Dynamics of Monetary Policy Spillover: The Role of Exchange Rate Regimes in the Asian Context

Submitted To

Prof. Ashwini Kumar

(Department of Economics, BITS Pilani KK Birla Goa Campus)

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Submitted By:

Student ID	Student Name
2020B3A71833G	Alben D'Souza
2020B3A71102G	Vishesh Chitransh
2020B3A30559G	Riddhi Zaynte
2020B3A41790G	Asmit Sharma
2020B3A41787G	Rahul Vaid

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ABSTRACT

This study looks at how the monetary policy of the United States has affected other Asian economies and how exchange rate regimes have shaped such spillovers. The study applies econometric methods such as vector autoregressive models, impulse response functions, and panel regressions on a panel of macroeconomic data from a sample of Asian countries - India, China, Singapore, Sri Lanka, Indonesia, UAE, Malaysia and Saudi Arabia, from September 20, 2016, to December 30, 2021. The results of this study will significantly affect policymakers in Asian nations and add to the body of knowledge on how monetary policy shocks and exchange rate regimes are transmitted in emerging market economies.

KEYWORDS

Monetary Policy Transmission, Emerging Market Economies, Inflation, Monetary Policy Cooperation, Vector autoregression

INTRODUCTION

In recent years, the spillover effects of monetary policies have been a topic of significant interest in academic literature and policy debates. Understanding the dynamics of these spillovers is crucial for policymakers, as their decisions affect their economies and those of their trading partners. Exchange rate regimes play a crucial role in determining the extent and direction of these spillovers, particularly in the context of Asian economies that have undergone significant structural changes in recent decades.
This paper aims to investigate the dynamics of monetary policy spillovers across Asian countries and examine the role of exchange rate regimes in shaping these spillovers.

Specifically, the study seeks to answer two key research questions: (i) How do monetary policy shocks in one country affect economic activity and inflation in other Asian countries with different exchange rate regimes? (ii) To what extent do exchange rate regimes moderate the transmission of monetary policy shocks across Asian economies?

To answer these questions, the study will use a panel of high-frequency macroeconomic data from a sample of Asian countries over the period 2000-2021. The analysis will employ a range of econometric techniques, including vector autoregressive (VAR) models, impulse response functions, and panel regressions.

The findings of this study will have significant implications for policymakers in Asian economies, particularly those highly integrated into the global financial system. By shedding light on the spillover effects of monetary policies and the role of exchange rate regimes, this study will provide policymakers with valuable insights into the potential risks and benefits of different exchange rate regimes and inform their decisions regarding monetary policy coordination and exchange rate management.

Furthermore, the study will contribute to the academic literature on the transmission of monetary policy shocks and exchange rate regimes in emerging market economies.

Data and Methodology

Data for this model has been collected from the Databank of the World Bank. The World Bank collects these data from the national statistical systems of the member nations. Therefore the authenticity of the data depends on the degree of accurate representation of the said data by the statistical system of the member nations. The study specifically focuses on the use of short-term interest rates of six Asian Economies (**India, China, Korea, Japan, Indonesia, and Israel**), with the **US** as the Central Economy(CE). We use high-frequency (monthly) data to capture quick-changing dynamics in the money market of the sample economies. The study covers the period from **May 20, 2016, to December 30, 2021**.

We use the methodology of the **spillover index and the associated tools of spillover tables and spillover plots**. The spillover index is a measure used in economics to assess the degree of interdependence between different economic units or regions. The spillover index can be used to analyse the impact of shocks or policy changes in one region on other regions and identify the channels through which these spillovers occur.

In our study, we use a simple covariance stationary two-variable VAR(1) process:

$Y_t = \Phi Y_{t-1} + \varepsilon_t$

As illustrated by **Rohit and Pradyumna(2019)**, the SI for such a case can be represented as

$$SI = \frac{\sum_{k=0}^{h-1} \sum_{i,j=1, i \neq j}^{N} a_{k,ij}^2}{N} \times 100$$

In our study, first, we estimate the SI values for the interest rate linkages in our sample economies. Then to answer the **Mundellian trilemma** through the lens of a time-varying framework, we estimate **rolling window SI** as an indicator for time-varying monetary policy spillover, which helps us to identify smoother time-varying dynamics. Then, we estimate our VAR models for windows of **68 months** incremented by one month. We formulate a recursive VAR model for the Asian economies with the US. Using high-frequency short-term interest rate data, the VAR model demonstrates the degree of interlinkages between the short-term interest rates in the sample economies.

We control for global factors in the VAR model, which may cause interlinkages and co-movement above and beyond what loss of monetary independence would explain. We use the first difference of the interest rates in the model to avoid the possibility of

spurious regression owing to the non-stationarity of the series. Specifically, the VAR model for Asian Economies (VARAE) is as follows:

$$VAR_{AE} : Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \ldots + A_p Y_{t-p} + X_p + \varepsilon_t$$

Here Yt is a vector of length 7 with short-term interest rates of six Asian Economies and the US. The order of the VAR model, i.e., (p), has been chosen as per AIC and SBC criteria. Xt is a vector of two control variables, i.e., **crude oil price** and the **S&P 500 index**. We do not rely on a specific choice of ordering the variables and estimate the values of SI for all of the possible VAR orderings using their algorithm. This provides us with three values for SI, i.e., an average value, a minimum value, and a maximum value using all of the possible orderings for the variables in **VARAE**. A high value of SI is expected to indicate a high degree of monetary policy spillover or a lower degree of monetary autonomy and vice versa.

