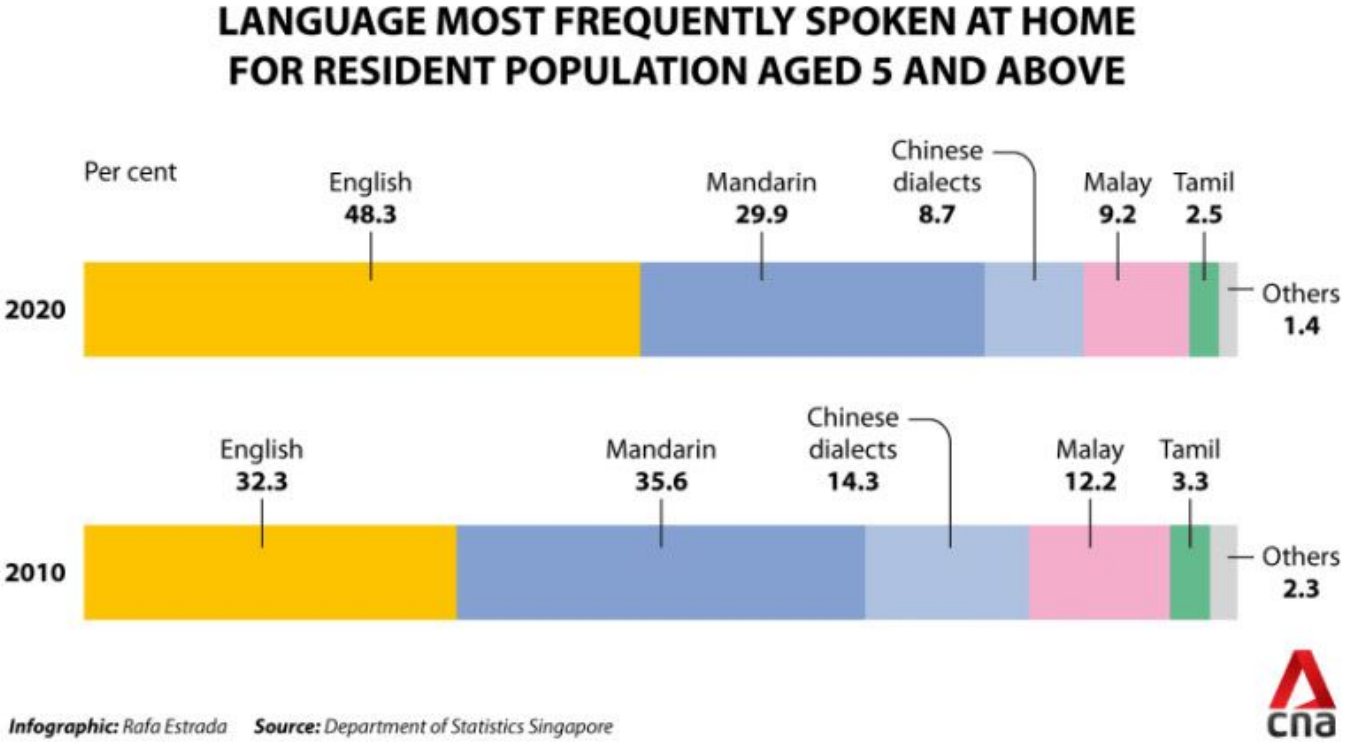
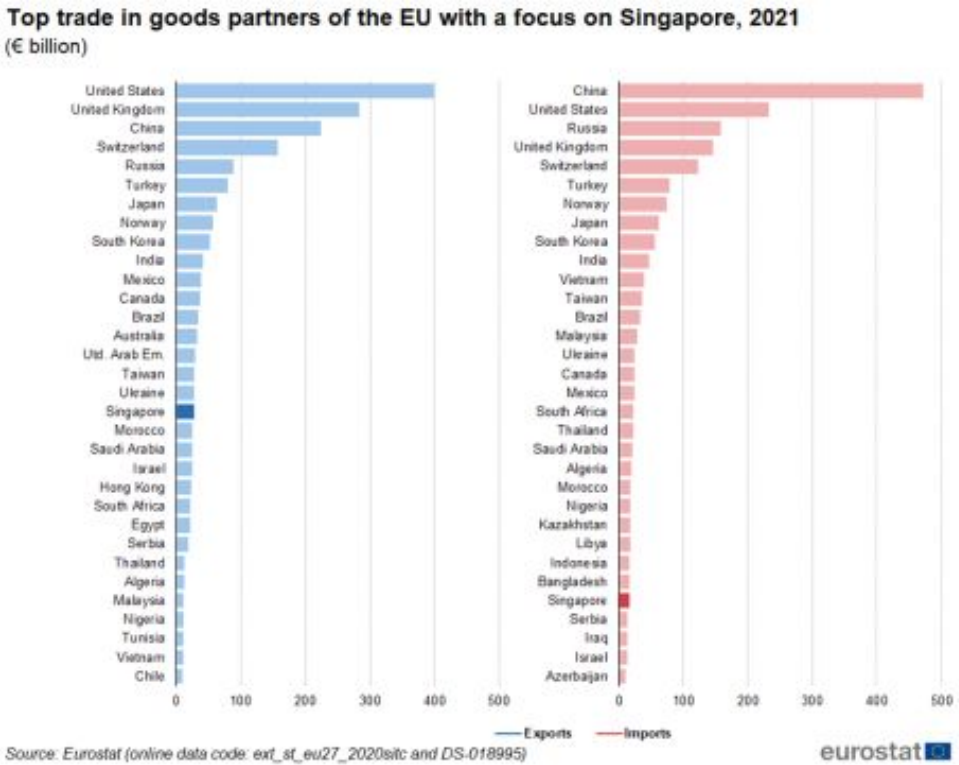
Analyzing China & US. Economic Relationships with Singapore Markets

Motivations

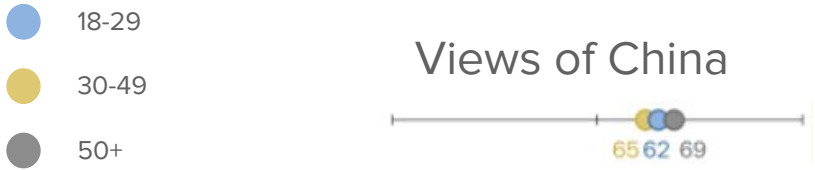
Motivations - Split Relationship - Cultural Ties



