THE FOREIGN EXCHANGE EXPOSURE OF BALTIC NON-FINANCIAL COMPANIES: MYTH OR REALITY?

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Abstract

The authors of this paper are looking for answers: are domestic companies operating in small market economies such as the Baltics with little or no direct foreign involvement also at risk. Assessment of foreign exchange risk is not a simple process, although it is generally accepted that the standard method for valuing financial risk today is the value-at-risk (VaR) method, which provides a quantitative measure of the downside risk of exposure in all foreign currency transactions. The aim of the study is recognized as the first step the Baltic States non-financial companies must take before considering risk mitigation strategies to reduce and, hopefully, eliminate foreign transaction exposure. Empirical analysis of the most-widely used currencies in the Baltic States confirms that more liquid currencies have smaller foreign exchange exposure comparing with not so commonly used. Conducted analysis shows that loss from unhedged foreign currency positions, as estimated by VaR methods, for several Baltic companies could be relatively large and shows the need for managing the risks. Our results have important implications for companies' managers and policy makers.

Key words: Foreign exchange exposure, VaR methods, risk measurement

JEL Code: G32, F31.

Introduction

In an increasingly globalizing world, companies in small open economies such as Baltic, are not isolated from the effects of international economic cycles, currency movements, and global competition. Companies face the challenge of evaluating the potential loss of transactions, especially in light of the recent financial crisis that showed what can happen as a result of poor risk management policy. Value-at-Risk (VaR) holds a special place in the risk assessment - it is used almost everywhere. Value-at-Risk is defined as a portfolio loss for a given horizon that should only be exceeded at a given target probability. It follows from the definition that the horizon choice plays a special role in risk assessment. According to the authors, the right choice of the so-called time horizon, that is choosing the outstanding

position's holding period, is one of the main problems in applying VaR methods. There are various difficulties in measuring foreign exchange exposure. First of all, there is no single unambiguous method of risk assessment, as different methods may produce different results. In the paper the authors used three estimation methods – historical, delta approximation method and GARCH. Secondly, each method has its own shortcomings.

The aim of the study is recognized as the first step the Baltic States non-financial companies must take before considering risk mitigation strategies to reduce and, hopefully, eliminate foreign exchange exposure.

To achieve the aim the following tasks were conducted:

1. Analysis of the theoretical aspects of the measuring foreign exchange exposure.
2. Analysis of Baltic companies' financial reports data to quantify foreign exchange exposure.
3. Examination of different VaR methods to measure and determine exchange rate exposure for a sample of Baltic companies.
5. Development of recommendation how Baltic companies should measure their outstanding currency positions.

The research methodology used in this paper is Value-at-Risk (VaR) methods to measure risk for different holding periods and probabilities. The paper starts with a literature review in order to highlight the difficulties faced by non-financial companies in identifying and measuring foreign exchange risk. As expected, VaR values are greater for longer holding periods and bigger significance levels. Empirical analysis of the most-widely used currencies in the Baltic States shows that BYR has the greatest estimated risk, while RUB has the smallest risk. Although UAH was less risky than SEK and PLN as estimated by historical VaR, VaR delta and GARCH methods showed that it could be as risky as PLN and more risky than SEK. Although generally different VaR methods give similar risk estimates they may vary. Our results show that a company can suffer significant losses due to changes in foreign exchange rates if its outstanding currency positions are not hedged.

1. Nature and measurement of foreign exchange exposure

Foreign exchange exposure refers to the sensitivity of a company's cash flows to changes in the exchange rates. The majority of theoretical and empirical studies have analysed the multinational corporations to test the nature and causes of foreign exchange exposure due to cash flows and asset and liability values that are directly affected by exchange rate

movements. For multinational corporations not only foreign operating cash flows are at risk, but also the foreign asset and liability values reported in consolidated financial statements.

- But what about domestic companies operating in small market economies such as the Baltics with little or no direct foreign involvement?
- Are these companies also at currency risk or risk contribution from unhedged currency exposure is relatively low?
- Is denying any exchange risk because it does all its business in home currency really works?