Empirical Application

We wrote code to import necessary libraries such as pandas, numpy, statsmodels, and matplotlib. It also reads a CSV file containing data related to ST (Short term interest), crude oil, and S&P 500. Then, it performs an Augmented Dickey-Fuller (ADF) test to check whether the time series data is stationary or not. If it is stationary, it means that the statistical properties of the data do not change over time, and it is easier to analyze. Afterwards, the code estimates a Vector Autoregression (VAR) model using the data and summarises the results. A VAR model is a multivariate time series model that considers the relationship between multiple time series variables.

The ADF test output indicates that all the time series data is non-stationary, which means that their statistical properties change over time. However, this is not necessarily a problem since VAR models can handle non-stationary data. The VAR model summary provides the coefficients of the model, which indicate the relationship between each variable and the other variables in the system. The summary also includes some statistical measures, such as the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the FPE (Final Prediction Error), which can be used to compare different models.

From the summary of the regression results, we can see the following:

- The model is a VAR model with seven variables (or equations) and one lag.
- The results table provides the coefficients, standard errors, t-statistics, and p-values for each lagged variable in the model for each of the seven equations.
- The AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) values are reported, which can be used for model selection.
- The results indicate that the lagged values of some of the variables have a statistically significant effect on the current value of the dependent variable in each equation.
  For example, in the equation for STI (India), the lagged value of STI (India) itself, as well as the lagged values of STI (Indonesia), crude oil prices, and S&P 500 index, have statistically significant effects on the current value of STI (India).
- The results also indicate that the lagged values of some of the variables do not have a statistically significant effect on the current value of the dependent variable in each equation.
  For example, in the equation for STI (India), the lagged values of STI (China), STI (Korea), STI (Japan), STI (Israel), and STI (US) do not have statistically significant effects on the current value of STI (India).

- The results also provide information about the goodness of fit of the model, including the log-likelihood, FPE (Final Prediction Error), and the determinant of the estimated covariance matrix.
- Overall, the summary of the regression results suggests that the VAR model may be useful for modelling the relationships between the variables in the dataset, but further analysis and interpretation are needed to fully understand the implications of the model.

We then calculate and plot the impulse response function (IRF) using the results of a VAR (vector autoregression) model. The IRF measures the response of each variable in the VAR model to a one-standard-deviation shock to one of the variables, holding all other variables constant.. The IRF should be orthogonalized, which means that the responses of each variable are adjusted to remove the effects of shocks to other variables.

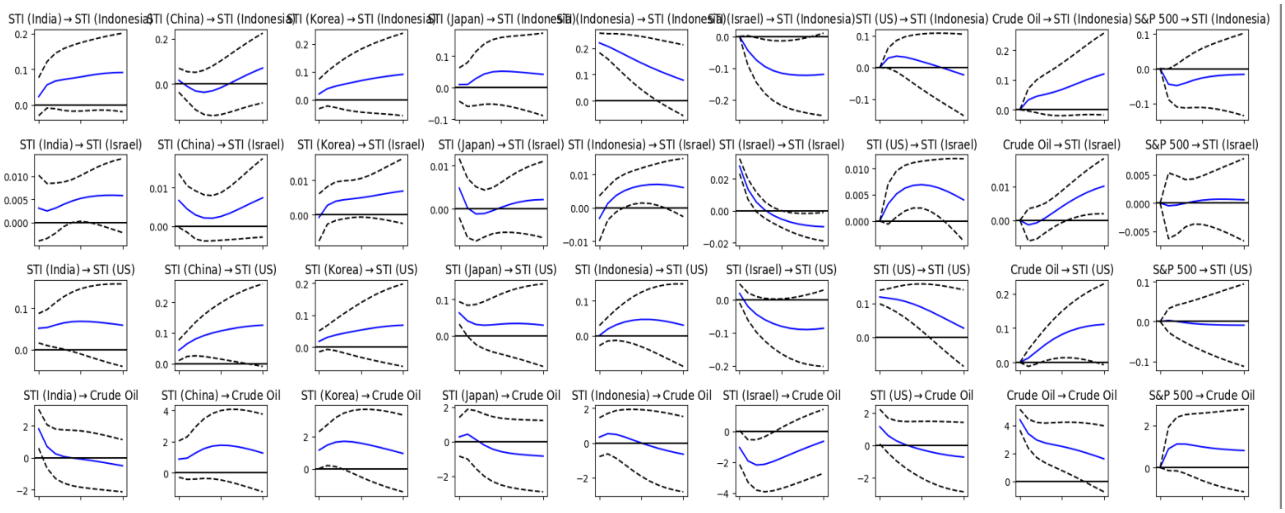
The code calculates and plots the Forecast Error Variance Decomposition (FEVD) of the variables in a VAR model. The FEVD shows the percentage of the forecast error variance of each variable that can be attributed to its own innovations (i.e., own shock) and to the innovations of other variables (i.e., cross-shocks). The FEVD analysis is useful for understanding each variable's relative importance in driving the model's forecast error variance.

