

A longitudinal investigation of value at risk approach in measuring transaction exposure risk

Fatollah Salimian
Salisbury University

Kashi Khazeh
Salisbury University

Detailed Abstract

The demise of fixed exchange rate regime, in March of 1973, brought concerns to MNCs with respect to the level of risk associated with fluctuations in the magnitude of different currencies. Then again, in today's integrated global economy, coupled with the era of market driven exchange rate system, the task of conducting global business has become very challenging. Hence, in this analysis, Value at Risk "VaR" approach is employed to measure the risk/transaction exposure for an MNC operating commercial activities in six different countries during 2009 -2012 for a specific holding period (monthly). The maximum one-month loss is carried out, as a holding period, to investigate this longitudinal investigation.

The inception of Euro in 1999 eliminated exchange rate risk of 12 countries' currencies. At that time, as the large numbers of foreign currencies were eliminated, yet, other different national currencies needed to be exchanged to conduct international commerce.

Existing multinational corporations (MNC's) and/or newly formed, run their task of importing/exporting goods and services routinely around the world. Furthermore, they not only manufacture component parts domestically, but in other nations as well.

In 1973, gold was no longer the protector of U.S. dollar. Subsequently, depreciation of the U.S. dollar, coupled with the high unpredictability of exchange rates in the foreign exchange market became the new normal (Table 1 as well as Figures 1A & 1B). Twelve years after the emergence of freely floating exchange rates system (1985), the level of *daily* foreign exchange transaction was reported to be \$.14 trillion a day. Ten years later (1995), the reported level was nearly \$1 trillion. In 2006, the reported level had surpassed \$2 trillion. Finally, on September 1, 2010, the level of *daily* foreign exchange transaction had reached/surpassed \$4 trillion.

Table 1
Summary Statistics for The Monthly Percent Changes of Six Currencies (2009-2012)

	<i>AUD</i>	<i>CAD</i>	<i>CHF</i>	<i>EUR</i>	<i>GBP</i>	<i>JPY</i>
Mean	0.429984	0.254284	0.242716	-0.04523	-0.17404	0.337898
Median	0.35461	0.510745	0.517529	0.40361	-0.27392	0.195669
Standard Deviation	4.46064	3.035377	3.661475	3.329839	3.030915	2.709769
Kurtosis	1.454314	1.793571	2.639533	1.180313	2.934938	0.333354
Skewness	-0.40268	-0.22397	0.019675	-0.16181	-0.43969	-0.29956

Figure 1A

Monthly Percent Changes for Individual Currencies (2009-2012)