To answer all these questions we have to measure foreign exchange exposure of non-financial companies operating in the Baltic States. For example, Aggarwal & Harper (2010) show that the foreign exchange exposure faced by domestic companies is not significantly different from that observed in the sample of multinational corporations. Agyei-Ampomah, Mazouz & Yin (2013) findings indicate that the majority of UK non-financial firms are exposed to foreign exchange risk, specifically, they have found that over 75.84% of the sample firms experience significant exposure to the TWC (US$, Euro or JP¥) in one or more years. Measuring foreign exchange risk represents the first step any organization must take before considering appropriate risk mitigation strategies. Today, the standard method for reporting financial risk focuses on the value-at-risk (VaR) methodology, which defines the predicted worst case loss at a specific confidence level over a given period of time. The VaR concept has emerged as the most prominent measure of downside market risk. It places an upper bound on losses in the sense that these can exceed the VaR threshold with only a small target probability, typically chosen between 1% and 5%.

The VaR can be used to measure potential foreign exchange exposure by calculating possible losses from unhedged positions. VaR is an estimate of the worst possible loss (i.e., the decrease in the market value of a foreign exchange position) a position could suffer over a given time horizon, under normal market conditions (defined by a given level of confidence). The VaR measure of exchange rate risk is used by companies to estimate the exposure of a foreign exchange position resulting from a company's activities over a certain time period under normal conditions.

The VaR calculation depends on 3 parameters:

• The holding period, i.e., the length of time over which the foreign exchange position is planned to be held. The typical holding period is 1 day for financial institutions, but as in this

research we analysed non-financial companies the holding period starts from 1 month to 12 months.

• The confidence level at which the estimate is planned to be made. The usual confidence levels are 99 percent and 95 percent.

• The unit of currency to be used for the denomination of the VaR.

Growing body of literature has proposed new models for VaR estimation, attempting to improve upon the existing ones, and compared the performance of alternative proposed models. In accordance with Giannopoulos & Tunaru (2005), from the estimation point of view, VaR is still important as determining the cut-off point where the sample of profits and losses values should be truncated for further estimation of more extreme measures of risk. By comparing several VaR methods: historical simulation, Monte Carlo simulation, parametric methods and extreme value theory Abad & Benito (2013) have found evidence that parametric approach estimates VaR at least as well as other VaR methods that have been developed recently, such as the models based on extreme value theory.

Literature analysis reveals that VaR estimation results vary widely depending on the methodology and that no VaR model is adequate in all situations (Kuester, Mittnik & Paolella, 2006). Bams, Lehnert & Wolff (2005) suggest that more sophisticated tail-modelling approaches come at the cost of more uncertainty about the VaR-estimate itself.

The class of GARCH models introduced by Bollerslev (1986) has been very successful in modelling significant volatility clustering and other properties of financial returns data. Mittnik and Paolella (2000) demonstrate that more general GARCH structures and skewed fat-tailed distributions (a skewed Student-t or a skewed stable distribution) improve the precision of out-of-sample VaR calculations.

In this paper the authors are testing following VaR methods: historical, delta approximation method and GARCH .

2. Research methods and data

2.1. Sample selection and data

The analysis conducted in this paper is based on companies' financial reports' data and statistics, and certain empirical studies. The data set is based on firms that were publicly listed on NASDAQ OMX Baltic Stock Exchange Main and Secondary lists. The authors have chosen for research companies listed in Baltic Main and Secondary Lists for the period spanning 2008 to 2013, excluding financial companies-banks. There were 78 companies listed

on NASDAQ OMX Baltic exchanges main list in 2013, including a bank (Šiauliu bankas). Over the analysed period some companies have left the main list (for example, Trigon Property Development, Sanitas) others have joined (for example, Lietuvos energijos, LESTO, Linas agro) as a result 77 companies were chosen for analysis. The data were taken from the Nasdaq website.

Our dataset consists of daily prices of euro in terms of foreign currencies. The currencies include the US dollar, the Russian rubble (RUB), the Belarusian rubble (BYR), the Polish zloty (PLN), the Swedish krona (SEK) and the Ukrainian Hryvna (UAH), which are the most popular currencies within Baltic companies.

The time span includes the period from January 1999 (introduction of the euro) to January 2014, a total of 181 observations. The data are obtained from Bank of Latvia. The raw exchange rates are transformed into continuously compounded returns, according to:

$$r_t = \ln \frac{ER_t}{ER_{t-1}} \qquad (1)$$

where ER_t denotes the exchange rate at time t. Summary statistics (Table 1) indicate that all currencies' returns exhibit excess kurtosis, which means that the probabilities of extreme events are larger than those probabilities for normal distribution, and positive skewness, which means that there were more appreciations than depreciations for all currencies except USD, which had more negative returns.

