

CROSS-BORDER LINKAGES BETWEEN THE GLOBAL RUBBER SPOT AND FUTURES MARKETS

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Abstract:

This paper investigates the linkage between the spot and futures markets of rubber globally. The daily spot price data of rubber in India, Malaysia and Thailand from 4th January 2016 to 2nd November 2022 have been collected from the website of the Association of Natural Rubber Producing Countries (ANRPC); for the same period, the rubber future daily price has been collected from the website of investing.com. The correlation, the Granger causality test, the Johansen cointegration test and the Vector error correction models (VECM) have been applied to test the linkages. The results of the Granger causality and the correlation coefficients revealed the causality between global spot and futures markets for rubber. Johansen's cointegration results justify using VECM; the error correction terms revealed that the correction to the long-term equilibrium would be adjusted in the spot price series. The price of SRU and STF rubber futures traded at Singapore Exchange (SGX) lead the spot price of rubber in India, Malaysia, and Thailand. The study outcomes would help the stakeholders of the rubber industry globally.

Keywords: price transmission; lead-lag; causality; cointegration; vector error correction model; econometric

1. Introduction

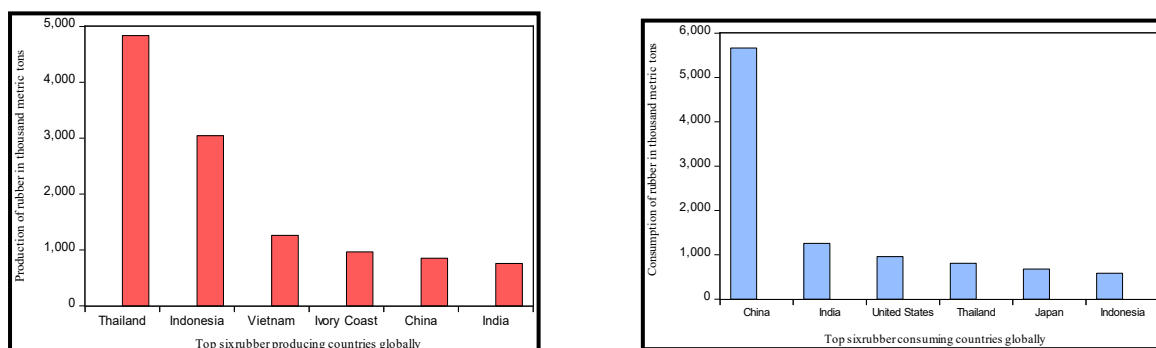
The risk-return linkages and the price transmission process in different financial markets have become the agenda for many academicians today (Golitsis et al. 2022; Jiang et al. 2022; Kishor 2022; Raza et al. 2022; Renzhi 2022; Su et al. 2022; Zheng & Pan 2022). Increased price volatility, international trades, dynamic currency and oil prices have made the commodity and financial markets more volatile; rubber is not exceptional for that (Ahoba & Gaspard 2019; Janda et al. 2021; Kaewsompong et al. 2016; Wei Su et al. 2019; Zunxin et al. 2018).

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China, India, the United States, Thailand and Japan are the largest consumers of rubber in the world rubber market. As the economy in India and China are booming, the demand for rubber in these countries is increasing rapidly (Wei Su et al. 2019).

In the financial year 2021, Thailand, Indonesia, Vietnam, Ivory Coast, China and India are the top six rubber-producing countries globally. The production and consumption data of the top six countries for the year 2021 are presented in Figure 1. Even though China, India and the United States are the major rubber-consuming countries, they are not the top-producing countries. This production-consumption gap has increased rubber import-export activities globally (Kumar et al. 2021).

Figure 1. Rubber production and consumption in 2021 by the top six producing and consuming countries globally.



