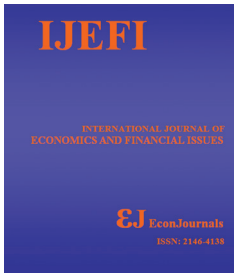

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Estimated Impact of Covid-19 on Exchange Rate Risk of Multinational Enterprises Operating in Emerging Markets

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ABSTRACT

Multinational enterprises (MNE) operating in emerging countries are exposed to various types of risk. Exchange rate risk is an important and anticipated part of MNE's total risk exposure, with a variety of tools available to mitigate that risk. In this study, we focus on transaction exposure of cash flows in eight distinctive emerging market currencies and employ the modified value-at-risk (MVaR) model to estimate the maximum one-period loss during an 18-month period spanning pre-and post-Covid-19 periods. The predicted losses by MVaR are then compared to the ex-post results, to identify any differences in the pre- and post-Covid-19 periods and to determine the need for adjustments in hedging strategies by MNEs during similar global crises. The motive of this research is to understand the limitations of hedging and what MNEs can do to mitigate transaction exposure risk. The results provide insights on whether MNEs should hedge their currency risk or not. The COVID-19 pandemic did impact all firms globally, so this study is relevant and pertinent as firms plan their post-pandemic growth.

Keywords: International Factor Movements, International Business, International Finance, Exchange Rate, Modified Value at Risk
JEL Classifications: F0, F2, F3

1. INTRODUCTION

Multinational Enterprises (MNEs) are business organizations that operate in multiple countries. MNEs engagement in the international arena exposes them to additional types of risk in comparison to domestic corporations. An important risk factor facing MNEs is the exchange rate risk. The exchange rate risk may be particularly significant for MNEs operating primarily in emerging markets.

Since the majority of MNEs operate in multiple emerging countries, their currency risk exposure will be subject to the transaction exposure of their currency portfolio (cash inflows as well as outflows in different currencies). The volatility and co-movements of these currencies are known to be unstable over time. With the tremendous growth in the foreign exchange transaction volume over the last four decades, as well as the growing volatility of foreign exchange rates in the floating exchange rate era proper management of currency exchange rate risk is an extremely important part of MNEs' overall risk management strategy.

Table 1 illustrates the growth of the foreign exchange market over the last four decades, indicating the growth in the average daily global foreign exchange transaction volume was from $.14 trillion in 1985 to $7.5 trillion in 2022. With free trade blocs and pacts between various countries across the world, the just-in-time integration of supply chains across all industries, and daily forex trading volumes will continue to increase. Globalization and the free movement of goods will spur even more foreign exchange risk management for MNEs.

In order to manage their exchange rate risk, MNEs attempt to quantify the exchange rate risks they face and implement hedging techniques using a variety of financial market tools to minimize these risks. A widely used method to quantify the transaction risk associated with flexible exchange rates is the traditional

Table 1: Milestones of daily foreign exchange transaction volume globally

Year	In $ trillion
1985	$ 0.14
1995	$ 1.00
2006	$ 2.00
2010	$ 4.00
2014	$ 5.00
2019	$ 6.60
2022	$ 7.50

Source: Bank of International Settlements (BIS), October 27, 2022

"value-at-risk" (VaR) approach. The VaR approach computes a specific dollar value on the downside risk (i.e., the maximum likely loss) an MNE will face over a specific time period at a particular confidence level. An important deficiency of the VaR model is its assumption that exchange rate movements follow a normal distribution and reliance on the historical standard deviation of exchange rate movements in estimating the maximum loss. In this study, we utilize the "modified" value-at-risk, (MVaR) approach, which considers the skewness as well as the excess kurtosis and/or absolute kurtosis of the exchange rate movements, resulting in a more reliable risk estimate.

