India Mexico FX Forecasting: Examining 10yr Bond Spread and use of ARIMA and GARCH to Forecast FX

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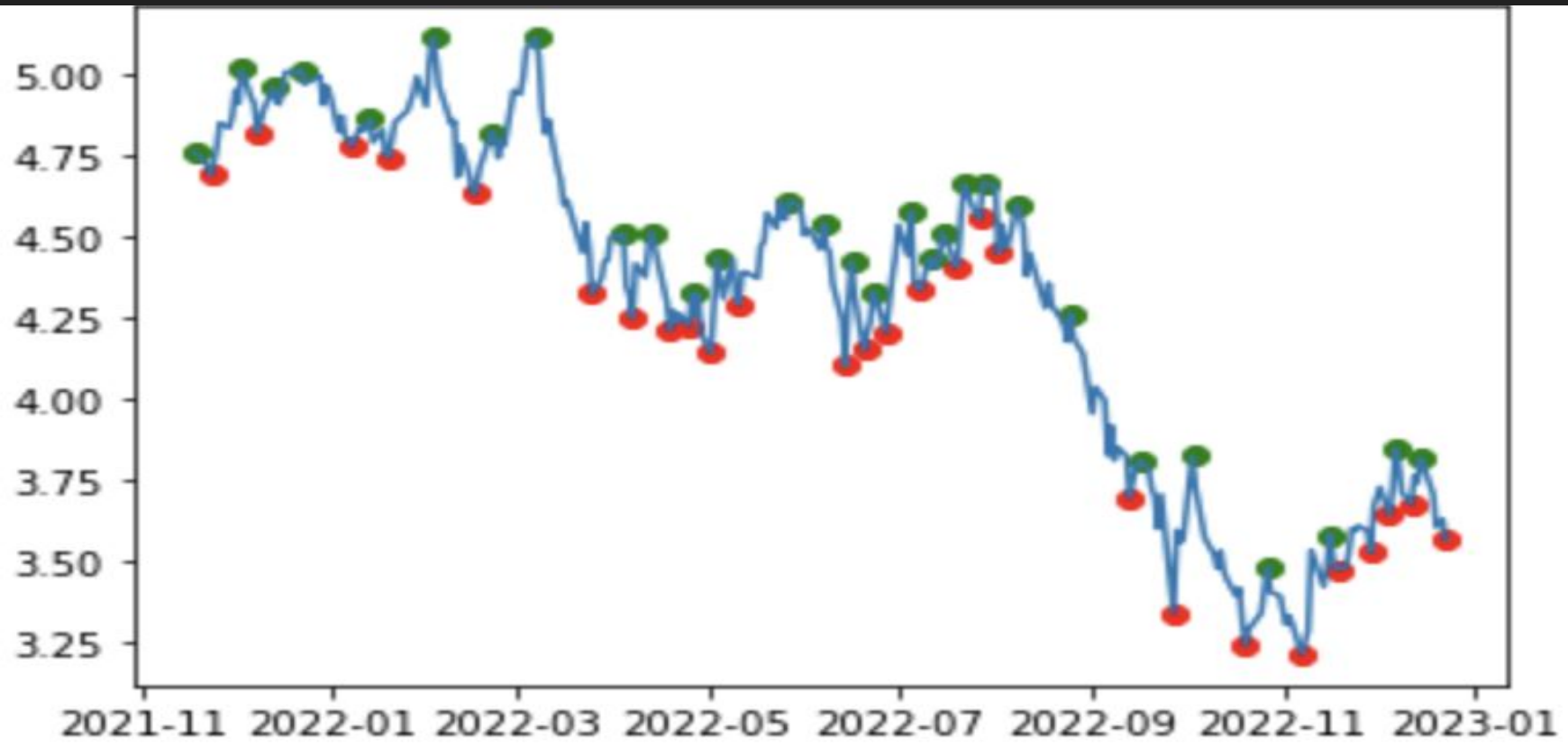
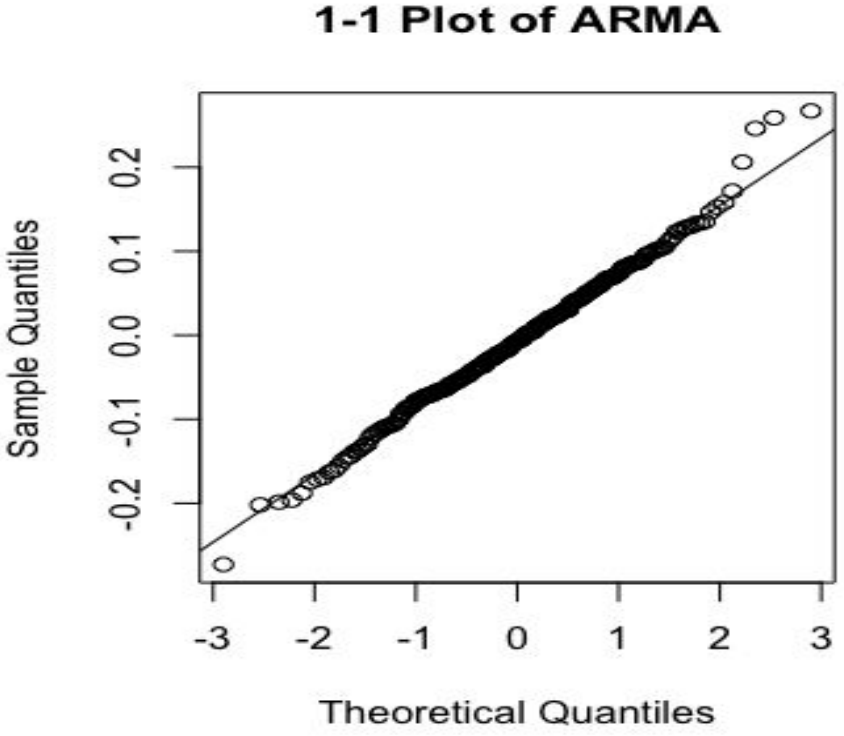
Overview

