

A Delta Normal Approach for Modelling Risk Forecasting of Currency Portfolio: The Case of Albanian Agro Exporters

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ABSTRACT

This research explores the benefits of a proactive model developed through delta normal approach implementation for the forecasting of currency portfolio volatility. The latter becomes a necessity for the Albanian agro exporters as they act in an international trading environment and face the de-Euroization process effects in domestic market. The forecasting of value at risk (VaR) at 99% confidence level is obtained through the implementation of a moving window containing 251 daily currency exchange rates logarithmic returns calculated by the exponentially weighted moving average method (EWMA). A decay factor of 0.94 is used in the simulated currency portfolios database (composed from six different currency positions) pertaining to 30 agro exporters in reference of 2018 year data. The analysis of incremental VaR decomposed in risk per currency unit and VaR contribution concludes that the implementation of this mechanism offers hedge opportunities and enables the agro exporters to undertake even speculative interventions.

KEYWORDS

Agriculture Exporters, Currencies Variance-Covariance Estimation, Currency Portfolios, Delta Normal Approach, Value at Risk Estimation, Volatility Forecasting, Weighted Moving Average Method

1. INTRODUCTION

This paper outlines a proactive exchange rate risk management mechanism, by using the ‘Delta Normal’ approach elements. The mechanism is proposed to be explored from the main participants of national foreign currencies market. Also, the various agricultural exporters operating in Albania are included, in correspondence of business needs (expressed in transactions number and volume). According to the statistics of Agriculture and Rural Development Ministry of 2018 agricultural exports are increased by 25% compared with the previous year. This increase is due to an expansion of export even in Middle East and Northern Africa besides the ‘agro-traffic’ in European Union.

This approach has properly oriented the national policies toward the implementation of grant schemes for farmers, focused on agro exports. This orientation was undertaken in interaction with national strategic development plan, in compliance with governmental established milestones related to 2015-2020 period (National Strategic Rural development plan). Correspondingly, these businesses can be considered as main promoters of the labour market maturation. We estimate they foster the social cohesion and rural development with special regard to agriculture and forestall exporting activities. For this purpose the national strategic plan clusters them into various distinctive categories

DOI: 10.4018/IJAEIS.2020100104

This article, originally published under IGI Global’s copyright on October 1, 2020 will proceed with publication as an Open Access article starting on February 2, 2021 in the gold Open Access journal, International Journal of Agricultural and Environmental Information Systems (converted to gold Open Access January 1, 2021), and will be distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

such as: export products of comparative advantage, increased international demand products, import substitution products that can be exported, commodities that are produced upon request for export and in potential export commodities that need to be tested.

Under these circumstances the market reality implies to consider two critical elements:

1. An adequate product development process together with efficient trade and delivery practices,
2. A relevant development of internal financial policies in order to meet the agro exporters exigencies; meaning here the risk management toward a sustainable growth.

Meanwhile a special attention goes to exchange risk management practices. On the one hand, it can be outlined that Albanian agro exporters operate in a dynamic currency market. The volatility of exchange rates of local currency vs foreign currencies might put them in a difficult position given that they do not implement any risk management practices. On the second hand, the economic situation of the country plays a negative role towards choosing a long term risk management policy.

The fact that Albanian agro exporters operate using different international currencies exposes them to a continuous currency exchange rates risk. Albanian agro exporters report open positions mainly in: Euro (EUR), United States Dollar (USD), Great Britain Pound (GBP), Swiss franc (CHF), Canadian Dollar (CAD) and Australian Dollar (AUD). Thus, the risk management policies are a necessity.

Therefore, considering the above circumstances, the exchange rate risk management model proposed in this paper consists in overall currency portfolios Value at Risk (VaR) estimation in domestic currency- Albanian Lek (ALL) in a short time period of one day.

Value at Risk (VaR) estimation becomes a very interesting and important instrument especially when apart from the usual factors influencing exchange rates, the de-euroization process continuously devaluates the common currency. This plays an important role considering that Euro is the main currency used in the country. Similarly, a volatile behaviour is observed even for the other foreign currencies exchange rates.

In this context, during 2018 it should be highlighted that agro exporter's portfolios currencies demonstrated a remarkable volatility referring to exchange rate fluctuations versus the domestic currency (e.g. USD (13%), AUD (12%), CHF (10.5%), CAD (9.4%), GBP (8.6%) and EUR (3%)). Euro maintained a persistent downward trend in terms of domestic currency counter value.

Subsequently, in this research work is demonstrated that the model developed through the Delta Normal approach elements (without additional costs) successfully helps in their currency position adjustments. It should be noted the exchange risk management itself isn't the agro-exporters main object of activity. This model helps not only for hedge practices but even for profitability purposes. It is also explained that undoubtedly, that it is to agro-exporters discretion to appropriately make use of the proposed model in compliance with respective business needs, market circumstances and potential internal limits set. Once the model's reliability is tested, we think this will pave the way to other research studies in the field. The remainder of the paper is structured conventionally. In Section 1 we discuss the contributors' research designs on the matter. In Section 2 we describe the model development, research data collection and VaR estimation process. Section 3 discusses the key results of our analysis, findings, limits, recommendations and open issues needed to be addressed in the future.

