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THE COMMON CURRENCY (EURO) EFFECT ON FDI

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Abstract

This paper studies the effect of the Euro on international FDI flows. Research is based on data from 30 OECD reporting countries and 4 most important partner countries based on combined FDI flows over the period 2002-2011. FDI flows are estimated by implementing the widely used gravity equation approach. In general, we find that there is no significant Euro effect on the FDI outward flows. Moreover, we also do not find significant effect of the EU membership and exchange rate standard deviation on the FDI flows. In the presence of country-pair fixed effects, we find that only GDP is of significance in the model. We conclude that most of the variations in the dependent variable are explained by unobservable country-pair fixed effects.

Keywords: foreign direct investment, common currency, Euro, monetary union, the gravity equation, European Union

JEL classification: C33, E42, F15, F21, F23

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1. Introduction

According to OECD benchmark definition of foreign direct investment (FDI), an international investment is classified as FDI when the lasting interest implies the existence of a long term relationship between the direct investor and the direct investment enterprise (resident in an economy other than that of the direct investor). The direct or indirect ownership has to be at least 10% of the voting power of an enterprise abroad (OECD, 2008).

After the downfall of communism, the Central and Eastern European countries (CEECs) were regarded as unappealing positions for FDI. When the recession was over and the economies started to catch up with Western European levels of GDP per capita, the CEECs became highly attractive targets for FDI. This was encouraged not only by a mass privatisation of state assets but also by the expectation that these countries would quickly integrate their already industrialised and now liberalised economies into the European economic area by offering above average profit rates for foreign investors (Gauselman et al., 2011).

In 1999 eleven European Union (EU) countries adopted common currency – the Euro. Since then, six more countries have joined the Euro area, also called - Eurozone. The voluntary substitution of their national currencies with the euro implies that the adoption of the Euro is considered not only to be politically but also economically advantageous (Bitāns and Kaužēns, 2004). As part of the task, they removed responsibility for monetary policy and turned it over to an untested, entirely unfamiliar and newly fabricated central bank called the European Central Bank (Baldwin et al., 2008). From an economics point of view, the common currency was supposed to ameliorate free movement of capital, which is a fundamental principle of the European Union. It was expected to foster trade through diminishing transaction costs due to the elimination of exchange rate volatility risk, which would encourage cross border investments (Rose, 2000). Economic and Monetary Union (EMU) coordinates economic and fiscal policies and a common monetary policy. It is a great step forward in the process of economic integration, which can be divided in six groups: preferential trading area; free trade area; customs union; single market;

economic and monetary union; complete economic integration[1] (European Commission, 2012). However, the past research is limited due to the data available at that time. Now there is more information available, therefore, a better analysis can be done regarding predictions of FDI.

All EU countries are members of Economic and Monetary Union (EMU), but only a subset is inside the monetary and currency union - Eurozone. Latvia joined EU in 2004 and it will join Eurozone in 2014, since the European Commission has officially accepted this fact. The general idea of this paper is to investigate euro effect on FDI flows between countries. Apart from that the aim is to predict Latvia's FDI flows after committing to Eurozone based on the model obtained. According to the research done by Bank of Latvia, adopting the Euro would not generate immediate gains. Mainly due to the exchange rate regime that already limits fluctuations against the Euro. Another important aspect is that ECB monetary policy is rather focused on the growth of the Euro area than individual members. It may not be consistent with the needs of Latvian economy. Research implies that over a longer period of time, meaning couple decades, gains could be more favourable compared to the scenario where Latvia would preserve its own national currency (Bitāns and Kaužēns, 2004). However, that does not necessarily mean that there would not be gains concerning FDI.

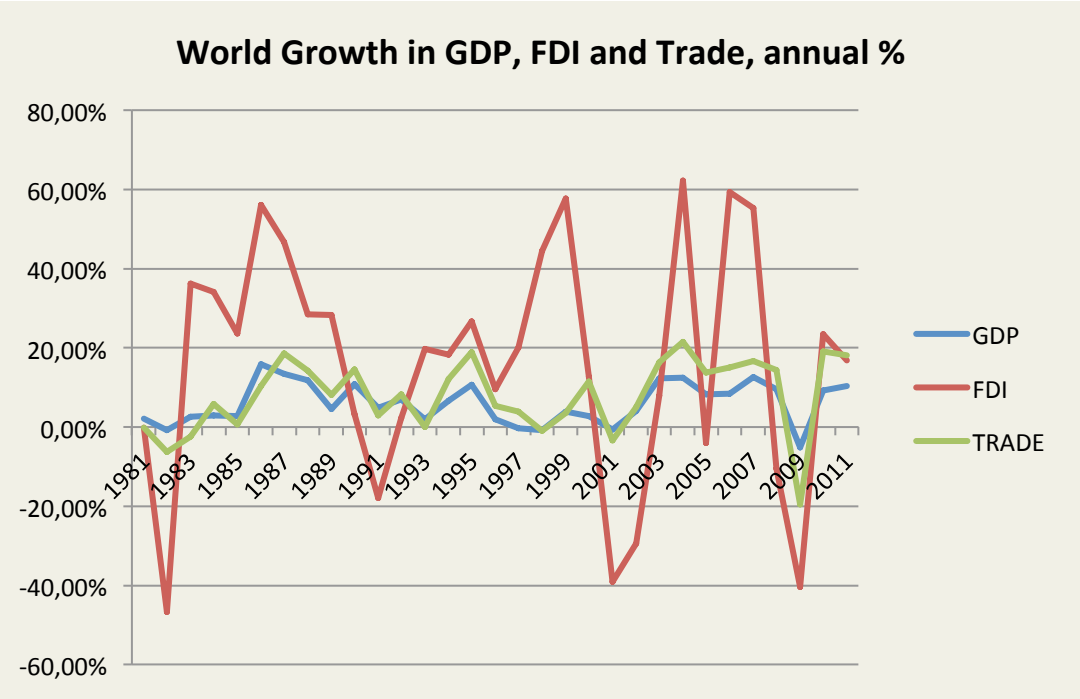
The common currency can influence FDI flows through three channels: reduced exchange rate uncertainty, reduced transaction costs and increased price transparency (Dinga and Dingova, 2011). Uncertainty negatively affects investment, because ambiguity about exchange rate movement has an adverse effect on FDI decisions (Carruth et al., 2000). Three channels mentioned above are expected to make long-term international investments more attractive. Latvia fixed its local currency exchange rate against the Euro in 2005, thus, one could expect that an introduction of the Euro would not change FDI flows significantly, since exchange rate volatility was absent already. However, Rose (2000) states that the common currency effects on trade are much larger in magnitude than those of eliminating exchange rate volatility

[1] With reduced customs tariffs between certain countries, no internal tariffs on some or all goods between the participating countries, the same external customs tariffs for third countries and a common trade policy, common product regulations and free movement of goods, capital, labour and services, a single market with a common currency and monetary policy, harmonised fiscal and other economic policies.

but retaining separate currencies. Previously mentioned research by the Bank of Latvia and research by Rose (2000) are both a little contradicting each other. However, they could be seen as out-dated at this time and, moreover, the paper by Rose (2000) has been criticized afterwards due to the methodology used, which makes this an interesting topic to study. It leads us to the following research question and sub-question: How does a common currency (Euro) impact FDI flows? How would FDI flows into Latvia change after committing to the Euro?

FDI flows have grown significantly over the past decades, increasing from 52 billion dollars to 1694 billion dollars in the last 30 years. Alongside being the main recipient of world FDI flows, Europe is also the leading source of these flows. Furthermore, roughly 96 per cent of FDI inflows in Europe aim to the EU and over 66 per cent to the Eurozone. Hence, FDI is an important and large part of country's economy. The importance of FDI is represented in *Figure 1,* where we can see that FDI tends to fluctuate together with GDP and trade, but the magnitude of fluctuations by far exceed those of others. *Figure 1* shows that growth rates before the crisis were much higher for FDI than for GDP and trade. For comparison, it is interesting to note that in the past 26 years up till the start of global economic crisis, GDP increased by 360% compared to 4100% increase of FDI.

Figure 1



Source: unctadstat.unctad.org

The existence of FDI has several explanations. The simplest way is that FDI can be seen as horizontal or vertical. The so called horizontal FDI is market oriented, where it gives companies access to foreign markets, and it acts as a substitute for trade. The vertical FDI is production oriented, where global companies outsource low paid jobs abroad, while keeping high value added jobs at home. Thereby, some parts or the entire final product are produced abroad and then shipped back home (Petroulas, 2006).