Source: (Statista 2022)

The liberalisation policies of the major developing countries have exposed the domestic markets to the global market, resulting in increased price volatility in the domestic markets (Ahoba & Gaspart 2019). In addition to the global demand-supply gap, cross-border trades expose the rubber price to currency exchange risk (Butt et al. 2020). One of the alternatives to natural rubber is a synthetic rubber, which is one of the by-products of crude oil; hence, the price of rubber is dependent on global crude oil price (Kumar et al. 2021). Any commodity traded in spot, derivatives and export-import markets will have a global demand-supply influence, shaping the price and volatility of such commodities in the domestic market (Nadig & Viswanathan 2021); rubber is one such commodity.

Futures on commodities were introduced globally to manage and reduce price volatility through the flow of information between the cash and futures markets (Choudhary & Bajaj 2013). Several studies have concluded that the futures price series lead the spot price series and the futures prices will contribute to the price discovery process of the underlying for example (Choudhary & Bajaj 2013; Penone & Trestini 2022; Zheng & Pan 2022). However, rubber futures are actively traded only in SGX, Singapore; Shanghai Futures Exchange, China, and Tokyo Commodity Exchange (TOCOM), Japan. Except in China, rubber futures are not traded in the top-producing countries shown in Figure 1. Developing countries like India have introduced rubber trading a couple of times; the pressure from the

tyre makers has made it irregular in the market (Kumar et al. 2021). Hence, examining the price transmission process and the linkage between the spot and futures price series of rubber in the global market is the need of the hour. This study does that for the rubber futures series traded at TOCOM and SGX with the spot price series in India, Malaysia and Thailand.

2. Literature Review

Several academic works have been published on price determinants, production–consumption, and import-export analysis of rubber.

The demand-supply gap in the international market, the price of synthetic rubber, oil price, currency exchange rates and the import-export activities are the key price determinants for rubber in the international market (Arunwarakorn et al. 2017; Basri et al. 2018; Burger et al. 2002; Fong et al. 2020; K V Raju 2016; Khin et al. 2017; Khin et al. 2019; Khin et al. 2019; Lekshmi et al. 1996). A few studies have given short-term and long-term price forecast models for rubber (Khin et al. 2008; Sakan 2012; Zahari et al. 2017).

The price transmission between the world cash rubber market and the Ivorian marker, price transmission in the Asian rubber market and the analysis of price bubbles in the international rubber market has been studied by (Ahoba & Gaspart 2019; Kaewsompong et al. 2016 and Wei Su et al. 2019) respectively. The price transmission and the hedging feasibility study for natural rubber with crude futures were done by (Kumar et al. 2021). None of the studies reviewed above focused on the price transmission between the cash and futures market for rubber in the global market.

Various academic professionals have extensively covered price transmission in agricultural markets. Spatial and vertical price transmission is the broad categories of such studies. Spatial price transmission studies of (Abdulai 2000; Ahoba & Gaspart 2019; Barboza et al. 2022; Goodwin & Holt 1999; Kaewsompong et al. 2016; Pierre & Kaminski 2019) have examined the price and volatility transmission of agricultural commodities in different markets; may be locally or globally.

Findings on asymmetric price transmission in various stages of the supply chain of meat and agricultural commodities were given by (Lim & Ahn 2020; Loginova & Irek 2022; Raeder et al. 2022; Thazhugal Govindan Nair 2021). A segment of spatial price transmission analysis is the analysis of price and volatility transmission between the spot and futures series of any assets. Studies by Nadig & Viswanathan (2021), Penone & Trestini(2022) and Thazhugal Govindan Nair(2021) found that the futures on agricultural spices and commodities futures are dominating in price discovery and the volatility shocks flow from futures to the spot market.

The major aims of these studies were to examine the response of spot prices to future market shocks and to understand the magnitude of price transmission in two markets. The present research is related to spatial transmission; However, a different research wing has examined the price transmission from TOCOM and SGX rubber future series to spot rubber price series of India, Thailand, and Malaysia.

3. Material and methods

The spot rubber prices in India, Thailand and Malaysia from 4th January 2016 to 2nd November 2022 are taken from the website of (ANRPC 2022). These sample series are taken based on the availability of data on the website of the ANRPC. For the same period, the prices of the SRU, STF and JRU rubber futures traded at SGX and TOCOM have been gathered from the website (Investing.com 2022).