1.1 Literature Review

Since 1973 exchange rate variability is a major source of macroeconomic uncertainty affecting companies in an open economy. Thus, especially international trading businesses were obligated to measure and manage this emerging risk (Bartram, 2004; Booth, 1990; Choi, 1995; Crabb, 2002; Gao, 2000; Heckerman, 1972). In this respect, the work of Allayannis et al., (2001) explained how these approaches became an integral part of every company's decision about foreign currency exposure management.

Furthermore, as Belk and Edelshain (1997) have demonstrated, businesses tend to manage their business exposures daily. Therefore, special attention must be paid to the practice used aiming a proactive currency risk management approach trying to create a value added for the business itself. Bartov and Bodnar (1994) showed that currency risk management issue in non-financial companies isn't correlated within their core business. Thus, it is even advised that currency risk management be independently dealt by respective treasury/finance departments or even entrepreneurs themselves. Moreover it can be added that, most of multinational companies decided to have risk management committees to oversee the treasury strategy in managing exchange rates (and interest rates) risk (Doherty, 2000; Fraser and Pantzalis, 2004; Joseph, 2002; Miller and Reuer, 1998; Pantzalis et al., 2001; von Ungern-Sternberg and von Weizsäcker, 1990). These researches opened the door to further studies by applying conventional financial tools aiming at exchange rate risk management.

The portfolio VaR techniques were established by Marshall and Siegel (1997) and Linsmeier and Pearson (2000) and were developed to meet the needs for measuring market risk by using different confidence levels in compliance with Hendricks (1997) arguments. Meanwhile additional seminal estimation models derived from Adler and Dumas (1984) and Jorion (1990) work as well as subsequent authors studied the impact of different variable definitions, model specifications and design methodologies. Other authors explored the interrelations between exchange rate exposures and economic competitive environments.

In any case, referring to the above mentioned context the literature demonstrates that VaR is the most used technique compared to semi-variance, target semi-variance and shortfall probability for the following reasons:

- it is a standard evaluation and monitoring instrument (in addition the new RiskMetrics methodology accelerated its standardization process Zumbach (2007));
- it is capable to quantify the global exposure of a certain subject to various sources of risk (this one is another big advantage compared to traditional measures such as duration, convexity, delta or other risk unit measures).

In the other hand, Dowd (2003) and Krause (2003) demonstrated that the use of VaR is subject of criticism dealing with its contradiction in respect to diversification theory. The diversification of currencies reduces risks but is not verified in this case, because the combination of two portfolios into a single one generates a higher portfolio VaR than the one of each single portfolio.

The use of VaR criticism has been confirmed even before. Beder (1995) suggests that the use of VaR is seductive but dangerous; however, it can be managed aiming at the exact estimation of decomposition analysis (Hallerbach (2003)).

Mainly there are three basic approaches used to compute VaR, although there are numerous variations within each approach. The measure can be computed analytically by making assumptions about return distributions (Historical Simulation) for market risks as well as by using the variance-covariances (Variance-Covariance Method) across these risks with the help of Delta-Normal approach. The same can also be estimated by running hypothetical portfolios (using historical data) in Monte Carlo simulations.

Companies' objectives are to minimize foreign exchange losses or maximize exchange gains. To do so, they initially need to exactly evaluate the extent of exposures they face in order to manage them into an acceptable level by using one of the previously mentioned methods (Historical/ Monte Carlo Simulation, Variance-Covariance Method).

The use of one of the presented approaches has been subject of several studies focusing on large multinational companies (MNC). Some authors like Collier and Davis (1985) as well as Bodnar and Gebhardt (1999) found that countries such as UK and USA, MNCs have similar policies in general, with a few notable exceptions. They have stated that Asian Pacific MNCs display significant differences in their foreign exchange risk management approaches. Notwithstanding the latter specifically vary

when companies make use of hedge practices. Thus, some companies do not manage the overall open position but only some specific currency exposures.

As a result, they manage only those positions on which currency depreciation is expected while extending those positions on which currency appreciation is expected. This approach is known as “selective management”. Moreover, there are companies engaged in speculations, by generating risk exposures in addition to those arising from their normal business activity, aiming at simultaneously exchange risk management and profitability increase.

Nonetheless, should be admitted that the literature emphasizes currency exposures and exchange rate fluctuations correlation as the most essential factors related to currencies portfolio management techniques selection. Currently, there is still no consensus regarding the most accurate exchange rate risk management methodology used by non-financial companies. This makes the position of agro-exporters even more difficult world-wide. Thus, it is imperative to take into consideration the sensitive case of agro-exporters operating in a developing economy such as the Albanian one.

2. MODEL DEVELOPMENT

The foreign currencies exchange rates data together with currency exposures reported by the end of 2018 from agro exporters operating in Albania, theoretically imply that the most adequate method regarding VaR calculation is the one of variance-covariances method, implemented with the help of Delta Normal approach elements.