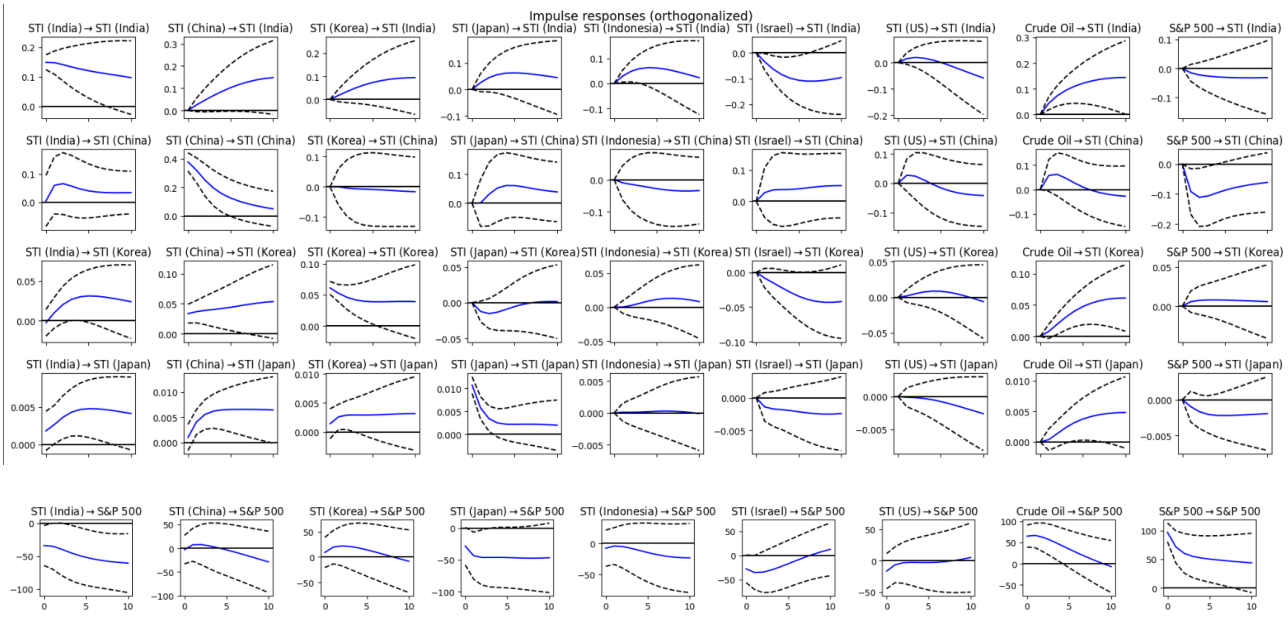
Conclusion

The model used is a VAR (Vector Autoregression) with seven equations.
The results show coefficients, standard errors, t-statistics, and probabilities for each variable in the model.

For each of the six countries in the model (India, China, Korea, Japan, Indonesia, and Israel), there is a constant term and coefficient for the lagged values of the country's own stock market index (STI).
For each country, there are also coefficients for the lagged values of the other countries' stock market indices, crude oil prices, and the S&P 500 index.
The lagged value of STI (India) has a positive and statistically significant coefficient on STI (India) in the next period, as expected.
The lagged value of STI (China) has a positive and statistically significant coefficient on STI (China) in the next period, but the coefficient for STI (India) is not statistically significant.
The lagged value of STI (Korea) has a positive and statistically significant coefficient on STI (Korea) in the next period, and the coefficients for STI (India) and STI (China) are also statistically significant but smaller in magnitude.
The lagged value of STI (Japan) does not have a statistically significant coefficient on STI (Japan) in the next period.