The paper proceeds as follows. The next chapter will give an extensive related literature overview. Chapter 3 will describe and explain the data collected and used for empirical analysis, followed by chapter 4 describing the methodology used in this analysis. Chapter 5 will present results of the research, discuss these results and compare them to the literature discussed in the literature overview and. Finally, chapter 6 will discuss the concluding remarks and findings including suggestions for further research.

2. Literature Overview

The empirical literature based on the gravity equation supports the theory that home and host country's market size have a positive impact on FDI, while distance between the two countries has a negative impact. However, Kleinert and Toubal (2007), suggest that distance raises the costs of exporting and affects positively the decision to build affiliates in foreign countries. Therefore, there is no reason why distance should affect negatively the volume of sales. As shortly explained in the introduction, FDI classifies in the horizontal and vertical FDI. Firms choose to produce abroad if it is more profitable than exporting. The paper by Kleinert and Toubal (2007) provides evidence of justified use of the gravity equation for estimating sales of foreign affiliates of multinational firms. They present three theoretical models different in their structure. The first two models explain the horizontal nature of multinational firms, one which assumes symmetric firms and the second that incorporates firm heterogeneity. The third model clarifies vertical multinational firms based on a factor-proportions approach. The obtained gravity equations look similar regarding the variables in the model. The first two models only differ in a derivation procedure in order to come to a gravity equation and the fact that the second model assumes fixed

costs increasing in distance. The third model is different because it adds relative factor endowment variable and the sum of both countries GDPs to the model as well. The aim of their paper is to provide evidence for justified use of countries GDP and distance between them in the gravity equation model. This paper will have only a short look into this, avoiding the discussion of sophisticated formulas and techniques used in the Kleinert and Toubal (2007) study to derive the gravity equation. According to their theoretical analysis, the horizontal models predict the coefficients of the home and host country GDP to be equal to one. The distance coefficient is predicted to be negative. The vertical model, however, suggests including the sum of home and host countries GDP, and predicting the coefficient to be one. Additionally, home GDP coefficient should be negative and host country GDP coefficient positive. Distance is predicted to be negative, while the relative factor endowment should be positive (Kleinert and Toubal, 2007). After performing an empirical analysis based on their theory, Kleinert and Toubal justify the use of gravity equation, mainly based on the fact that it can be derived from various models. Their findings supports the use of horizontal model, because they found that excluding relative factor endowment and the sum of countries GDP does not strongly bias the estimation results from horizontal gravity models (Kleinert and Toubal, 2007).

A large amount of evidence indicates that majority of the largest multinational enterprises tend to concentrate activities in their home region. Hejazi (2005) provides evidence that supports the gravity equation's consistency. His analysis simply suggests the use of regional control variables, which will indicate if the particular region has more outward FDI than predicted by the simple gravity model. The simple version of gravity equation with both countries market size and distance in the model would lead to a biased conclusion if it was inferred for some particular region. Thus, Hejazi (2005) suggests the use of control variables in the gravity equation model to make it consistent.

As mentioned earlier, there have been quite some previous researches regarding the common currency effect on foreign direct investments and trade. Some of them, however, are contradicting each other concerning the presence and magnitude of this effect. The primary reason for this could be the different time spans the research was done. All of the papers have widely implemented the use of gravity equation approach. Kindleberger (1969) emphasized that when thinking about FDI the question

is not why capital might flow into a country, but rather why some particular asset would be worth more under foreign than domestic control. Razan (2003) suggests that the law of diminishing returns implies that the marginal product of capital should be high in poor countries and low in rich countries. Therefore, the capital should flow from rich to poor countries.

The seminal paper by Rose (2000) is considered to be the predecessor of other studies about the importance of a common currency effect on international trade, because he found that joining the common currency union would increase trade by 235%. However, his work has received quite some criticism stating that the methodology used in the gravity equation approach was not entirely correct. According to Baldwin et al. (2008) the so called "gold medal mistake" was corrected by Rose himself in Rose and van Wincoop (2001) paper. In original paper by Rose (2000) the Euro dummy included the effects of omitted variables, so the impact was biased. After correcting for this mistake in Rose and van Wincoop (2001), the so called "Rose effect" decreased to roughly 91%. Economic paper by Baldwin et al. (2008) from European Commission analysed and summarized studies made by Coeurdacier et al. (2008), Russ (2007) and others. They reported that according to these studies the overall magnitude of the Euro effect on FDI is not clear. Most of the authors find it positive, however, the estimates range from 15% to 200% within the EU and from 7,5% to 100% from EU to outside EU countries. Hence, the actual effect of FDI is ambiguous, since it highly depends on the time span studied and the methodology applied.

Petroulas (2006) used a difference-in-differences strategy in his research. He states that the idea behind it is to measure the effect of the introduction of the Euro on FDI for Euro countries, while keeping the effects for all other time-invariant variables and country specific time-varying effects constant. He puts an emphasis on the gravity equation approach, but he also used a general equilibrium approach. Interesting part in his research is that he included the variable "stock" in his regression referring to the stock market value of particular country. Concentrating on the gravity equation, results are more or less as expected. He found that the most important determinant in magnitude and significance is GDP of the country that receives FDI. Surprisingly, GDP of the investing country was found as insignificant. He reports that introduction of the Euro increased inward FDI by 14-16% within Euro area. His findings indicate

that, if Germany and Belgium-Luxembourg are excluded as both, receivers of FDI and investors, most of the Euro effect disappears. However, his findings regarding the introduction of the Euro are quite constrained regarding the time period, since data observations are till 2001 (Petroulas, 2006).

The paper by Dinga and Dingova (2011) is better in that way since it covers data up till 2008. They also mainly used the gravity equation and the difference-in-differences approach for their study; however, they also implemented the propensity scores matching strategy, which allows comparing the potential outcomes between country pairs which share the Euro currency and the countries that do not. Theory implies that the product of countries' GDP should have a positive and significant effect on FDI flows. Results obtained by Dinga and Dingova (2011) confirm this theory. They also found that geographical distance between countries, common language and common border have a significant effect on FDI, and therefore, the findings confirm the positive role of geographic factors in FDI allocation. Most importantly, regarding the impact of the Euro on FDI flows, they found that the effect differs for the sample of OECD countries and for the subsample of the EU countries. In general the Euro does not have a significant impact on FDI, but when examining only the subset of EU countries the Euro has a significant effect of 14.3 to 42.5 per cent. Furthermore, the study suggests that the EU membership has a larger influence than the Euro, because it fosters FDI flows by 55 to 166 per cent. The impact of the Euro presented is smaller than in other recent literature probably because of the propensity score matching technique used, which ensures that the control group of districts contains only similar countries in terms of probability to introduce the Euro. Another possible reason they mention is the different (longer) time span used in their study (Dinga and Dingova, 2011).

Relatively simple, but an interesting study was done by Choi and Park (2012) regarding the Euro effect on FDI in the real estate industry in Germany. Even though data are limited to the real estate industry the results can still be interpreted as quite general. With the help of gravity equation model they analysed data for 24 years up till 2009. Based on a pooled OLS regression they found that total FDI flow between Germany and the Euro member country is 143 per cent higher than those of non-euro country. EU member country increased total FDI flow by 50.7 per cent. After including random effects in the model only FDI inflows were influenced by the

adoption of the Euro. However, according to theory the implementation of random effects is not completely justified in case of studying bilateral FDI flows, thus the results are not surprising (Choi and Park, 2012).

Sousa and Lochard (2009) in their study as a dependent variable used FDI stock instead of FDI flows as studies mentioned before. An advantage of using FDI stock is that due to a disinvestment FDI flows are sometimes reported as negative numbers. In case of using logarithms for interpreting obtained coefficients as elasticities these observations with negative numbers are usually dropped. However, when using FDI stock, there is no such problem. An interesting aspect they also discuss is that an increase in exchange rate volatility decreases vertical FDI, but increases horizontal FDI, which could make the total effect ambiguous. That is how they explain the fact that exchange rate volatility in most cases is insignificant. Inspired by Flam and Nordstrom (2007) they believed that the EU dummy may not control properly for Single Market effects, because, for instance, some non EU countries like Norway and Switzerland also participate in the Single Market. In time span 1992-2005 they found the EU dummy to be insignificant, but when analysing 1982-2005 it becomes significant and increases the FDI stock by 35 per cent. An introduction of the single market dummy did not modify the results, because the part of EU integration was captured in Single Market, thus producing a considerable overlap between the two integration processes. In sample 1992-2005 the Euro effect was estimated as 29 per cent increase in FDI stock and in the sample 1982-2005 it was 43 per cent. The differences could be explained by the better assessment of European integration. The concluding remarks are that the Euro effect has been smoothly increasing over time, and that it has induced the relatively less developed Euro member countries to invest in the most advanced and tightly integrated Euro member economies (Sousa and Lochard, 2009).