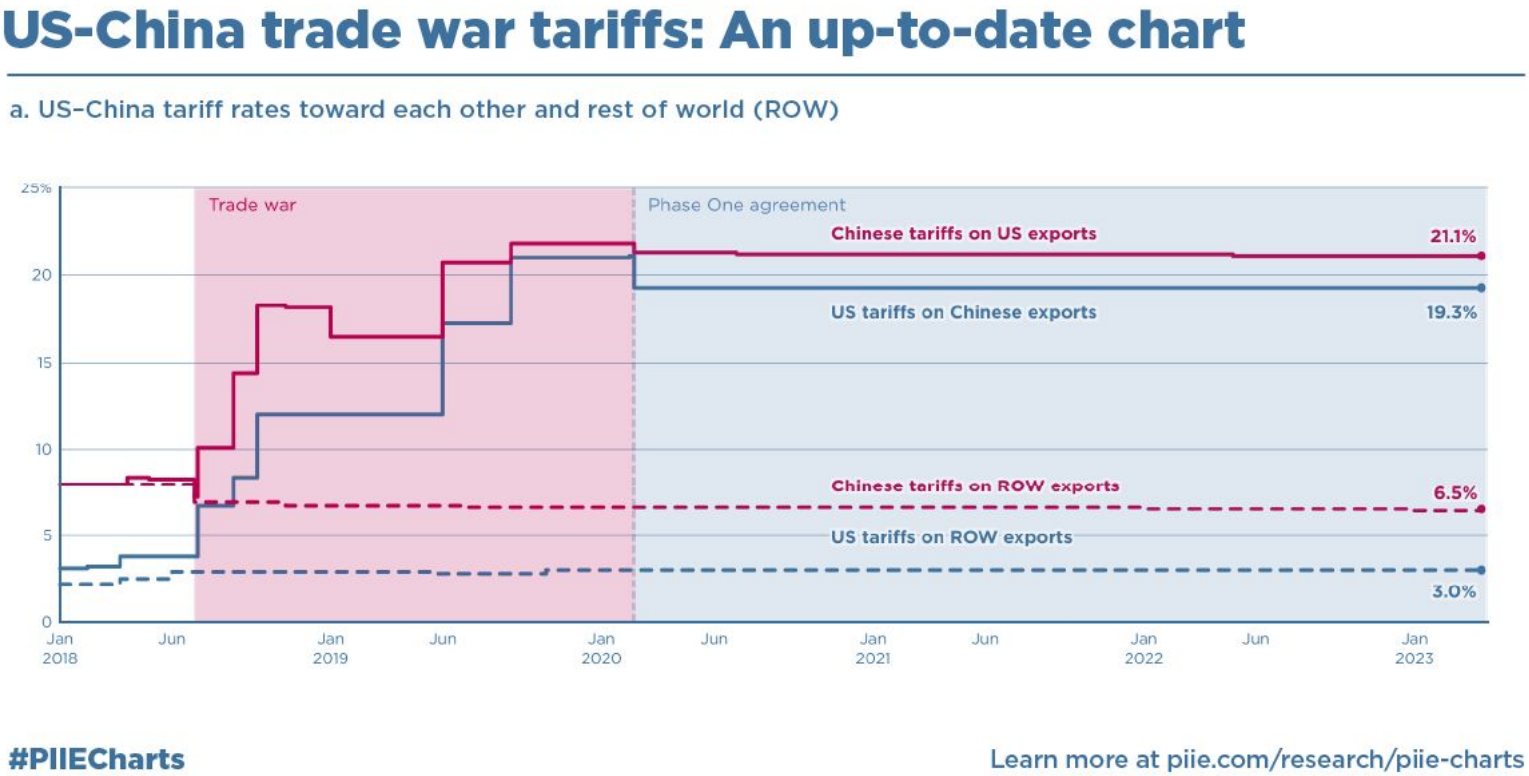
Motivations - Split Relationship - Strong Economic Ties



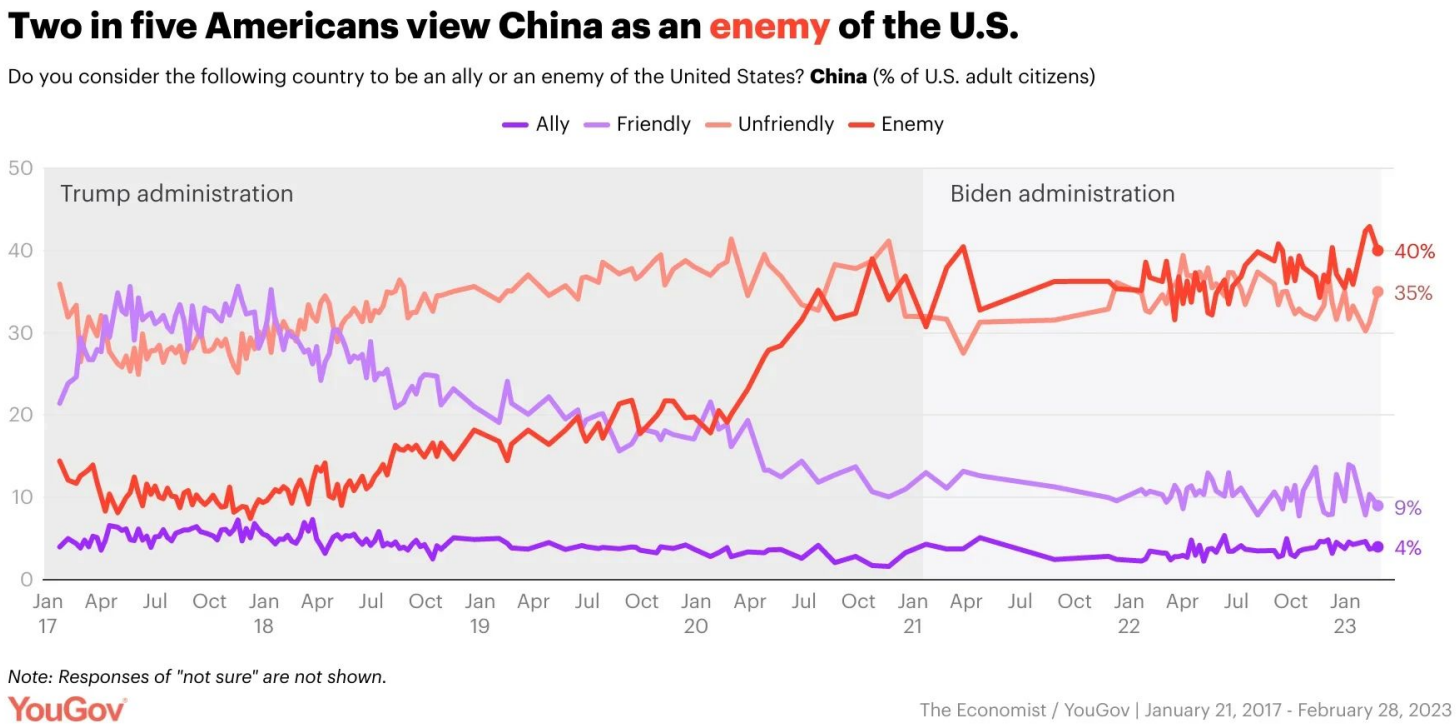
Motivation - Split Relationship - Singapore’s Favorability Ratings



Motivation - Tensions - High Trade Tensions



Motivation - Tensions - US Hostile view of China



Motivations - Middle Powers Stuck In Middle

Research Question

Which Superpower economy (U.S. or China) has a greater relationship with Singapore Financial Markets ?

Hypothesis

H0: The United States & China’s Economies have near equal relationship on Singapore’s markets.

H1: One superpower’s economy has a more substantial relationship with Singapore’s markets.