The domestic market dynamics suggest that Delta Normal approach variance-covariances matrix may be used and repeated in a short period of time frequency such as one day period for the overall currency portfolios VaR estimation. This approach, being of parametric nature, it simultaneously allows for the estimation of currency risk per units as well as their contribution to overall portfolio VaR in a daily basis.

It must be noted that the VaR estimation is calculated in local currency (ALL), so, in the same currency which agro exporters operating in Albania use in their financial statements for regulatory purposes as well as for calculating the respective exchange gains/losses.

In addition as previously mentioned, the Delta Normal approach calculation of VaR is easy to be implemented as requires only two key factors such as:

- currencies daily exchange rates logarithmic returns calculation (EUR/ALL, USD/ALL, GBP/ALL, CHF/ALL, CAD/ALL, AUD/ALL). The currencies exchange rates daily logarithmic returns are calculated as follows: $f(t)=\ln(P_t/P_{t-1})$. The daily currency exchange rates logarithmic returns variance calculation is obtained using the equation:

$$\sigma^2 i/t+1 \mid t = \lambda \sigma^2 i/t \mid t-1 + (1-\lambda) * (r_{i,t} - \hat{\epsilon})^2 \quad (1)$$

After this calculation stationary values are obtained.

- daily currency portfolio exposures.

The currency exchange rates can be retrieved from Central Bank of Albania while daily currency portfolio exposures are accurately recorded from agro exporters themselves. Both factors are used to calculate variance-covariance matrix estimation.

Onward, the overall currency portfolio VaR estimation through the proposed model is enabled through the multiplication of daily currencies fix exchange rates logarithmic returns, variance-covariance matrix, currency portfolio exposures vector and the latter's transposed vector.

Comparatively, aiming at estimating daily VaR currency portfolio exposures and simultaneously test the proposed model validity during a year time period, the variance-covariance matrix calculation is estimated by using a moving window containing last 251 daily currency exchange rates logarithmic returns.

The latter estimation is performed for each portfolio currency per daily fix exchange rates calculations reported from Central Bank of Albania. In other words, the 2017 exchange rates data are used to forecast the 2018-daily VaR results referring to agro exporters' currencies positions.

Thus, the variance of daily currency exchange rates logarithmic returns is calculated using the exponentially weighted moving average (EWMA) method introduced by JP Morgan in RiskMetrics (Zumbach, 2007). The EWMA approach is considered as a special GARCH case with a daily decay factor (λ) of 0.94. The decay factor indicates the degree of influence of past observations on the estimation of current daily exchange rates logarithmic returns variance. Its value (0.94) set by RiskMetrics means that the past observations have a significant impact on future values estimation.

The daily currency portfolio exposures vectors converted and transposed used for the above purposes are calculated in domestic currency (ALL).

Finally, a 99% confidence level is established for daily VaR estimation in agro exporters' currencies portfolio in conformity with the proposed model validity argumentation line.

2.1 Data Collection Process

In order to test the agro exporters' currency portfolio VaR for a short period of one day during the year 2018, the following elements are used:

- significant exchange gains/losses;
- significant open currency positions, as presented in respective balance sheet statements.

A list of 65 agro exporters is obtained using the two elements above mentioned. The list is composed as follows:

- Vegetables (Tomatoes, Cucumbers)-28 units;
- Fish and fish products-10 units;
- Olives and olive oil-8 units;
- Fruits (Raspberries, Blueberry, Apples, Strawberries, Pomegranate, Citrus fruits, tangerines, melons and watermelons)-7 units;
- Dry fruits (nuts, chestnuts)- 6 units;
- Medicinal and aromatic plants-6 units.

Among them, for the estimation of variance-covariances matrix through Delta Normal approach with respect to daily VaR calculations only 30 agro exporters' currency portfolios are examined. These 30 agro exporter's currency positions correspond to 251 cumulative daily currency positions for an entire year that satisfy:

- the highest overall currency portfolio size reported during 2018;
- and persistence of reporting in six foreign currencies starting from 2008.

The above data confirm that selected agro businesses are mainly limited liability companies (above 96%) and the rest are joint stock companies.

The currencies portfolio panel data is constructed by distributing agro exporters' currency portfolios (in six currencies for eleven consecutive years) by group of activity in order to have as much as possible a coherent data distribution and avoid the prominent crossings between different

business activities. In addition, aiming at testing the proposed model's validity, the end of year currency positions are considered as daily portfolio exposures.