Flam and Nordstrom's (2008) findings regarding the Euro impact on FDI are contrary to all the previous studies. They believe that the results depend entirely on the way in which Single Market is controlled and if the influence of the Single Market is allowed to change over the time. Sousa and Lochard (2009) in their research used both – EU and Single Market dummies, but Flam and Nordstrom combine both of them under Single Market dummy. Their results indicate that there is no Euro effect on FDI within the euro area and from the Euro area to non-euro countries. They found a

significant and large negative effect on FDI from non-euro to Euro countries. Their explanation for this is that, when the Single Market is not controlled for, or when it is controlled for by a fixed, time-invariant effect, the Euro impact on FDI within the EU is the same as in most of the previous studies. But when the Single Market is controlled for and is allowed to vary, meaning that they split the Single Market in three parts – To Single Market, From Single Market and Within Single Market – and in two subsamples 1999-2001 and 2002-2006, the impact of the Single Market on FDI, both within the Euro area and between the Euro and non-euro countries, is estimated to be more than 100 per cent. Furthermore, they estimated the same gravity equation for trade as well and found that the Euro has had different effects on FDI and trade. Theoretically FDI can be both a complement to and a substitute for the trade. Based on their results Flam and Nordstrom (2008) imply that FDI and trade tend to be substitutes rather than complements with respect to the monetary union. To conclude, their main contribution regarding studies about the Euro effect on FDI is the correct use of a Single Market dummy in their model, which obviously completely changes the outcome, as they showed (Flam and Nordstrom, 2008).

3. Data

Annual FDI outward flows during the period 2002-2011 are used for the analysis. It covers the whole 10 years since Euro coins and banknotes were put into circulation; therefore, it enables a good comparison between FDI flows to countries which have adopted the Euro and those which have not adopted the Euro. FDI outward flows data is obtained from OECD website and is reported in current US dollars[2]. There are 34 OECD countries in total, but Chile, Israel, Mexico and Czech Republic are missing a lot of observations in the data available on the website. Therefore, 30 OECD countries are chosen as reporting (home) countries and for each of them 4 partner countries (host) are chosen based on the largest FDI outward flows combined over the 10 year period. On average over all countries and years, the 4 most important partner

[2] Nominal instead of real terms are used because trends in inflation rates could lead to a spurious correlation. FDI and GDP are effectively deflated by the multilateral resistance terms, which are unobserved price indices (Shepard, 2012). Another reason is that the world-wide allocation of FDI flows always depends on a country's relative position (in terms of GDP per capita or total GDP), as compared to other countries. Hence, this relative position would not be affected by transforming all variables into constant US dollars.

countries receive around 55% of the respective reporting country's FDI outflows. The 30 reporting countries include 19 EU countries and 11 non-EU countries[3].

FDI outflows can be measured in two ways. First, it is the outflow from country i to country j, secondly, it is the same as FDI inflows for country j from country i. In an ideal world these numbers should be identical, but in practise there is often difference in the reported values. There is no theory that would indicate that any of these values is better. Thus, to keep it consistent, we always take FDI outward flows from country i to country j. If in some cases the value is not reported, then we take it as FDI inflow for country j from country i and report as FDI outflow for country i to country j in order not to lose the number of observations.

The total number of observations is 1200, however, due to the use of natural logarithms in the analysis, which will be explained in the next chapter, observations decreased to 989. It is because sometimes the reported FDI flows are negative numbers due to the disinvestment compared to the last year, but logarithms does not work with negative numbers, therefore those observations are dropped. The exclusion of negative FDI outflow observations could be also explained from the economics perspective. The negative FDI outflow would just mean that the destination country has become less attractive for investments; however, it does not necessarily mean that home country has become more attractive.

GDP for both – home and host countries - is also measured in current US dollars for the same reasons as FDI, and the numbers are taken form the World Bank website[4]. The same holds for population, which is also obtained from the World Bank website[5]. Based on the information available on Time and Date website[6] the geographical distance is calculated between the two capital cities of the corresponding countries and is reported in kilometres. The standard deviation of currency exchange rates is calculated based on the historical exchange rates available on Oanda website[7]. Home country's currency is always taken as a numerator and host country's currency as a denominator. Based on quarterly data, the exchange rate standard deviation is

[3] See Apendix 1 for full list of reporting and partner countries
[4] http://search.worldbank.org/data?qterm=GDP&language=EN
[5] http://data.worldbank.org/indicator/SP.POP.TOTL/countries
[6] http://www.timeanddate.com/worldclock/distance.html
[7] http://www.oanda.com/currency/historical-rates/

calculated for each year. The members and dates of entry in EU and Eurozone are obtained from the official website[8] of European Union. Countries are reported to have a common border if they have a border on a physical ground or officially stated border in the water as, for instance, Australia and New Zealand. Countries are considered to have a common language, if they have common at least one of the officially stated languages in the country. This information is taken from Nations Online website[9]. *Table 1* below presents descriptive statistics of the variables used in the analysis. To make numbers more transparent FDI outflows and GDP are reported in millions.

Table 1: Descriptive statistics

Variable	Observations	Mean	Std. Deviation	Maximum	Minimum
FDI outflow (millions)	990	6310.48	11646.97	109097.00	1.00E-06
GDP_i (millions)	1003	1285793.05	2581639.98	14991300.00	7318.19
GDP_j (millions)	1001	3012042.98	4687662.94	14991300.00	1284.51
$Population_i$	1003	37528606	60174248	312000000	287523
$Population_j$	1003	102000000	203000000	1340000000	62800
Distance	1003	3414.82	4142.69	16898	56
Exchange rate std. dev.	999	0.067466	0.450814	10.45431	-0.0634
Euro	1003	0.178465	0.383094	1	0
EU	1003	0.376869	0.484844	1	0
Border	1003	0.263210	0.440595	1	0
Language	1003	0.250249	0.433373	1	0

4. Methodology

This paper also adopts the commonly used gravity equation approach. The use of the gravity equation in international economics has been extensively proved by many academics. Amongst others, Kleinert and Toubal (2007) focused on the gravity equation particularly for FDI. Their paper was discussed already in the literature overview chapter. Observations in this paper are gathered into a balanced panel data. The advantages of a panel study is that it allows us to measure cross-section effects

[8] http://europa.eu/about-eu/countries/index_en.htm
[9] http://www.nationsonline.org/oneworld/american_languages.htm

over time and account for heterogeneity in the cross-section and time series, thus, reducing bias in estimation. Accounting for the individual heterogeneity allows controlling for time-invariant effects, which we cannot observe or measure, for example, cultural factors, geographical and political factors. That is possible by including fixed effects in the model, when assuming that something specific within the individual may impact the outcome. Panel data also decreases the problem of multicollinearity, since variations in variables are combined over time. The gravity equation will be estimated using an OLS estimation method. The data are transformed in natural logarithms, because it reduces the weight of outliers with very large FDI flows and it allows us to interpret estimated coefficients as elasticities (Dinga and Dingova, 2011). The downside for the use of logarithms is that we lose observations which had negative values due to the disinvestment in FDI. Based on their theory and complicated derivation techniques Kleinert and Toubal (2007) derived the basic empirical gravity equation, when using the volume of affiliate sales as the dependent variable. Considering FDI instead of affiliate sales, the empirical equation looks like this:

$$FDI_{ijt} = \beta_0 + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDP_{jt}) + \beta_3 \ln(Dist_{ij}) + \varepsilon_{ijt} \quad (1)$$

The traditional gravity equation approach specifies FDI flows between countries as a function of various institutional and geographical explanatory factors. Thus, other control explanatory and dummy variables are added in the model. Omission of relevant variables and inclusion of irrelevant variables would lead to a bias in our estimates. Dummy variables are chosen mainly based on Rose and van Wincoop (2001), which have been later generally accepted in other studies. Also, papers discussed in the literature overview like Dinga and Dingova (2011), Flam and Nordstrom (2008), Sousa and Lochard (2009) and Kleinert and Toubal (2007) implement those dummy variables for robustness check. Moreover, dummies are chosen also based on a logical sense what could possibly influence the amount of FDI flows. Since the interest is in "pure" Euro effect on FDI, we add two monetary variables: currency exchange rate standard deviation and dummy for countries using euro as a national currency. We add language dummy, because it could enhance FDI through easier communication between investors and enterprises. Neighbour countries usually are similar in cultural factors and in ways of dealing with business related issues, which could foster FDI flows between them. Hence, border dummy is added to

the model as well. Usually studies concerning the gravity equation include GDP per capita in the regression as well in order to control for the GDP effect. For the same reasons we include population in the regression. Population is preferred over GDP per capita, because since we already have a GDP on the regression right side and GDP is a product of GDP per capita and population, they would be highly correlated with each other. Since we are using the natural logarithms in the regression, population variable covers the necessary effect. Based on this approach FDI outward flow from country i to country j in the unrestricted model can be written as:

$$\ln(FDI_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{it}) + \beta_2 \ln(GDP_{jt}) + \beta_3 \ln(Pop_{it}) + \beta_4 \ln(Pop_{jt}) + \beta_5 \ln(Dist_{ij}) + \beta_6 SD_t + \beta_7 Euro_{it} + \beta_8 EU_{it} + \beta_9 Border_{ij} + \beta_{10} Lang_{ij} + \mu_i + \mu_t + \varepsilon_{ijt} \quad (2)$$

