

Appendix

Descriptive Statistic

Date: 12/09/20 Time: 18:14 Sample: 7/01/2010 6/30/2020				
	COMPOSITE	S_P_500_RE	SSEC_RETU	STI_RETURN
Mean	0.000256	0.000494	0.000107	-6.29E-05
Median	0.000442	0.000692	0.000551	5.23E-05
Maximum	0.101907	0.093830	0.057635	0.060718
Minimum	-0.088804	-0.119840	-0.084909	-0.073529
Std. Dev.	0.010615	0.011048	0.013371	0.008544
Skewness	-0.393745	-0.725387	-0.820476	-0.489651
Kurtosis	12.10295	20.09257	8.809273	11.06388
Jarque-Bera	8031.843	28310.33	3505.888	6348.321
Probability	0.000000	0.000000	0.000000	0.000000
Sum	0.590074	1.141389	0.247964	-0.145154
Sum Sq. Dev.	0.260072	0.281726	0.412616	0.168501
Observations	2309	2309	2309	2309

Unit Root Test

Null Hypothesis: SSEC LOG has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=26)				
		t-Statistic	Prob.*	
Augmented Dickey-Fuller test statistic		-2.157525	0.2223	
Test critical values:		1% level	-3.433016	
		5% level	-2.862604	
		10% level	-2.567382	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(SSEC LOG)				
Method: Least Squares				
Date: 02/10/21 Time: 21:48				
Sample (adjusted): 7/02/2010 6/30/2020				
Included observations: 2285 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SSEC_LOG(-1)	-0.003294	0.001527	-2.157525	0.0311
C	0.011362	0.005254	2.162565	0.0307
R-squared	0.002035	Mean dependent var	2.96E-05	
Adjusted R-squared	0.001598	S.D. dependent var	0.005868	
S.E. of regression	0.005863	Akaike info criterion	-7.439266	
Sum squared resid	0.078491	Schwarz criterion	-7.434247	
Log likelihood	8501.362	Hannan-Quinn criter.	-7.437436	
F-statistic	4.654912	Durbin-Watson stat	1.970389	
Prob(F-statistic)	0.031089			

Null Hypothesis: STI LOG has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=26)				
Augmented Dickey-Fuller test statistic				
Test critical values:	1% level	-2.635967	0.0958	
	5% level	-3.432884		
	10% level	-2.862548		
MacKinnon one-sided p-values				
Augmented Dickey-Fuller Test Equation Dependent Variable: D(STI LOG) Method: Least Squares Date: 02/10/21 Time: 21:50 Sample (adjusted): 7/02/2010 6/30/2020 Included observations: 2396 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	P-ob.
STILOG(-1)	-0.008160	0.002237	-3.652867	0.0004
0	0.02407	0.00370	2.634825	0.0085
R-squared	0.002894	Mean dependent var	-8.33E-06	
Adjusted R-squared	0.002477	S.D. dependent var	0.003769	
S.E. of regression	0.003765	Akaike info criterion	-8.325514	
Sum squared resid	0.033928	Schwarz criterion	-8.320668	
Log likelihood	9975.986	Hannan-Quinn criter.	-8.333758	
F-statistic	6.948320	Durbin-Watson stat	2.014763	

Null Hypothesis: SPSODLO has a unit root Exogenous: Constant Lag Length: 8 (Automatic - based on SIC, maxlag=26)				
Test critical values:				
	1% level	-3.432764		
	5% level			
	10% level	-2.597322		
MacKinnon one-sided p-values				
Augmented Dickey-Fuller Test Equation Dependent Variable: D(S_P500LOG) Method: Least Squares Date: 02/10/21 Time: 21:49 Sample (adjusted): 7/15/2010 6/30/2020 Included observations: 2508 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	P-ob.
S_P500LOG(-1)	-0.000879	0.000702	-1.252537	0.2105
D(S_P500LOG(-1))	-0.130121	0.019963	-6.518134	0.0000
D(S_P500LOG(-2))	0.081329	0.020009	4.054859	0.0000
D(S_P500LOG(-3))	-0.013372	0.020052	-0.666871	0.5049
D(S_P500LOG(-4))	-0.066181	0.020060	-3.300825	0.0010
D(S_P500LOG(-5))	-0.020045	0.020065	-0.999008	0.3179
D(S_P500LOG(-6))	-0.060522	0.020028	-3.021795	0.0025
D(S_P500LOG(-7))	0.108796	0.019998	5.440358	0.0000
D(S_P500LOG(-8))	-0.071570	0.019957	-3.586235	0.0006
C	0.003107	0.002314	1.343007	0.1784
R-squared	0.064487	Mean dependent var	0.000180	
Adjusted R-squared	0.061117	S.D. dependent var	0.004773	
S.E. of regression	0.004625	Akaike info criterion	-7.910835	
Sum squared resid	0.053427	Schwarz criterion	-7.887600	
Log likelihood	9930.187	Hannan-Quinn criter.	-7.902401	
F-statistic	19.13280	Durbin-Watson stat	1.981154	
Prob(F-statistic)	0.000000			