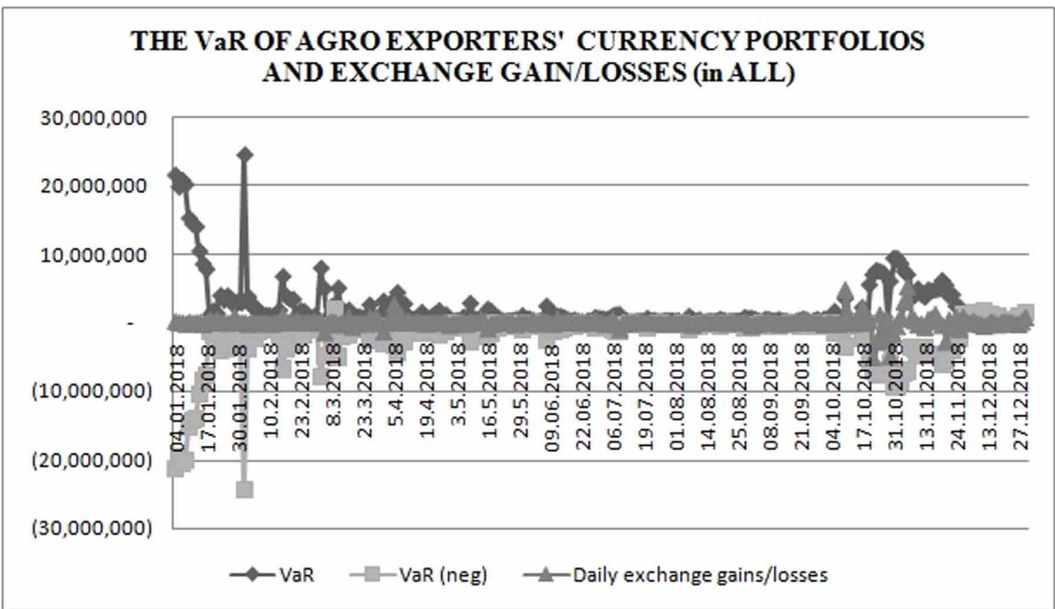
Then, respective simulated positions panel data (from 2008-2018) are used assuming that there is only one "agro-exporter" dealing with high daily open positions in different currencies. Thus, the currency portfolios size doesn't represent any correlation with business activity and respective sales turnover. As a consequence, the final target (agro exporters currency portfolio VaR estimation using the Delta Normal approach) is to test the proposed model's validity under "extreme" conditions.

2.2 The VAR Estimation

The implementation of the proposed model using the selected agro exporters' currency positions sample simultaneously helps in the Delta Normal model validity testing. Thus, daily exchange gains/losses in the simulated currency portfolios panel data are compared with VaR estimated using Delta Normal approach elements (see Figure 1). Correspondingly, while using a 99% confidence level, the maximum breaches statistically allowed should not be greater than three.

Indeed, referring to the estimations in the selected sample, the daily exchange gains exceed twice respective VaR data. More specifically, the above breaches refer to the beginning of fourth quarter 2018 (respectively on 10/10/2018 and 27/10/2018). In these days, (except of EUR which decreased with 0.008%) all currencies exchange rates have demonstrated salient fluctuations toward their previous data, which contradicts the normality distribution assumption made in the Delta Normal approach used.

Figure 1. The VaR of agro exporters' currency portfolios and exchange gains/losses (in ALL). Source: Authors elaboration.



In general, daily VaR statistics referring to agro exporters' simulated currency portfolios show that their maximum level reached 195,406 EUR while the minimum was 260 EUR. The values are converted in EUR by using the average EUR/ALL exchange rate during 2018. Meanwhile with respect to daily maximum exchange losses it was proved to be equal to 42,843 EUR whereas the maximal gains resulted in 41,441 EUR.

Accordingly, it can be outlined that these results dictate a proactive management of currency portfolios in close reference to the agro exporters operating in Albanian market through the implementation of the proposed model.

3. DISCUSSION

The main objective of this research is the identification and development of a proactive model without additional costs, of dynamic structure, and above all not complicated. A model which intends to estimate maximum losses due to exchange rates fluctuations in currency portfolios of agro exporters operating in Albania must consider that the financial operations are mostly performed in EUR and USD. One of the main objectives of this research is to try to pave the way to other studies of similar nature actually nonexistent in the country. The concept of VaR developed and presented in this research represents a novelty. Following are presented findings, recommendations, limits, strengths and open issues to be addressed in the future. They pertain to:

- linear positions;
- frequently used currencies returns distributions against domestic currency (normality assumption);
- and to the modest risk culture and expertise among agro exporters operating in Albania as well as in conformity with the above examination results.

It can be affirmed that Delta Normal approach through which it was designed and developed the proposed model at 99% confidence level presents an appropriate variance-covariance estimation method regarding daily exchange rate volatility forecasting.

Under the same argumentation line, additional reliable data are obtained even from back testing results in respect to above exchange rate results/VaR ratio (shown in Table 1) during the entire period under examination.

Subsequently, referring to the following statistics, it can also be stated that in general during the time period analysed, EUR and USD exchange rates against ALL haven't demonstrated high daily magnitude fluctuations as is the case of other currencies used by agro exporters. They (EUR and USD) even have displayed some contradictory trends between them.

Table 1. The proposed model and Delta Normal approach back testing results as per portfolio currency exchange rate returns during 2018

	EUR	USD	GBP	CHF	CAD	AUD
Log Returns over 1%	101	112	137	131	141	155
Observations no	252	252	252	252	252	252
Average Exchange results/VaR deviation (%)	0.81%	0.75%	0.93%	0.95%	0.91%	0.95%

Source: Authors elaboration

The EUR and USD exchange rate returns against ALL have exceeded respectively 101 and 112 times the exchange rate logarithmic return of 1% (considering the confidence level established) unlike the rest of other portfolio currencies. Specifically, the other currencies such as: CAD, AUD, GBP and CHF have demonstrated more significant fluctuations at 99% confidence level as well as have more frequently contributed to the overall portfolio daily incremental VaR.