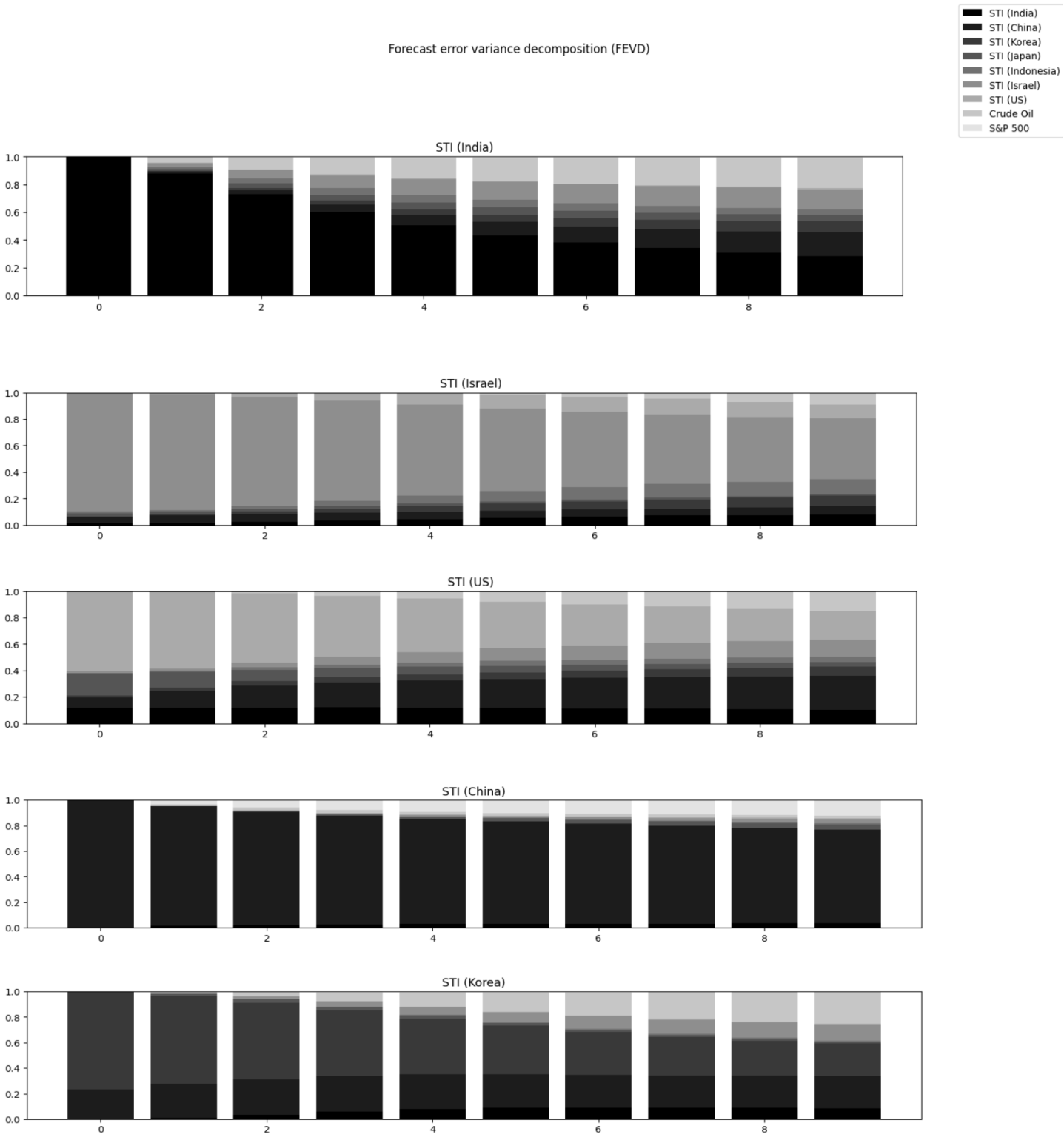
The tables represent the Forecast Error Variance Decomposition (FEVD) for two different stock indexes, STI (India) and STI (China), and several other variables such as STI (Korea), STI (Japan), STI (Indonesia), STI (Israel), S&P 500, Crude Oil, and themselves. The values show the proportion of the forecast error variance for each variable that is attributable to each of the variables in the system over a ten-period forecast horizon.