The Covid-19 pandemic revealed the chinks in the armor of global trade. With trade routes shut down and export controls, many countries were short of critical medical supplies and emergency goods. Our study is the first to analyze possible changes in MNEs transaction risk in emerging markets during the pre-and post-Covid-19 periods. The pandemic-driven disruption to economies might induce greater exchange rate volatility and related co-variances among currencies. This will have a measurable impact on transaction risk. We study the eight major emerging countries' currencies during the 18 months before and the 18 months after Covid-19 using the MVaR approach to quantify predicted losses and then compare these predicted losses with the actual/ex-post results. This study enables MNEs to minimize potential losses by determining which particular currency portfolios (i.e., combinations of currencies) have the least/most transaction risk. The results provide insights on whether MNEs should hedge their currency risk or not. The COVID-19 pandemic did impact all firms globally, so this study is relevant and pertinent as firms plan their post-pandemic growth.

Globalization, integration of supply chains, and numerous inter-country trade pacts have led to explosive growth in foreign exchange trading. Table 1 shows how daily forex trading volume has increased over time. This massive trading volume has increased volatility in emerging markets as evidenced from the multiple currency crises such as the Asian economic crisis in 1997, Russian, Mexican, Argentinian, and many other countries' inflationary currency defaults over the past three decades. MNEs operating in such volatile markets must hedge their currency risks to secure their financial positions. There have been no comprehensive studies of the "modified" value-at-risk (MVaR) measure. Our study compares the maximum expected losses with the actual currency losses over this particular post-Covid-19 crisis period for emerging markets currencies. A comparison of these findings with the pre-Covid-19 findings will have significant practical implications for MNEs and even mid-sized US firms that have significant revenues and/or expenditures across different emerging markets currencies. The results of this research will provide meaningful insights for MNEs to determine their hedging strategy. Hedging currency risk is quite expensive and firms have to weigh the expected benefits and costs of hedging. Our study will help in making these difficult yet necessary decisions for MNEs. While there are a variety of tools available to mitigate and/or eliminate the exchange rate risk, there are instances where firms may benefit from the decision not to hedge, if they anticipate exchange rate movements in their favor.

2. LITERATURE REVIEW

Cayton et al. (2010) show that VaR has become an increasingly popular way for financial institutions to measure the risk of holding assets in multiple currencies. Mohammadi and Akhtekhane (2012) estimate the risk associated with the U.S. dollar/rial exchange rate using VaR. Mabrouk and Aloui (2011), Rejeb et al. (2012) and Khazeh and Winder (2010) also employ VaR methodology to estimate the exchange rate risk associated with multiple currencies and currency portfolios. Artzner et al. (2001) were first to explore the concept of conditional VaR. Additional studies on MVaR include Kaut et al. (2007), Basak and Shapiro (2001) and Alexander and Baptista (2004). Garcia and Castro (2018) apply VaR methodology to assess the risk associated with the Mexican Peso/U.S. Dollar exchange rate and how the risk differed/changed in the pre- and post-Great Recession (2008/2009) time periods. Sharma and Mathur (2016) estimate how the VaR associated with the exchange rates between the Indian rupee and the U.S. dollar, the Euro and the British pound have changed as a result of Brexit. Poornima et al. (2014) use VaR to forecast the risk of the Indian rupee in relation to the U.S. dollar, the Euro and the U.K. pound sterling. Kemda et al. (2015) use VaR to estimate the risk associated with the U.S. dollar/ZAR (South African) exchange rate. Abbara and Zevallos (2018) test the accuracy of employing 15-min VaR data for five major, equally-weighted currency portfolios to forecast exchange rate risk.

While the previous studies mostly focus on the risk exposure of individual currencies using daily percentage changes, standard deviations and VAR of the aforementioned currencies, we focus on the MVaR of individual emerging market currencies as well as currency portfolios. In addition, we offer the first study comparing the risk profiles of emerging market currencies in the pre- and post-Covid-19 periods via the MVaR method as well as the actual ex-post results.

3. DATA

For the pre-Covid period in this study we select the 18-month period preceding the acknowledgement by the World Health Organization (WHO) of a transmissible respiratory virus epidemic in Wuhan, China on December 31, 2019. (i.e., July 01, 2018, to December 31, 2019). The post-Covid period includes the 18 months following the recognition of Covid-19 by WHO (i.e., January 01, 2020, to June 30, 2021. Both the pre-and

post-Covid period selected are 18 months in duration. We use the daily exchange rates data from the Federal Reserve Bank database.