As previously stated daily VaR of agro exporter's currency portfolios results match the forecasted exchange gains/losses at 99% confidence level.

3.1 Findings

The reliability of the proposed model in estimating VaR in the simulated currency portfolios of agro exporters operating in Albania, even under extreme conditions revealed that:

- The daily variance of logarithmic currencies exchange rates returns against ALL calculated through the Exponentially Weighted Moving Average (EWMA) method with a daily decay factor (λ) of 0.94 is the appropriate approach for the exchange rates volatility forecasting in short time period of one day.

Furthermore, this constitutes an additional practice concerning the financial forecasting tailored to the agro exporters dealing also with transactions focused only on a certain foreign currency referring to selective management approaches.

Thus, the above parametric estimation helped in VaR decomposition and analysis by-currency. Therefore:

- the 2018 statistics (refer to Table 2.) confirm that except of EUR and USD even the other currencies have demonstrated a significant impact in the daily VaR of agro exporters' simulated currency portfolios.

Table 2. The decomposition of VaR by currency in agro exporters' currency portfolios during 2018

	EUR	USD	GBP	CHF	CAD	AUD
β^1 currency (+/-) is estimated as a results of variance-covariance matrix multiplication with currency positions equivalent in ALL and its product multiplication with overall currency portfolio variance.	181	195	188	59	41	50
Risk per 2currency unit (+/-)² is estimated through the multiplication of its β with overall currency portfolios VaR.	215	215	113	182	32	69
Contribution³ to VaR per currency (+/-) is estimated as a multiplication product of β with overall currency portfolios VaR and its position equivalent in ALL.	182	205	148	212	45	82

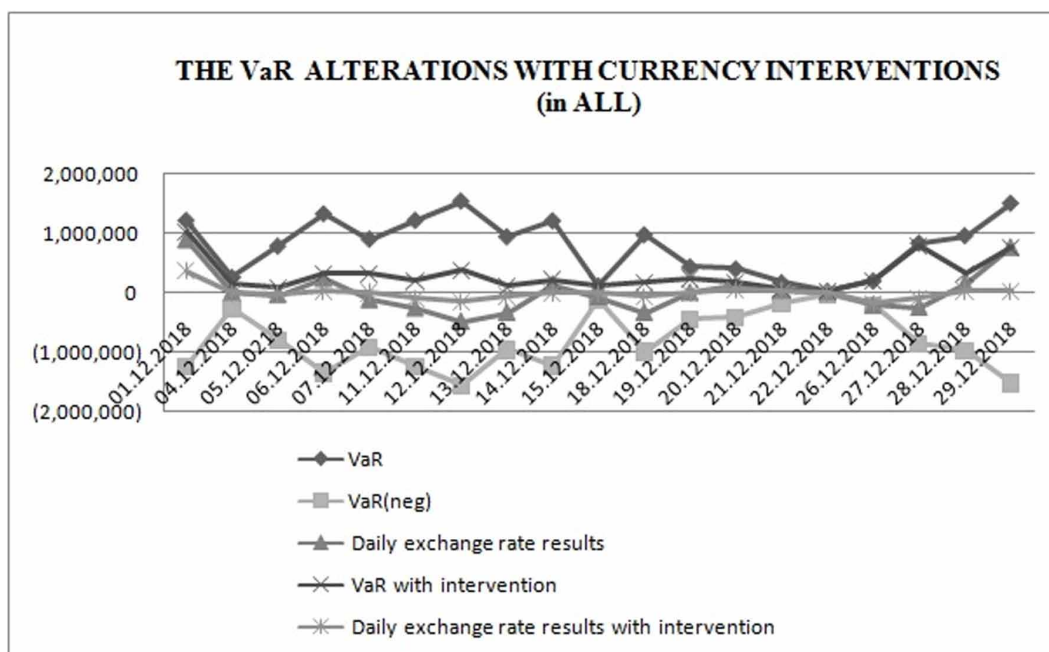
Source: Authors elaboration

As a consequence, it can be affirmed that Delta Normal approach was revealed such as a very important instrument in “mapping” exchange rate risk in currency portfolios, and thus, the proposed mechanism can accurately contribute towards a proactive exchange risk management.

3.2 Recommendations

Referring to the simulated currency portfolios daily VaR estimations, the analysis of incremental VaR data decomposed especially in risk per currency unit and VaR contribution enables precise interventions to be undertaken from agro exporters aiming at a proactive management toward currency portfolios exchange rate losses as demonstrated in Figure 2.