The independent variables included in the gravity model in order to estimate FDI outward flows are presented and described below:

- GDP stands for gross domestic product, measured in current US dollars at time t,
- Pop stands for total population of the corresponding country at time t,
- Dist stands for geographical distance between the capital cities of the two countries, measured in kilometres,
- SD stands for currency exchange rate standard deviation at time t,
- Euro is a dummy variable that takes a value of 1 if both countries are members of Eurozone and value of 0 if otherwise,
- EU is a dummy variable that takes a value of 1 if both countries are members of EU and value of 0 if otherwise,
- Border is a dummy that takes a value of 1 if both countries have a common border and value of 0 if otherwise,
- Lang is a dummy variable that takes a value of 1 if both countries have a common official language and value of 0 if otherwise.

Finally, μ_i and μ_t represent the country-pair fixed effects and period fixed effects, respectively, to account for unobserved variations in FDI flows on an individual level and changes occurring over time. When accounting for country-pair fixed effects, the disadvantage is that the variables that are changing only in the same direction as fixed effects cannot be included. We have to eliminate distance, language dummy and

border dummy from the equation. The reason is the multicollinearity problem, which arises because these are the variables, which do not change over the time. Based on the theories and empirical results discussed in the literature overview chapter, the *Table 2* below presents predictions regarding the signs of coefficients in the unrestricted model and the source on which the prediction is based.

Table 2: Prediction of signs of coefficients

Coefficient	Sign	Source
Intercept	No prediction	
GDP home country	Positive	Kleinert and Toubal (2007), Sousa and Lochard (2009), Flam and Nordstrom (2008), Petroulas (2006)
GDP host country	Positive	Kleinert and Toubal (2007), Sousa and Lochard (2009), Flam and Nordstrom (2008)
Population home country	Negative	
Population host country	Negative	
Distance	Negative	Kleinert and Toubal (2007), Sousa and Lochard (2009), Dinga and Dingova (2011), Rose (2000), Flam and Nordstrom (2008)
Exchange rate standard deviation	Negative	Rose (2000), theories discussed in this paper's introduction
Euro dummy	Ambiguous	Flam and Nordstrom (2008)
EU dummy	Positive	Flam and Nordstrom (2008), Sousa and Lochard (2009)
Border dummy	Positive	Kleinert and Toubal (2007), Flam and Nordstrom (2008), Rose (2000).
Language dummy	Positive	Flam and Nordstrom (2008), Dinga and Dingova (2011), Rose (2000)

Three different empirical models, which are all based on equation (2), will be estimated. The first one does not consider any fixed effects. The second model considers period fixed effects and the third model considers country-pair fixed effects. Each time the regression will be estimated in four different variations by changing the variables included in the model and variables excluded from the model. This is done in order to check for the robustness, to see how the magnitude and significance of the

variables changes in the absence of others and to probably identify redundant variables.

5. Results

First, the correlation matrix of all explanatory variables is presented in *Table 3* in order to check for the problem of multicollinearity.

Table 3: Correlation Matrix

	BORDER	DIST	EU	EURO	FDI	GDP i	GDP j	LANG	POP i	POP j	STDEV
BORDER		-0.40	0.20	0.16	-0.02	-0.03	-0.20	0.14	-0.05	-0.04	-0.03
DIST	-0.40		-0.49	-0.29	0.00	0.16	0.44	0.22	0.17	0.18	0.13
EU	0.20	-0.49		0.59	0.03	-0.15	-0.34	-0.15	-0.17	-0.29	-0.10
EURO	0.16	-0.29	0.59		0.08	-0.04	-0.21	-0.03	-0.05	-0.18	-0.07
FDI	-0.02	0.00	0.03	0.08		0.47	0.11	0.09	0.41	0.02	-0.04
GDP i	-0.03	0.16	-0.15	-0.04	0.47		-0.01	0.09	0.89	0.05	0.00
GDP j	-0.20	0.44	-0.34	-0.21	0.11	-0.01		0.00	0.00	0.51	0.01
LANG	0.14	0.22	-0.15	-0.03	0.09	0.09	0.00		0.05	-0.07	-0.01
POP i	-0.05	0.17	-0.17	-0.05	0.41	0.89	0.00	0.05		0.09	-0.01
POP j	-0.04	0.18	-0.29	-0.18	0.02	0.05	0.51	-0.07	0.09		0.02
STDEV	-0.03	0.13	-0.10	-0.07	-0.04	0.00	0.01	-0.01	-0.01	0.02	

As we can see, there is a quite high correlation of 0.89 between GDP of the home country and population of the home country. It is not surprising though, because it could be expected that once population increases, the gross domestic product should also increase. However, 0.89 is still acceptable and should not cause any problems of multicollinearity. The OLS estimator will still be consistent and unbiased. Moreover, the use of a panel data also reduces the possibility of multicollinearity. The rest of variables are not dangerously correlated.

The following part of this chapter describes the results obtained from the regressions. The first look in the results is to check for magnitude of R^2, since it measures how good the explanatory power of the model is. *Table 4* provides the output results without considering any fixed effects in the model.

Table 4: OLS regression

Variable	(1)	(2)	(3)	(4)
ln(GDP i)	**0.81*****	**0.78*****	**2.48*****	**2.47*****
	(0.043)	(0.044)	(0.098)	(0.103)
ln(GDP j)	**0.32*****	**0.34*****	**0.22*****	**0.19****
	(0.036)	(0.035)	(0.075)	(0.078)
ln(Distance)	**-0.40*****	**-0.43*****	**-0.35*****	**-0.33*****
	(0.054)	(0.075)	(0.045)	(0.065)
ln(Population i)			**-1.79*****	**-1.78*****
			(0.096)	(0.099)
ln(Population j)			**-0.07**	**-0.02**
			(0.071)	(0.074)
Exchange rate st.deviation		**-0.22**		**-0.29****
		(0.142)		(0.123)
EU dummy		**0.24**		**0.29***
		(0.190)		(0.165)
Euro dummy		**0.49****		**-0.01**
		(0.211)		(0.183)
Language dummy		**0.70*****		**0.14**
		(0.155)		(0.137)
Border dummy		**-0.61*****		**-0.24**
		(0.181)		(0.156)
Constant	**-6.61*****	**-6.31*****	**-18.34*****	**-18.34*****
	(1.220)	(1.229)	(1.198)	(1.248)
Period FE	No	No	No	No
Country FE	No	No	No	No
Observations	989	985	989	985
R^2	0.356	0.383	0.544	0.550

Note: The dependent variable is the natural logarithm of FDI outflows from originating to recipient country. Period and country fixed effects are not reported. Standard errors in parenthesis. Significance levels: *** 1%, ** 5%, * 10%.

The first column model includes both countries GDP and the distance between them. The signs of the coefficients are as expected and they all are significant at 1% level. If the GDP of the home country would increase by 1% the FDI outflows would increase by 0.81%, while if the distance increases by 1%, the FDI outflows would decrease by 0.4%. The R^2 value is not very high being 0.356. It means that only 35.6% of the variations in FDI flows are explained by the independent variables. After adding the exchange rate standard deviation and all the dummy variables to the model (column 2) the R^2 increases only by 2.7%. The magnitude of the GDP and the distance

coefficients is almost the same as before and they are still significant at 1% level. The Euro dummy is significant at 5% level and states that if both countries use the Euro as a national currency the FDI flows will increase by 63%[10]. Language and border dummies both are significant at 1% level. Having a common official language would increase FDI by 101% while a common border unexpectedly would decrease FDI by 46%. The third column considers a model similar to the one in column 1, but adds populations of the both countries in the regression. GDPs, distance and population for the home country are significant at 1% level. The home country's GDP coefficient has increased to 2.48 meaning that for each 1% increase in the GDP there would be a 2.48% increase in FDI outflows. As expected, 1% increase in the population at the home country would decrease FDI by 1.79%. The magnitude of the host country's GDP and distance has not changed significantly and the R^2 has increased to 0.544. The column 4 presents the full model by including all the independent variables in the regression. The results indicate that the R^2 has barely changed compared to the model 3. Coefficients of GDP, population and distance are pretty much the same as in the model 3, but GDP of the host country is now significant only at 5% level instead of 1%. The exchange rate standard deviation has appeared to be significant at 5% level and the EU dummy at 10% level. 1% rise in the exchange rate standard deviation would decrease FDI by 25.2%

Population of host country effect appears to be insignificant, meaning that it is not significantly different from zero. Exchange rate standard deviation only becomes significant once population is also included in the model. However, other dummies – language, border and the Euro become insignificant once the population is included in the model. If looking at the 5% significance level, then also the EU dummy can be neglected in all cases.