The following eight emerging market currencies were considered in this study: Brazilian real (BRL), Indian rupee (INR), Korean won (KRW), Malaysian ringgit (MYR), Mexican peso (MXN), South African rand (ZAR), Taiwanese dollar (TWD) and the Thai baht (THB). The eight countries constitute a significant portion of emerging market GDPs. China has been excluded from this study as the Chinese Yuan is tightly managed to float within a particular price band. This artificial control of the currency makes it less volatile and less relevant to this study.

Figures 1 and 2 provide minimum and maximum daily percentage change for the selected emerging market currencies versus the US dollar during pre-and post-Covid-19 periods respectively.

Among the selected emerging market currencies, the South African rand has the greatest range in daily percent change during the 18-month pre Covid-19 period (2.51-−3.95%). The Brazilian real also shows significant volatility, with a range of 3.99-−2.13%. On the other end of the spectrum, the Malaysian ringgit had the smallest range of these eight different currencies (0.88-−0.72%), closely followed by the Taiwanese dollar (1.68-−0.79%) and the Thai baht (1.20-1.33%).

In comparison during the post Covid-19 period, the Mexican peso has the greatest range in daily percentage change (5.4-−5.02%) closely followed by the Brazilian real (3.80-−4.40%), while the Thai baht had the lowest range (0.86-−1.03%) closely followed by the Taiwanese dollar (1.00-−1.20%).

We observe that the Brazilian real, Malaysian ringgit, and Mexican peso see a wider trading range in the post-covid period. The trading range for the Indian rupee remains mostly unchanged while the Korean won, South African rand, Taiwanese dollar and the Thai Baht traded in a narrower range in the post-covid period.

Figures 3 and 4 provide the standard deviation of the selected emerging market currencies based on daily percent changes during the pre- and post-Covid-19 periods.

Figure 3 above shows that during the pre-Covid period, the Malaysian ringgit had the lowest standard deviation (0.1937%) of daily percent change while the South African rand had the highest (0.9533%) standard deviation of daily percent changes among the eight emerging market currencies.

During the post Covid-19 period, the Brazilian real has the highest standard deviation of daily percent changes at 1.2307% while the Taiwanese dollar was the most stable with a low standard deviation of 0.2228%. The standard deviation of the daily percent changes has increased for six of the eight currencies in the post-Covid-19 period, indicating the emerging market currencies have become more volatile during the post-Covid-19 period. Only the Indian

Figure 1: Minimum and maximum daily percentage change for emerging market currencies (pre-covid July 2018-December 2019)

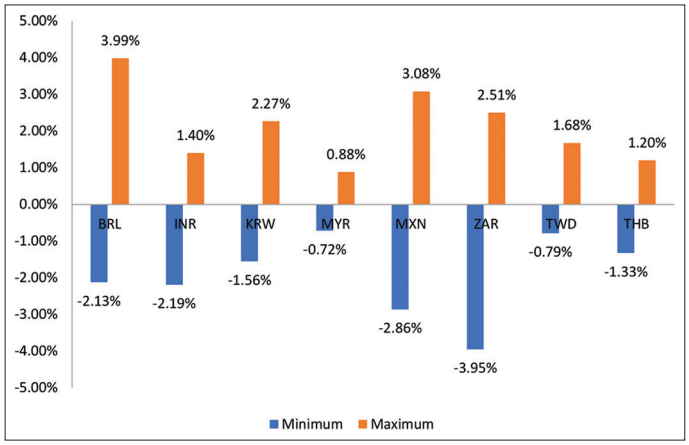


Figure 2: Minimum and maximum daily percentage change for emerging market currencies (Post-Covid January 2020-June 2021)