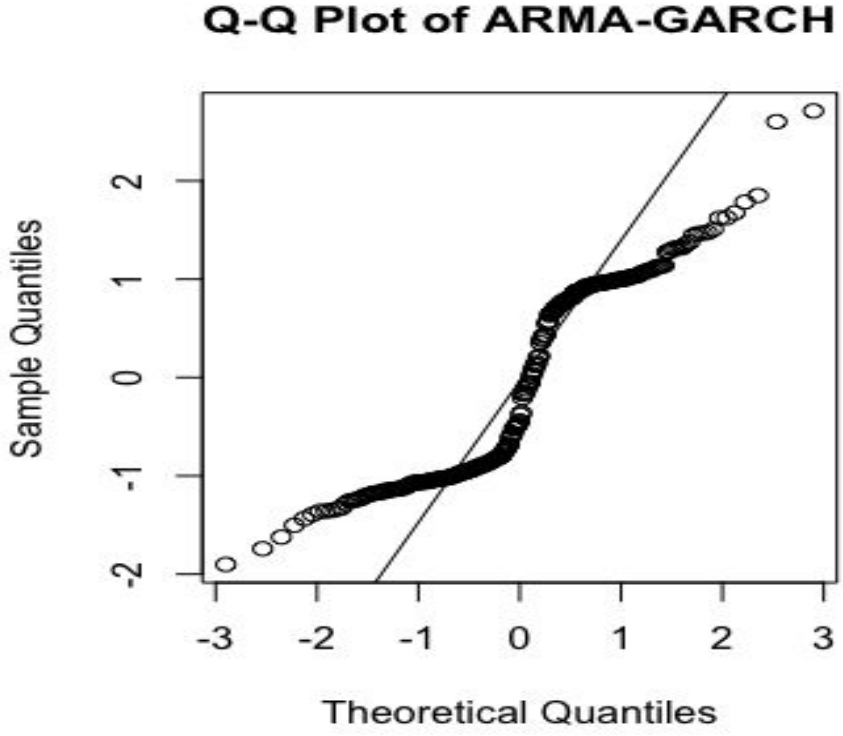
- The following time series models attempt to forecast the Indian Rupee and the Mexican Peso using the ARIMA and GARCH models
- The 10 year Bond Spread between the Indian and US 10 year bond yields, and the Mexican and US 10 year bond yields are being used as proxies to forecast the Indian Rupee and Mexican Peso, given the long term correlation between 10 year bond spreads and their respective currencies.
- ARIMA is more appropriate to use to forecast the Indian Rupee than the GARCH model. GARCH is more appropriate to use to forecast the Mexican Peso because Mexico is more vulnerable to economic developments in the United States than India. This makes the Mexican Peso more volatile than the Indian Rupee.