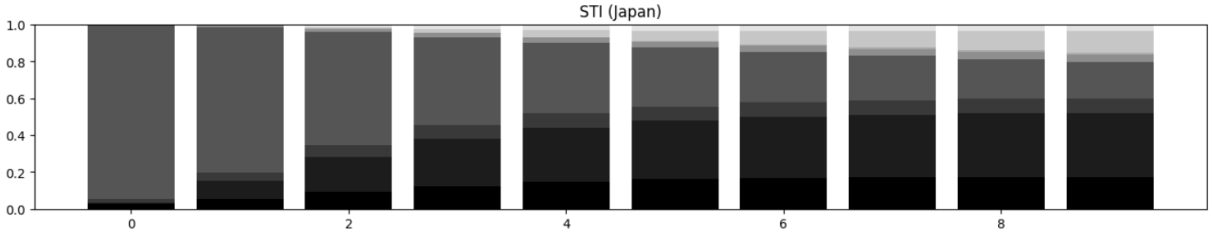


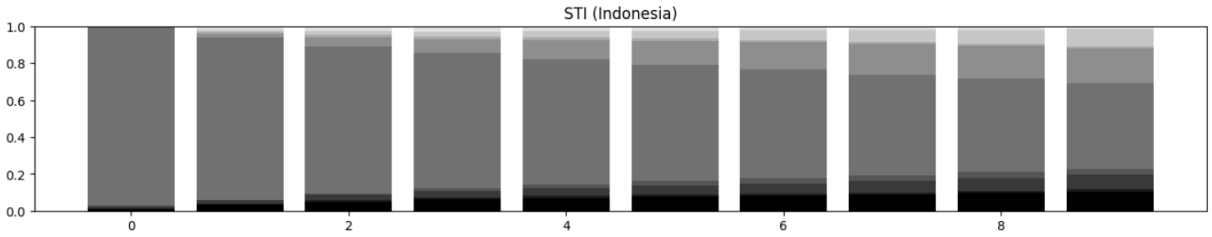


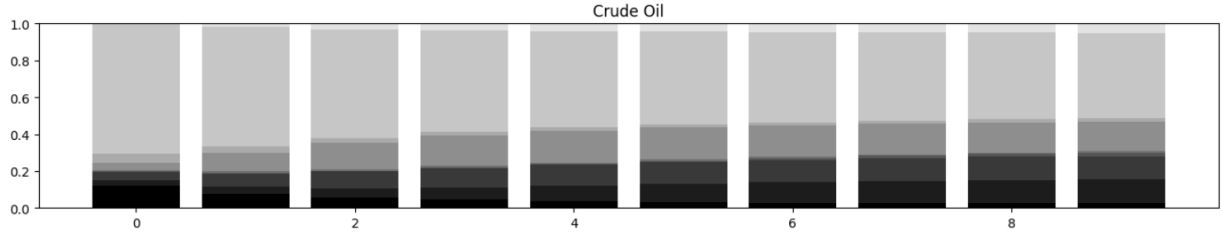
Looking at the FEVD for STI (India), we can see that in period 0, all the forecast error variance is attributed to STI (India) itself, with no contribution from any of the other variables. As we move further down the table, we see that the contribution of STI (India) to the forecast error variance decreases, while the contribution from other variables such as STI (China), STI (Japan), STI (Indonesia), and Crude Oil increases. This suggests that these variables become more important in explaining the variance of the forecast error for STI (India) as we move further into the future.

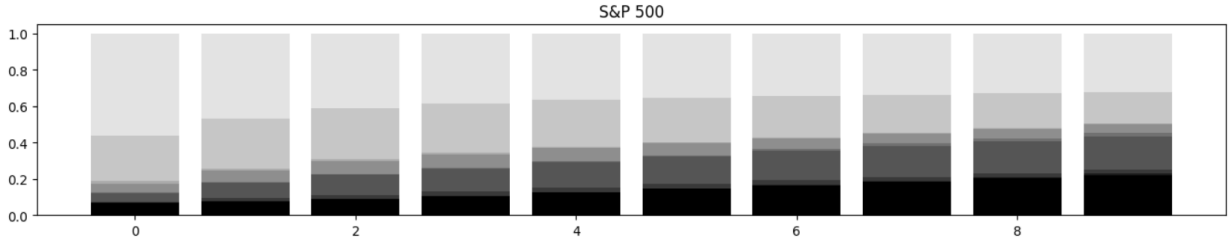
Similarly, looking at the FEVD for STI (China), we see that in period 0, almost all the forecast error variance is attributed to STI (China) itself, with very little contribution from any of the other variables. However, as we move further down the table, we see that the contribution from STI (China) decreases, while the contribution from other variables such as STI (India), STI (Korea), STI (Japan), and S&P 500 increases. This suggests that these variables become more important in explaining the variance of the forecast error for STI (China) as we move further into the future.


Forecast error variance decomposition (FEVD)
STI (India)
STI (China)
STI (Korea)
STI (Japan)
STI (Indonesia)
STI (Israel)
STI (US)
Crude Oil
S&P 500
STI (India)
STI (Israel)
STI (US)
STI (China)
STI (Korea)
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8


STI (Japan)
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8


STI (Indonesia)
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8


Crude Oil
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8


S&P 500
1.0
0.8
0.6
0.4
0.2
0.0
0
2
4
6
8

APPENDIX

Summary of Regression Results

Model:	VAR		
Method:	OLS		
Date:	Wed, 26, Apr, 2023		
Time:	15:31:50		
No. of Equations:	9.00000	BIC:	-18.5593
Nobs:	67.0000	HQIC:	-20.3490
Log likelihood:	-44.6718	FPE:	4.59621e-10
AIC:	-21.5208	Det(Omega_mle):	1.31419e-10

Results for equation STI (India)

	coefficient	std. error	t-stat	prob
const	0.232466	0.554334	0.419	0.675
L1.STI (India)	0.788884	0.074222	10.629	0.000
L1.STI (China)	0.045118	0.031781	1.420	0.156
L1.STI (Korea)	-0.011476	0.185932	-0.062	0.951
L1.STI (Japan)	2.098148	1.588820	1.321	0.187
L1.STI (Indonesia)	0.095167	0.040661	2.340	0.019
L1.STI (Israel)	-0.924863	0.595605	-1.553	0.120
L1.STI (US)	-0.013265	0.059666	-0.222	0.824
L1.Crude Oil	0.012236	0.004499	2.719	0.007
L1.S&P 500	-0.000157	0.000153	-1.025	0.305

Results for equation STI (China)

	coefficient	std. error	t-stat	prob
const	3.430747	1.408411	2.436	0.015
L1.STI (India)	-0.090983	0.188578	-0.482	0.629
L1.STI (China)	0.803037	0.080747	9.945	0.000
L1.STI (Korea)	-0.207579	0.472401	-0.439	0.660
L1.STI (Japan)	-2.590996	4.036756	-0.642	0.521
L1.STI (Indonesia)	-0.100772	0.103310	-0.975	0.329
L1.STI (Israel)	1.175191	1.513268	0.777	0.437
L1.STI (US)	-0.165576	0.151594	-1.092	0.275
L1.Crude Oil	0.027081	0.011432	2.369	0.018
L1.S&P 500	-0.000943	0.000389	-2.424	0.015

Results for equation STI (Korea)

	coefficient	std. error	t-stat	prob
const	-0.596075	0.259819	-2.294	0.022
L1.STI (India)	0.096019	0.034788	2.760	0.006
L1.STI (China)	0.024928	0.014896	1.673	0.094
L1.STI (Korea)	0.848575	0.087147	9.737	0.000
L1.STI (Japan)	-1.012556	0.744686	-1.360	0.174
L1.STI (Indonesia)	-0.001960	0.019058	-0.103	0.918
L1.STI (Israel)	-0.209288	0.279162	-0.750	0.453
L1.STI (US)	0.015278	0.027966	0.546	0.585
L1.Crude Oil	0.000942	0.002109	0.447	0.655
L1.S&P 500	0.000059	0.000072	0.825	0.410