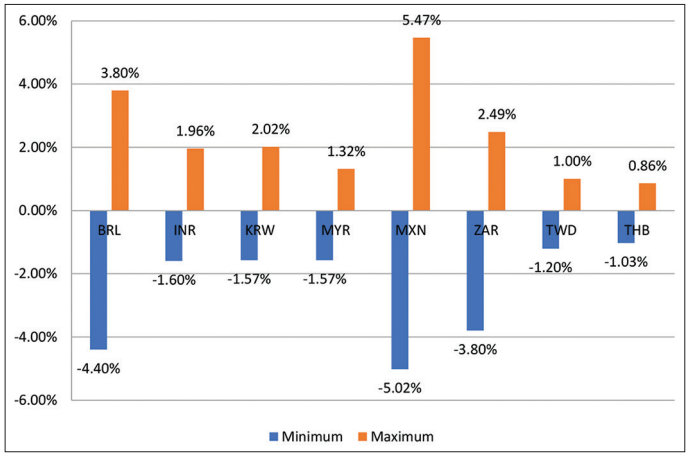


Figure 3: Standard deviation of emerging market currencies (Pre-covid July 2018-December 2019)

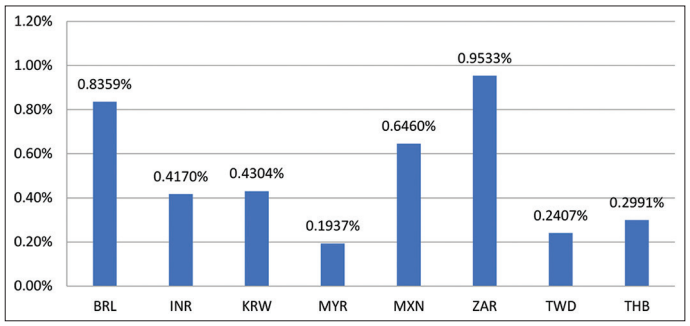
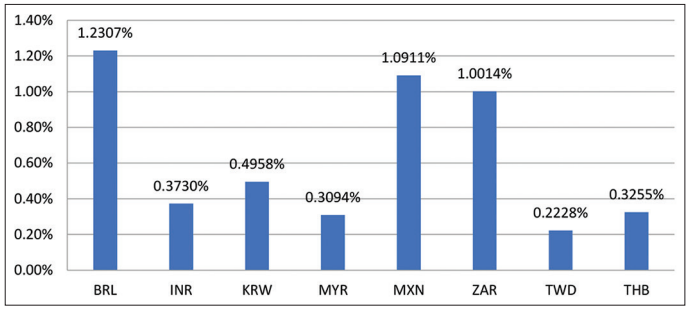


Figure 4: Standard deviation of emerging market currencies (post-covid January 2020-June 2021)



rupee and Taiwanese dollar show slightly reduced volatility in the post-Covid-19 period. The Brazilian real and the Mexican peso show the largest increase in standard deviation from the pre-Covid to post-Covid period.

4. METHODOLOGY

In this study, the results for the maximum 1-period holding period loss for an individual currency "i" or for a portfolio of currencies "p" is

$$E(e_t) - (Z) \times (\sigma_{i\ or\ p}) \quad (1)$$

Where $E(e_t)$ is the expected percentage change in the currency's value for the relevant period.

The results for the modified maximum 1-period holding loss for an individual currency "i" or for a portfolio of currencies "p" can be estimated using.

$$E(e_t) - (ModZ)x\ (\sigma_{i\ or\ p}) \quad (2)$$

Where

$$ModZ = (z + \frac{Skew\left(z^2 - 1\right)}{3!} + \frac{Kurt\left(z^3 - 3z\right)}{4!} + \frac{Skew^2\left(2z^3 - 5z\right)}{36} \quad (2A)$$

Where z is the normal z-score corresponding to the desired confidence level
Skew is the skewness of the population
Kurt is the excess kurtosis or absolute kurtosis – 3.

4.1. Portfolio's Variance

$$\sigma_p^2 = \sum_i w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq 1} w_i w_j \sigma_i \sigma_j \rho_{ij} \quad (3)$$

Portfolio's variance is computed using the above equation

Where
σ_p = standard deviation of daily % changes in currency portfolio
σ^2_p = variance of daily % changes in currency portfolio
w_i = proportion of total portfolio value denominated in currency i
w_j = proportion of total portfolio value denominated in currency j
σ_i = standard deviation of weekly percentage changes in currency i
σ_j = standard deviation of weekly percentage changes in currency j
ρ_{ij} = correlation coefficient of weekly percentage changes between currencies i and j.