Literature Review

Theory & Literature Review

- Stock Market Linkages between the Asean Countries, China and the US: A Fractional Integration/cointegration Approach - 2021
  - Fractional Cointegration over a series of asian countries between China & the US
  - Focused on general stock market & financial indices.
  - Found closer long term relationship with United States

Exploring Data

Exploring Data - Description of Data

Singapore

STI: Singapore FTSE Strait Times Index (Investing.com)

United States

SPY: S&P 500 Prices (Investing.com)

US Interest Rates: Discount Rate (FRED)

Production Index United States: Production: Industry: Total Industry Excluding Construction for United States (FRED)

USD: How many Singapore dollars are needed to purchase a US Dollar (Investing.com)

China

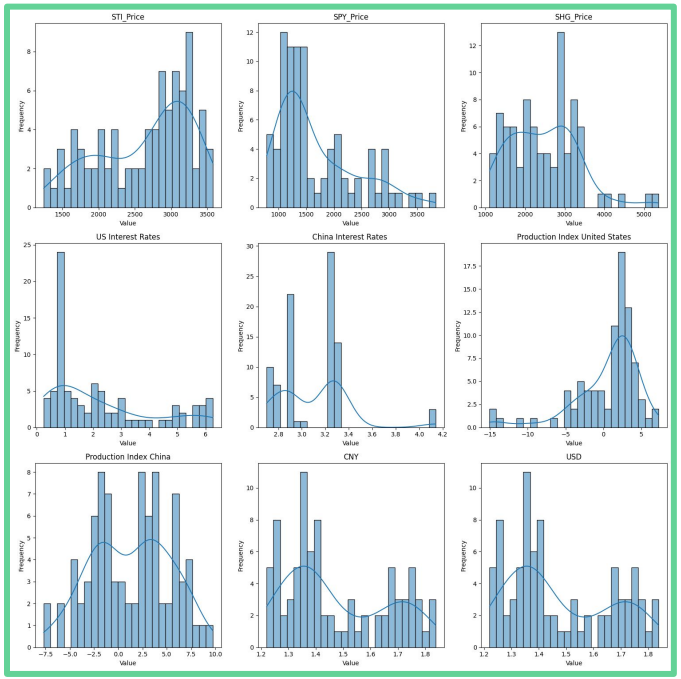
SHG: Shanghai Composite Index Prices

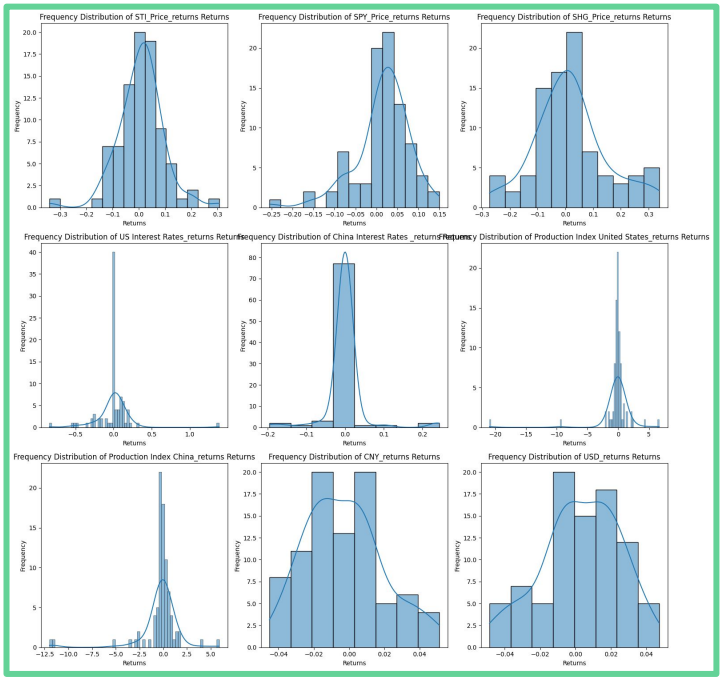
Chinese Interest Rates: Discount Rate (FRED)

Production Index China: Production: Industry: Total Industry Excluding Construction for United China (FRED)

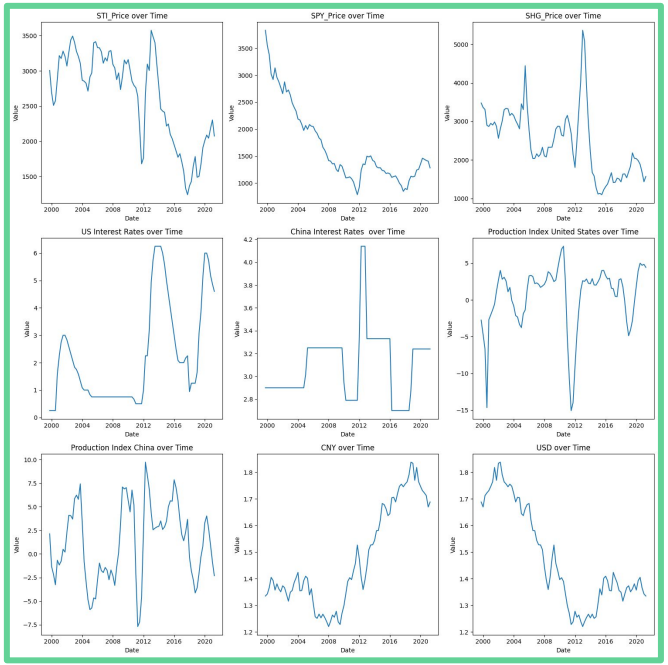
CNY: How many Singapore dollars are needed to purchase a Chinese Yen

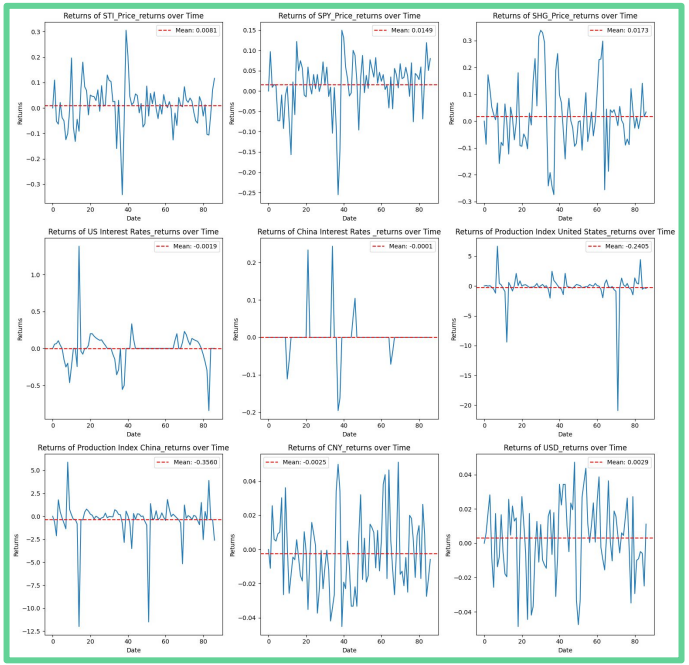
Exploring Data - Analysis - Frequency Distributions