Tab. 1: Calculated descriptive statistics of several currency exchange rates logarithmic returns

	BYR*	PLN	RUB	SEK	UAH	USD
minimum	-11.80%	-7.67%	-4.73%	-5.40%	-7.09%	-9.42%
maximum	46.57%	8.41%	14.66%	7.04%	24.10%	9.44%
mean	1.55%	-0.02%	0.29%	-0.03%	0.46%	0.05%
median	1.18%	-0.24%	0.00%	-0.12%	0.48%	0.17%
standard deviation	6.01%	2.80%	2.26%	1.97%	3.77%	2.46%
skewness	485.05%	42.22%	188.58%	30.65%	240.59%	-40.15%
kurtosis	3 483.89%	49.17%	887.31%	109.35%	1 224.37%	261.15%

*sample statistics for BYR were estimated omitting return for 31.01.2000, when there was a significant depreciation of BYR by approximately 600%.

2.2. Estimation methods

There are different methods of VaR estimation. In the paper the authors use three estimation methods – historical, delta approximation method and GARCH. In VaR estimation by historical method data are sorted in ascending order and $\alpha \cdot n$ th observation, where α is

VaR significance level, is taken as an estimate of VaR. The main advantages of the method are that it does not make any assumptions on distribution function of the data and is easy to calculate. In delta approximation method it is assumed that the data are normally distributed with estimated mean and variance parameters. The VaR estimate equals the α -quantile of the normal distribution with relevant parameters. GARCH estimation method is based on assumption that data are taken from GARCH(q,p) process, that is (Bera & Higgins, 1993)

$$x_t = \mu_t + \sigma_t \varepsilon_t, \tag{2}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 x_{t-1}^2 + \cdots + \alpha_q x_{t-q}^2 + \beta_1 \sigma_{t-1}^2 + \cdots + \beta_p \sigma_{t-p}^2. \tag{3}$$

In the paper GARCH(1,1) process specification was used.

Next important question is: What time horizons to choose for non-financial companies?

Earlier studies used a monthly, contemporaneous horizon to measure exposure. However, if the impacts of these exchange rate changes are longer lasting or more permanent in nature, then longer estimation time horizons may be more appropriate. This question of estimation time horizon has been addressed in studies such as Chow, Lee & Solt (1997), Bodnar & Wong (2003) and Martin & Mauer (2003) While generally these studies find that the estimated number of firms with significant foreign exchange exposure is higher for longer time horizons, Bodnar and Wong are cautious in recommending very long-term horizons that may lead to limited non-overlapping time periods. The authors estimate foreign exchange exposures with monthly, quarterly, semi-annual and annual horizons, because our companies prepare financial reports and budgeting for the same periods.

3. Empirical results

For estimation of foreign exchange risk the authors have used monthly exchange rates published by the Bank of Latvia for period from January 1999 (introduction of the euro) to January 2014.

Table 2 shows the VaR estimates for positions in foreign currency that is equivalent to 1 EUR. Estimation horizon was selected as 12 months due to the annual financial report being the main report from which companies assess their financial risks.

Tab. 2: Estimated VaR for a position in foreign currency equivalent to 1 EUR in % for various currencies, estimation horizon 12 months and confidence level 95%

12 months	BYR	PLN	RUB	SEK	UAH	USD
VaR historical	-83.302%	-10.726%	-6.031%	-12.375%	-8.325%	-8.437%
VaR delta	-95.835%	-14.966%	-8.992%	-10.987%	-14.783%	-12.509%
VaR GARCH	-61.875%	-14.696%	-9.952%	-10.723%	-13.202%	-9.167%

It is seen that BYR has the greatest estimated risk, while RUB has the smallest risk. Although UAH was less risky than SEK and PLN as estimated by historical VaR, VaR delta and GARCH methods showed that it could be as risky as PLN and more risky than SEK. Although generally different VaR estimates give similar risk estimates they may vary. Our results show that a company can suffer significant losses due to changes in foreign exchange rates if its outstanding currency positions are not hedged. To confirm this statement the authors have analysed open currency positions of different companies and measured possible losses. The tables 3 – 5 report VaR-results for different horizons and alternative VaR-models, at 95% confidence level and Bank of Latvia official exchange rates on 31.12.2012.