5. RESULTS

5.1. Currency Correlation (Emerging Markets)

The correlation coefficients between pairs of currencies can vary and hence are not stable and/or constant over time. The correlation coefficients for the eight selected emerging market currencies, based on daily percentage changes, are presented in Tables 2 and 3 during pre-and post-Covid-19 periods.

As it can be observed, for almost all the currency pairs, the correlation coefficients have changed substantially between the pre-and post-Covid-19 periods. During the pre-Covid period MYR-BRL had the lowest correlation coefficient of 0.1727 among the eight currency pairs and TWD-KRW had the highest correlation coefficient at 0.7123.

During the post-Covid period TWD-BRL had the lowest correlation coefficient of 0.1959 among the eight currency pairs and ZAR-MXP had the highest correlation coefficient of 0.6786. From Tables 2 and 3, the correlation coefficients between currency pairs are all different which can be attributed to the volatility of each currency during those periods. Interestingly, TWD correlation coefficients with all other currencies decreased from the pre to post-Covid period reflecting the pandemic's negative impact on exports affect on the Taiwan dollar.

Table 2: Correlation coefficient between emerging markets currency pairs (pre-covid July 2018-December 2019)

	BRL	INR	KRW	MYR	MXN	ZAR	TWD	THB
BRL	1.0000	0.2050	0.2892	0.1727	0.3801	0.4779	0.2782	0.2403
INR		1.0000	0.4349	0.3210	0.2166	0.3574	0.3625	0.2148
KRW			1.0000	0.5252	0.3997	0.4820	0.7123	0.4257
MYR				1.0000	0.1946	0.2787	0.4386	0.2474
MXN					1.0000	0.5357	0.3318	0.2348
ZAR						1.0000	0.4569	0.4169
TWD							1.0000	0.4242
THB								1.0000

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

Table 3: Correlation coefficient between emerging markets currency pairs (post-covid January 2020-June 2021)

	BRL	INR	KRW	MYR	MXN	ZAR	TWD	THB
BRL	1.0000	0.3005	0.2859	0.2406	0.5442	0.5433	0.1959	0.2683
INR		1.0000	0.2724	0.3489	0.4711	0.4192	0.2233	0.4038
KRW			1.0000	0.5276	0.3847	0.3226	0.4968	0.4023
MYR				1.0000	0.4378	0.3102	0.3858	0.3672
MXN					1.0000	0.6786	0.2690	0.3760
ZAR						1.0000	0.2837	0.3929
TWD							1.0000	0.3652
THB								1.0000

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

5.2. Modified Value-at-Risk, Maximum Daily Loss, Ex-post Returns and Standard Deviation for Emerging Markets Currencies

The MVaR predicts the maximum 1-day loss of the US dollar against the particular currency. The maximum 1-day loss is the actual maximum loss observed for each currency against the US dollar during the 18-month period. We compare the MVaR to the max daily loss for the selected emerging markets currencies. Table 4 summarizes the actual maximum daily loss and the average daily MVaR for the entire 18-month pre-Covid-19 time period. The MVaR for the Brazilian real (−2.44248%) indicates the deepest predicted maximum 1-day loss, while the MVaR for the Malaysian ringgit (−0.63354%) predicts the smallest maximum daily loss, among the eight selected currencies. In addition, looking at the change in the currency values using direct quotes (USD/FC) we observe that the Mexican peso and the Taiwanese dollar gain in value against the US dollar, while the other six currencies decline in value in the pre-covid period, with an average decline in value of 0.1775% across the eight emerging market currencies.

Comparing the maximum 1-day loss for each currency relative to the predicted 1-day loss using MVaR gives us a better understanding of the potential currency exposure risk. The maximum 1-day loss seems higher than predicted by MVaR for all currencies with the exception of BRL and TWD.

Figure 5 offers a visual comparison of the maximum daily loss predicted by the MVaR model and the actual maximum 1-day loss for the eight selected currencies during the pre-Covid period.