Null Hypothesis: SSEC LOG has a unit root Exogenous: Constant Lag Length: 0 (Automatic - based on SIC, maxlag=26)				
Augmented Dickey-Fuller test statistic				
Test critical values:	1% level	-2.1d753d	0Td3	
	5% level	-3.433016		
	10% level	-2.862604		
. one-sided p-values .				
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Met end Least SquaD				
ncluded" @rvat'ot's: t'2S5 aft.r tdi -strr ent*				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SSEC LOG(-1)	-0.06320	0.011362	-2.51525	0.01307
R-squared	0.002035	Mean dependent var	2.96E-05	
Adjusted R-squared	0.001598	S.D. dependent var	0.005888	
S.E. of regression	0.005863	Akaike info criterion	-7.439266	
Sum squared resid	0.078491	Schwarz criterion	-7.434247	
Log likelihood	8501.362	Hannan-Quinn criter.	-7.437436	
F-statistic	4.654912	Durbin-Watson stat	1.970389	
Prob(F-statistic)	0.031068			

Null Hypothesis: D(COMPOSITE LOG) has a unit root Exogenous: Constant Lag Length: 3 (Automatic - based on SIC, maxlag=26)				
			t-Statistic	Prob.
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Test clcal yalues	" evel	-2.7S44T?	DODDO	
	10% leve	-2.567321		
. MacKi- Dn i" 10@i one-sidcc o-yalues				
DeDencent V riaL e: Di"C DM POS T E**LOG .2 :				
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Sample -wjuste,d 7.0n'201D 8'3D.2D20				
I c ded ohse-various 2512 a'ter w iusme'ts				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(COMPOSITE_LOG(-1))	-1.070419	0.038442	-27.84479	0.0000
D(COMPOSITE_LOG(-1),2)	0.136209	0.032848	4.146598	0.0000
D(COMPOSITE_LOG(-2),2)	0.135428	0.027161	4.986141	0.0000
D(COMPOSITE_LOG(-3),2)	0.067910	0.019925	3.408212	0.0007
C	9.67E-05	9.23E-05	1.047248	0.2951
R-squared	0.469044	Mean dependent var	-6.98E-07	
Adjusted R-squared	0.469098	S.D. dependent var	0.006346	
Log likelihood	0044.018	Hanna--Quinn- criter	-7.8E1@11	
F-statistic	SMS.6721	Ei rbin-'A asc-- stat	1.99636a	