By taking in consideration the values of R^2, it could be stated that the model 3 is the most representative, because after including population in the model, the R^2 rises considerably, but after adding other variables to model 3, most of them turns out insignificant without an improvement in R^2. If we add only the Euro dummy to the model 3, it still turns out to be highly insignificant (this method is not reported).

[10] $(e^{0.49}-1)*100 = 63\%$

Table 5 provides results for the same regression equations, but including period fixed effects, which would account for unobservable effects over time.

Table 5: Period fixed effects model

Variable	(1)	(2)	(3)	(4)
ln(GDP i)	**0.78*****	**0.75*****	**2.47*****	**2.46*****
	(0.043)	(0.044)	(0.101)	(0.106)
ln(GDP j)	**0.30*****	**0.32*****	**0.22*****	**0.18****
	(0.035)	(0.035)	(0.075)	(0.078)
ln(Distance)	**-0.38*****	**-0.43*****	**-0.35*****	**-0.33*****
	(0.053)	(0.074)	(0.045)	(0.065)
ln(Population i)			**-1.78*****	**-1.77*****
			(0.098)	(0.102)
ln(Population j)			**-0.06**	**-0.02**
			(0.071)	(0.075)
Exchange rate st.deviation		**-0.21**		**-0.27****
		(0.140)		(0.122)
EU dummy		**0.13**		**0.28***
		(0.189)		(0.165)
Euro dummy		**0.55*****		**0.00**
		(0.207)		(0.184)
Language dummy		**0.70*****		**0.15**
		(0.153)		(0.136)
Border dummy		**-0.58*****		**-0.22**
		(0.178)		(0.156)
Constant	**-5.43*****	**-5.00*****	**-18.22*****	**-18.23*****
	(1.222)	(1.235)	(1.259)	(1.326)
Period FE	Yes	Yes	Yes	Yes
Country FE	No	No	No	No
Observations	989	985	989	985
R^2	0.384	0.410	0.554	0.559

Note: The dependent variable is the natural logarithm of FDI outflows from originating to recipient country. Period and country fixed effects are not reported. Standard errors in parenthesis. Significance levels: *** 1%, ** 5%, * 10%.

In the column 1 we can see that significance of the coefficients has not changed and magnitude has changed minimally compared to the same model without period fixed effects. 1% increase in GDP of home country and GDP of host country would increase FDI by 0.78% and 0.30% respectively. 1% rise in distance would decrease FDI flows by 0.38%. In comparison to model without period fixed effects the R^2 has increased by 2.8% to the value of 0.384. Model in the column 2 has a similar effect,

only the significance of the Euro dummy has changed from 5% level to 1% level. Also magnitude is higher leading to a 73.3% increase in FDI flows. Border dummy again unexpectedly has a significant and negative coefficient leading to 44% decrease in FDI. The model 3 is basically identical to the one without period fixed effects. Magnitude of the coefficients almost has not changed at all. Also the model 4 is almost identical to the one in the previous table yielding only minor changes in the coefficients. R^2 reaches 0.559 which is only 0.009 higher than before, therefore, we can conclude that there are not noteworthy period fixed effects in regression model.

Table 6 presents results for the same regression equations, but instead of period fixed effects it takes into account unobservable and time-invariant country-pair fixed effects.

Table 6: Country-pair fixed effects model

Variable	(1)	(2)	(3)	(4)
ln(GDP i)	**1.75*****	**1.86*****	**2.03*****	**2.28*****
	(0.332)	(0.343)	(0.377)	(0.402)
ln(GDP j)	**0.91*****	**0.84****	**0.88*****	**0.83****
	(0.306)	(0.343)	(0.312)	(0.334)
ln(Distance)				
ln(Population i)			**-4.75**	**-6.33****
			(2.894)	(3.060)
ln(Population j)			**1.19**	**1.15**
			(2.469)	(2.530)
Exchange rate st.deviation		**-0.07**		**-0.07**
		(0.201)		(0.201)
EU dummy		**0.23**		**-0.47**
		(0.348)		(0.371)
Euro dummy		**-0.20**		**-0.30**
		(0.536)		(0.546)
Language dummy				
Border dummy				
Constant	**-50.80*****	**-51.55*****	**0.38**	**21.90**
	(5.198)	(5.681)	(44.200)	(46.770)
Period FE	No	No	No	No
Country FE	Yes	Yes	Yes	Yes
Observations	989	985	989	985
R^2	0.705	0.705	0.705	0.706

Note: The dependent variable is the natural logarithm of FDI outflows from originating to recipient country. Period and country fixed effects are not reported. Variables language dummy, border dummy and distance are excluded due to the use of country fixed effects. Standard errors in parenthesis. Significance levels: *** 1%, ** 5%, * 10%.

In *Table 6* distance, language dummy and border dummy are excluded because they cause multicollinearity problem when using country-pair fixed effects. In the column 1 coefficients of GDP have risen compared to the model without country-pair fixed effects. 1% increase in GDP of home country and GDP of host country would lead to an increase in FDI of 1.75% and 0.91% respectively. R^2 has almost doubled and is 0.705. In column 2 and 3 the coefficients of GDPs are still significant at 1% level and have minimally increased in magnitude. The column 4 reports similar values for GDP as in column 3. Population of home country is significant at 5% level and has considerably increased in magnitude stating that 1% increase in population of home country would decrease FDI by 6.33%.

Population of the host country, exchange rate standard deviation, EU dummy and Euro dummy are reported as insignificant throughout the *table 6.* In the column 3 also population of the home country is insignificant.

R^2 over columns 1 to 4 is pretty much the same. Based on values of the R^2 one could say that the model with country-pair fixed effects would be the best fit. It means that country-pair fixed effects explain a quite large part of variations in the dependent variable – FDI outward flows. However, it is ambiguous and hard to tell, which column model in case of country-pair fixed effects is the best one, since they all yield the same values of R^2.

5.1. Analysis of Results

The model with the highest R^2 can explain the largest part of the variation in the dependent variable, thus, the model with country-pair fixed effects would be the best fit. It reaches the R^2 of 0.706 and means that country-pair fixed effects explain a quite large part of variations in the dependent variable – FDI outward flows, because the model without country-pair fixed effects had the R^2 of only 0.559 at most. However, it is ambiguous and hard to tell, which column model in the case of country-pair fixed effects is the best one, since they all yield the same values of R^2. From all the models tested, it is obvious, that inclusion of population in the regression changes a lot, because once we include population the R^2 jumps rapidly. Besides GDPs and distance, the significance of other variables changes after inclusion of population in the model. It could be argued though that only population of the home country is relevant, because population of the host country turned out insignificant in all cases.

