using FX forward contracts to mitigate this risk (see Exhibit 23). The approach to hedging was rather selective and even though they were aware of the fact that hedging transactions were applied to limit the exposure from FX fluctuations, NWR was also taking advantage of positive fluctuations when it was reasonable. According to the NWR's risk management policy, the Group aimed to cover up to 70% of its FX exposure.



Exhibit 23 Contractual maturity profile of NWR's Forward FX contracts (figures valid for year-end)

After the year 2013, NWR had to review its hedging policy, due to the corporate credit rating downgrade. Lower rating limited groups hedging possibilities and therefore namely NWR's access to currency derivatives notably decreased. Here we can see how corporate credit rating is important in terms of FX management. Especially in the case when a company finds itself in the zone close to default. The reason for that is rather intuitive, by entering a forward contract is the contracting party becoming a debtor to the particular financial institute (bank), since it is obliged to trade certain currency at agreed time. Hence, being given a negative rating is a signal for the bank that we are facing solvency difficulties, which implies that we might not be able to meet the requirements of the contract (also known as *settlement risk*). If the bank's counterparty violated the contract and did not deliver the agreed currency

Source: created by the author, based on the Annual Reports (2011-2014)

in desired amount/time, it would put the bank into speculative position⁸⁰, which the bank does not want to be in. Therefore banks usually enter derivative contracts only with parties that fulfill certain rating requirements, which the bank uses as an indicator of credibility and helps them to anticipate the settlement risk.

As we can see in the Table 8, which presents the latest development of the corporate ratings, the company's corporate credit rating has tremendously decreased during the last two years, because of the high indebtedness and bad solvency. Despite the capital restructuring and therewith connected positive rating upgrade in the end of 2014, we cannot expect that the company would be able to access the currency derivatives in the soonest times. Moreover, according to the rating agency Standard & Poor's is the future outlook rather negative, which does not present the company to the financial institutions in the good light.

Date	Moody's		Date	Standard and Poor's	
	Corporate credit rating			Corporate credit rating	
Before	B1	\times	Before	В	$\left \right>$
29.05.2013	B2	\downarrow	12.07.2013	B-	\downarrow
24.07.2013	Caa1	\downarrow	29.01.2014	CCC	\rightarrow
27.01.2014	Caa3	\downarrow	05.06.2014	CC	\downarrow
21.08.2014	Ca	\downarrow	01.08.2014	SD	\rightarrow
09.10.2014	Caa3	1	17.10.2014	CCC+	1
Outlook	stable		Outlook	negative	

Table 8 Development of corporate ratings⁸¹

Source: created by the author, based on (NWR - Corporate Ratings, 2015)

The recent hedging policy for managing the FX exposure is based on building on FX buffer through FX spot transactions, which in fact means buying the desired currency on the sport market when the exchange rate is favorable and fits the accepted level, according to the firm's forecasted FX predictions.

⁸⁰ It could consequently mean either loss or gain from unrealized forward contract; depending on how would the exchange rate on the spot market develop. E.g. in case of forward contract for buying EUR, which would the counterparty violate, the bank could under favorable FX movements realize the trade on the spot market and ultimately show profits.

⁸¹ Rating scale for both agencies is provided in the Appendix 5

3.2.2.2. Operating exposure

In this part we will focus on the ways how NWR manages or could manage its operating FX exposure. From the chapter 2 we know that the operating exposure can be managed above all with internal hedging methods. Let's go through these strategies one by one and discuss their suitability for purposes of NWR.

Starting with *currency of invoice*, we can see that this method is definitely relevant for our analyzed company, since it issues some of its invoices in Poland and Hungary either in CZK or EUR. This proves NWR's relatively strong bargaining power in these countries, because in general the exporting firms have to accept the local currency as the contracting one. On the other hand, looking at the input sides of NWR, we revealed that most of the expenses are denominated in CZK. Most of the costs are related to the mining and are tied to the local market. The company would not be therefore able to pay the personnel expenses or material costs in EUR. Compared to that, a possible cost item that could be invoiced in EUR is energy, which is not difficult to be obtained in other currency.

The company has substantial part of its customers located in Poland. After the process in the development projects in Dębieńsko and Morcinek will be once again re-established, the company will need to pay the costs for the research, which will be most probably denominated in PLN. Hence, at that moment the company could re-negotiate some of its sales contracts in Poland to offset the position and mitigate the potential fluctuations between EUR and PLN. Moreover, in the distant future when the development projects in Poland are ready and the mining operations start over there, the company will be paying considerable portion of its expenses in PLN. NWR Karbonia will be therefore most probably in the similar situation that NWR has with OKD. Most of the costs will be denominated in its functional currency (PLN) and the sales will depend on the scale of the Polish operations and the origin of its customers. If this production found its customers mainly in Poland, NWR could be conceivably able to negotiate invoicing in PLN. All in all, NWR will at that time very likely tend to offsets these cash flows and try to negotiate invoicing in one of its key currencies, where it could apply natural hedging.