Null Hypothesis: D(S_P500LOG) has a unit root Exogenous: Constant Lag Length: 7 (Automatic - based on SIC, maxlag=26)				
Augmented Dickey-Fuller test statistic Test values: 1% level -18.87140 0.0BD 5% level -34.3N84 10% level -2.862492 -2.597322				
*1.2811 one-sided p-values.				
Augmented Dickey-Fuller Test Equation Dependent Variable: D(S_P500LOG,2) Method: Least Squares Date: 02/10/21 Time: 21:50 Sample (adjusted): 7/1 5/2010 6/30/2020 Included observations: 2505 Aker adi-elm ents				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(S_P500LOG(-1))	7.7	2	3.8	fl
D(S_P500LOG(-1),2)			lat ,::	t2
D(S_P500LOG(-2),2)				
D(S_P500LOG(-3),2)				
D(S_P500LOG(-4),2)				
D(S_P500LOG(-5),2)	-0.18	30008	-L23597	02B0
D(S_P500LOG(-6),2)				
D(S_P500LOG(-7),2)	0.0DD212	OFIN—0o	2.27434 1	£LD230
C				
R-squared	0.597543	Mean dependent var	2.67E-06	
Adjusted R-squared	0.596254	S.D. dependent var	0.007279	
S.E. of regression	0.004625	Akaike info criterion	-7.911005	
Sum squared resid	0.053460	Schwarz criterion	-7.890093	
Log likelihood	9929.400	Hannan-Quinn criter.	-7.903414	
F-statistic	463.7940	Durbin-Watson stat	1.961219	
Prob(F-statistic)	0.000000			
Null Hypothesis: D(STI LOG) has a unit root Exogenous: Constant Lag Length: 1 (Automatic - based on SIC, maxlag=26)				
Augmented Dickey-Fuller test statistic Test values: 1% level -31.60375 0.0000 5% level -3.483021 10% level -2.862492 -2.597383				
Mac-Khnon *1.2891 one-sided p-values.				
Augmented Dickey-Fuller Test Equation Dependent Variable: D(STI LOG,2) Method: Least Squares Date: 02/10/21 Time: 21:51 Sample (adjusted): 7/07/2010 6/30/2020 Included observations: 2282 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(STI LOG(-1))	-0.946376	0.029683	-31.90375	0.0000
D(STI LOG(-1),2)	-0.057051	0.020853	-2.735848	0.0063
C	2.10E-05	7.91E-05	0.265661	0.7905
R-squared	0.502737	Mean dependent var	1.05E-05	
Adjusted R-squared	0.502301	S.D. dependent var	0.005359	
S.E. of regression	0.003750	Akaike info criterion	-8.317d51	
Sum squared resid	0.032557	Schwarz criterion	-8.309515	
Log likelihood	9492.755	Hannan-Quinn criter.	-8.314302	
F-statistic	1152.044	Durbin-Watson stat	2.007284	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(SSEC LOG) has a unit root Exogenous: Constant Lag Length: 1 (Automatic - based on SIC, maxlag=26)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-32.29564	0.0000
Test critical values:	1% level		-3.433183	
	5% level		-2.862678	
	10% level		-2.567422	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation Dependent Variable: D(SSEC LOG,2) Method: Least Squares Date: 02/10/21 Time: 21:48 Sample (adjusted): 7/07/2010 6/24/2020 Included observations: 2158 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(SSEC LOG(-1))	-0.979159	0.030319	-32.29564	0.0000
D(SSEC LOG(-1),2)	-0.002454	0.021545	-0.113920	0.9093
C	-2.45E-05	0.000127	-0.192423	0.8474
R-squared	0.489738	Mean dependent var	1.16E-05	
Adjusted R-squared	0.489264	S.D. dependent var	0.008279	
S.E. of regression	0.005917	Akaike info criterion	-7.420846	
Sum squared resid	0.075444	Schwarz criterion	-7.412754	
Log likelihood	8009.877	Hannan-Quinn criter.	-7.417759	
F-statistic	1034.159	Durbin-Watson stat	2.007318	
Prob(F-statistic)	0.000000			

Correlation

	STI_LOG	SSEC_LOG	COMPOSITE	S_P500LOG
STI_LOG	1.000000	0.178542	0.472349	0.268204
SSEC_LOG	0.178542	1.000000	0.390215	0.462921
COMPOSITE	0.472349	0.390215	1.000000	0.915595
S_P500LOG	0.268204	0.462921	0.915595	1.000000

Cointegration

Date: 02/10/21 Time: 21:09 Sample (adjusted): 7/07/2010 6/24/2020 Included observations: 2015 after adjustments Trend assumption: Linear deterministic trend Series: STI_LOG SSEC_LOG COMPOSITE_LOG S_P500LOG Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank test "Trace"				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.088576	30.32071	47.85814	0.4844
At most 1	0.084358	16.47753	28.79707	0.6784
At most 2	0.083021	6.62454	15.48477	0.6243
Jrzt test mo+cafes no cointegraa at the 0.05 level * denotes scion of the bYp04 esis at the d.BN level				
Unrestricted Cointegration Rank test "Maximum Eigenvalue"				
Mo. of CE's	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.088576	17.8444	27.5844	0.6882
At most 1	0.083021	6.62454	15.48477	0.6243
Hair-e@envalue test mo+cafes no cointegraa at the 0.05 level * denotes scion of the bYp04 esis at the d.BN level				
Unrestricted Cointegration Coefficients "Normalized by bTMS 1 T b=T):				
STI_LOG	SSEC_LOG	COMPOSITE	S_P500LOG	
20.25700	-1.377540	-37.85122	20.94135	
M3T#2W	1.105W3	2.340755	2.84000	
-17.73174	0.658622	3.472038	5.600181	
Unrestricted Adjustment Coefficients (alpha):				
DI ? TI LOG	-0.800786	-3.92E-05	-0.800786	1.99E-04
D(SSEC_LOG)	-3.85E-05	-0.000403	-3.72E-05	9.82E-08
D(COMPOSITE)	0.000199	-3.85E-05	-0.000199	2.23E-05
D(S_P500LOG)	-7.45E-05	-5.70E-05	-0.800786	-6.23E-05
1 Cointegration Equation(s): Log likelihood 32422.47				
Normalized cointegration coefficients (standard error in parentheses)				
1 BBdOB	0.889083	0.88555	0.033753	
	(0.16659)	(0.35933)	(0.23094)	
D(STI_LOG)	-0.003770			
	(0.00154)			
D(SSEC_LOG)	-0.000780			
	(0.00265)			
D(COMPOSITE)	0.004037			
	(0.00199)			
D(S_P500LOG)	-0.001489			
	(0.00217)			
2 Cointegration Equation(s): Log likelihood 32407.44				
STI_LOG	SSEC_LOG	COMPOSITE	S_P500LOG	
1.000000	0.000000	-2.001064	1.082145	
		(0.38994)	(0.24193)	
0.000000	1.000000	-1.948640	0.711158	
		(0.90262)	(0.56002)	