Figure 5: Max 1 day loss versus modified value-at-risk for emerging currencies one- period loss/gain (pre-covid July 2018-December 2019)

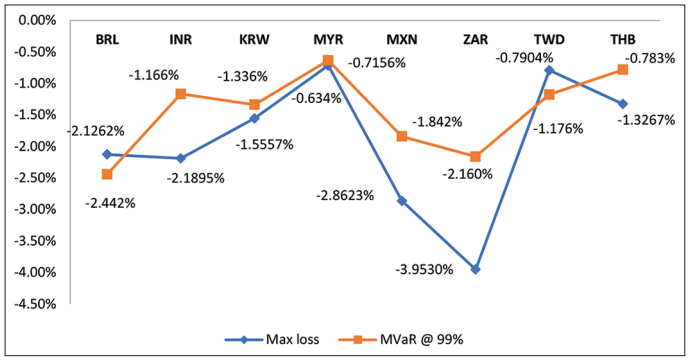


Table 5 summarizes the post-Covid-19 maximum 1-day loss for each emerging market currency against the US dollar during the 18-month period and the predicted MVaR 1-day loss. The Mexican peso shows the largest predicted maximum daily loss at −3.31% while the smallest maximum daily loss is predicted for the Taiwanese dollar at −0.69%. During the post-Covid-19 period, all the emerging market currencies had a greater 1-day loss against the US dollar compared to the predicted MVaR 1-day loss. This is indicative of the increased volatility and larger negative impact of the pandemic on economic activity in these emerging countries.

In addition, looking at the change in the currency values using direct quotes (USD/FC) we observe that the Brazilian real, Indian rupee, Malaysian ringgit, and Taiwanese dollar have declined in value while the Korean won, Mexican peso, South African rand and Thai baht have gained in value against the USD in the post-covid period. Overall, the eight emerging market currencies have gained an average of 0.0056% in the post-covid period.

Figure 6 offers a visual comparison of the maximum daily loss predicted by the MVaR model and the actual maximum 1-day loss against the eight selected currencies during the post-Covid period. We observe that in the post-Covid period for all emerging market currencies, the maximum 1-day loss is consistently higher than the MVaR predicted 1-day loss.

5.3. Optimal Hedging Portfolios

We use nonlinear optimization methods to construct the optimal portfolio. The order of each currency's entry in the portfolio numerically makes the MVaR as small as possible at every instance. The MVaR is a complex function of the standard deviation as well as the skewness and kurtosis (Equation 2). So, the entry order is influenced by the standard deviation, but also the covariances and kurtosis (i.e., we might have two currencies with equal standard deviations but unequal kurtosis, leading one of the two to be favored).

In Table 6 we present equally weighted hedge portfolios for the eight selected emerging market currencies, based on both the standard deviations and MVaR of the currency portfolios.

Table 4: Emerging markets currencies realized return and MVAR (Pre-covid July 2018-December 2019)

Currency	$(S_1 - S_0)/S_0$ (%)	Max daily loss (%)	MVaR @ 99% (%)
BRL	−0.3467	−2.12616	−2.44248
INR	−0.1289	−2.18952	−1.16621
KRW	−0.1302	−1.55574	−1.33628
MYR	−0.0819	−0.71565	−0.63354
MXN	0.4967	−2.86230	−1.84166
ZAR	−1.2282	−3.95296	−2.16039
TWD	0.0867	−0.79039	−1.17587
THB	−0.0878	−1.32670	−0.78294
Average	−0.1775	−1.9399	−1.4424

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

Table 5: Emerging markets currencies realized return and MVAR (Post-covid July 2018-December 2019)

Currency	$(S_1 - S_0)/S_0$ (%)	Max loss (%)	MVaR @ 99% (%)
BRL	−0.0076	−4.3985	−3.24502
INR	−0.1543	−1.5963	−1.17150
KRW	0.1723	−1.5737	−1.46487
MYR	−0.1457	−1.5748	−0.90324
MXN	0.0997	−5.0211	−3.31130
ZAR	0.0093	−3.7954	−2.16683
TWD	−0.0014	−1.2044	−0.68699
THB	0.0725	−1.0291	−0.78569
Average	0.0056	−2.5242	−1.7169

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

Table 6: Emerging markets equally weighted currency portfolio (Pre-covid July 2018-December 2019)