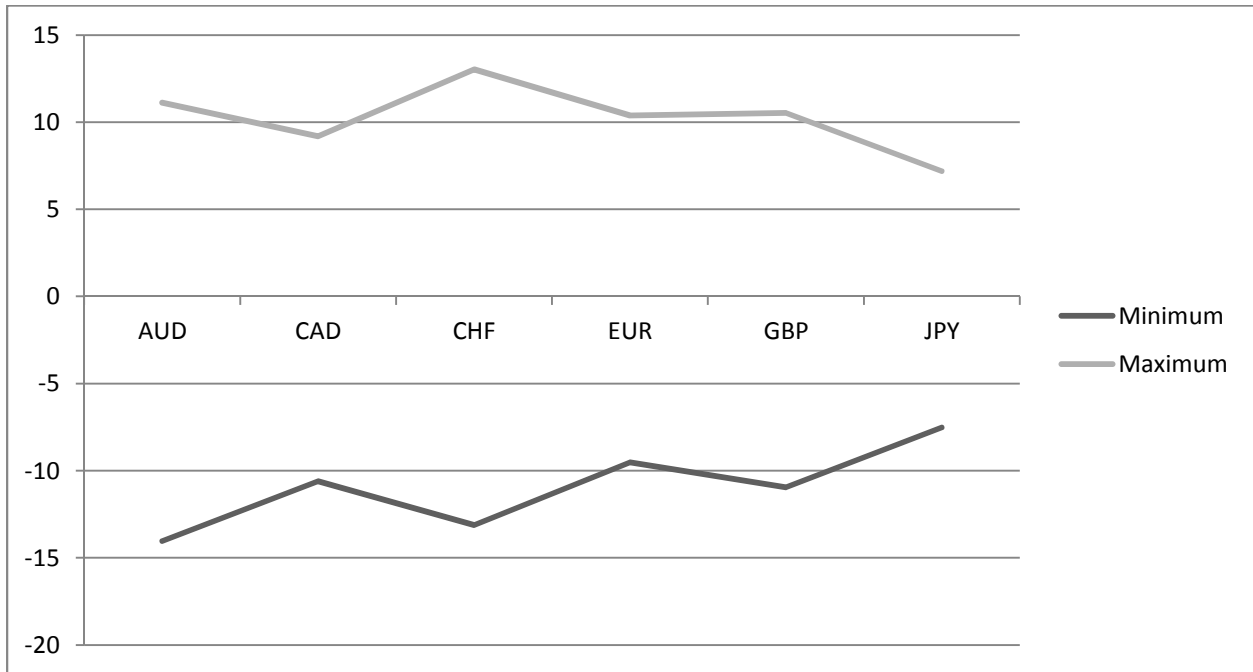
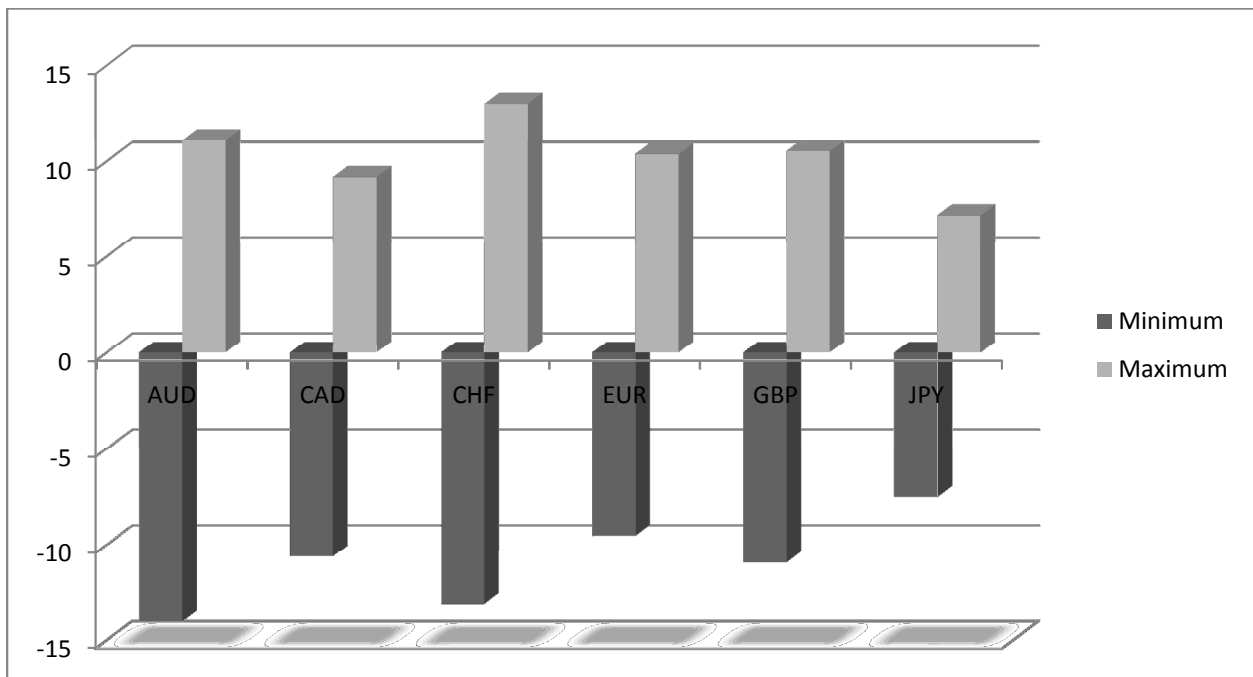