India 10yr Bond Spread

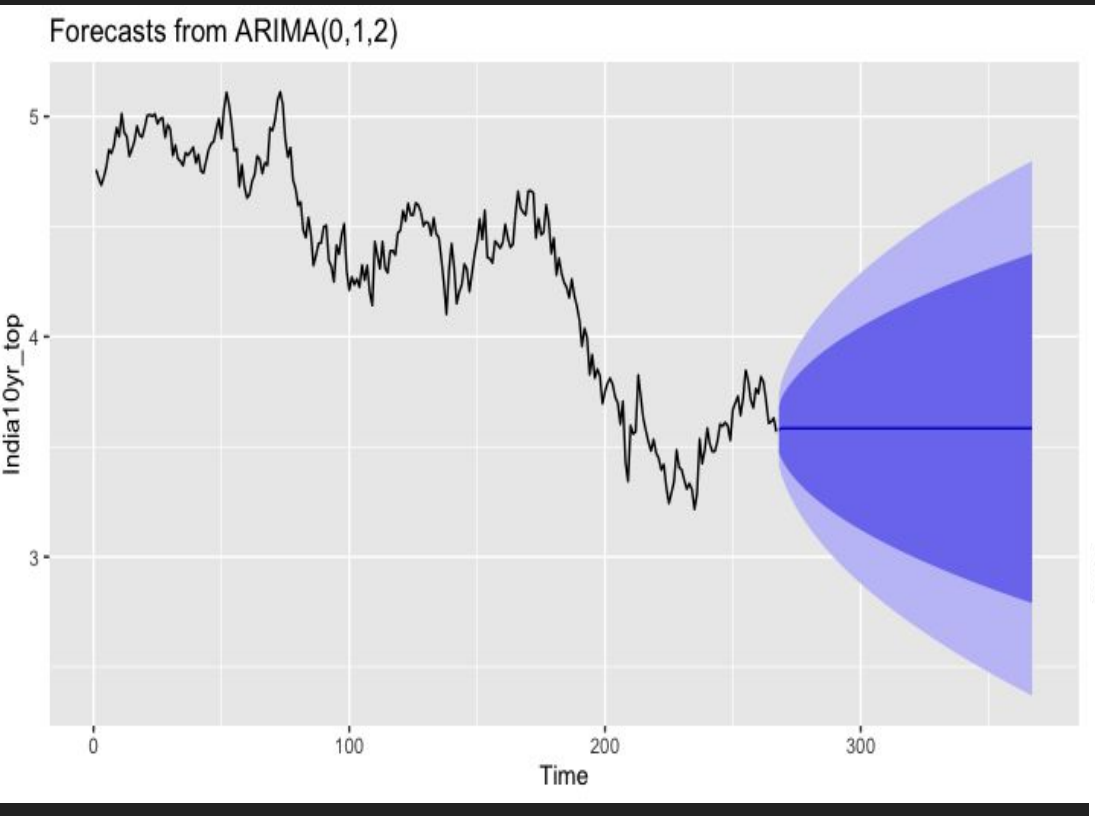


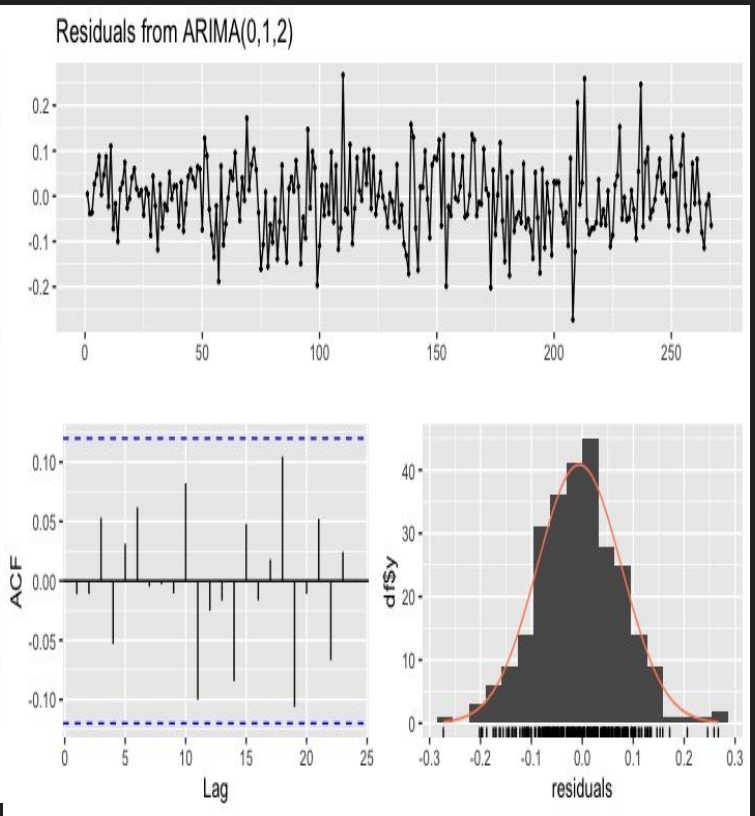
India 10yr Bond Spread QQ Plot (ARIMA More appropriate to use)