Exploring Data - Analysis - Over Time





Exploring Data - Analysis - Unit Root Tests

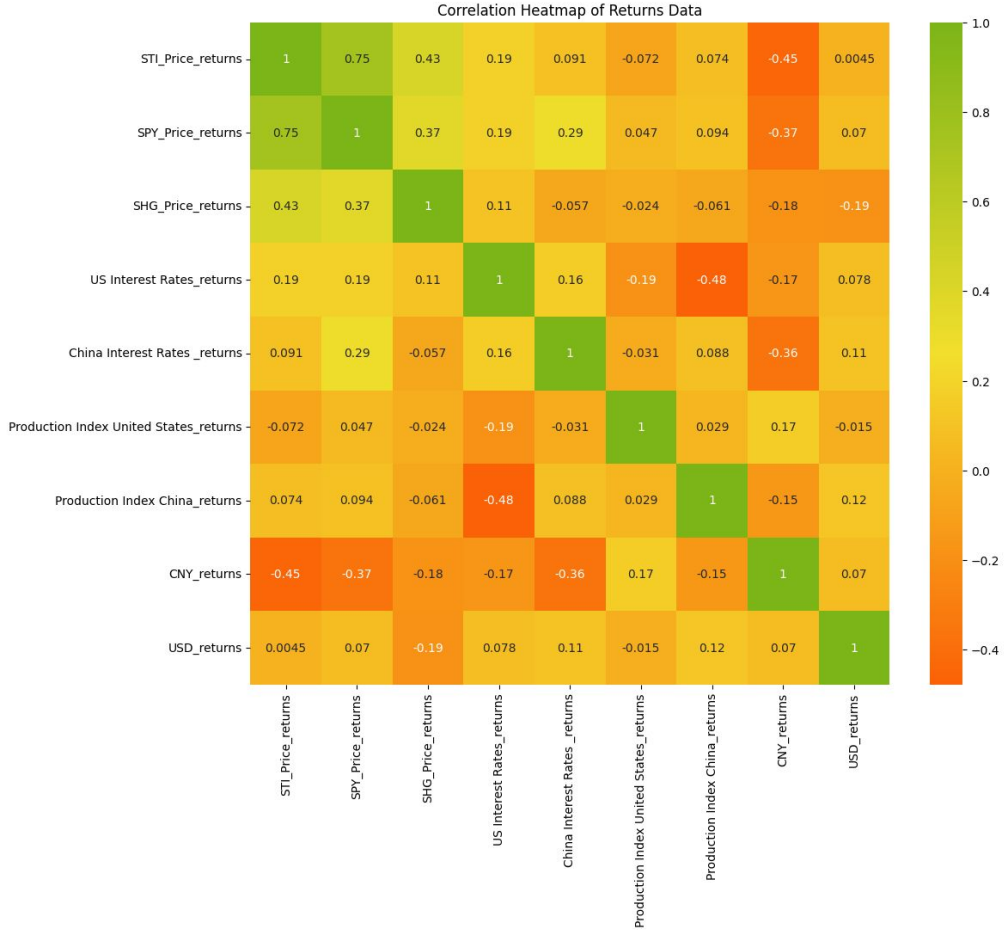
Raw Data

	ADF Statistic	p-value	1%	5%	10%	Stationary
Production Index United States	-4.738997	0.000071	-3.510712	-2.896616	-2.585482	True
US Interest Rates	-3.702849	0.004073	-3.511712	-2.897048	-2.585713	True
China Interest Rates	-3.566120	0.006443	-3.509736	-2.896195	-2.585258	True
Production Index China	-2.570815	0.099180	-3.518281	-2.899878	-2.587223	False
STI_Price	-2.058086	0.261699	-3.509736	-2.896195	-2.585258	False
SHG_Price	-1.998478	0.287241	-3.512738	-2.897490	-2.585949	False
CNY	-1.189168	0.678238	-3.510712	-2.896616	-2.585482	False
USD	-0.731810	0.838337	-3.509736	-2.896195	-2.585258	False
SPY_Price	2.977513	1.000000	-3.508783	-2.895784	-2.585038	False

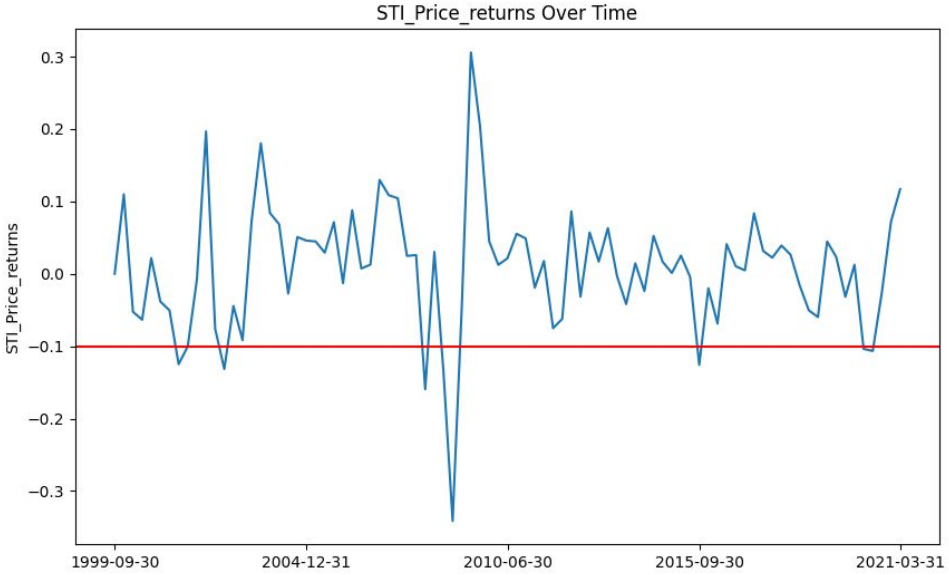
Returns

	ADF Statistic	p-value	1%	5%	10%	Stationary
Production Index China	-9.380165	6.992015e-16	-3.508783	-2.895784	-2.585038	True
Production Index United States	-8.913760	1.086592e-14	-3.508783	-2.895784	-2.585038	True
USD	-7.637972	1.929603e-11	-3.508783	-2.895784	-2.585038	True
US Interest Rates	-7.257332	1.717181e-10	-3.508783	-2.895784	-2.585038	True
SPY_Price	-6.911232	1.210916e-09	-3.508783	-2.895784	-2.585038	True
STI_Price	-6.741941	3.102912e-09	-3.509736	-2.896195	-2.585258	True
CNY	-6.571515	7.914444e-09	-3.509736	-2.896195	-2.585258	True
China Interest Rates	-6.152980	7.484435e-08	-3.510712	-2.896616	-2.585482	True
SHG_Price	-5.366548	3.980530e-06	-3.511712	-2.897048	-2.585713	True

Exploring Data - Cross Correlations - Returns Data



Exploring Data - Crisis Variable



Crisis Quarters:

2001-06-30
2001-09-30
2002-09-30
2008-03-31
2008-09-30
2008-12-31
2015-09-30
2020-03-31
2020-06-30

Internet Crash

2008 Financial Crisis

China 2015 bubble

Covid

Research Methodology & Research

Research - Research Methodology

Steps:

- Cointegration Analysis
- VEC Models
- Granger Causality Tests
- Impulse Response
- Variance Decomposition

Research - VEC Analysis - Cointegration Analysis

Engle-Granger Cointegration Test

Date: 12/04/23 Time: 22:06
Series: STI_PRICE SHG_PRICE
Sample: 1999Q3 2021Q1
Included observations: 87
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
STI_PRICE	-2.825761	0.1684	-15.65905	0.1110
SHG_PRICE	-3.888295	0.0148	-29.28362	0.0040

*MacKinnon (1996) p-values.

Intermediate Results:

	STI_PRICE	SHG_PRICE
Rho - 1	-0.128079	-0.205282
Rho S.E.	0.045325	0.052795
Residual variance	33530.08	79786.43
Long-run residual variance	69370.41	224719.5
Number of lags	1	1
Number of observations	85	85
Number of stochastic trends**	2	2

Engle-Granger Cointegration Test

Date: 12/04/23 Time: 22:04
Series: CNY STI_PRICE
Sample: 1999Q3 2021Q1
Included observations: 87
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
CNY	-3.521603	0.0382	-24.04849	0.0155
STI_PRICE	-4.165185	0.0067	-34.01848	0.0011

*MacKinnon (1996) p-values.