Figure 1B
Monthly Percent Changes for Individual Currencies (2009-2012)



While MNCs are exposed to three important types of exchange rate risk (Transaction, Economic, and Translation), it is the transaction risk, by and large, of prime significance. Hence, the main focus of this study. Accordingly, MNC's are compelled to employ a variety of techniques (i.e., Forward, Futures, Options and/or Money Markets) to hedge their exposure to that risk.

Recently, the Value-at-Risk (VaR) approach has been one the best recognized and extensively used approach to gauge transaction risk. This technique of evaluation may be employed to assess the maximum likely loss on the value of the MNC's net cash flows denominated in one or several foreign currencies for some specific holding period. The holding period under this study is for a "maximum 1-month loss" but it could be as short as 1-week or even shorter such as 1-day loss. These estimates of the maximum 1-month loss can then be used to analyze the feasibility of hedging

The maximum 1-month loss for an individual currency "i" or for a portfolio of currencies "p" can be estimated using the following equation: $E(e_t) - (Z) \times (\sigma_{i \text{ or } p})$, where :

The expected percentage change in the currency's value for the relevant period = $E(e_t)$

The Z-score corresponding to the desired confidence level used (i.e., 95%, 97.5%, ...) in this case at 95% = 1.65

The standard deviation of the percentage change in the currency's or portfolio of currencies value over previous period = $\sigma_{i \text{ or } p}$

Objective of this study

This study considers a time horizon of 1-month as the holding period. Accordingly, we employ a longitudinal approach to the "VaR" methodology to measure the transaction risk for an assumed US based MNC conducting business in six different countries, hence requiring transaction in six different currencies. The results will inform MNC's with vital information as to whether or not any of the aforementioned hedging techniques are needed. The six countries' foreign currencies included in this analysis, obtained from the Federal Reserve Bank, and are the Australian dollar, the Canadian dollar, the Swiss franc, the Euro, the British pound, and the Japanese yen. While the time period analyzed in this study is 2009 – 2012, but exchange rates during 2005 – 2008 are used as the base. Each year, starting in 2005, includes twelve consecutive monthly observations on the applicable spot exchange rates.

The preliminary results of this longitudinal approach (four-year study) are presented under three distinct scenarios. As a starting point, scenarios "A to Z" as well as "Z to A" are arbitrary selection of the currencies. These two selections are based on the currency symbols alphabetical and reverse alphabetical order of entry. The third scenario represented by "BCS" (the Best Case order of entry). Under all three scenarios, the maximum 1-month loss, utilizing VaR model, is lowered as more and more currencies are added. However, VaR starts at a higher level and progressively is lowered based on the 'A to Z: while "Z to A" and the 'BCS" start at the lower levels with some bumps due to correlation coefficient among the currencies (Table 2).

Table 2
Correlation Coefficients based on Monthly Percentage Changes

	<i>AUD</i>	<i>CAD</i>	<i>CHF</i>	<i>EUR</i>	<i>GBP</i>	<i>JPY</i>
<i>AUD</i>	1					
<i>CAD</i>	0.737639	1				
<i>CHF</i>	0.678109	0.424767	1			
<i>EUR</i>	0.794345	0.55124	0.79142	1		
<i>GBP</i>	0.691306	0.610737	0.572738	0.712786	1	
<i>JPY</i>	-0.0608	-0.12992	0.268888	0.108855	0.004113	1

The longitudinal results of these four years (Table 3) reveal that under all three scenarios, VaR is lower (in most cases) as each additional currencies are added.