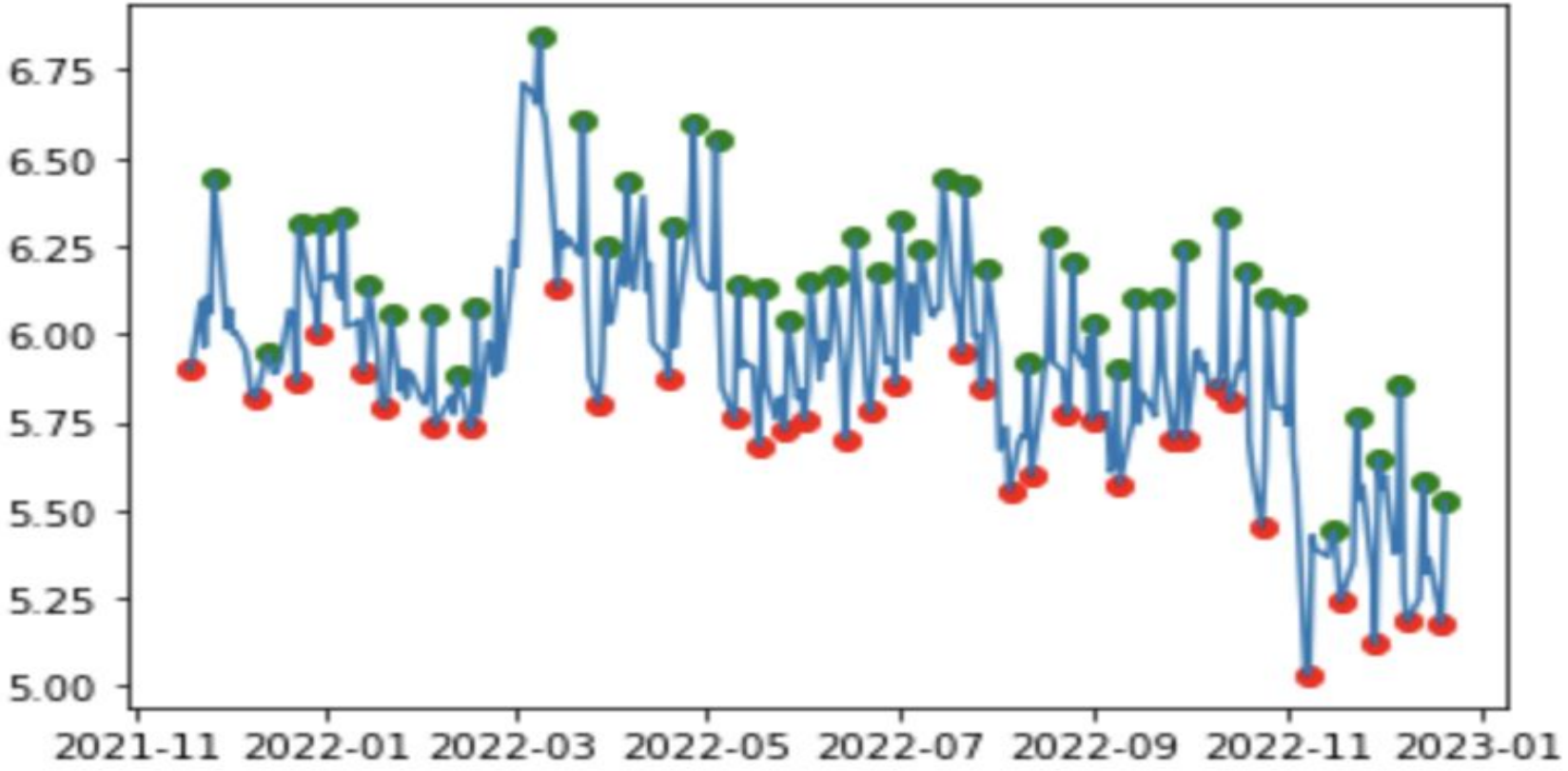


India 10 yr Bond Spread ARIMA Forecasting

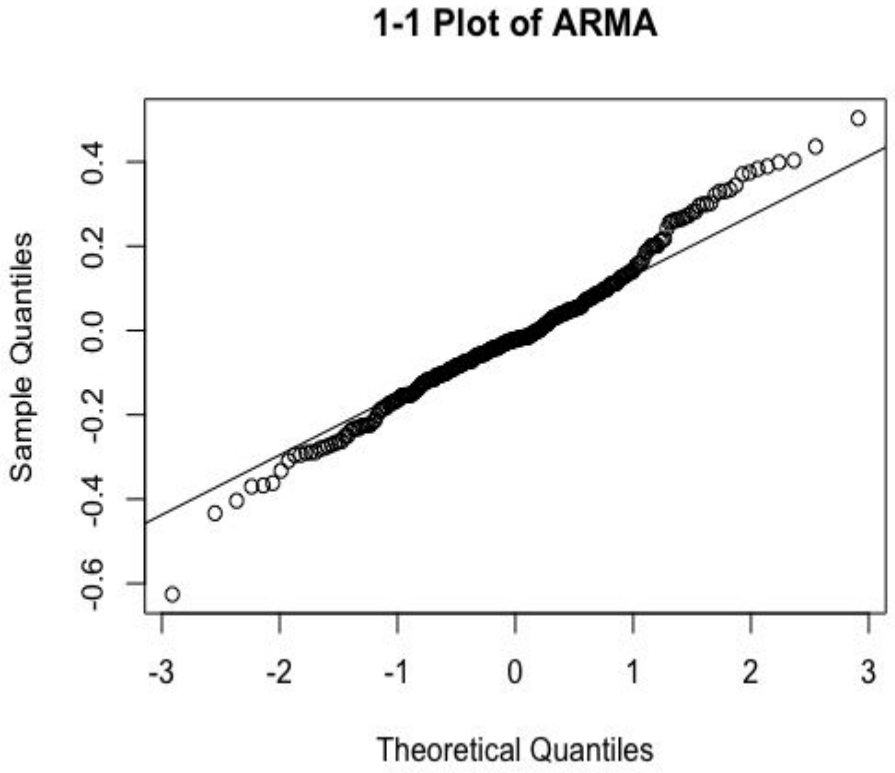


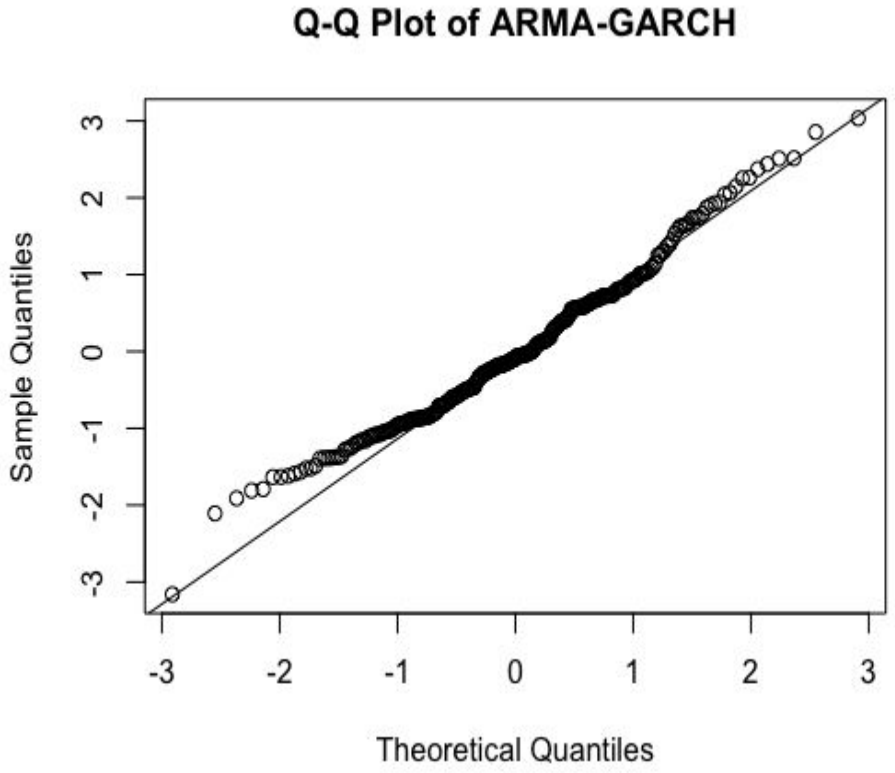


Mexico 10 yr Bond Differential

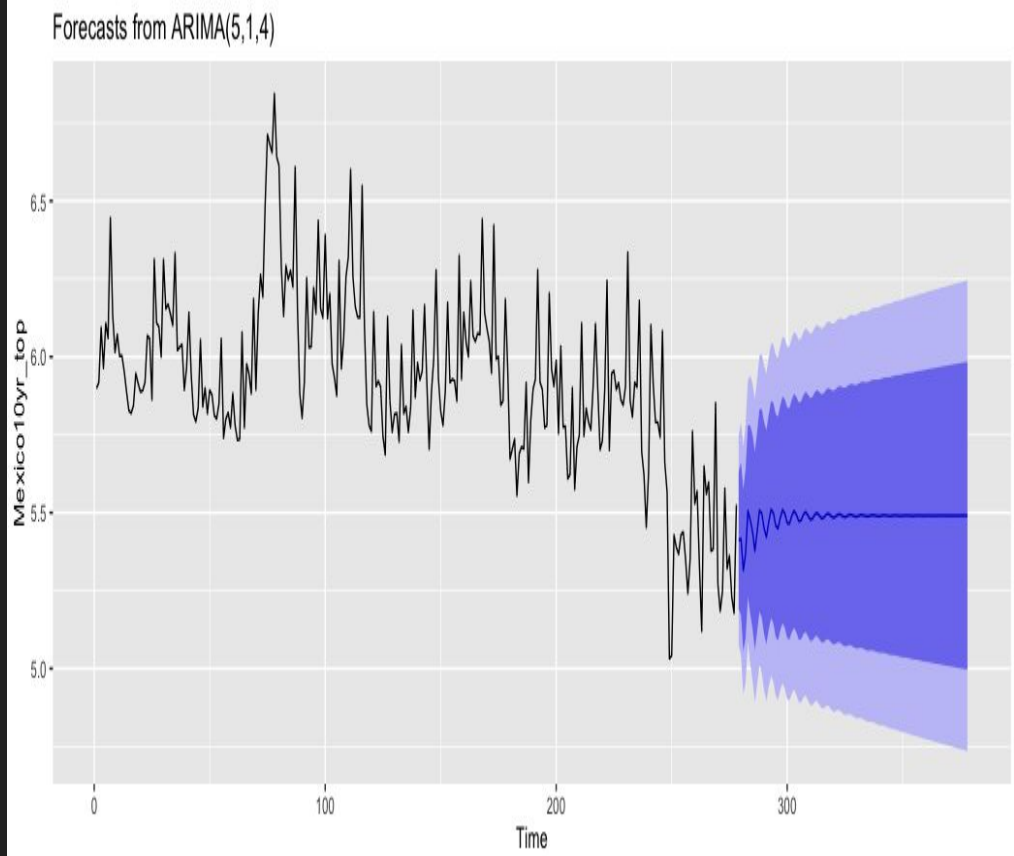