D(STI LOG)	-0.003224 (0.00187)	-0.000257 (0.00100)
D(SSEC LOG)	0.004840 (0.00321)	-0.005226 (0.00172)
D(COMPOSIT)	0.004546 (0.00242)	-0.000753 (0.00130)
D(S P500LOG)	-0.000894 (0.00263)	-0.000846 (0.00141)

3 Cointegrating Equation(s):	Log likelihood	32600.36
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Normalized cointegrating coefficients (standard error in parentheses)			
STI LOG	SSEC LOG	COMPOSITE	S P500LOG
1.000000	0.000000	0.000000	0.064243 (0.10627)
0.000000	1.000000	0.000000	-0.280076 (0.17967)
0.000000	0.000000	1.000000	-0.508680 (0.07434)

Adjustment coefficients (standard error in parentheses)			
D(STI_LOG)	D(SSEC_LOG)	D(COMPOSIT)	D(S P500LOG)
-0.006745 (0.00270)	-0.001047 (0.00109)	0.007121 (0.00289)	
0.003890 (0.00462)	-0.005439 (0.00187)	0.000543 (0.00495)	
-0.000454 (0.00348)	-0.001875 (0.00141)	-0.007390 (0.00373)	
-0.005306 (0.00379)	-0.001681 (0.00154)	0.002867 (0.00406)	

Lag Length Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: S P 500			SPX	INDEX	VALUE SHANGHAI	STOCK
Exogenous variables: C						
Date: 02/06/21 Time: 14:15						
Sample: 7/01/2010 6/30/2020						
Included observations: 1401						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-41122.97	NA	3.70e+20	58.71087	58.72585	58.71647
1	-27522.09	27104.66	1.40e+12	39.31776	39.39264	39.34575
2	-27283.76	473.6049	1.02e+12	39.00037	39.13515*	39.05075
3	-27241.04	84.63877	9.80e+11	38.96223	39.15691	39.03500*
4	-27221.07	39.45679	9.74e+11	38.95657	39.21114	39.05173
5	-27199.00	43.48943	9.66e+11	38.94789	39.26236	39.06544
6	-27173.54	50.01781	9.53e+11	38.93438	39.30875	39.07433
7	-27156.95	32.48859	9.52e+11	38.93354	39.36781	39.09588
8	-27103.28	104.8374	9.02e+11	38.87975	39.37392	39.06447
9	-27086.70	32.25980	9.02e+11	38.87894	39.43301	39.08606
10	-27048.52	74.11247*	8.74e+11*	38.84729*	39.46125	39.07679