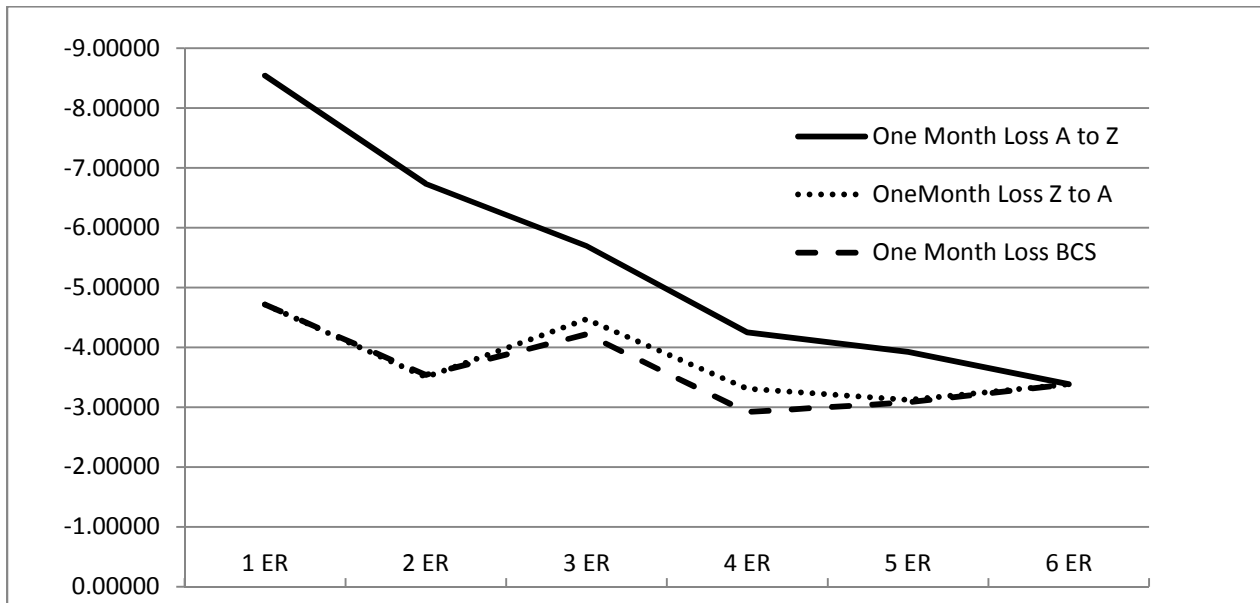
Table 3
Maximum One-Month Loss (2009-2012)

Number of ER	One Month Loss A to Z	One Month Loss Z to A	One Month Loss BCS
1 ER	-8.54045	-4.718795312	-4.718795312
2 ER	-6.73402	-3.499597084	-3.536799111
3 ER	-5.69275	-4.46897883	-4.218758464
4 ER	-4.24941	-3.309967004	-2.918914877
5 ER	-3.92216	-3.120984558	-3.079471589
6 ER	-3.38598	-3.385979518	-3.385979518

Nevertheless, by the time each of the six currencies is included in the portfolio, the VaR values coincide regardless of the order of entry (6 ER in Table 3 as well as Figure 2). One can also observe that in most cases, the reduction in risk that results from additional currencies diminishes as the number of currencies in the portfolio expands (Figure 2).

The results (monthly approach) reveal the key relationships that form the groundwork for the VaR calculations as well the relevant portfolio theory. It is clear that VaR can change significantly under each scenario over time. In addition, the rate at which transaction risk is diminished, as more and more currencies are added may depend on the particular combinations of currencies. Additionally, these results could also provide key insight and advice for MNC's in their expansion/contraction decisions to get into/out of certain markets.

Figure 2
Alphabetical vs. BCS Order of Entry Scenarios (2009-2012)



Future research could evaluate alternative time periods for comparison studies to weigh the stability of the relationships over time. Additionally, these future results could also provide key insight and guidance for MNC's in their decisions for managing transaction risk. Furthermore, these future results could reinforce MNC's strategies in their expansion/contraction decisions to get into/out of certain markets.