Intermediate Results:

	CNY	STI_PRICE
Rho - 1	-0.177653	-0.233535
Rho S.E.	0.050447	0.056068
Residual variance	0.001820	26508.32
Long-run residual variance	0.004616	77851.96
Number of lags	1	1
Number of observations	85	85
Number of stochastic trends**	2	2

Engle-Granger Cointegration Test

Date: 12/04/23 Time: 22:01
Series: STI_PRICE SPY_PRICE
Sample: 1999Q3 2021Q1
Included observations: 87
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
STI_PRICE	-2.612602	0.2421	-11.99433	0.2357
SPY_PRICE	-3.803318	0.0186	-7.731862	0.4997

*MacKinnon (1996) p-values.

Intermediate Results:

	STI_PRICE	SPY_PRICE
Rho - 1	-0.090579	-0.071897
Rho S.E.	0.034670	0.018904
Residual variance	27975.20	8499.763
Long-run residual variance	67894.83	13605.44
Number of lags	1	1
Number of observations	85	85
Number of stochastic trends**	2	2

View | Proc | Object | Print | Name | Freeze | Sample | Sheet | Stats | Spec

Engle-Granger Cointegration Test

Date: 12/04/23 Time: 22:03
Series: STI_PRICE USD
Sample: 1999Q3 2021Q1
Included observations: 87
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=11)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
STI_PRICE	-2.447767	0.3106	-12.29255	0.2224
USD	-1.451757	0.7816	-3.708460	0.8282

*MacKinnon (1996) p-values.

Intermediate Results:

	STI_PRICE	USD
Rho - 1	-0.099258	-0.043122
Rho S.E.	0.040550	0.029703
Residual variance	41856.78	0.001970
Long-run residual variance	88855.05	0.001970
Number of lags	1	0
Number of observations	85	86
Number of stochastic trends**	2	2

Research - VAR Analysis - Crisis Dummy Variables Lag-12

	STI_PRICE_...	SPY_PRICE...	USD_RETU...	US_INTERE...	PRODUCTI...
R-squared	0.921730	0.941569	0.824779	0.992629	0.977694
Adj. R-squared	0.554464	0.667391	0.002588	0.958039	0.873027
Sum sq. resids	0.043282	0.018625	0.006746	1.605681	32.90571
S.E. equation	0.057701	0.037851	0.022780	0.351446	1.590977
F-statistic	2.509709	3.434152	1.003148	28.69775	9.341037
Log likelihood	173.2358	204.8577	242.9408	37.72736	-75.52632
Akaike AIC	-2.966289	-3.809538	-4.825087	0.647271	3.667369
Schwarz SC	-1.050499	-1.893748	-2.909297	2.563061	5.583159
Mean dependent	0.011884	0.019727	0.003323	1.961467	0.418406
S.D. dependent	0.086446	0.065631	0.022809	1.715685	4.464873

Determinant resid covariance (dof adj.)	1.40E-10
Determinant resid covariance	2.19E-14
Log likelihood	647.2844
Akaike information criterion	-8.994250
Schwarz criterion	0.584701
Number of coefficients	310

	STI_PRICE	SHG_PRICE...	CNY_RETU...	CHINA_INT...	PRODUCTI...
R-squared	0.886788	0.844958	0.786334	0.884459	0.748168
Adj. R-squared	0.355562	0.117451	-0.216253	0.342303	-0.433506
Sum sq. resids	0.062605	0.210116	0.007868	0.022917	89.55978
S.E. equation	0.069396	0.127133	0.024601	0.041986	2.624731
F-statistic	1.669323	1.161444	0.784305	1.631374	0.633142
Log likelihood	159.3945	113.9889	237.1717	197.0815	-113.0736
Akaike AIC	-2.597187	-1.386372	-4.671246	-3.602174	4.668629
Schwarz SC	-0.681397	0.529419	-2.755456	-1.686384	6.584419
Mean dependent	0.011884	0.018868	-0.003664	0.002233	-0.462096
S.D. dependent	0.086446	0.135328	0.022307	0.051771	2.192225

Determinant resid covariance (dof adj.)	7.48E-11
Determinant resid covariance	1.17E-14
Log likelihood	670.8601
Akaike information criterion	-9.622935
Schwarz criterion	-0.043985
Number of coefficients	310

Research - VAR Analysis - Engle Granger Causality Test

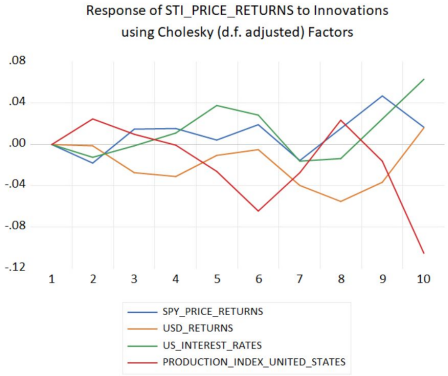
Dependent variable: STI_PRICE_RETURNS

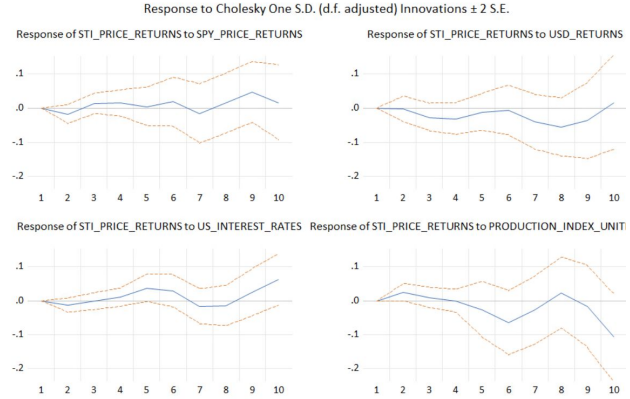
Excluded	Chi-sq	df	Prob.
SPY_PRICE_RETURNS	18.08217	12	0.1132
USD_RETURNS	11.04844	12	0.5248
US_INTEREST_RATES	19.89324	12	0.0691
PRODUCTION_INDEX...	14.56607	12	0.2660
All	59.78296	48	0.1184

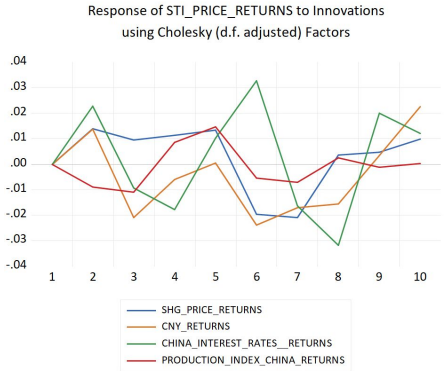
Dependent variable: STI_PRICE_RETURNS

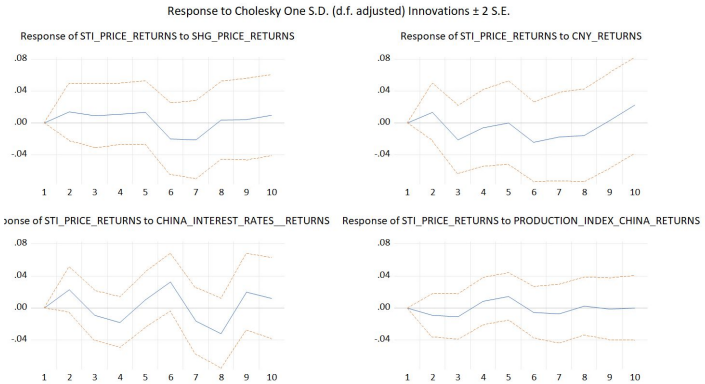
Excluded	Chi-sq	df	Prob.
SHG_PRICE_RETURNS	9.909474	12	0.6239
CNY_RETURNS	6.791385	12	0.8711
CHINA_INTEREST_RA...	15.75222	12	0.2029
PRODUCTION_INDEX...	9.344915	12	0.6732
All	37.31886	48	0.8674