Results for equation STI (Japan)

	coefficient	std. error	t-stat	prob
const	-0.072577	0.040810	-1.778	0.075
L1.STI (India)	0.009008	0.005464	1.648	0.099
L1.STI (China)	0.007610	0.002340	3.253	0.001
L1.STI (Korea)	0.027819	0.013688	2.032	0.042
L1.STI (Japan)	0.549469	0.116969	4.698	0.000
L1.STI (Indonesia)	-0.000848	0.002993	-0.283	0.777
L1.STI (Israel)	-0.047749	0.043848	-1.089	0.276
L1.STI (US)	-0.004542	0.004393	-1.034	0.301
L1.Crude Oil	0.000237	0.000331	0.716	0.474
L1.S&P 500	-0.000010	0.000011	-0.894	0.371

Results for equation STI (Indonesia)

	coefficient	std. error	t-stat	prob
const	1.507835	0.830806	1.815	0.070
L1.STI (India)	-0.004105	0.111240	-0.037	0.971
L1.STI (China)	-0.090969	0.047632	-1.910	0.056
L1.STI (Korea)	0.141579	0.278664	0.508	0.611
L1.STI (Japan)	-1.038312	2.381238	-0.436	0.663
L1.STI (Indonesia)	0.881279	0.060941	14.461	0.000
L1.STI (Israel)	-1.555692	0.892660	-1.743	0.081
L1.STI (US)	0.048023	0.089424	0.537	0.591
L1.Crude Oil	0.014316	0.006744	2.123	0.034
L1.S&P 500	-0.000462	0.000230	-2.014	0.044

Results for equation STI (Israel)

	coefficient	std. error	t-stat	prob
const	-0.081770	0.110124	-0.743	0.458
L1.STI (India)	0.002737	0.014745	0.186	0.853
L1.STI (China)	-0.003062	0.006314	-0.485	0.628
L1.STI (Korea)	0.051111	0.036937	1.384	0.166
L1.STI (Japan)	-0.375494	0.315636	-1.190	0.234
L1.STI (Indonesia)	0.012465	0.008078	1.543	0.123
L1.STI (Israel)	0.449147	0.118323	3.796	0.000
L1.STI (US)	0.028944	0.011853	2.442	0.015
L1.Crude Oil	-0.000230	0.000894	-0.257	0.797
L1.S&P 500	-0.000005	0.000030	-0.161	0.872

Results for equation STI (US)

	coefficient	std. error	t-stat	prob
const	-1.007836	0.567424	-1.776	0.076
L1.STI (India)	0.036744	0.075975	0.484	0.629
L1.STI (China)	0.065276	0.032532	2.007	0.045
L1.STI (Korea)	0.158441	0.190322	0.832	0.405
L1.STI (Japan)	-1.255066	1.626339	-0.772	0.440
L1.STI (Indonesia)	0.063514	0.041622	1.526	0.127
L1.STI (Israel)	-1.264644	0.609669	-2.074	0.038
L1.STI (US)	0.951935	0.061075	15.586	0.000
L1.Crude Oil	0.002482	0.004606	0.539	0.590
L1.S&P 500	0.000027	0.000157	0.174	0.862

Results for equation Crude Oil

	coefficient	std. error	t-stat	prob
const	-18.636288	19.427835	-0.959	0.337
L1.STI (India)	-1.107825	2.601280	-0.426	0.670
L1.STI (China)	0.757487	1.113835	0.680	0.496
L1.STI (Korea)	8.184008	6.516377	1.256	0.209
L1.STI (Japan)	62.413567	55.683633	1.121	0.262
L1.STI (Indonesia)	1.275701	1.425068	0.895	0.371
L1.STI (Israel)	-35.539531	20.874248	-1.703	0.089
L1.STI (US)	0.119346	2.091117	0.057	0.954
L1.Crude Oil	0.637427	0.157693	4.042	0.000
L1.S&P 500	0.009163	0.005368	1.707	0.088

Results for equation S&P 500

	coefficient	std. error	t-stat	prob
const	860.088865	482.753175	1.782	0.075
L1.STI (India)	-83.856477	64.637988	-1.297	0.195
L1.STI (China)	11.047253	27.677166	0.399	0.690
L1.STI (Korea)	175.394231	161.922408	1.083	0.279
L1.STI (Japan)	-2089.900435	1383.656515	-1.510	0.131
L1.STI (Indonesia)	-5.365830	35.410851	-0.152	0.880
L1.STI (Israel)	-378.008544	518.694407	-0.729	0.466
L1.STI (US)	8.031029	51.961199	0.155	0.877
L1.Crude Oil	4.263706	3.918440	1.088	0.277
L1.S&P 500	0.737387	0.133395	5.528	0.000