Tab. 3: Estimated losses by VaR methods for "Olympic Entertainment Group"(Estonia) open currency positions in 2012 with confidence level 95% (EUR)

Position/ Period	10 961 000.00USD			2 411 000.00 PLN		
	historical	delta	GARCH	historical	delta	GARCH
1 month	-416 017.40	-420 130.40	-244 099.40	-90 800.45	-105 428.60	-89 247.22
3 month	-720 825.00	-710 248.40	-434 363.10	-161 880.03	-180 173.30	-163 952.99
6 month	-843 390.80	-981 088.40	-642 454.00	-215 633.44	-251 466.60	-240 127.47
12 month	-905 552.70	-1 342 609.80	-983 895.90	-250 163.71	-349 042.90	-342 751.57

Position/ Period	220 000 BYR		
	historical	delta	GARCH
1 month	-6 611.86	-111 588.10	-15 059.86
3 month	-13 644.86	-150 391.40	-41 253.41
6 month	-15 684.83	-170 536.50	-73 444.15
12 month	-159 727.08	-183 758.70	-118 640.86

Tab. 4: Estimated losses by VaR methods for "Premia Foods" (Estonia) open currency positions in 2012 with confidence level 95% (EUR)

Position/	113 000.00 USD	320 000.00 RUB

Period	historical	delta	GARCH	historical	delta	GARCH
1 month	-4 025.61	-4 634.22	-2 699.47	-6 801.77	-9 138.02	-12 113.17
3 month	-6 658.33	-8 232.04	-5 047.40	-9 593.62	-14 692.28	-18 360.71
6 month	-8 570.39	-11 936.95	-7 823.04	-14 795.99	-19 264.54	-22 597.39
12 month	-12 992.53	-17 498.03	-12 782.96	-16 324.26	-24 340.01	-26 939.91
Position/ Period	-28 000.00 PLN			-66 000.00 SEK		
	historical	delta	GARCH	historical	delta	GARCH
1 month	-1 438.45	-1 269.90	-1 065.34	-1 951.62	-2 091.83	-1 805.03
3 month	-2 258.16	-2 228.96	-2 009.66	-2 475.98	-3 636.38	-3 326.64
6 month	-1 996.69	-3 193.42	-3 029.31	-3 885.00	-5 159.98	-4 907.52
12 month	-4 013.51	-4 599.56	-4 499.36	-6 644.15	-7 329.63	-7 117.34

Tab. 5: Estimated losses by VaR methods for "Utenos trikotažas"(Lithuania) open currency positions in 2012 with confidence level 95% (EUR)

Position/ Period	-43 000.00USD			321 000.00UAH		
	historical	delta	GARCH	historical	delta	GARCH
1 month	-1 531.87	-1 763.47	-1 027.23	-14 213.72	-16 427.82	-9 251.95
3 month	-2 533.70	-3 132.55	-1 920.69	-18 411.76	-26 317.29	-16 183.78
6 month	-3 261.30	-4 542.38	-2 976.91	-25 988.65	-34 432.70	-24 212.53
12 month	-4 944.06	-6 658.54	-4 864.31	-24 486.51	-43 480.80	-38 832.30

Tables 3-5 show that estimated by VaR methods losses from unhedged foreign currency positions for several Baltic firms could be relatively large and shows the need for managing the risks. Although VaR methods may sometimes give imprecise results for longer periods, they give rather good approximations of the losses in shorter periods.

Conclusion

The objective of this study has been to determine if Baltic non-financial companies with little or no direct foreign involvement are exposed to exchange rate risk. Conducted analysis confirms that losses from unhedged foreign currency positions, as estimated by VaR methods, for several Baltic companies could be relatively large and shows the need for managing the

risks. Although VaR methods may sometimes give imprecise results for longer periods, they generally give rather good approximations of the possible losses in shorter periods.

Examination of 77 Baltic non-financial companies' vulnerability to foreign exchange exposure by different estimation methods shows that VaR method can be used to measure the part of the currency position that should be hedged. There is no unique way to determine which method is preferable, different methods are based on different assumptions. Therefore some analysis should be done on which method to choose in every practical situation. It is worth mentioning that the important assumption of delta approximation method is that the distribution of the sample is similar to the normal, while the main assumption of historical method is independence of the sample observations. Methods based on GARCH models take into account volatility dynamics. Authors of the paper would advise to try all the methods and then choose the one that is the most suitable for the analysed data.

Empirical analysis of the most-widely used currencies in the Baltic States confirms that more liquid currencies have smaller foreign exchange exposure comparing with not so commonly used. For example, BYR has the greatest estimated risk, while RUB has the smallest risk. Although UAH was less risky than SEK and PLN as estimated by historical VaR, VaR delta and GARCH methods showed that it could be as risky as PLN and more risky than SEK. Although generally different VaR estimates give similar risk estimates they may vary. Research results allow the authors to conclude that foreign exchange risk is reality for our companies and has to be measured and managed.

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