Research - VAR Analysis - Impulse Response

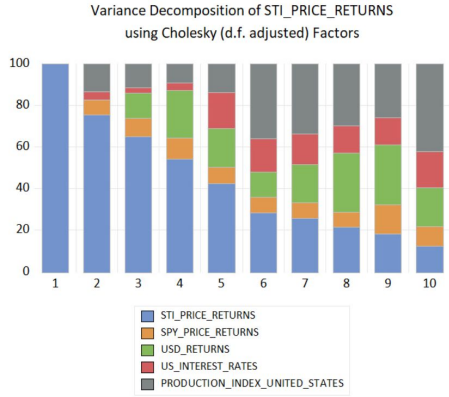


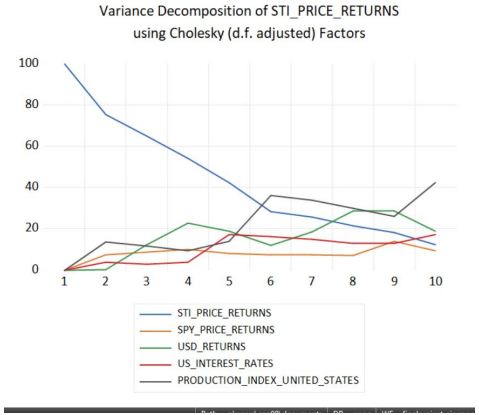


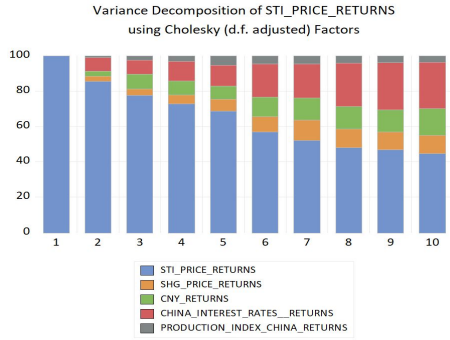


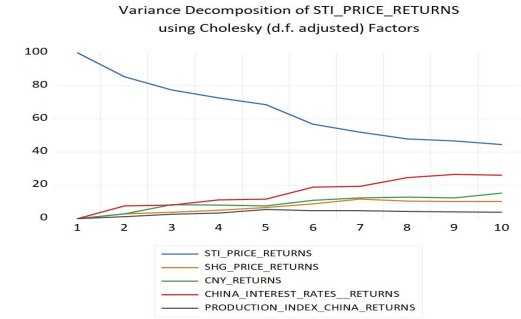


Research - VAR Model - Variance Decomposition









Research - Residual Analysis

Normality Test Jarque Bera

Component	Jarque-Bera	df	Prob.
1	0.005670	2	0.9972
2	1.474088	2	0.4785
3	0.309648	2	0.8566
4	3.343680	2	0.1879
5	5.253672	2	0.0723
Joint	10.38676	10	0.4072

Autocorrelation - Portmanteau Test

Lags	Q-Stat	Prob.*	Adj Q-Stat	Prob.*	df
1	43.65656	---	44.24651	---	---
2	91.51039	---	93.41141	---	---
3	138.7550	---	142.6246	---	---
4	178.5221	---	184.6321	---	---
5	219.1267	---	228.1369	---	---
6	243.0595	---	254.1509	---	---
7	273.4924	---	287.7165	---	---
8	298.5496	---	315.7657	---	---
9	331.2778	---	352.9568	---	---
10	355.7102	---	381.1480	---	---
11	370.2586	---	398.1970	---	---
12	383.0495	---	413.4243	---	---
13	396.4518	0.0000	429.6366	0.0000	25

Component	Jarque-Bera	df	Prob.
1	0.327879	2	0.8488
2	1.222480	2	0.5427
3	2.310084	2	0.3150
4	0.815849	2	0.6650
5	0.102304	2	0.9501
Joint	4.778596	10	0.9055

*Approximate p-values do not account for coefficient estimation

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: No residual autocorrelations up to lag h
Date: 12/05/23 Time: 20:33
Sample: 1999Q3 2021Q1
Included observations: 75

Lags	Q-Stat	Prob.*	Adj Q-Stat	Prob.*	df
1	41.65197	---	42.21483	---	---
2	88.02043	---	89.85366	---	---
3	138.7422	---	142.6888	---	---
4	172.6345	---	178.4906	---	---
5	200.7571	---	208.6219	---	---
6	230.5849	---	241.0435	---	---
7	251.2972	---	263.8879	---	---
8	268.3278	---	282.9520	---	---
9	285.9448	---	302.9713	---	---
10	303.9070	---	323.6969	---	---
11	315.0080	---	336.7059	---	---
12	331.1730	---	355.9500	---	---
13	352.5187	0.0000	381.7714	0.0000	25

Research - ARDL(4) Model - Model Analysis

Dependent Variable: STI_PRICE_RETURNS
Method: ARDL
Date: 12/05/23 Time: 20:55
Sample (adjusted): 2000Q3 2021Q1
Included observations: 83 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): CRISIS(-1) SHG_PRICE_RETUR
NS(-1) CNY_RETURNS(-1) CHINA_INTEREST_RATES(-1)
PRODUCTION_INDEX_CHINA_RETURNS(-1)
Fixed regressors: C
Number of models evalulated: 3072
Selected Model: ARDL(3, 2, 0, 1, 3, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
STI_PRICE_RETURNS(-1)	0.257720	0.162718	1.583845	0.1180
STI_PRICE_RETURNS(-2)	-0.185569	0.138844	-1.336523	0.1860
STI_PRICE_RETURNS(-3)	0.225233	0.126892	1.774992	0.0805
CRISIS(-1)	-0.077080	0.035658	-2.161637	0.0343
CRISIS(-2)	0.063383	0.037163	1.705548	0.0928
CRISIS(-3)	0.066694	0.039512	1.687946	0.0961
SHG_PRICE_RETURNS(-1)	0.032797	0.077164	0.425025	0.6722
CNY_RETURNS(-1)	1.145425	0.437340	2.619071	0.0109
CNY_RETURNS(-2)	-0.609190	0.456379	-1.334834	0.1865
CHINA_INTEREST_RATES(-1)	0.127491	0.061996	2.056420	0.0437
CHINA_INTEREST_RATES(-2)	-0.295419	0.088842	-3.325219	0.0014
CHINA_INTEREST_RATES(-3)	0.049078	0.093834	0.523033	0.6027
CHINA_INTEREST_RATES(-4)	0.115622	0.059015	1.959199	0.0543
PRODUCTION_INDEX_CHINA_RETURN...	-0.003645	0.004186	-0.870605	0.3871
PRODUCTION_INDEX_CHINA_RETURN...	-0.006148	0.004066	-1.511932	0.1353
PRODUCTION_INDEX_CHINA_RETURN...	-0.008416	0.003892	-2.162610	0.0342
C	0.005244	0.105825	0.049557	0.9606

R-squared	0.493341	Mean dependent var	0.008579
Adjusted R-squared	0.370515	S.D. dependent var	0.087801
S.E. of regression	0.069661	Akaike info criterion	-2.309899
Sum squared resid	0.320275	Schwarz criterion	-1.814474
Log likelihood	112.8608	Hannan-Quinn criter.	-2.110865
F-statistic	4.016575	Durbin-Watson stat	1.854019
Prob(F-statistic)	0.000030		