To examine the linkages and price transmission process in different markets, various econometric models were used in the past. The recent studies concerning the price transmission between spot and futures series have used the cointegration test, Granger causality test, vector autoregression (VAR) and VECM. For example, to investigate the price transmission, discovery, and hedging ability of agricultural futures in the Italian market and to examine the price and volatility spillovers between the spot and futures series of spices and rubber in India, the Johansen cointegration and VECM model have been used by (Penone & Trestini 2022; Thazhugal Govindan Nair 2021).

To analyse the price discovery and transmission process between the stock index and index futures (Choudhary & Bajaj 2013; Yang et al. 2012), use the cointegration and VECM models. Further evidence of using VECM and cointegration models can be seen in the studies (Radha & Balakrishnan 2017; Zhang 2015). Hence, this empirical study has applied the Granger causality test, Johansen cointegration test and the VECM to examine the linkage and price transmission process between the global rubber future spot markets.

4. Econometric models

The formal representation of the rubber spot price as per the long-term ordinary least square (OLS) technique is presented in Equation (1).

$$p_t = \alpha + \beta_1 \times SRU_t + \beta_2 \times STF_t + \beta_3 \times JRU_t + \varepsilon_t \quad (1)$$

Where: p_t - spot price of rubber; α - the intercept; SRU_t - the price of RSS 3 rubber future in SGX; STF_t - the price of TSR 20 rubber future in SGX; JRU - the price of rubber future in TOCOM; β_1 -slope between the spot price and RSS 3 rubber future; β_2 - slope between the spot price and TSR 20 rubber future; β_3 - slope between the spot price and JRU rubber future; ε_t - the error term and t - time index.

Applying Equation (1), one would estimate the values for $\alpha, \beta_1, \beta_2, \beta_3$ and ε_t . If the series of ε_t are stationary, then the dependent and independent variables stated in Equation (1) are cointegrated. Further, in the post-estimation fitness summary, if the R- squared is close to 1 and greater than the Durbin-Watson statistics, then Equation (1) estimates are spurious. The cointegration between the variables can be easily investigated by applying the cointegration test (Johansen 1991). After the OLS technique, the univariate, simultaneous equations, and VAR composite models of the last two models became popular (Brooks 2008). The general representations of the bivariate VAR (1) model are presented in Equations (2-4).

$$sp_t = \alpha_{sp} + \beta_{11} \times sp_{t-1} + \beta_{12} \times fp_{t-1} + \varepsilon_t \quad (2)$$

$$fp_t = \alpha_{fp} + \beta_{21} \times fp_{t-1} + \beta_{22} \times sp_{t-1} + u_t \quad (3)$$

$$\begin{pmatrix} sp_t \\ fp_t \end{pmatrix} = \begin{pmatrix} \alpha_{sp} \\ \alpha_{fp} \end{pmatrix} + \begin{pmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{pmatrix} \times \begin{pmatrix} sp_{t-1} \\ fp_{t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_t \\ u_t \end{pmatrix} \quad (4)$$

Where: sp_t and fp_t - spot and the future price of rubber; α_{sp} and α_{fp} - the intercepts; β_{11} and β_{12} - the slope of the spot price with its first lag and with the first lag of future price; sp_{t-1} and fp_{t-1} - previous day's price of rubber spot and future; ε_t and u_t - the white noise error terms and t - time index. The slopes and the intercepts in equation (2-4) are the estimates using OLS, where sp_t and fp_t are stationary variables. Equation (4) is the matrix representation of Equations (2-3). Equations (2-4) form the VAR (1) model, where the lag order is one; this can be extended to n lags based on the Akaike, Schwartz and Hannan-Quinn information criterion.