Portfolio SD (%)	MVaR (%)	Portfolio composition
0.19651	−0.58584	MYR
0.18801	−0.47066	MYR, TWD
0.18894	−0.52768	MYR, TWD, THB
0.20434	−0.59351	MYR, TWD, THB, INR
0.23681	−0.68335	MYR, TWD, THB, INR, KRW
0.25249	−0.73237	MYR, TWD, THB, INR, KRW, MXN
0.28309	−0.76770	MYR, TWD, THB, INR, KRW, MXN, BRL
0.33437	−0.82964	MYR, TWD, THB, INR, KRW, MXN, BRL, ZAR

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

Table 7: Emerging markets equally weighted currency portfolio (post-covid January 2020-June 2021)

Portfolio SD (%)	MVaR (%)	Portfolio composition
0.20388	−0.68977	TWD
0.20500	−0.62467	TWD, MYR
0.20404	−0.59948	TWD, MYR, THB
0.21106	−0.57767	TWD, MYR, THB, INR
0.23168	−0.62639	TWD, MYR, THB, INR, KRW
0.30778	−0.79266	TWD, MYR, THB, INR, KRW, ZAR
0.37327	−0.91582	TWD, MYR, THB, INR, KRW, ZAR, MXN
0.43842	−0.96195	TWD, MYR, THB, INR, KRW, ZAR, MXN, BRL

BRL: Brazilian real, INR: Indian rupee, KRW: Korean won, MYR: Malaysian ringgit, MXN: Mexican peso, ZAR: South African rand, TWD: Taiwanese dollar, THB: Thai baht

The currencies are added to the portfolio starting with the currency with the lowest standard deviation, and each additional currency is added from lowest to highest volatility. The order of currency inclusion based on the least to highest standard deviation are as follows, Malaysian ringgit, Taiwanese dollar, Thai baht, Indian rupee, Korean won, Mexican peso, Brazilian real and South African rand.

The resulting portfolio standard deviations reflect the pairwise covariances of the currencies in each portfolio. As we construct the currency portfolios using rolling 12-month standard deviations and correlation coefficients, the computed MVaR values for the portfolios are different from individual currency MVaR values in Table 6. For example, in Table 6 the MYR MVaR value is −0.63354% (which is computed using 18 months of return data), whereas in Table 6 the MYR MVaR value is −0.58584% (based on 6-months of SD data from the rolling 12-month standard deviations over the 18-month period). They reflect, in a sense, *optimal* currency portfolios based on modern portfolio theory and, hence, should provide superior information to MNEs about the risks of operating across multiple currencies.

We find that the equally weighted two currency portfolio of Malaysian ringgit and Taiwanese dollar has the lowest standard deviation (0.18801%). In addition, this two currency MYR, TWD has the lowest MVaR value (−0.47066%) of all the currency portfolios during the pre-Covid period.

Figure 7 provides a graphical representation of the portfolio standard deviation and MVaR as the different currencies are added to the portfolio.

In Table 7, we identify the optimal currency portfolios in the post-Covid-19 period. When standard deviation and MVaR are considered together, we find that the equally weighted four currency portfolio of Taiwanese Dollar, Malaysian Ringgit, Thai Baht, and Indian Rupee has the lowest predicted MVaR 1-day loss (0.57767%) in the post-Covid period, though we observe that the standard deviation of the optimal portfolio has increased substantially during the post-Covid-19 period. We can conclude that in addition to the increase in the volatility of the individual

Figure 6: Realized versus modified value-at-risk for emerging currencies one- period loss/gain (post-covid January 2020-June 2021)