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: STI_PRICE_RETURNS
Method: ARDL
Date: 12/05/23 Time: 20:57
Sample (adjusted): 2000Q3 2021Q1
Included observations: 83 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): CRISIS(-1) SPY_PRICE_RETURN
S(-1) USD_RETURNS(-1) US_INTEREST_RATES(-1)
PRODUCTION_INDEX_UNITED_STATES_RETURNS(-1)
Fixed regressors: C
Number of models evalulated: 3072
Selected Model: ARDL(1, 2, 0, 0, 3, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
STI_PRICE_RETURNS(-1)	0.427761	0.167873	2.548129	0.0130
CRISIS(-1)	-0.006358	0.039987	-0.159010	0.8741
CRISIS(-2)	0.085116	0.033595	2.533592	0.0135
CRISIS(-3)	0.141281	0.036780	3.841214	0.0003
SPY_PRICE_RETURNS(-1)	-0.183305	0.205553	-0.891765	0.3756
USD_RETURNS(-1)	-0.165058	0.383119	-0.430826	0.6679
US_INTEREST_RATES(-1)	-0.049738	0.027009	-1.841535	0.0698
US_INTEREST_RATES(-2)	0.141357	0.045242	3.124437	0.0026
US_INTEREST_RATES(-3)	-0.036247	0.039964	-0.906989	0.3675
US_INTEREST_RATES(-4)	-0.063951	0.025557	-2.502322	0.0147
ODUCTION_INDEX_UNITED_STATES...	-0.000123	0.003107	-0.039653	0.9685
RODUCTION_INDEX_UNITED_STATES...	0.004413	0.003019	1.461585	0.1483
C	0.011072	0.017010	0.650905	0.5172

R-squared	0.397476	Mean dependent var	0.008579
Adjusted R-squared	0.294186	S.D. dependent var	0.087801
S.E. of regression	0.073764	Akaike info criterion	-2.232995
Sum squared resid	0.380875	Schwarz criterion	-1.854140
Log likelihood	105.6693	Hannan-Quinn criter.	-2.080792
F-statistic	3.848161	Durbin-Watson stat	2.105286
Prob(F-statistic)	0.000162		

*Note: p-values and any subsequent tests do not account for model selection.

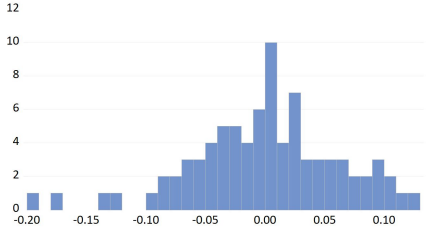
Dependent Variable: STI_PRICE_RETURNS
Method: ARDL
Date: 12/05/23 Time: 20:59
Sample (adjusted): 2000Q3 2021Q1
Included observations: 83 after adjustments
Maximum dependent lags: 3 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): CRISIS(-1) SHG_PRICE_RETUR
NS(-1) CNY_RETURNS(-1) CHINA_INTEREST_RATES(-1)
PRODUCTION_INDEX_CHINA_RETURNS(-1) SPY_PRICE_RETURN
S(-1) USD_RETURNS(-1) US_INTEREST_RATES(-1)
PRODUCTION_INDEX_UNITED_STATES_RETURNS(-1)
Fixed regressors: C
Number of models evalulated: 786432
Selected Model: ARDL(1, 2, 0, 3, 3, 1, 3, 1, 3, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
STI_PRICE_RETURNS(-1)	0.484976	0.164317	2.951473	0.0046
CRISIS(-1)	-0.010733	0.038989	-0.275290	0.7841
CRISIS(-2)	0.181311	0.038345	4.728357	0.0000
CRISIS(-3)	0.163775	0.039401	4.156665	0.0001
SHG_PRICE_RETURNS(-1)	0.003230	0.075812	0.042605	0.9662
CNY_RETURNS(-1)	1.279368	0.421571	3.034764	0.0036
CNY_RETURNS(-2)	-0.897220	0.417066	-2.151263	0.0358
CNY_RETURNS(-3)	0.089529	0.408419	0.219210	0.8273
CNY_RETURNS(-4)	-1.042154	0.424058	-2.457574	0.0171
CHINA_INTEREST_RATES(-1)	0.225178	0.061750	3.646610	0.0006
CHINA_INTEREST_RATES(-2)	-0.356776	0.082965	-4.300314	0.0001
CHINA_INTEREST_RATES(-3)	-0.114648	0.092706	-1.236681	0.2214
CHINA_INTEREST_RATES(-4)	0.283808	0.068792	4.125598	0.0001
PRODUCTION_INDEX_CHINA_RETURN...	0.001822	0.004700	0.387716	0.6997
PRODUCTION_INDEX_CHINA_RETURN...	-0.010644	0.004044	-2.632400	0.0109
SPY_PRICE_RETURNS(-1)	-0.360507	0.209052	-1.724490	0.0901
SPY_PRICE_RETURNS(-2)	0.273807	0.161351	1.696965	0.0953
SPY_PRICE_RETURNS(-3)	0.471385	0.158894	2.966658	0.0044
SPY_PRICE_RETURNS(-4)	-0.239761	0.152740	-1.569733	0.1221
USD_RETURNS(-1)	-0.979960	0.394150	-2.486263	0.0159
USD_RETURNS(-2)	0.642035	0.367256	1.748194	0.0859
US_INTEREST_RATES(-1)	-0.004897	0.024390	-0.200793	0.8416
US_INTEREST_RATES(-2)	0.048901	0.043823	1.115880	0.2692
US_INTEREST_RATES(-3)	0.035736	0.042406	0.842729	0.4030
US_INTEREST_RATES(-4)	-0.084461	0.026532	-3.183385	0.0024
PRODUCTION_INDEX_UNITED_STATES...	0.000365	0.002763	0.132170	0.8953
C	-0.135238	0.104486	-1.294315	0.2009

R-squared	0.675815	Mean dependent var	0.008579
Adjusted R-squared	0.525300	S.D. dependent var	0.087801
S.E. of regression	0.060493	Akaike info criterion	-2.515458
Sum squared resid	0.204928	Schwarz criterion	-1.728606
Log likelihood	131.3915	Hannan-Quinn criter.	-2.199345
F-statistic	4.490030	Durbin-Watson stat	1.835046
Prob(F-statistic)	0.000001		

*Note: p-values and any subsequent tests do not account for model selection.