However, if the spot and futures price series are cointegrated, then the estimations of VAR are not valid, which calls for error correction in the VAR system. If the linear combination of two serially correlated series is stationary, such series are called cointegrated. Johansen (1991) has proposed the Trace and the Max eigenvalue tests to examine the cointegration (Choudhary & Bajaj 2013). These tests have become popular in most price transmission analysis studies. As the spot and future price series have shown the cointegration equation, this study has used the VECM to examine the price transmission process. The general form of the estimated VECM (1) model is presented in Equation (5 - 6).

$$\Delta sp_t = \alpha_{sp} + \beta_{11} \times \Delta sp_{t-1} + \beta_{12} \times \Delta fp_{t-1} + \lambda_{sp} \times ect_{t-1} + \varepsilon_t \quad (5)$$

$$\Delta fp_t = \alpha_{fp} + \beta_{21} \times \Delta fp_{t-1} + \beta_{22} \times \Delta sp_{t-1} + \lambda_{fp} \times ect_{t-1} + u_t \quad (6)$$

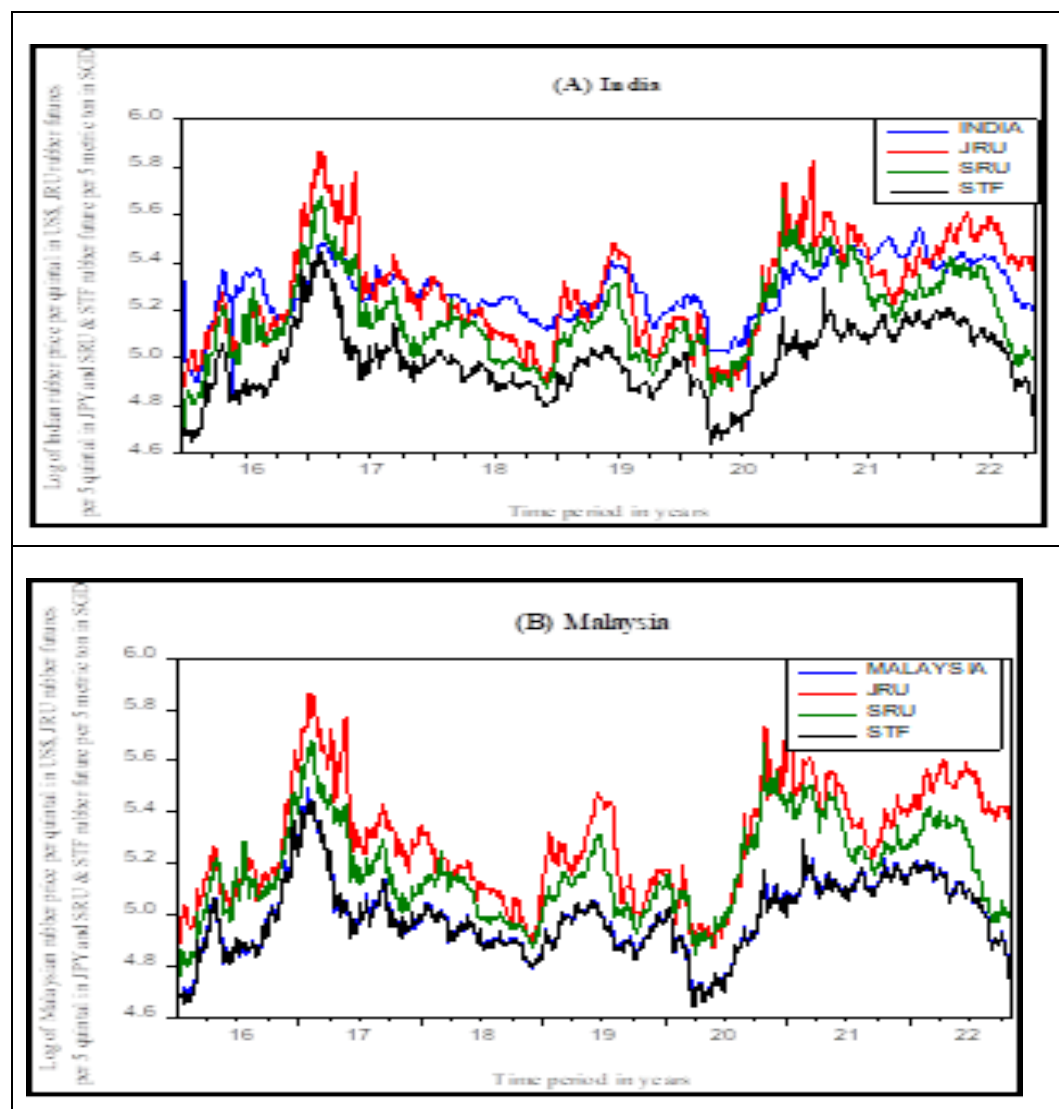
Where: α_{sp} and α_{fp} - the intercepts; β_{11} , β_{12} , β_{21} and β_{22} -the short-run coefficients; ect_{t-1} - the error correction term; λ_{sp} and λ_{fp} -the coefficients for error correction; ε_t and u_t - the white noise error terms and t - time index. In the model specified in Equations (5-6), if λ_{sp} is significant and not equal to zero, however, λ_{fp} is not significant, then the spot rubber price will correct and restore the equilibrium in short-term movements of the spot, and future rubber price series and vice versa hold good. If both λ_{sp} and λ_{fp} are statistically significant, then both the spot and the future price will bring correction to restore the equilibrium (Hamilton 1994). The λ_{sp} and λ_{fp} are the short-run adjustment coefficients of the VECM model, and they measure the price transmission speed.