Results regarding the effect of GDP are consistent with the findings in other studies like Kleinert and Toubal (2007), Flam and Nordstrom (2008) and Sousa and Lochard (2009), yielding positive and significant impact on FDI outflows. GDP acts as a proxy for the market size of a country, therefore, implying how attractive the particular country is. Results of distance also go in line with the previous findings, namely, it has a negative effect on FDI. Most common explanation is that costs are increasing with distance, and probably also the fact that the larger the distance between the two countries, less information they have regarding each other. Population variable does not explicitly appear in any of the previous studies discussed, thus we cannot compare

its results within the other studies. Exchange rate standard deviation in the fixed effects model is not significantly different from zero, which is consistent to the findings in Sousa and Lochard (2009), Dinga and Dingova (2011) and Petroulas (2006). The reasonable explanation for the exchange rate standard deviation to be insignificant could be that many countries have fixed their currency exchange rates against, for instance, Euro, and, therefore, limits the risk of exchange rate fluctuations. We also found the EU dummy to be insignificant in all cases, if looking at 5% level. This result is not consistent with the findings in other papers discussed, especially with Dinga and Dingova (2011), who suggests that the EU has a positive effect of 55 to 166 per cent on FDI. However, Sousa and Lochard (2009) found the EU dummy to be insignificant in sample 1992-2005 and significant in sample 1982-2005. Thus, the EU dummy can be seen as really dependent on the time span and techniques used in the study. The Euro dummy in this paper was found to be significant only in the models where population was not included and estimation was in absence of country-pair fixed effects. The finding of no effect of the Euro on FDI outflows is only similar to Flam and Nordstrom (2008) paper, where they stated that once accounted correctly for the Single Market effect, the Euro effect disappears. Border dummy is reported as having a negative effect on FDI, and in the cases where population is excluded it is significant. This finding is not consistent with the papers discussed in the literature overview, because Kleinert and Toubal (2007) and Dinga and Dingova (2011) found significant and positive effects. Moreover, logically thinking it also does not make sense that having a common border would decrease FDI. The negative coefficient found in this paper could be due to the reason that 30 reporting (home) countries do not have the same 4 partner (host) countries in the data analysed. This fact could lead to a biased estimate of the border dummy. Having a common language has a positive and significant effect on FDI if population is not included in the model. This finding is similar to Dinga and Dingova (2011) and Flam and Nordstrom (2008), who also provide evidence for positive impact of the common language on FDI.

To sum up, judging by the values of R^2, model including country-pair fixed effects has higher explanatory power than simple OLS model and the model with period fixed effects. It means that a large part of FDI allocations is explained by country-pair specific individual factors, which are unobservable. The disadvantage for this model is that we are not able to see the effects of distance, common language and border due

to the reasons explained before. The tricky part is the presence of population in the model, because with its presence the dummy variables become insignificant. Without the population in the period fixed effects model, having a common currency (Euro) would foster FDI by 73%. According to the gravity equation user guide for international trade by Shepard (2012), the population should be avoided from the gravity equation. If we presume that this is a case also for the gravity equation for estimating FDI, then the results would suggest that Euro dummy increases FDI by 73% in the case of period fixed effects model. In country-pair fixed effects model, the Euro is insignificant despite of the exclusion of population variable. Therefore, when considering the country-pair fixed effects model, only GDPs have an explanatory power of FDI, while the rest is covered by unobservable and time-invariant country-pair fixed effects.

6. Conclusion

In this paper we investigate the effect of the Euro on FDI outward flows. We analyse FDI outward flows from 30 OECD reporting countries to the 4 most important partner countries based on the combined FDI flows over the 10 year period. The four partner countries, therefore, are not necessarily the same for each reporting country. We found ambiguous results. With different restrictions on the gravity equation (2), we conclude that if both countries have a common currency Euro, FDI flow would increase by 73% compared to the situation of having different currencies. However, we found that inclusion of country-pair fixed effects in the model is vital, since these unobservable effects appear to have a large explanatory power. In the presence of country-pair fixed effects our findings suggest that FDI outflows depend only on GDP of both countries. These results do not justify our expectations and predictions based on the theory and empirical literature discussed. Controversial is also the presence of population in the model, in which case all the effects of dummy variables can be neglected. The results indicate that FDI outflows are highly country-pair dependent, because we obviously cannot ignore the strong effect of the country-pair fixed effects in the model. The downside is that in this case we cannot observe the effect of distance, which approved to be significant at 1% level and negative in the models without country-specific fixed effects. The Euro impact of 73% in the model with period fixed effects could be misguided leading to a spurious effect, because the Euro

dummy coefficient could just capture the part of the country-pair fixed effects. Moreover, based on discussions in Baldwin et al. (2008) the presence of country-pair fixed effects in the model is important, because that was the main shortcoming made by Rose (2000) yielding a very high Euro dummy effect. This was later averted by Rose and Wincoop (2001) significantly decreasing the effect of the Euro. Therefore, we suggest the model with country-pair fixed effects to be the most representative. In that case we conclude that there is no Euro effect on FDI in our analysis. Getting back to the sub-question of our research mentioned in the introduction, namely, how would FDI flows into Latvia change after committing to the Euro? Based on the findings obtained from our data analysis, the FDI flows would not change after committing to the Euro. More likely, individual, unobservable specific factors would be the main effect. The adaption of the Euro could foster the flows of FDI indirectly. For instance, having the Euro could increase the GDP, which based on our results would mean also an increase in FDI. But that is already a topic for other study.

Further research would suggest more into depth analysis, for example, propensity scores matching technique. Also larger sample size would be advised, analysing bilateral FDI flows for countries between each other. For instance, if we take 30 reporting countries, then we suggest taking the same 30 countries as partner countries. This would probably prevent the bias that aroused concerning the border dummy. Another suggestion is, to split the sample in parts like Flam and Nordstrom (2008), meaning to measure separately effects within EU, from EU members to non-EU members and from non-EU members to EU members. This approach could reveal more information regarding the Euro effect. Last, but not least, consider techniques that would allow distance, border dummy and language dummy to be present in the model of country-pair specific effects.

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Appendix

Four partner countries are chosen based on the largest FDI outward flows for the corresponding reporting country combined over the 10-year period.

1. Full list of reporting and partner countries

Reporting country	Partner countries
Australia	United Kingdom, Canada, USA, New Zealand
Austria	Russia, Germany, Romania, Croatia
Belgium	Luxembourg, USA, Netherlands, United Kingdom
Canada	USA, United Kingdom, Japan
Denmark	Singapore, Germany, USA, Sweden
Estonia	Finland, Lithuania, Latvia, Cyprus
Finland	Belgium, Sweden, Russia, Netherlands
France	USA, Belgium, United Kingdom, Netherlands
Germany	Netherlands, United Kingdom, USA, Luxembourg
Greece	Turkey, Cyprus, Poland, USA
Hungary	Switzerland, Slovakia, Croatia, Bulgaria
Iceland	Finland, United Kingdom, USA, Denmark
Ireland	Luxembourg, USA, United Kingdom, Netherlands
Italy	Spain, France, Netherlands, Germany
Japan	USA, China, United Kingdom, Netherlands
Korea	China, USA, United Kingdom, Hong Kong
Luxembourg	United Kingdom, Switzerland, USA, Netherlands
Netherlands	Switzerland, Luxembourg, Belgium, United Kingdom
New Zealand	USA, Australia, Singapore, Bermuda
Norway	Bermuda, USA, Belgium, Netherlands
Poland	United Kingdom, Luxembourg, Lithuania, Switzerland
Portugal	USA, Spain, Netherlands, Denmark
Slovakia	Czech Republic, Cyprus, Austria, Netherlands
Slovenia	Croatia, Serbia, Montenegro, Russia
Spain	Brazil, United Kingdom, USA, Mexico
Sweden	USA, Norway, United Kingdom, Netherlands
Switzerland	USA, Netherlands, Germany, Luxembourg
Turkey	Netherlands, Azerbaijan, Germany, USA
United Kingdom	Netherlands, Canada, USA, Australia
USA	Netherlands, Luxembourg, United Kingdom, Canada

2. Standard deviations of exchange rates

Currencies	Year	Std. dev. of exchange rate
EUR/EUR	2002	0,00000
	2003	0,00000
	2004	0,00000
	2005	0,00000
	2006	0,00000
	2007	0,00000
	2008	0,00000
	2009	0,00000
	2010	0,00000
	2011	0,00000
EUR/GBP	2002	0,00866
	2003	0,01329
	2004	0,01073
	2005	-0,00589
	2006	0,00583
	2007	0,01430
	2008	0,02931
	2009	0,01622
	2010	0,01960
	2011	0,01235
EUR/USD	2002	0,04977
	2003	0,04184
	2004	0,03457
	2005	-0,04594
	2006	0,03296
	2007	0,05050
	2008	0,09175
	2009	0,06434
	2010	0,04605
	2011	0,03607
AUD/CAD	2002	0,01753
	2003	0,01925
	2004	0,03400
	2005	0,03370
	2006	0,01402
	2007	0,01972
	2008	0,05322
	2009	0,04855
	2010	0,03342
	2011	0,01721
AUD/NZD	2002	0,03457
	2003	0,02415
	2004	0,02589
	2005	0,01056
	2006	0,03567
	2007	0,01640
	2008	0,03963
	2009	0,00802
	2010	0,01796
	2011	0,02732
DKK/EUR	2002	0,00004