FEVD for STI (India)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	0.879953	0.012411	0.005957	0.013380	0.017015	0.024082	0.004543	0.038001	0.004658
2	0.727426	0.031944	0.016600	0.030569	0.036273	0.059505	0.006889	0.082362	0.008433
3	0.599755	0.053731	0.028564	0.042892	0.048848	0.091025	0.006555	0.118028	0.010602
4	0.503758	0.075864	0.040103	0.049593	0.054579	0.114277	0.005132	0.144902	0.011792
5	0.433063	0.097430	0.050507	0.052229	0.055456	0.129619	0.003841	0.165395	0.012461
6	0.380512	0.117886	0.059565	0.052351	0.053371	0.138662	0.003361	0.181447	0.012844
7	0.340666	0.136893	0.067285	0.051041	0.049703	0.143046	0.004012	0.194299	0.013054
8	0.309760	0.154254	0.073762	0.048978	0.045368	0.144112	0.005906	0.204708	0.013153
9	0.285245	0.169877	0.079119	0.046569	0.040948	0.142876	0.009039	0.213152	0.013175

FEVD for STI (China)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.000121	0.999879	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	0.013452	0.935743	0.000000	0.000003	0.000350	0.002914	0.002815	0.012712	0.032011
2	0.022376	0.884379	0.000047	0.002784	0.000879	0.005912	0.003793	0.020550	0.059281
3	0.026972	0.848926	0.000139	0.009156	0.001631	0.008433	0.003546	0.022861	0.078335
4	0.029304	0.822992	0.000251	0.016569	0.002708	0.010808	0.003239	0.022392	0.091736
5	0.030655	0.802011	0.000387	0.023155	0.004160	0.013364	0.003549	0.021153	0.101566
6	0.031639	0.783409	0.000563	0.028306	0.005941	0.016278	0.004676	0.020121	0.109067
7	0.032528	0.765959	0.000798	0.032121	0.007925	0.019569	0.006527	0.019615	0.114958
8	0.033438	0.749249	0.001098	0.034919	0.009950	0.023134	0.008892	0.019645	0.119676
9	0.034412	0.733282	0.001461	0.037015	0.011867	0.026802	0.011545	0.020100	0.123515

FEVD for STI (Korea)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.001449	0.231061	0.767490	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	0.011570	0.263573	0.690904	0.016100	0.000001	0.007186	0.000383	0.006768	0.003518
2	0.036160	0.277554	0.599168	0.026848	0.000385	0.020723	0.002006	0.031011	0.006144
3	0.060981	0.277989	0.512123	0.027800	0.001843	0.038920	0.004211	0.068699	0.007433
4	0.078404	0.271730	0.438283	0.023911	0.004251	0.059366	0.005904	0.110323	0.007828
5	0.087600	0.264017	0.379647	0.019237	0.006890	0.079403	0.006573	0.148911	0.007723
6	0.090671	0.257697	0.334838	0.015378	0.009077	0.097072	0.006324	0.181566	0.007377
7	0.090008	0.253804	0.301248	0.012557	0.010467	0.111398	0.005552	0.208026	0.006941
8	0.087377	0.252356	0.276222	0.010550	0.011026	0.122182	0.004687	0.229103	0.006496
9	0.083867	0.252931	0.257526	0.009094	0.010905	0.129681	0.004085	0.245825	0.006085

FEVD for STI (Japan)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.027679	0.008399	0.016219	0.947702	0.000000	0.000000	0.000000	0.000000	0.000000
1	0.056168	0.094569	0.046477	0.786255	0.000077	0.010439	0.000052	0.000808	0.005154
2	0.091866	0.188861	0.065887	0.611732	0.000097	0.018848	0.000134	0.007962	0.014612
3	0.123241	0.255054	0.074236	0.477736	0.000125	0.023842	0.000325	0.022233	0.023209
4	0.145920	0.294849	0.077151	0.384449	0.000192	0.027433	0.000773	0.040089	0.029144
5	0.160366	0.317851	0.078121	0.319846	0.000292	0.030694	0.001659	0.058449	0.032721
6	0.168502	0.331279	0.078621	0.273914	0.000384	0.033839	0.003158	0.075633	0.034670
7	0.172252	0.339395	0.079151	0.240093	0.000430	0.036726	0.005407	0.090945	0.035601
8	0.173126	0.344544	0.079814	0.214316	0.000419	0.039151	0.008493	0.104212	0.035924
9	0.172192	0.347970	0.080572	0.194061	0.000376	0.040975	0.012453	0.115505	0.035895

FEVD for STI (Indonesia)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.010495	0.005535	0.008144	0.001938	0.973889	0.000000	0.000000	0.000000	0.000000
1	0.035300	0.003698	0.018758	0.001931	0.882411	0.019438	0.008588	0.010424	0.019452
2	0.050614	0.008383	0.026630	0.006524	0.800087	0.047416	0.013668	0.019222	0.027457
3	0.060624	0.012366	0.033732	0.013469	0.733441	0.076723	0.015119	0.026309	0.028217
4	0.068682	0.013169	0.040917	0.020000	0.678209	0.104301	0.014646	0.033528	0.026549
5	0.076188	0.011790	0.048356	0.025027	0.630115	0.128723	0.013343	0.042066	0.024392
6	0.083422	0.010150	0.055922	0.028481	0.586128	0.149328	0.011800	0.052437	0.022331
7	0.090182	0.009850	0.063391	0.030620	0.544587	0.165891	0.010363	0.064628	0.020490
8	0.096147	0.011798	0.070540	0.031738	0.504898	0.178487	0.009265	0.078257	0.018869
9	0.101066	0.016259	0.077200	0.032087	0.467113	0.187406	0.008683	0.092744	0.017444