Currency diversification is for the purpose of NWR rather irrelevant method. The company currently operates only with two currencies: EUR and CZK, which are highly

correlated. NWR's sales generating unit OKD, does not have on its balance sheet except EUR and CZK any other currencies with which could this currency pair be correlated (or against). As far as the balance sheet of the group is concerned, the situation is rather similar, since the development projects in Poland were suspended and there are currently no significant expenses in PLN. Nevertheless, we may have a look at the Table 9, presenting the mutual correlation between currency pair EUR/CZK and EUR/PLN. From the figures can be seen, that they are rather positively correlated in terms of one week correlation. Therefore as soon as, the development is re-established and the expenses for research will be reported on the liabilities side of the group's balance sheet, the correlation relationship should help to decrease the FX exposure. However, one limitation can be seen in the period of presented correlation, which is based on only one week fluctuations. Therefore it is hard to judge whether these figures will hold also in longer horizon.

Currency	EUR/CZK	EUR/PLN
EUR/CZK	100%	51,6%
EUR/PLN	51,6%	100%

Table 9 Currency correlation of EUR/CZK and EUR/PLN (one week)

Source: (MyFXbook - Correlation, 2015)

Diversifying operations is in the mining industry hardly possible due to the fact, that the company is with its costs side strongly tied to the Czech market and its operations are inseparable. To a certain extent is NWR diversifying its operations in the case of its development projects in Poland. However, these activities are building completely new operations, where the mining site will not be dependent on the existing production. Moreover, we cannot speak here about diversification due to the threat of exchange rate fluctuations, since it was driven by expansion purposes to ensure new mining potential and supplement declining mining resources of the Czech sites. All this is conditioned by the financial situation of NWR, which first has to finish the development projects and consequently start with building up the mining sites.

Leading & Lagging could be a relevant strategy to manage both the transaction and operating exposure, since NWR is doing business with rather small amount of customers and has with many of them long-term relationships. It could be therefore pretty likely, that NWR might be able to negotiate with its counterparts, which could meet our company with the

payment dates halfway. However, as we revealed earlier, NWR has substantial troubles with its liquidity. Hence, getting paid later could incur significant troubles for the company's daily business operations.

As far as the method *funding* is concerned, the company has been using funds from various foreign capital markets, especially for borrowing finances in CZK and EUR. Nevertheless, funding could be currently limited by the solvency profile of NWR.

Netting same as *Matching* does not make for NWR much of a sense. Even though the company units are located in multiple countries, there are not that many intercompany transactions within the group, which could be netted. The units work on almost stand-alone basis with an exception of NWR Karbonia (until it was suspended), which was not generating any profits and the cash flows were therefore only one-way.

Regarding *currency clauses*, this method could be a possible tool for NWR. Partial risk sharing within contracts could be, similarly as in the case of leading & lagging, likely thanks to the long term well maintained relationships with NWR's customers, which could be potentially willing to share this burden. Nevertheless, since the following-up industries have been as well as the mining industry negatively influenced by the declining coal and steel prices, it is possible, that the willingness could diminish due to the worse financial situation of the whole environment.

3.2.2.3. Translation exposure

NWR, as a multinational company, faces every year translation exposure during assembling its consolidation and compiling its accounting reports. NWR's reporting currency is EUR, so all other assets and liabilities denominated in other currencies have to be translated correspondingly. During this process, NWR differentiate between items of foreign currency transactions and foreign operations. The former (including all foreign currency denominated monetary assets and liabilities) is translated at the exchange rates at the date of the transactions into the respective Group's functional currency, which is EUR. Concerning foreign operations, group's assets and liabilities connected to operations with non-EUR currency have to be translated according to the group's policy into EUR at the exchange rate

ruling at the reporting date. Compared to that, the items of equity are translated at the historical exchange rates.

Eventually, all the differences that arise from the translation are consequently recognized in consolidated statement of comprehensive income within the *other comprehensive income* part. The impact of the consolidation, or more precisely of the FX translation differences on the income statement of NWR, is illustrated by the Exhibit 24.



Exhibit 24 Foreign exchange translation differences

Source: created by the author, based on the Annual Reports (2011-2014)

Conclusion

The goal of this thesis was to introduce the fundamental theoretical background of the foreign exchange exposure and present the essential mechanisms in this area. Another aim was to point out the ways how can firms approach the risk and show the available possibilities that the subjects have for management of this issue. Eventually, the thesis focused on practical analysis of a real multinational company, where we analyzed the firm's economic performance and examined the impacts of FX exposure on the operations of mining holding group New World Resources, Plc.