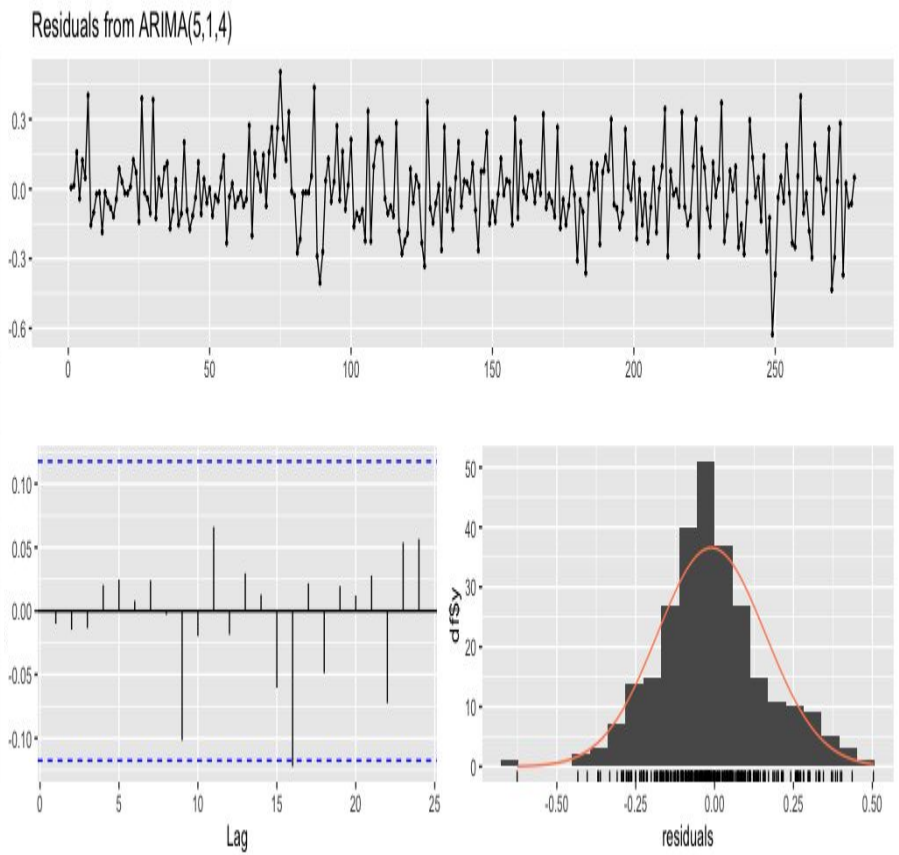
Mexico 10yr Bond Forecasting QQ Plot



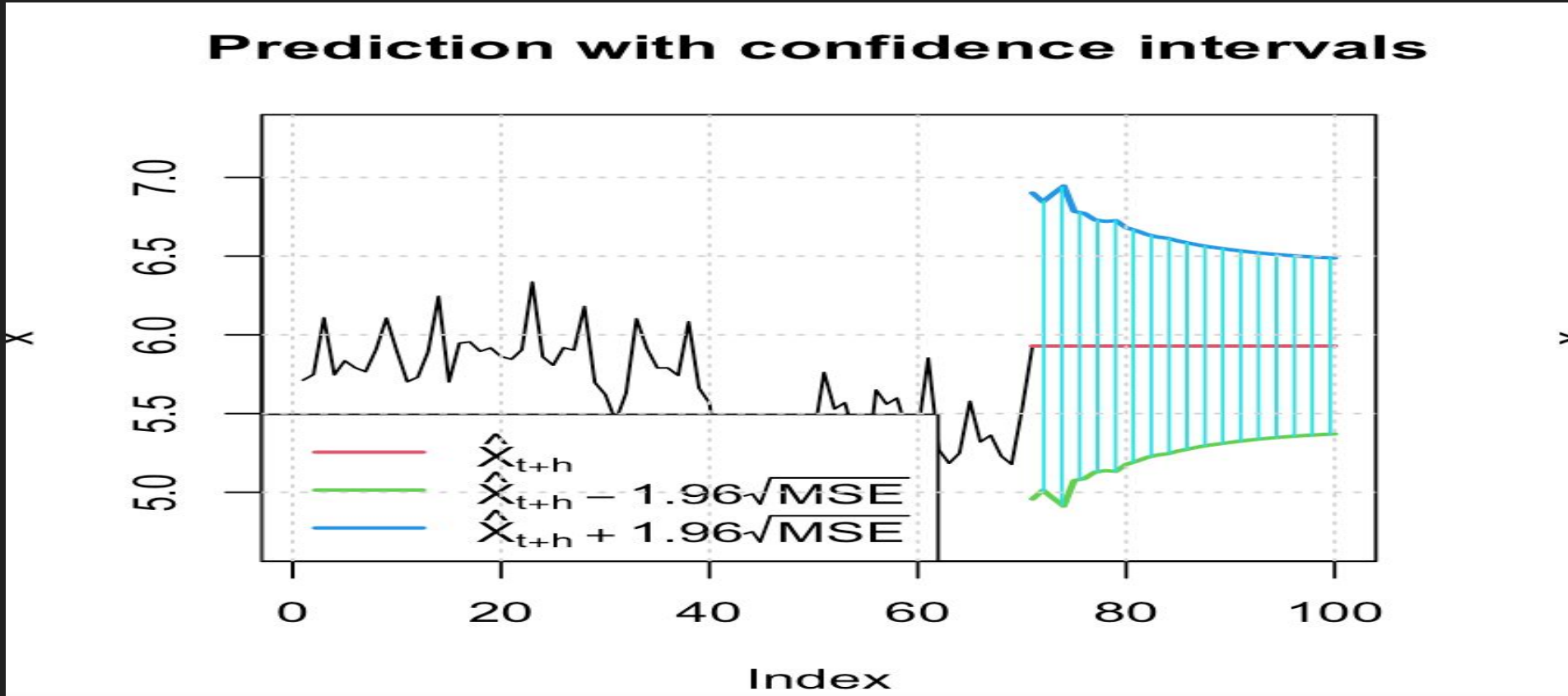


Mexico 10 yr Bond Differential forecasting-ARIMA





Mexico 10 yr Bond Differential Forecasting-GARCH