FEVD for STI (Israel)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.011006	0.051330	0.000759	0.026242	0.011429	0.899234	0.000000	0.000000	0.000000
1	0.014341	0.058633	0.007163	0.020793	0.010585	0.877103	0.009586	0.001590	0.000205
2	0.021044	0.060624	0.019112	0.020177	0.020923	0.825192	0.030759	0.001880	0.000289
3	0.031094	0.059334	0.031825	0.019461	0.039196	0.758811	0.057933	0.002078	0.000267
4	0.042861	0.056516	0.043159	0.017679	0.060388	0.689732	0.083745	0.005627	0.000294
5	0.054129	0.053810	0.052611	0.015668	0.079866	0.625918	0.102859	0.014725	0.000414
6	0.063354	0.052688	0.060438	0.014148	0.094806	0.571306	0.113435	0.029251	0.000574
7	0.070020	0.054084	0.067096	0.013269	0.104355	0.526513	0.116334	0.047617	0.000712
8	0.074322	0.058266	0.072973	0.012851	0.108970	0.490292	0.113605	0.067922	0.000800
9	0.076741	0.064992	0.078307	0.012655	0.109674	0.460805	0.107381	0.088608	0.000838

FEVD for STI (US)

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.114068	0.080907	0.013673	0.169423	0.000013	0.015324	0.606591	0.000000	0.000000
1	0.116154	0.128813	0.026241	0.118873	0.007761	0.016810	0.581794	0.003406	0.000148
2	0.118324	0.164976	0.035100	0.086438	0.017649	0.036593	0.525057	0.015770	0.000092
3	0.119050	0.189466	0.041282	0.067138	0.026202	0.058576	0.463242	0.034899	0.000145
4	0.118025	0.206386	0.046201	0.055656	0.032527	0.078303	0.405874	0.056733	0.000295
5	0.115683	0.219200	0.050653	0.048612	0.036616	0.094845	0.355419	0.078501	0.000472
6	0.112602	0.230012	0.054959	0.044022	0.038757	0.108177	0.311984	0.098846	0.000640
7	0.109237	0.239906	0.059193	0.040762	0.039331	0.118522	0.274984	0.117276	0.000789
8	0.105868	0.249353	0.063322	0.038217	0.038732	0.126191	0.243687	0.133713	0.000916
9	0.102643	0.258490	0.067276	0.036066	0.037322	0.131533	0.217398	0.148247	0.001024

FEVD for Crude Oil

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.119427	0.028806	0.048252	0.002688	0.003960	0.040493	0.048049	0.708325	0.000000
1	0.078536	0.035471	0.072408	0.005376	0.008167	0.100634	0.034824	0.647923	0.016660
2	0.056643	0.049587	0.091658	0.004005	0.009324	0.142633	0.025776	0.589912	0.030461
3	0.044289	0.066948	0.105003	0.003644	0.008629	0.164658	0.020154	0.548445	0.038230
4	0.036719	0.083945	0.113603	0.004877	0.007415	0.173552	0.016871	0.520708	0.042310
5	0.031805	0.098769	0.118910	0.007038	0.006411	0.175142	0.015225	0.502080	0.044621
6	0.028548	0.110878	0.122038	0.009620	0.005927	0.172973	0.014795	0.489032	0.046190
7	0.026455	0.120329	0.123709	0.012398	0.006075	0.168976	0.015308	0.479247	0.047503
8	0.025274	0.127382	0.124367	0.015310	0.006877	0.164176	0.016557	0.471284	0.048772
9	0.024873	0.132335	0.124281	0.018352	0.008314	0.159135	0.018367	0.464261	0.050083

FEVD for S&P 500

	STI (India)	STI (China)	STI (Korea)	STI (Japan)	STI (Indonesia)	STI (Israel)	STI (US)	Crude Oil	S&P 500
0	0.068322	0.000506	0.005010	0.048304	0.003783	0.046025	0.016789	0.250173	0.561087
1	0.075744	0.001984	0.015246	0.086606	0.002673	0.064960	0.010410	0.276332	0.466044
2	0.088282	0.002754	0.021949	0.109810	0.002522	0.073211	0.007602	0.281407	0.412462
3	0.104987	0.002614	0.025426	0.125709	0.003157	0.074664	0.006166	0.274831	0.382447
4	0.124300	0.002222	0.026526	0.138583	0.004661	0.071961	0.005333	0.261661	0.364751
5	0.144772	0.002104	0.025992	0.150057	0.007043	0.067012	0.004785	0.244990	0.353245
6	0.165222	0.002678	0.024464	0.160473	0.010156	0.061248	0.004359	0.226851	0.344551
7	0.184742	0.004299	0.022502	0.169647	0.013722	0.055686	0.003976	0.208651	0.336773
8	0.202663	0.007252	0.020574	0.177257	0.017404	0.050957	0.003635	0.191392	0.328866
9	0.218518	0.011717	0.019029	0.183030	0.020871	0.047357	0.003391	0.175776	0.320312