We introduced several groups of risk that a firm may face while trading internationally and put exchange rates into context of potential threat for the company's activities. The thesis explained that FX risk is an issue that embodies a potential threat to all subjects on the market. The thesis shows that fluctuations of exchange rates influence not only companies engaging in international trading, but also local entities that are exposed by the foreign competitors on the home market. These foreign subjects might be given advantage by favorable exchange rates and could therefore in the long term result in declining competitiveness of the local companies.

The theoretical part also explained how particular movements in exchange rates can influence the bottom line of a company. We defined the general rule of thumb that the FX risk increases with more volatile currencies and longer time span of the open positions. On practical examples was shown that subjects in long positions are generally harmed by sudden appreciation of their home currency, while firms in short position would suffer from the weakening home currency. In other words, depreciation of home currency is in general welcomed by exporters, whereas the FX movements in the other direction would be beneficial rather for importers.

We introduced the main sources of the FX exposure and identified its three fundamental types: Transaction, Operating and Translation exposure. The thesis reveals that mitigation of the operating exposure is in general more demanding, compared to the transaction exposure, since it is considered to be a threat especially in the long run and can therefore lead to a loss of competitiveness. Operating exposure needs to be systematically analyzed and its mitigation is possible only with a strategy plan that needs to be followed and regularly reviewed. On the other hand transaction exposure is very important topic in terms of day-to-day operations and its management traditionally belongs to the responsibilities of companies' risk management or treasury departments. Regarding the translation exposure we found out, that this type is often considered to be an accounting fiction, since it solely depends on the sensibility of consolidated financial statements to the FX changes and despite the fact that there are some techniques how it can be approached it is in general hardly possible to be managed.

The thesis also explains that proper FX forecasting (combination of fundamental, technical and market based analysis) can be conceivably beneficial for increasing awareness of potential future exposure. Based on that, and on relevant quantification the company decides whether the particular changes are negative for its open positions and whether it is necessary to take any actions. We introduced four general approaches to hedging FX exposure: not hedging at all, hedging selectively, through internal business practices and with external strategies. The biggest space was dedicated to the last two, where we one by one introduced particular instruments of the both groups and presented their applicability for various hedging situations. Selecting a suitable strategy and using appropriate instruments depends on many various factors, such as market development, business goals, performance, wealth, risk aversion, solvency and many others.

The last chapter of the thesis presents an economic analysis of NWR with respect to the impacts of FX exposure and its management. We found out, that the company has been recently experiencing very turbulent times with continuously decreasing financial performance. During the analysis we revealed that the drivers of unsuccessful development stand outside the company. The biggest problem was declining growth rate of Chinese economy, which is crucial for coal pricing. As a result of that, Chinese local demand for coal decreased, huge stockpiles (of mostly Australian coal) were created and offered for lower prices. The benchmark prices of this commodity are quoted mostly according to the Australian coal in USD. These prices are consequently taken over and with small margin used in European market. During the last five years have dropped the prices of thermal coal by 50% and in case of the strategically more important coking coal was the decline even 65%. It is important to say, that mining business is a field with really high fixed costs. Hence, with such severe decrease of prices and consequently downfall of sale revenues, many firms (including NWR) were operating in red numbers.

Consequence of that was that NWR had to optimize its mining operations, which led to massive cost-cuts. Even though NWR went through capital restructuring, it still faces alarmingly low liquidity and solvency troubles which were reflected in significant downgrade in its corporate credit rating.

The analysis of inputs and outputs revealed that most of the NWR's costs are currently denominated in CZK, while 46% of its revenues are denominated in EUR (the rest in CZK). Even though NWR's functional currency is EUR, its revenues are generated by the Czech based subsidiary OKD with CZK as its functional currency. NWR is therefore exposed to the potential appreciation of CZK through OKD. Almost half of the transaction exposure is hedged naturally and the other is hedged by NWR's FX buffers.

We found out that the impact of USD denominated benchmark coal prices on the EUR (CZK) prices has been recently rather positive, since there was a continuous appreciation of USD towards EUR (about 25% during last 5 years). NWR did not intervene anyhow and profited from relatively higher EUR prices.

Our analysis revealed an interesting and at the same time important implication. NWR has now due to the negative rating very limited access to the currency derivatives and because of that it had to review its FX hedging policies. The company does not mitigate the FX risk with help of currency forward contracts anymore (as it used to do until 2013), but manages its transaction exposure with FX buffers through spot market instead. This rating situation is unfortunately rather unlikely to change in the upcoming years.