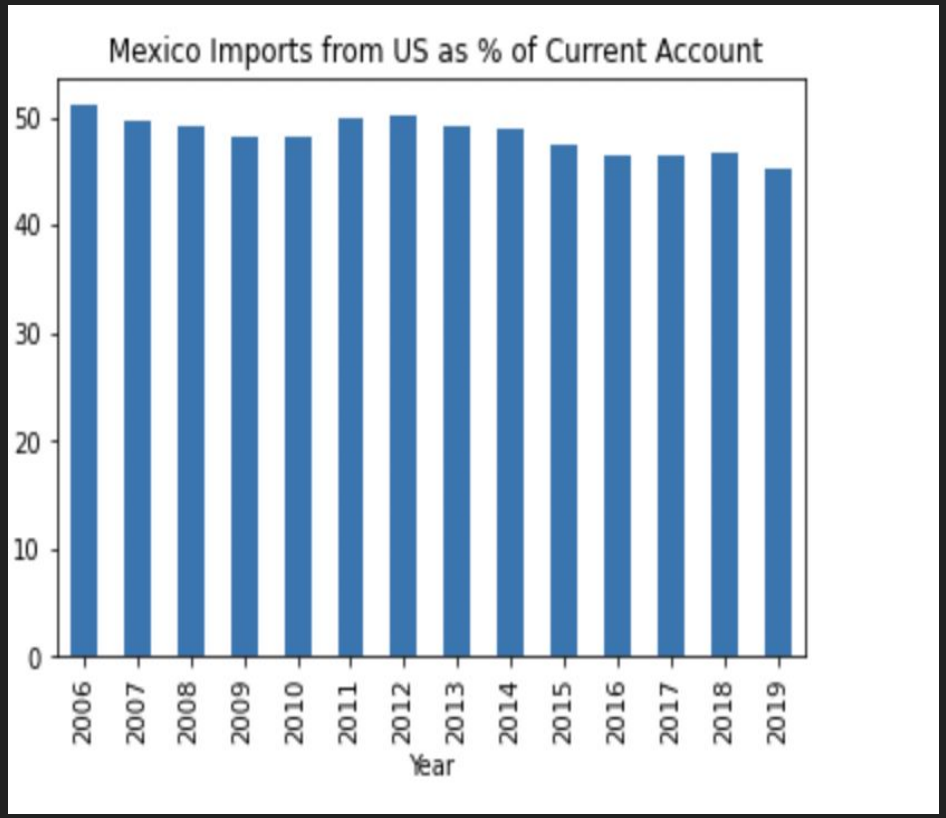


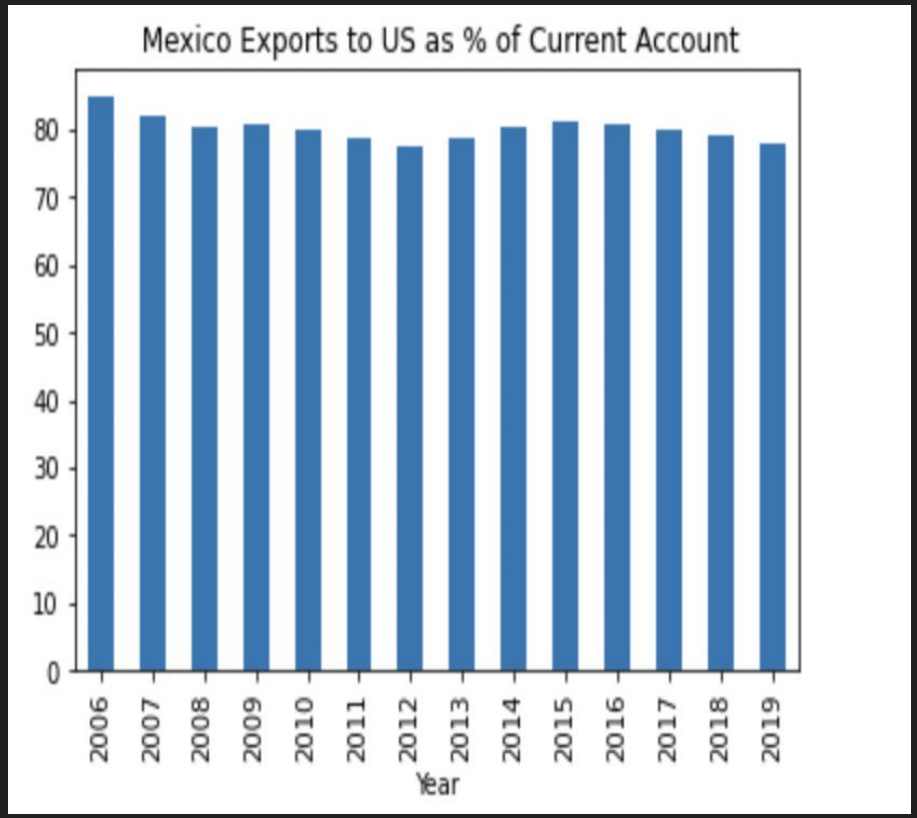
Use of Garch over ARIMA

- Since Mexico is more vulnerable to economic developments in the United States than India, it is more appropriate to rely on the GARCH model to forecast the Mexican Peso than ARIMA.
- Such vulnerability can be measured by how the 10 year Bond Spread, or in other words the 10 year interest rate differential, is impacted by trade dynamics with the US.