Research - ARDL Model - Residual Analysis

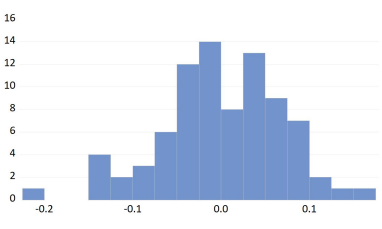


Series: Residuals	
Sample 2000Q3 2021Q1	
Observations 83	
Mean	1.64e-16
Median	0.001809
Maximum	0.121894
Minimum	-0.193152
Std. Dev.	0.062496
Skewness	-0.480060
Kurtosis	3.620943
Jarque-Bera	4.521433
Probability	0.104276

Date: 12/05/23 Time: 20:55
Sample: 1999Q3 2021Q1
Included observations: 83
Q-statistic probabilities adjusted for 3 dynamic regressors

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.061	0.061	0.3222	0.570
		2	0.035	0.031	0.4272	0.808
		3	0.063	0.060	0.7823	0.854
		4	-0.160	-0.170	3.0682	0.546
		5	0.025	0.043	3.1240	0.681
		6	0.147	0.155	5.1030	0.531
		7	0.091	0.096	5.8743	0.555
		8	0.010	-0.049	5.8844	0.660
		9	0.011	-0.007	5.8968	0.750
		10	-0.159	-0.129	8.3456	0.595
		11	-0.117	-0.082	9.6978	0.558
		12	0.005	-0.002	9.7005	0.642
		13	-0.076	-0.075	10.288	0.670
		14	-0.027	-0.063	10.361	0.735
		15	0.048	0.040	10.599	0.780
		16	-0.207	-0.166	15.095	0.518
		17	-0.112	-0.072	16.432	0.493
		18	-0.082	-0.057	17.168	0.512
		19	-0.037	0.041	17.322	0.568
		20	0.086	0.058	18.156	0.577
		21	0.086	0.051	18.993	0.586
		22	-0.001	-0.002	18.993	0.646
		23	0.022	0.059	19.051	0.698
		24	-0.083	-0.077	19.871	0.704
		25	-0.129	-0.106	21.881	0.643
		26	0.017	-0.046	21.918	0.693
		27	0.034	-0.023	22.067	0.734
		28	-0.047	-0.116	22.354	0.765
		29	0.218	0.183	28.580	0.487
		30	0.083	0.089	29.494	0.492
		31	-0.129	-0.089	31.748	0.429
		32	-0.011	-0.076	31.765	0.478
		33	-0.112	-0.068	33.543	0.441
		34	0.050	0.086	33.902	0.472
		35	-0.011	-0.139	33.921	0.520
		36	0.017	-0.040	33.962	0.566

*Probabilities may not be valid for this equation specification.

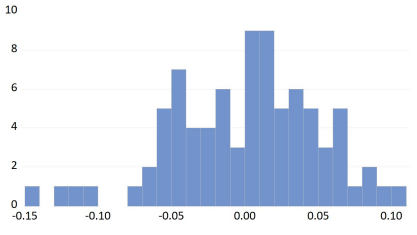


Series: Residuals	
Sample 2000Q3 2021Q1	
Observations 83	
Mean	1.03e-16
Median	-0.001071
Maximum	0.160890
Minimum	-0.213810
Std. Dev.	0.068153
Skewness	-0.392788
Kurtosis	3.409423
Jarque-Bera	2.713954
Probability	0.257438

Date: 12/05/23 Time: 20:58
Sample: 1999Q3 2021Q1
Included observations: 83
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.060	-0.060	0.3067	0.580
		2	-0.133	-0.137	1.8513	0.396
		3	0.039	0.022	1.9823	0.576
		4	-0.055	-0.071	2.2523	0.689
		5	-0.059	-0.061	2.5690	0.766
		6	-0.070	-0.099	3.0242	0.806
		7	-0.148	-0.180	5.0467	0.654
		8	0.052	-0.000	5.3026	0.725
		9	0.023	-0.029	5.3548	0.802
		10	-0.000	-0.004	5.3548	0.866
		11	0.151	0.123	7.5770	0.751
		12	0.014	0.012	7.5975	0.816
		13	-0.007	0.016	7.6026	0.868
		14	0.018	0.001	7.6374	0.907
		15	0.037	0.075	7.7819	0.932
		16	-0.073	-0.039	8.3393	0.938
		17	-0.043	-0.009	8.5405	0.954
		18	0.052	0.084	8.8286	0.964
		19	0.038	0.051	8.9873	0.974
		20	0.079	0.121	9.6871	0.973
		21	0.013	0.047	9.7063	0.982
		22	-0.117	-0.102	11.298	0.970
		23	0.111	0.095	12.754	0.957
		24	-0.085	-0.097	13.612	0.955
		25	-0.212	-0.178	19.061	0.794
		26	0.093	0.038	20.129	0.785
		27	0.003	-0.014	20.130	0.825
		28	-0.149	-0.168	22.965	0.735
		29	0.055	-0.055	23.354	0.760
		30	0.161	0.126	26.815	0.633
		31	0.129	0.087	29.062	0.566
		32	0.006	-0.010	29.067	0.616
		33	-0.195	-0.158	34.438	0.399
		34	0.035	-0.029	34.614	0.438
		35	-0.024	-0.055	34.699	0.483
		36	-0.161	-0.087	38.609	0.353

Probabilities may not be valid for this equation specification.



Series: Residuals	
Sample 2000Q3 2021Q1	
Observations 83	
Mean	6.66e-17
Median	0.005632
Maximum	0.102874
Minimum	-0.143196
Std. Dev.	0.049991
Skewness	-0.453423
Kurtosis	3.155477
Jarque-Bera	2.927632
Probability	0.231352

Date: 12/05/23 Time: 21:00
Sample: 1999Q3 2021Q1
Included observations: 83
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.081	0.081	0.5677	0.451
		2	-0.120	-0.127	1.8225	0.402
		3	-0.059	-0.039	2.1308	0.546
		4	-0.244	-0.256	7.4330	0.115
		5	-0.014	0.015	7.4519	0.189
		6	-0.010	-0.088	7.4620	0.280
		7	0.027	0.017	7.5280	0.376
		8	0.080	-0.001	8.1298	0.421
		9	0.064	0.067	8.5197	0.483
		10	-0.158	-0.197	10.923	0.364
		11	0.023	0.099	10.973	0.446
		12	0.102	0.062	11.999	0.446
		13	-0.179	-0.175	15.222	0.294
		14	0.041	0.029	15.398	0.352
		15	0.119	0.126	16.865	0.327
		16	-0.148	-0.196	19.173	0.260
		17	-0.220	-0.292	24.324	0.111
		18	-0.089	-0.021	25.190	0.120
		19	0.069	0.071	25.708	0.139
		20	0.201	0.021	30.243	0.066
		21	0.061	-0.053	30.669	0.079
		22	-0.129	-0.109	32.607	0.068
		23	0.076	0.052	33.281	0.076
		24	-0.091	-0.082	34.275	0.080
		25	-0.099	0.033	35.457	0.080
		26	0.047	-0.090	35.736	0.097
		27	0.075	0.040	36.447	0.106
		28	-0.009	-0.056	36.459	0.131
		29	0.079	0.128	37.264	0.140
		30	0.139	0.069	39.823	0.108
		31	0.007	0.037	39.830	0.133
		32	-0.076	-0.111	40.628	0.141
		33	-0.088	0.056	41.712	0.142
		34	0.082	0.059	42.686	0.146
		35	0.078	-0.056	43.581	0.151
		36	-0.031	0.049	43.721	0.176

*Probabilities may not be valid for this equation specification.

Research - Interpretation

Accept the null hypothesis: Due to the ARDL model having a stronger relationship from Chinese Economic variables & the US economic variables having a stronger short term variation than China. Therefore there is no conclusive evidence that China has a significantly stronger relationship even though it is arguably slightly stronger due to the models proposed here from ARDL & Cointegration.

Policy Implications

Policy Implications

- Singapore should remain agnostic culturally & economically between these 2 superpowers and continue to split their growth off the backs of these superpowers.
    - Continue trade relationships and investment flows to each country.
    - Continue to stabilize culture to not favor one side or the other.

Future Research

- Understand Economic Relationship between China & US between every Pacific & American Middle Economic Superpower

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