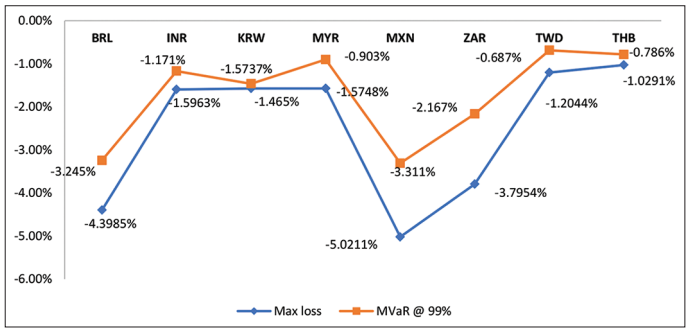
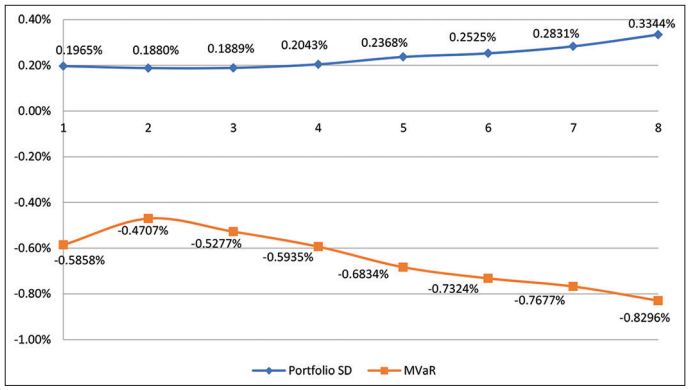


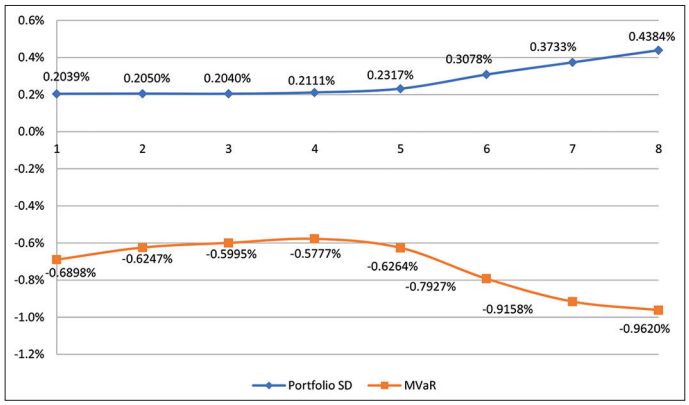
Figure 7: Equally weighted emerging countries currency portfolio (pre-covid July 2018-December 2019)



currencies, the volatility of diversified currency portfolios has also increased during the post-Covid period.

Figure 8 presents a visualization of the portfolio standard deviation and MVaR as additional currencies enter the portfolio. The addition of the currencies to the portfolio from one (TWD) to two (TWD, MYR) increases the resulting portfolio's standard deviation. Adding the third currency THB lowers the three-currency portfolio's standard deviation. This could be the optimal emerging market currency portfolio if MNEs wish to hedge their transaction exposure risk, since adding more currencies results in the portfolio risk to continue to increase. Given the increased volatility in the post-Covid period, MNEs operating in emerging

Figure 8: Equally weighted emerging countries currency portfolio (post-covid January 2020-June 2021)



markets have substantial transaction exposure risk. In order to mitigate any currency loss, above results suggest hedging in these three currencies (Malaysian ringgit, Taiwanese dollar and Thai baht) would offer the best risk mitigation.

6. CONCLUSION

Our results indicate the US dollar gained slightly against the currency values of the eight selected emerging countries during the pre-covid period and declined slightly on the average against the emerging market currencies during the post-Covid-19 period. Six of the eight currencies (BRL, INR, KRW, MYR, MXN, TWD) had a wider trading range, and six of the eight currencies (BRL, KRW, MYR, MXN, ZAR, THB) had larger standard deviations during the post-Covid-19 period. The consequences of Covid-19 resulted in a surge in maximum expected one-period loss (MVaR) for seven of the eight currencies with TWD being the only exception. The actual maximum daily loss was higher for five of the eight currencies (BRL, KRW, MYR, MXN, TWD), confirming increased currency exposure risk for MNEs operating in emerging markets in the post-Covid-19 period.

These results will convey important information to MNEs operating in those eight emerging markets during pre- and post-Covid-19 periods. Hedging is expensive and maintaining a hedge is costly. It can be concluded that those MNEs with net overall foreign currency outflows would have benefited from hedging by reducing the volatility of their currency exchange returns. However, given the net increase in the average currency values in the post-Covid-19 period, unhedged positions may have performed better. Further research into identifying optimal weighted hedging portfolios based on the emerging market currencies, to supplement our equally weighted portfolio results would be beneficial, providing further insight into the decision on which currency risk exposures should be hedged for best results.

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