Figure 2. The VaR alterations with currency interventions (in ALL) Source: Authors elaboration



Thus, using December 2018⁴, December data are used to test the currency interventions effect in daily exchange and VaR results as in confront of other months of year all foreign currencies significantly depreciate against ALL mainly due to remittances flows. Under certain conditions, being also that currency portfolios data are declared in respective financial statements the a/m currency interventions should be accurately explained in the integrative notes as they challenge the accumulated exchange results in order to comply with fiscal requirements. currency market data and agro exporters currency positions, this time in addition to some simulated currency interventions (sell/buy transactions of the agro exporters' respective portfolios can be freely done through commercial banks and foreign exchange agencies operating in Albania.) Referring to highest currencies contribution in daily overall VaR portfolio, it can be evidenced that VaR as well as exchange results change. The implementation of the appropriate currency interventions, prevent the above mentioned portfolios exchange rate losses. At a later moment, it is also possible to transform them in gains. These satisfactory results were achieved on behalf of agro exporters VaR statistics during December 2018 (above 19 days), and correspondingly the simulated currency interventions results are presented in Table 3.

Table 3. The statistics of agro exporters' currency portfolios simulated interventions during December 2018

VaR reduction in presence of companies currency interventions	Daily exchange rate losses prevention in presence of companies currency interventions	Daily exchange rate losses in presence of companies currency intervention transformed in gains	Daily exchange rate gains reductions in presence of companies currency interventions	Main currencies in which the interventions were made⁶ The currency interventions are done referring to Risk per currency unit estimations.
19	7	2	10	EUR, USD, CHF and GBP

Source: Authors elaboration

The simulated currency interventions undertaken from agro exporters in these cases can be treated as speculative, as they don't necessary represent a business need in the sold/bought amounts. Furthermore, in some cases they do not only reduce overall portfolio daily VaR and respective exchange losses but tend to generate future profits on behalf of preliminary estimates. At the same time they could generate a fiscal interest (in terms of higher incomes calculation). Under these circumstances it is worth mentioning that currency interventions result to be important as the exchange rate fluctuations affect their counter values (in domestic currency). Thus, not only it can be guaranteed a hedge practice but in the same time the profitability option could be explored. In order to keep under control the above interventions, the establishment of portfolios daily VaR limits becomes another feature which might better orient agro exporters hedging strategies. In fact, establishing limits assumes the allocation of a "reserve fund" to cover potential losses derived from exchange rates fluctuations and vice-versa leads to the positions expansion under favourable forecasted conditions.

In this regard, the limit used is estimated to be the maximum of daily VaR referring to the latest 60 days time period. Correspondently, 2018 year results demonstrate that daily VaR and exchange gains/losses are contained in the upper and lower daily VaR limits set as demonstrated in Figure 3.

In this context, the limits setting and their frequent review in Albanian market conditions become a simple and at the same time, an efficient risk transfer element especially for agro exporters that attempt to internally manage exchange risk.

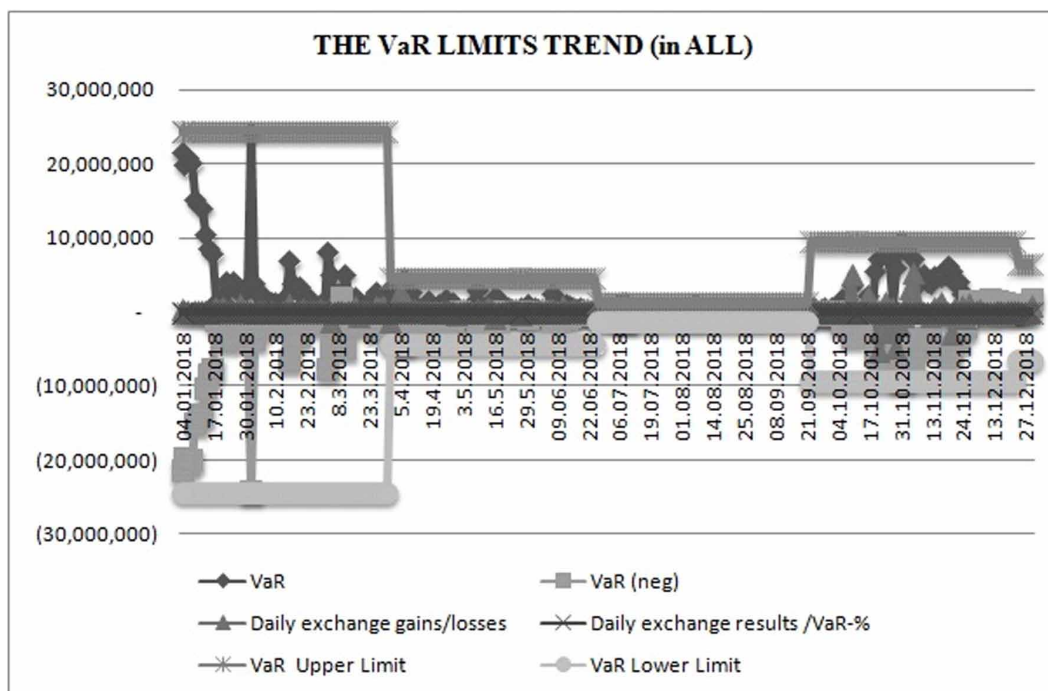
3.3 Limits

The proposed model can be adequately implemented only in the case of normally distributed currency exchange rate returns or when such assumption is made, in coherence with Delta Normal approach. Otherwise, in fat tails distribution situations it would underestimate the proportion of outliers by compromising real daily VaR of currency portfolios. Fat tails distribution situations also generate distorted VaR results in case of non-linear instruments positions, such as currency options or exotic derivatives usage, etc. In such cases the non-linear positions are represented from the underlying instruments "deltas" and the persistence of asymmetry in respective distributions isn't captured from Delta Normal approach while estimating the variance-covariances matrix.