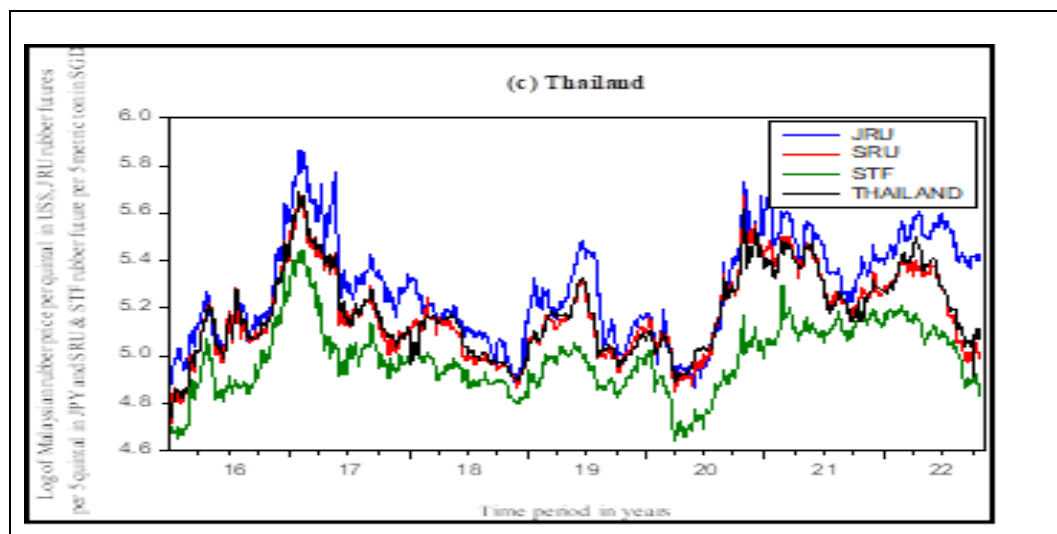
5. Results and discussion

The log price series of rubber spot in India, Malaysia, and Thailand with the log price series of rubber futures SRU, STF and JRU traded at SGX and TOCOM are plotted in panels (A), (B) and (C) of Figure 1. It is evident that the historical price trends of all the plotted series are almost similar. Demand and supply disturbances in the world rubber market have resulted in increased fluctuations in the market.

For example, reduced demand due to the COVID-19 pandemic has resulted in the lowest price point in late 2019. The import-export restrictions in early 2020 resulted in a very high positive spike in the middle of that financial year. These trends are evident in all the spot and futures series plotted in Figure 1.