Currencies	Year	Std. dev. of exchange rate
AUD/GBP	2002	0,00935
	2003	0,01856
	2004	0,00999
	2005	0,00655
	2006	0,00787
	2007	0,01178
	2008	0,01912
	2009	0,03397
	2010	0,01787
	2011	0,00982
AUD/USD	2002	0,01503
	2003	0,04407
	2004	0,02428
	2005	0,01239
	2006	0,01145
	2007	0,03741
	2008	0,10587
	2009	0,08970
	2010	0,03996
	2011	0,02466
EUR/HRK	2002	0,06615
	2003	0,04458
	2004	0,08351
	2005	-0,06347
	2006	0,03130
	2007	0,02214
	2008	0,04788
	2009	0,04958
	2010	0,04712
	2011	0,04301
EUR/RON	2002	0,19652
	2003	0,14768
	2004	0,03995
	2005	0,06445
	2006	0,03439
	2007	0,08370
	2008	0,08229
	2009	0,02981
	2010	0,06591
	2011	0,07364
EUR/RUB	2002	1,89384
	2003	0,60212
	2004	0,76337
	2005	0,88035
	2006	0,16144
	2007	0,44362
	2008	0,34605
	2009	0,46825
	2010	1,31279
	2011	0,80383
EUR/PLN	2002	0,19227

Currencies	Year	Std. dev. of exchange rate
	2003	0,00007
	2004	0,00012
	2005	0,00013
	2006	0,00005
	2007	0,00007
	2008	0,00005
	2009	0,00007
	2010	0,00010
	2011	0,00012
DKK/SEK	2002	0,00680
	2003	0,00940
	2004	0,00822
	2005	0,01940
	2006	0,01058
	2007	0,00528
	2008	0,05033
	2009	0,03241
	2010	0,03828
	2011	0,01453
DKK/USD	2002	0,00672
	2003	0,00558
	2004	0,00470
	2005	0,00631
	2006	0,00445
	2007	0,00672
	2008	0,01215
	2009	0,00876
	2010	0,00615
	2011	0,00474
DKK/SGD	2002	0,00842
	2003	0,00868
	2004	0,00481
	2005	0,00714
	2006	0,00297
	2007	0,00498
	2008	0,00901
	2009	0,00496
	2010	0,01051
	2011	0,00263
EUR/SEK	2002	0,04976
	2003	0,06617
	2004	0,06578
	2005	0,15313
	2006	0,08125
	2007	0,03906
	2008	0,36952
	2009	0,24582
	2010	0,28018
	2011	0,10387
HUF/BGN	2002	0,00011
	2003	0,00021
	2004	0,00019
	2005	0,00010

Currencies	Year	Std. dev. of exchange rate
	2003	0,15681
	2004	0,21108
	2005	0,07520
	2006	0,05641
	2007	0,08171
	2008	0,17334
	2009	0,14108
	2010	0,01758
	2011	0,19260
EUR/TRY	2002	0,18961
	2003	0,07652
	2004	0,07541
	2005	0,05381
	2006	0,12182
	2007	0,04575
	2008	0,09387
	2009	0,02571
	2010	0,05446
	2011	0,13452
EUR/CYP	2002	0,00232
	2003	0,00281
	2004	0,00338
	2005	0,00397
	2006	0,00106
	2007	0,00215
HUF/SKK	2002	0,00212
	2003	0,00486
	2004	0,00178
	2005	0,00166
	2006	0,00399
	2007	0,00168
	2008	0,00525
HUF/EUR	2009	0,00359
	2010	0,00484
	2011	0,00736
HUF/CHF	2002	0,00004
	2003	0,00004
	2004	0,00008
	2005	0,00008
	2006	0,00017
	2007	0,00008
	2008	0,00037
	2009	0,00021
	2010	0,00029
	2011	0,00028
JPY/CNY	2002	0,00258
	2003	0,00268
	2004	0,00121
	2005	0,00391
	2006	0,00115
	2007	0,00079
	2008	0,00276
	2009	0,00209

Currencies	Year	Std. dev. of exchange rate
	2006	0,00022
	2007	0,00007
	2008	0,00036
	2009	0,00023
	2010	0,00014
	2011	0,00031
HUF/HRK	2002	0,00047
	2003	0,00084
	2004	0,00056
	2005	0,00052
	2006	0,00091
	2007	0,00024
	2008	0,00121
	2009	0,00074
	2010	0,00051
	2011	0,00119
JPY/EUR	2002	0,00016
	2003	0,00015
	2004	0,00011
	2005	0,00008
	2006	0,00019
	2007	0,00012
	2008	0,00074
	2009	0,00030
	2010	0,00039
	2011	0,00040
JPY/GBP	2002	0,00008
	2003	0,00008
	2004	0,00005
	2005	0,00007
	2006	0,00019
	2007	0,00005
	2008	0,00079
	2009	0,00039
	2010	0,00022
	2011	0,00029
JPY/USD	2002	0,00030
	2003	0,00033
	2004	0,00017
	2005	0,00041
	2006	0,00007
	2007	0,00019
	2008	0,00042
	2009	0,00028
	2010	0,00048
	2011	0,00033
EUR/CHF	2002	0,00411
	2003	0,03414
	2004	0,01419
	2005	0,00327
	2006	0,01314
	2007	0,01621
	2008	0,03625

Currencies	Year	Std. dev. of exchange rate
	2010	0,00265
	2011	0,00128
KRW/GBP	2002	0,01216
	2003	0,00687
	2004	0,03650
	2005	0,00011
	2006	0,00011
	2007	0,00008
	2008	0,00041
	2009	0,00024
	2010	0,00012
	2011	0,00007
KRW/USD	2002	0,00000
	2003	0,00000
	2004	0,06547
	2005	0,00000
	2006	0,00000
	2007	0,00000
	2008	0,00000
	2009	0,00004
	2010	0,00000
	2011	0,00000
KRW/CNY	2002	0,00011
	2003	0,00011
	2004	0,54187
	2005	0,00052
	2006	0,00048
	2007	0,00088
	2008	0,00094
	2009	0,00026
	2010	0,00053
	2011	0,00058
KRW/HKD	2002	0,00027
	2003	0,00854
	2004	0,51130
	2005	0,00011
	2006	0,00010
	2007	0,00013
	2008	0,00013
	2009	0,00030
	2010	0,00005
	2011	0,00005
PLN/CHF	2002	0,01989
	2003	0,00591
	2004	0,01396
	2005	0,00758
	2006	0,00697
	2007	0,01356
	2008	0,03082
	2009	0,01239
	2010	0,01398
	2011	0,02107
PLN/GBP	2002	0,00627

Currencies	Year	Std. dev. of exchange rate
	2009	0,00807
	2010	0,05736
	2011	0,04465
NOK/EUR	2002	0,00325
	2003	0,00445
	2004	0,00228
	2005	0,00232
	2006	0,00241
	2007	0,00192
	2008	0,00577
	2009	0,00279
	2010	0,00122
	2011	0,00053
NOK/USD	2002	0,00954
	2003	0,00303
	2004	0,00552
	2005	0,00296
	2006	0,00397
	2007	0,00876
	2008	0,01906
	2009	0,01120
	2010	0,00416
	2011	0,00445
NOK/BMD	2002	0,00957
	2003	0,00310
	2004	0,00553
	2005	0,00283
	2006	0,00390
	2007	0,00859
	2008	0,01866
	2009	0,01120
	2010	0,00416
	2011	0,00445
PLN/EUR	2002	0,01306
	2003	0,00817
	2004	0,01041
	2005	0,00464
	2006	0,00369
	2007	0,00578
	2008	0,01368
	2009	0,00738
	2010	0,00106
	2011	0,01100
SEK/EUR	2002	0,00060
	2003	0,00083
	2004	0,00080
	2005	0,00180
	2006	0,00094
	2007	0,00045
	2008	0,00375
	2009	0,00217
	2010	0,00306
	2011	0,00128

Currencies	Year	Std. dev. of exchange rate
	2003	0,00403
	2004	0,00885
	2005	0,00359
	2006	0,00262
	2007	0,00778
	2008	0,01060
	2009	0,00689
	2010	0,00529
	2011	0,01071
PLN/LTL	2002	0,04751
	2003	0,02835
	2004	0,03618
	2005	0,01610
	2006	0,01267
	2007	0,02012
	2008	0,04748
	2009	0,02561
	2010	0,00364
	2011	0,03805
EUR/DKK	2002	0,00281
	2003	0,00354
	2004	0,00547
	2005	-0,00743
	2006	0,00249
	2007	0,00412
	2008	0,00366
	2009	0,00336
	2010	0,00524
	2011	0,00671
EUR/MXN	2002	0,85322
	2003	0,66045
	2004	0,38816
	2005	0,74166
	2006	0,55519
	2007	0,48372
	2008	0,58587
	2009	0,41667
	2010	0,62109
	2011	0,71322
EUR/BRL	2002	0,63201
	2003	0,16793
	2004	0,02146
	2005	0,30756
	2006	0,05357
	2007	0,06598
	2008	0,19434
	2009	0,17273
	2010	0,09307
	2011	0,05784
TRY/EUR	2002	0,09660
	2003	0,02774
	2004	0,02446
	2005	0,01900