Therefore we focused rather on internal hedging methods to face the risk systematically and eliminate the overall operating exposure with rather a long-term strategy. The corresponding recommendation is based on the fact, that NWR does business with small amount of customers with whom it has well maintained long-term relationships. NWR could utilize these relations and systematically try to push through currency clauses, which would enable risk sharing between the contracting parties and decrease of the exposure for NWR. Thanks to the good relations it could also try to do leading and lagging, where possible. However, this practice could be limited by the NWR's liquidity troubles and especially deferred payments could endanger the firm's day to day operations. Another big issue, in terms of the FX exposure, is NWR's development projects in Poland, which are temporarily suspended due to the lack of funds. Nevertheless, as soon as the development process is re-established (if ever), there would be considerable expenses denominated in PLN. These expenses could NWR offset by re-negotiating its contracts with Polish customers, to whom it at the moment issues invoices either in EUR or CZK. Changing the contracting currency to PLN could be for them conceivably acceptable and could offset the exposure arising from potential appreciation of PLN towards EUR.

All in all, we showed that FX exposure plays very important, but not a major role in NWR's financial operations. The performance of the firm is tightly connected to the pricing environment on world coal markets, which is unfortunately outside NWR's ability to influence.

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Appendix

Characteristic	Foreign Currency Futures	Forward Contracts
Size of contract	Standardized contracts per currency	Any size desired
Maturity	Fixed maturities, longest typically being one year	Any maturity up to one year, sometimes longer
Location	Trading occurs on an organized exchange floor	Trading occurs between individuals and banks with other banks by telecom linkages
Pricing	Open outcry process on the exchange	Prices are determined by bid and ask quotes
Margin/Collateral	Initial margin that is marked to market on daily basis	No explicit collateral, but standard bank relationship necessary
Settlement	Rarely delivered upon; settlement normally takes place through purchase of offsetting position	Contract is normally delivered upon, although the taking of offsetting positions is possible
Commissions	Single commission covers both purchase and sale ("roadtrip")	No explicit commission; banks earn effective commissions through the bid-ask spreads
Trading hours	Traditionally traded during exchange hours; some exchanges have moved to 24 hours	Negotiated by phone or Internet 24 hours a day through bank global networks
Counterparties	Unknown to each other due to the auction market structure	Parties are in direct contact in settling forward specifications
Liquidity	Liquid but relatively small in total sales volume and value	Liquid and relatively large in sales volume compared to futures contract

Appendix 1 Foreign Currency Futures vs. Forward Contracts

Source: created by the author, based by (Eiteman, Stonehil, & Moffett, 2007)

Appendix 2 Geographical scope of mining operations



Source: Annual Report 2013

Appendix 3 Geographical location of the key customers



Source: http://www.newworldresources.eu/en/products/our-products-and-customers



Appendix 4 NWR's strategy 2017

Source: Annual Report 2013

Appendix 5 NWR's risk management framework

Setting of strategic	The Board (Audit and Risk Management Committee – further details on pages 94 to 97)	Internal Audit	
↓ ↓	 > Review and approve the Group's principal risks and Internal audit's risk-based plan > Assess the scope and effectiveness of the system established by management to identify, assess, manage and monitor financial and non-financial risks > Assess whether the level of residual risk is acceptable for the Group > Review reports on any material breaches of risk limits and the adequacy of proposed actions 	> Assess risks as part of the	
	Group Risk Management	risk-based internal audit plan	
	 > Coordinate and support risk management activities across the Group > Implement appropriate structures for risk management > Identify and assess the Group's principal risks > Propose the risk limits > Monitor the Group's principal risks and manage these directly where appropriate > Ensure consistent reporting on risk management activities 	> Monitor and audit the risk management process	
Î	Subsidiary Management / Operational level	 Monitor and audit internal controls 	
Operational risk identification	 > Operational risk identification and assessment > Prioritise and lead risk mitigation activities > Implement internal control measures 	55.11.010	

Source: Annual Report 2013

Appendix 6 Rating scales Standard & Poor's and Moody's

S&P	Moody's	Rating grade description (Moody's)	
AAA	Aaa		Minimal credit rist
AA+	Aal		
AA	Aa2		Very low credit risk
AA-	Aa3	e	
A+	A1	rad	
А	A2	t g	Low credit risk
A-	A3	nen	
BBB+	Baa1	stn	
BBB	Baa2	Ive	Moderate credit risk
BBB-	Baa3	In	
BB+	Ba1		
BB	Ba2		Substantial credit risk
BB-	Ba3		
B+	B1		
В	B2		High credit risk
B-	B3		
CCC+	Caa1	le	
CCC	Caa2	rac	Very high credit risk
CCC-	Caa3	e 8	
CC	Ca	ıtiv	In or near default with possibility of
С		sula	recovery
SD	C	pec	In default, with little chance of
D		SJ	recovery

Source: re-created by the author, based on https://www.cnb.cz/en/monetary_policy/inflation_reports/2011/2011_IV/boxes_and_annexes/zoi_2011_IV_box_2.html