3.4 Strengths

The simulated currency positions of the agro exporters used to implement and further test the reliability of the proposed model are the highest reported during 2018 between 65 units which hold and report them since 2008.

Figure 3. The VaR limits trend (in ALL) Source: Authors elaboration



Moreover even under extreme conditions (yearly currency positions are treated as daily ones and is continuously passed from certain businesses currency positions data to another one), the proposed model together with Delta Normal approach gave satisfactory results in VaR estimation and rationally same results can be achieved while dealing with lower currency positions. In other words, all the other agro exporters which weren't encompassed in the investigation sample can comfortably use it.

After recognizing that currency positions panel data used for the proposed model implementation and testing refer to the highest and different agro exporters activities it can also be concluded that:

- it can be used from every kind of business which holds and reports open positions in foreign currencies independently from the field of activity and fiscal classification,
- the Exchange Agencies operating in Albania which mainly deal with open currency positions and act on the status of physical and juridical persons may also take it under consideration.

Finally it must be added that the above mentioned model can be developed without additional expenses, as the calculations platform can be developed even in Excel. Therefore, the estimation of daily VaR in agro exporters' currency portfolios is automatic. The calculations are to be performed every day or several times during a day by finance/treasury employees or entrepreneurs themselves. These calculations have to be in compliance with daily currency portfolios accounted figures and fix foreign currencies exchange rates data calculated and reported from Central Bank of Albania. By using the same logic, it can be also developed even more "friendly-financial platforms" related to currency portfolios volatility risk forecasting. These platforms can be offered by specialized companies which are in full disposal of businesses exigencies as the domestic informatics market has experienced a significant progress. This process, simplifies the exchange risk management process while helping businesses to concentrate only on buy and sell currency transactions.

3.5 Open Issues to be Addressed In The Future

In the near future maybe it will be reasonable to widen this simple econometric analysis by considering:

- The additional information in the market (good/bad news related to forex markets, etc);
- Speculations that commercial banks and exchange agencies might make;
- Political events in the country as well as in the countries with trade partnership relations, etc.
- Internal market opportunities (e.g. non-linear instruments development and usage such as: currency options or exotic derivatives aiming to enhance exchange risk management process);
- That in the above circumstances, it becomes mandatory the estimation of conditional variance processes referring to Switching Regime⁷ provide an accurate analysis of exchange rates that demonstrate prominent occasional fluctuations related to forex market information, political events, etc. models category in forecasting currencies exchange rates volatility;
- Then, the implementation of Monte Carlo Simulation becomes a must for dynamic currency portfolios variance estimation and management. But alternatively from Delta Normal approach, the latter is an expensive technique which also requires preliminary detailed statistical analysis and encompasses periods longer than one calendar year, as well as good financial engineering expertise. This is difficult to be internally managed from agro exporters operating in Albanian market;
- The development of a specialized financial platform that offers immediate risk management approaches to agro exporters as well as to third parties interested on the matter.

However, nowadays is strongly believed that the development and implementation of the proposed model (in the quality of the integrated variance-covariances estimation methods) from agro exporters operating in the country constitutes a step forward in terms of exchange rate risk management. At the same time, it provides them with the necessary expertise to avoid or minimize losses in the context of future domestic forex market developments. These kinds of studies can spread a financial culture among businesses dealing with currency exposures issues.