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

VAR Test

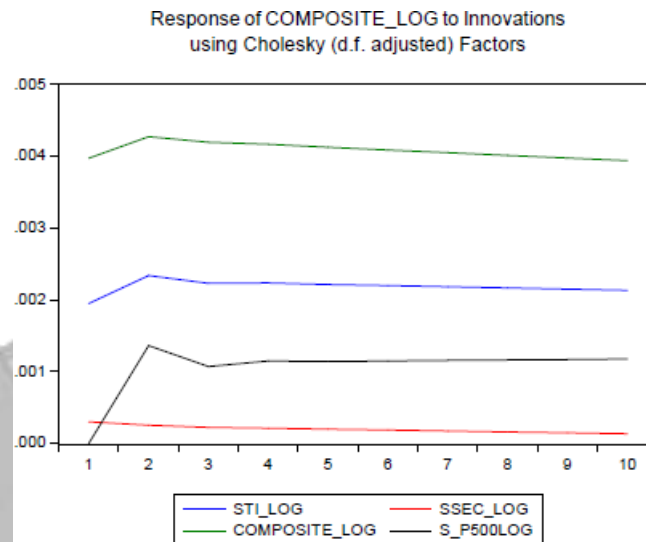
Vector Autoregression Estimates				
Date: 02/10/21 Time: 22:50				
Sample (adjusted): 7/08/2010 6/24/2020				
Included observations: 2111 after adjustments				
Standard errors in () & t-statistics in []				
	STI_LOG	SSEC_LOG	S_P500LOG	COMPOSITE
STI_LOG(-1)	0.867323 (0.02510) [34.5534]	-0.025224 (0.04249) [-0.59360]	0.022198 (0.03505) [0.63339]	-0.077112 (0.03228) [-2.38672]
STI_LOG(-2)	0.125915 (0.02513) [5.01124]	0.027962 (0.04254) [0.65738]	-0.025847 (0.03508) [-0.73674]	0.077912 (0.03231) [2.41104]
SSEC_LOG(-1)	-0.031454 (0.01376) [-2.28608]	0.987526 (0.02329) [42.3976]	-0.006148 (0.01921) [-0.32002]	-0.025681 (0.01769) [-1.45135]
SSEC_LOG(-2)	0.030176 (0.01374) [2.19572]	0.006836 (0.02327) [0.29383]	0.004192 (0.01919) [0.21845]	0.023818 (0.01767) [1.34759]
S_P500LOG(-1)	0.305776 (0.01629) [18.7678]	0.204453 (0.02756) [7.41273]	0.825173 (0.02275) [36.2742]	0.313781 (0.02095) [14.9751]
S_P500LOG(-2)	-0.309153 (0.01633) [-18.9313]	-0.202858 (0.02765) [-7.33792]	0.173486 (0.02280) [7.60878]	-0.308611 (0.02100) [-14.6944]
COMPOSITE_LOG(-1)	0.000586 (0.01865) [0.03140]	-0.007796 (0.03158) [-0.24691]	-0.011862 (0.02604) [-0.45549]	1.036915 (0.02399) [43.2266]
COMPOSITE_LOG(-2)	0.006014 (0.01864) [0.32253]	0.008492 (0.03156) [0.26906]	0.014197 (0.02603) [0.54534]	-0.046352 (0.02398) [-1.93307]
C	0.014713 (0.00833) [1.76630]	0.001941 (0.01410) [0.13768]	0.015494 (0.01163) [1.33213]	0.021460 (0.01071) [2.00318]
R-squared	0.989029	0.994666	0.998686	0.997100
Adj. R-squared	0.988987	0.994646	0.998681	0.997089
Sum sq. resid	0.024884	0.071601	0.048706	0.041324
S.E. equation	0.003448	0.005836	0.004814	0.004434
F-statistic	23685.94	48999.31	199708.3	90344.98
Log likelihood	8978.661	7867.366	8274.059	8447.547
Akaike AIC	-8.498021	-7.445160	-7.830468	-7.994834
Schwarz SC	-8.473912	-7.421051	-7.806359	-7.970725
Mean dependent	3.492106	3.439458	3.293027	3.688084
S.D. dependent	0.032852	0.079763	0.132545	0.082181
Determinant resid covariance (dof adj.)	1.07E-19			
Determinant resid covariance	1.05E-19			
Log likelihood	34143.20			
Akaike information criterion	-32.31378			
Schwarz criterion	-32.21735			
Number of coefficients	36			

Granger Causality Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 02/10/21 Time: 23:14
Sample: 7/01/2010 6/30/2020
Included observations: 2111

Dependent variable: COMPOSITE_LOG			
Excluded	Chi-sq	df	Prob.
STI_LOG	5.815252	2	0.0546
SSEC_LOG	3.720236	2	0.1557
S_P500LOG	228.0627	2	0.0000
All	232.0484	6	0.0000

Impulse Response



Variance Decomposition

Period	S.E.	STI LOG	SSEC LOG	COMPOSIT S	P500LOG
1	0.003448	19.28849	0.456092	80.25542	0.000000
2	0.005124	20.42263	0.338920	75.15202	4.086427
3	0.006219	20.59415	0.292652	74.77360	4.339591
4	0.007168	20.71210	0.265819	74.37406	4.648021
5	0.007990	20.78255	0.245925	74.13873	4.832798
6	0.008729	20.83446	0.229747	73.95005	4.985748
7	0.009402	20.87476	0.215797	73.79386	5.115575
8	0.010024	20.90784	0.203378	73.65639	5.232384
9	0.010603	20.93590	0.192100	73.53148	5.340512
10	0.011147	20.96029	0.181734	73.41520	5.442771

Cholesky Ordering: STI_LOG SSEC_LOG COMPOSITE_LOG S_P500LOG

Variance Decomposition of COMPOSITE_LOG using Cholesky (d.f. adjusted) Factors