India is less vulnerable to trade dynamics with the US than Mexico

Mexico is more vulnerable to trade dynamics with the United States than India

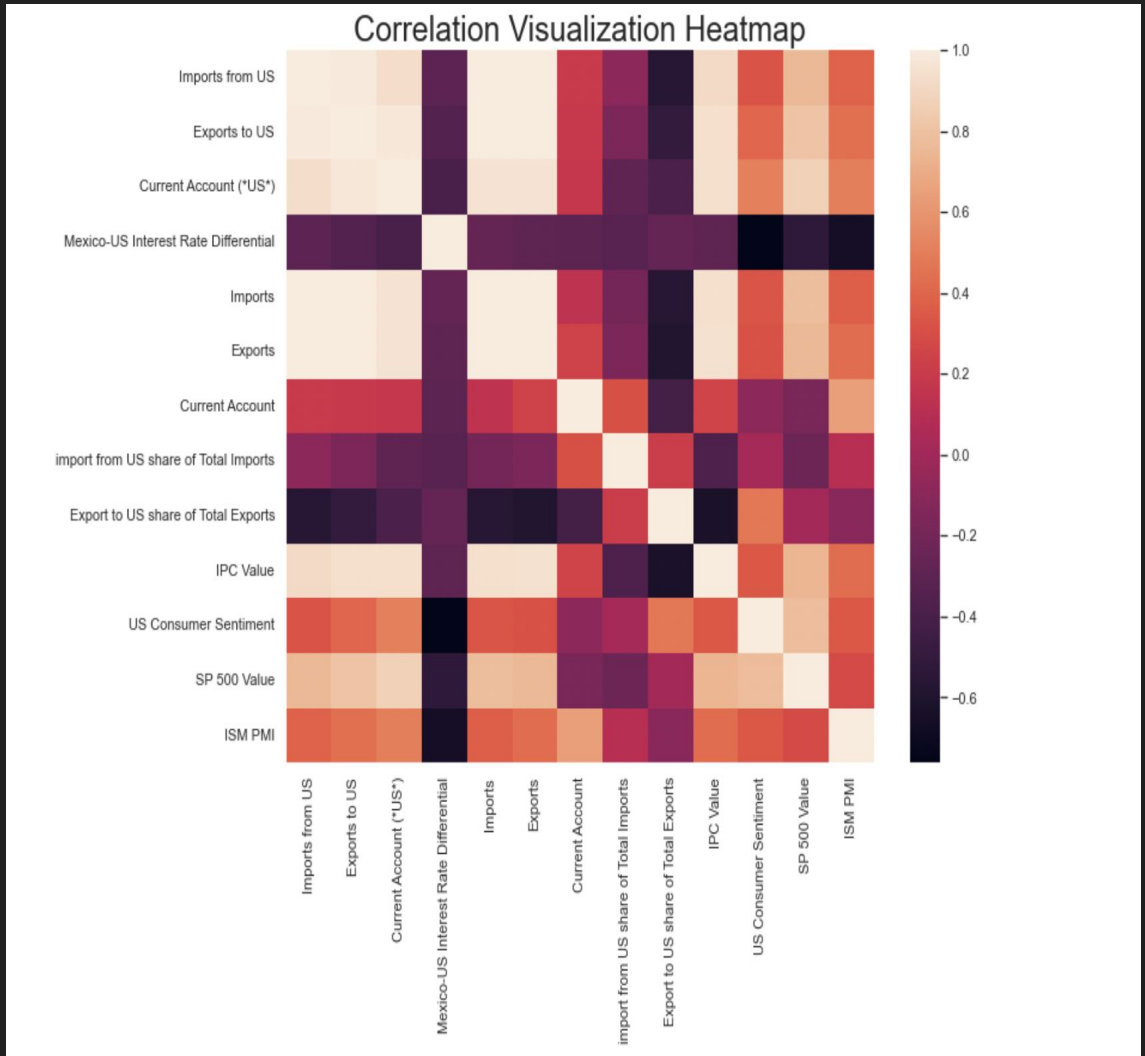




Such trade dynamics with the United States seems to impact Mexico's interest rate differential more than India's interest rate differential.

	Imports from US	Exports to US	Current Account (*US*)	Mexico-US Interest Rate Differential	Imports	Exports	Current Account	import from US share of Total Imports	Export to US share of Total Exports
Imports from US	1.000000	0.984677	0.922690	0.298561	0.987139	0.985622	0.074582	-0.525034	-0.608972
Exports to US	0.984677	1.000000	0.975785	0.368309	0.996738	0.996428	0.088589	-0.640804	-0.564916
Current Account (*US*)	0.922690	0.975785	1.000000	0.439797	0.965486	0.966702	0.102310	-0.758181	-0.485122
Mexico-US Interest Rate Differential	0.298561	0.368309	0.439797	1.000000	0.404200	0.392375	-0.091367	-0.726534	-0.433472
Imports	0.987139	0.996738	0.965486	0.404200	1.000000	0.995776	0.046314	-0.651821	-0.595741
Exports	0.985622	0.996428	0.966702	0.392375	0.995776	1.000000	0.137832	-0.635398	-0.630467
Current Account	0.074582	0.088589	0.102310	-0.091367	0.046314	0.137832	1.000000	0.118544	-0.432791
import from US share of Total Imports	-0.525034	-0.640804	-0.758181	-0.726534	-0.651821	-0.635398	0.118544	1.000000	0.355595
Export to US share of Total Exports	-0.608972	-0.564916	-0.485122	-0.433472	-0.595741	-0.630467	-0.432791	0.355595	1.000000

	Imports from US	Exports to US	Current Account (*US*)	India-US Interest Rate Differential	Imports	Exports	Current Account	Import from US share of Total Imports	Export to US share of Total Exports
Imports from US	1.000000	0.772573	0.281866	0.379128	0.846583	0.703648	-0.863234	0.222873	0.364609
Exports to US	0.772573	1.000000	0.826944	0.602165	0.847642	0.894620	-0.631422	-0.211446	0.611111
Current Account (*US*)	0.281866	0.826944	1.000000	0.574196	0.531170	0.728741	-0.189688	-0.516895	0.600572
India-US Interest Rate Differential	0.379128	0.602165	0.574196	1.000000	0.723498	0.807817	-0.484766	-0.629210	-0.059913
Imports	0.846583	0.847642	0.531170	0.723498	1.000000	0.932048	-0.896068	-0.323606	0.196977
Exports	0.703648	0.894620	0.728741	0.807817	0.932048	1.000000	-0.674332	-0.463973	0.208328
Current Account	-0.863234	-0.631422	-0.189688	-0.484766	-0.896068	-0.674332	1.000000	0.091061	-0.146198
Import from US share of Total Imports	0.222873	-0.211446	-0.516895	-0.629210	-0.323606	-0.463973	0.091061	1.000000	0.239360
Export to US share of Total Exports	0.364609	0.611111	0.600572	-0.059913	0.196977	0.208328	-0.146198	0.239360	1.000000



To examine how such economic developments in the US significantly impact the Bond Spread and the IPC Stock Value, US Consumer Sentiment, the SP 500, and ISM PMI were used to measure how such US economic dynamics cause volatility within the interest rate differential and IPC.

It seems that such demand and supply dynamics in the US economy cause significant volatility within IPC and 10 year bond spread.

Such volatility can be attributed to Mexico's economy being heavily manufacturing oriented, and dependent on such manufacturing-oriented economies.

	US Consumer Sentiment	ISM PMI	US Consumer Sentiment (*w/out ISM PMI)	SP500	SP500 (*w/out ISM PMI)	SP500 squared
IPC	-548.231604	717.05242	-465.755211	27.237073	27.563201	0.008601

	US Consumer Sentiment	ISM PMI	US Consumer Sentiment (*w/out ISM PMI)
MEX_US_InterestRateDifferential_logged	-0.01142	-0.017154	-0.013393

Pinpointing the specific cause of such Volatility

Looking at the regression coefficients of the US Consumer Sentiment when ISM PMI is included and taken out of the regression analyses, US Manufacturing dynamics seem to have a significant impact on not only the interest rate differential and the IPC, but also the Mexican Peso.

Conclusion

- The use of the GARCH model to forecast the Mexican Peso is more appropriate than the use of the ARIMA model because the Mexican Peso is more volatile than the Indian Rupee.
- It is recommended to use the GARCH model to forecast such currencies whose economies are significantly dependent on the US’s economy, particularly if it involves manufacturing.