Currencies	Year	Std. dev. of exchange rate
SEK/NOK	2002	0,02009
	2003	0,03432
	2004	0,01393
	2005	0,03022
	2006	0,02343
	2007	0,01658
	2008	0,01052
	2009	0,01039
	2010	0,02323
	2011	0,01307
SEK/GBP	2002	0,00103
	2003	0,00175
	2004	0,00163
	2005	0,00170
	2006	0,00021
	2007	0,00128
	2008	0,00163
	2009	0,00207
	2010	0,00193
	2011	0,00127
SEK/USD	2002	0,00555
	2003	0,00545
	2004	0,00466
	2005	0,00720
	2006	0,00466
	2007	0,00491
	2008	0,01467
	2009	0,00904
	2010	0,00546
	2011	0,00408
CHF/EUR	2002	0,00191
	2003	0,01503
	2004	0,00594
	2005	0,00136
	2006	0,00529
	2007	0,00604
	2008	0,01485
	2009	0,00356
	2010	0,02983
	2011	0,03037
CHF/USD	2002	0,03516
	2003	0,01507
	2004	0,02399
	2005	0,03001
	2006	0,01580
	2007	0,02385
	2008	0,03840
	2009	0,04007
	2010	0,04415
	2011	0,05848
GBP/EUR	2002	0,02211
	2003	0,02846
	2004	0,02315

Currencies	Year	Std. dev. of exchange rate
	2006	0,03981
	2007	0,01435
	2008	0,02593
	2009	0,00548
	2010	0,01333
	2011	0,02509
TRY/USD	2002	0,05540
	2003	0,04192
	2004	0,02788
	2005	0,00800
	2006	0,03144
	2007	0,04793
	2008	0,07218
	2009	0,02675
	2010	0,01256
	2011	0,03949
TRY/AZN	2002	0,03095
	2003	0,02769
	2004	0,06577
	2005	0,02123
	2006	0,00920
	2007	0,03293
	2008	..
	2009	..
	2010	..
	2011	..
GBP/AUD	2002	0,07011
	2003	0,12120
	2004	0,06189
	2005	0,03738
	2006	0,04607
	2007	0,06710
	2008	0,09626
	2009	0,13145
	2010	0,04971
	2011	0,02392
GBP/CAD	2002	0,08700
	2003	0,07949
	2004	0,06719
	2005	0,11196
	2006	0,05998
	2007	0,10394
	2008	0,03626
	2009	0,03209
	2010	0,03584
	2011	0,01349
EEK/EUR	2002	0,00000
	2003	0,00000
	2004	0,00000
	2005	0,00000
	2006	0,00000
	2007	0,00000
	2008	0,00000

Currencies	Year	Std. dev. of exchange rate
	2005	0,01250
	2006	0,01257
	2007	0,02982
	2008	0,04432
	2009	0,02049
	2010	0,02648
	2011	0,01645
GBP/USD	2002	0,06007
	2003	0,04172
	2004	0,02180
	2005	0,05647
	2006	0,06074
	2007	0,03453
	2008	0,16482
	2009	0,08197
	2010	0,03346
	2011	0,02120
USD/CAD	2002	0,01508
	2003	0,07041
	2004	0,05040
	2005	0,02618
	2006	0,01357
	2007	0,07031
	2008	0,08398
	2009	0,07024
	2010	0,01120
	2011	0,02089
USD/EUR	2002	0,05663
	2003	0,03264
	2004	0,02182
	2005	0,02935
	2006	0,02130
	2007	0,02647
	2008	0,04554
	2009	0,03353
	2010	0,02636
	2011	0,01869
USD/GBP	2002	0,02670
	2003	0,01517
	2004	0,00635
	2005	0,01703
	2006	0,01809
	2007	0,00860
	2008	0,05432
	2009	0,03486
	2010	0,01428
	2011	0,00827
CAD/USD	2002	0,00612
	2003	0,03508
	2004	0,03075
	2005	0,01798
	2006	0,01052
	2007	0,06139

Currencies	Year	Std. dev. of exchange rate
	2009	0,00000
	2010	0,00000
EEK/LTL	2002	0,00073
	2003	0,00011
	2004	0,00004
	2005	0,00000
	2006	0,00023
	2007	0,00000
	2008	0,00000
	2009	0,00000
	2010	0,00000
EEK/LVL	2002	0,00105
	2003	0,00070
	2004	0,00063
	2005	0,00000
	2006	0,00004
	2007	0,00008
	2008	0,00027
	2009	0,00015
	2010	0,00004
EEK/CYP	2002	0,00015
	2003	0,00015
	2004	0,00023
	2005	0,00026
	2006	0,00008
	2007	0,00015
EEK/EUR	2008	0,00233
	2009	0,00164
	2010	0,00118
CAD/JPY	2002	2,68332
	2003	2,56134
	2004	2,34850
	2005	5,80051
	2006	1,01574
	2007	5,07624
	2008	10,45431
	2009	4,08798
	2010	3,34130
	2011	3,46156
CAD/GBP	2002	0,01557
	2003	0,01455
	2004	0,01212
	2005	0,02337
	2006	0,01341
	2007	0,02272
	2008	0,00990
	2009	0,01029
	2010	0,01424
	2011	0,00535
NZD/USD	2002	0,02537
	2003	0,02790
	2004	0,02578
	2005	0,01177

Currencies	Year	Std. dev. of exchange rate
	2008	0,06795
	2009	0,05322
	2010	0,01056
	2011	0,02104
ISK/DKK	2002	0,00155
	2003	0,00217
	2004	0,00051
	2005	0,00357
	2006	0,00599
	2007	0,00135
	2008	0,00998
	2009	0,00296
	2010	0,00140
	2011	0,00073
ISK/EUR	2002	0,00023
	2003	0,00030
	2004	0,00008
	2005	0,00045
	2006	0,00081
	2007	0,00018
	2008	0,00132
	2009	0,00041
	2010	0,00018
	2011	0,00010
ISK/GBP	2002	0,00023
	2003	0,00019
	2004	0,00019
	2005	0,00030
	2006	0,00058
	2007	0,00019
	2008	0,00083
	2009	0,00042
	2010	0,00012
	2011	0,00000
ISK/USD	2002	0,00072
	2003	0,00033
	2004	0,00048
	2005	0,00029
	2006	0,00067
	2007	0,00059
	2008	0,00245
	2009	0,00024
	2010	0,00029
	2011	0,00011
NZD/AUD	2002	0,02532
	2003	0,01961
	2004	0,02100
	2005	0,00896
	2006	0,02676
	2007	0,01237
SIT/HRK	2002	0,00058
	2003	0,00025
	2004	0,00044

Currencies	Year	Std. dev. of exchange rate
	2006	0,02077
	2007	0,02503
	2008	0,08364
	2009	0,07236
	2010	0,02185
	2011	0,02869
NZD/BMD	2002	0,02515
	2003	0,03107
	2004	0,02581
	2005	0,01137
	2006	0,02098
	2007	0,02452
	2008	0,08173
	2009	0,07237
	2010	0,02185
	2011	0,02869
NZD/SGD	2002	0,03425
	2003	0,04374
	2004	0,03293
	2005	0,00976
	2006	0,03755
	2007	0,02600
	2008	0,09466
	2009	0,07884
	2010	0,00862
	2011	0,01928
SKK/EUR	2002	0,00045
	2003	0,00020
	2004	0,00025
	2005	0,00015
	2006	0,00059
	2007	0,00031
	2008	0,00111
SKK/CZK	2002	0,02437
	2003	0,00817
	2004	0,00801
	2005	0,00847
	2006	0,01243
	2007	0,01411
	2008	0,02267
EUR/CZK	2009	0,02634
	2010	0,03332
	2011	0,03343
SKK/CYP	2002	0,00023
	2003	0,00013
	2004	0,00008
	2005	0,00015
	2006	0,00036
	2007	0,00023
SIT/RSD	2002	0,00246
	2003	0,00768
	2004	0,00912
	2005	0,00874

Currencies	Year	Std. dev. of exchange rate
	2005	0,00028
	2006	0,00013
	2007	0,00113
	2008	0,00169
SIT/RUB	2002	0,00689
	2003	0,00192
	2004	0,00294
	2005	0,00371
	2006	0,00065

Currencies	Year	Std. dev. of exchange rate
	2006	0,01312