REFERENCES

- Adler, M., & Dumas, B. (1984). Exposure to Currency Risk: Definitions and Measurements. *Financial Management*, 13(2), 41–50. doi:10.2307/3665446
- Allayannis, G., Ihrig, J., & Weston, J. P. (2001). Exchange-rate hedging: Financial versus operational strategies. *The American Economic Review*, 91(2), 391–395. doi:10.1257/aer.91.2.391
- Bartov, E., & Bodnar, G. M. (1994). Firm Valuation, Earnings Expectations, and the Exchange-Rate Exposure Effect. *The Journal of Finance*, 49(5), 1755–1786. doi:10.1111/j.1540-6261.1994.tb04780.x
- Bartram, S. (2004). Linear and nonlinear foreign exchange rate exposure of German nonfinancial corporations. *Journal of International Money and Finance*, 23(4), 673–699. doi:10.1016/j.jimonfin.2004.03.002
- Beder, T. S. (1995). VaR: Seductive but Dangerous. *Financial Analysts Journal*, 51(5), 12–24. doi:10.2469/faj.v51.n5.1932
- Belk, P. A., & Edlshain, D. J. (1997). Foreign exchange risk management—The paradox. *Managerial Finance*, 23(7), 5–24. doi:10.1108/eb018632
- Bodnar, G. M., & Gebhardt, G. (1999). Derivatives usage in risk management by US and German non-financial firms. *Journal of International Financial Management & Accounting*, 10(3), 159–187. doi:10.1111/1467-646X.00049
- Booth, L., & Rotenberg, W. (1990). Assessing foreign exchange exposure: Theory and application using Canadian firms. *Journal of International Financial Management & Accounting*, 2(1), 1–22. doi:10.1111/j.1467-646X.1990.tb00015.x
- Choi, J. J., & Prasad, A. M. (1995). Exchange risk sensitivity and its determinants: A firm and industry analysis of US multinationals. *Financial Management*, 24(3), 77–88. doi:10.2307/3665559
- Collier, P. A., & Davis, E. W. (1985). The management of currency transaction risk by UK multinational companies. *Accounting and Business Research*, 16(3), 327–334. doi:10.1080/00014788.1985.9729284
- Crabb, P. R. (2002). Multinational corporations and hedging exchange rate exposure. *International Review of Economics & Finance*, 11(3), 299–314. doi:10.1016/S1059-0560(02)00110-7
- Fraser, S., & Pantzalis, C. (2004). Foreign exchange rate exposure of US multinational corporations: A firm specific approach. *Journal of Multinational Financial Management*, 14(3), 261–281. doi:10.1016/j.mulfin.2003.07.008
- Gao, T. (2000). Exchange rate movements and the profitability of US multinationals. *Journal of International Money and Finance*, 19(1), 117–134. doi:10.1016/S0261-5606(99)00038-8
- Hallerbach, W. G. (2003). Decomposing Portfolio Value-at-Risk: A General Analysis. *The Journal of Risk*, 5(1), 1–18. doi:10.21314/JOR.2003.076
- Heckermann, D. (1972). The exchange risks of foreign operations. *The Journal of Business*, 45(1), 42–48. doi:10.1086/295424
- Hendricks, D. (1996). Evaluation of Value-at-Risk Models Using Historical Data. *Economic Policy Review*, 2, 36–69. doi:10.2139/ssrn.1028807
- Jorion, P. (1990). The Exchange Rate Exposure of U.S. Multinationals. *The Journal of Business*, 63(3), 331–345. doi:10.1086/296510
- Joseph, N. L. (2000). The choice of hedging techniques and the characteristics of UK industrial firms. *Journal of Multinational Financial Management*, 10(2), 161–184. doi:10.1016/S1042-444X(99)00025-0
- Kevin, D. (2002). *An introduction to market risk measurement*. John Wiley and Sons Ltd.
- Krause, A. (2003). Exploring the Limitations of Value at Risk: How Good Is It in Practice? *The Journal of Risk Finance*, 4(2), 19–28. doi:10.1108/eb022958

Linsmeier, T. J., & Pearson, N. D. (2000). Value at Risk. *Financial Analysts Journal*, 56(2), 47–66. doi:10.2469/faj.v56.n2.2343

Marshall, C., & Siegel, M. (1997). Value-at-risk: Implementing a risk measurement standard. *Journal of Derivatives*, 1, 91–111. doi:10.3905/jod.1997.407975

Miller, K. D., & Reuer, J. J. (1998). Firm strategy and economic exposure to foreign exchange rate movements. *Journal of International Business Studies*, 29(3), 493–514. doi:10.1057/palgrave.jibs.8490004

National Strategic Rural development plan 2015-2020, Ministry of Agriculture and Rural Development. (n.d.). Retrieved January 5, 2019, from: www.bujqesia.gov.al/

Neil, D. (2000). *Integrated Risk Management: Techniques and Strategies*. McGraw-Hill, Inc.

Pantzalis, C., Simkins, B. J., & Laux, P. A. (2001). Operational hedges and the foreign exchange exposure of US multinational corporations. *Journal of International Business Studies*, 32(4), 793–812. doi:10.1057/palgrave.jibs.8490995

Von Ungern-Sternberg, T., & Von Weizsäcker, C. C. (1990). Strategic foreign exchange management. *The Journal of Industrial Economics*, 37(4), 381–395. doi:10.2307/2098346

Zumbach, G. (2007). *The Riskmetrics 2006 Methodology*. Retrieved January 12, 2019, from: <https://ssrn.com/abstract=1420185>

ENDNOTES

- β of the currency (+/-) is estimated as a results of variance-covariance matrix multiplication with currency positions equivalent in ALL and its product multiplication with overall currency portfolio variance.
- ² Risk per currency unit (+/-) is estimated through the multiplication of its β with overall currency portfolios VaR.
- ³ Contribution to VaR per currency (+/-) is estimated as a multiplication product of β with overall currency portfolios VaR and its position equivalent in ALL.
- ⁴ December data are used to test the currency interventions effect in daily exchange and VaR results as in confront of other months of year all foreign currencies significantly depreciate against ALL mainly due to remittances flows. Under certain conditions, being also that currency portfolios data are declared in respective financial statements the a/m currency interventions should be accurately explained in the integrative notes as they challenge the accumulated exchange results in order to comply with fiscal requirements.
- ⁵ The currency interventions of the agro exporters' respective portfolios can be freely done through commercial banks and foreign exchange agencies operating in Albania.
- ⁶ The currency interventions are done referring to Risk per currency unit estimations.
- ⁷ These models provide an accurate analysis of exchange rates that demonstrate prominent occasional fluctuations related to forex market information, political events, etc.