Figure 1. Lopriceseries of (A) rubber in India and JRU, SRU, STF rubber futures, (B) rubber in Malaysia and JRU, SRU, STF rubber futures, (C) rubber in Thailand and JRU, SRU, STF rubber futures





Source: Authors' processing using ANRPC (2022) and investing.com (2022)

Due to the financial crisis in 2009, followed by the oil crisis, the oil price in the international market dropped drastically till the end of 2015; this has resulted in the increased demand for synthetic rubber (Kumar et al. 2021; Pan et al. 2014). However, the oil prices started increasing at the beginning of 2016, which resulted in increased rubber spot and futures prices in all the markets in the mid of 2016. Since the rubber price changes are highly volatile and very sensitive to the demand-supply and oil price shocks, examining the price transmission dynamics in the global spot and futures market is important for the rubber market stakeholders and policymakers. The descriptive statistics for the daily rubber spot and futures return series are reported in the first section of Table 1.

Table 1. Descriptive statistics and the unit root test results for rubber spot and future series

	India	Malaysia	Thailand	JRU	SRU	STF
Mean	0.00	0.00	0.00	0.00	0.00	0.00
Maximum	0.41	0.15	0.13	0.07	0.12	0.18
Minimum	-0.4	-0.35	-0.08	-0.1	-0.13	-0.13
Std. Dev.	0.02	0.02	0.02	0.02	0.02	0.02
Skewness	-1.06	-2.33	-0.02	-0.33	-0.05	0.44
Kurtosis	240.38	40.48	7.03	6.34	10.73	25.62
Jarque-Bera	3773281	95510.4	1086.77	775.84	4001.23	34306.7
Probability	0.00	0.00	0.00	0.00	0.00	0.00
Panel A: Level series						
ADF-prob.	0.17	0.06	0.1	0.07	0.07	0.1
PP – prob.	0.06	0.07	0.06	0.07	0.1	0.1
Panel B: Return series						
ADF-prob	0.00	0.00	0.00	0.00	0.00	0.00
PP - prob	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' computations using ANRPC (2022) and investing.com (2022)

The mean return of all the series in Panel (B) is zero and the standard deviation is 2% for all the series. These results indicate that the volatility in the global rubber market is high. The gap between the maximum and minimum (range) returns for the spot series is greater than that of the future series; this implies that the rubber spot market's volatility is more than the futures market. This phenomenon is common in any commodity market because the demand-supply correction immediately reflects in the spot market compared to futures (Pan et al. 2014). The statistically significant values of the Jarque and Bera test imply that the data are not normally distributed. Extreme losses (longer left tail) are evident from the negative skewness for all the spot and future series except for STF. The long fat tails are also evident from the high values of kurtosis. India – spot price of rubber in India; Malaysia – spot price of rubber in Malaysia; Thailand – spot price of rubber in Thailand; JRU – Symbol of the rubber future price traded at Tokyo Commodity Exchange; SRU and STF – Symbols of the rubber futures price traded at Singapore Exchange; prob. – probability; Std. Dev – standard deviation; ADF – Augmented Dickey-Fuller Test; PP - Phillips-Perron

This study has performed the ADF and PP tests to check the stationarity of the spot and future series, the probability values of these tests are also reported in Table 1. The null hypothesis for the ADF and PP tests is that the series has a unit root, and the lag length for the ADF test has been selected based on the Schwarz information criterion. The probability values reported in the second section of Table 1 indicate that at a 95% confidence level, the selected spot and future rubber series are not stationary in the level form. As the probability values of ADF and PP tests for the return series are less than 0.01, they are stationary series.

The correlation coefficients between the rubber spot price and future prices and the probability values for the Granger causality test are reported in Table 2

Table 2. Correlation and Granger causality test results

Null hypothesis: SRU, STF and JRU futures does not cause the spot price						
Series	India		Malaysia		Thailand	
	Correlation	GCT - prob.	Correlation	GCT - prob.	Correlation	GCT - prob.
SRU	0.73	0.00	0.83	0.00	0.91	0.00
STF	0.79	0.00	0.86	0.00	0.98	0.00
JRU	0.73	0.00	1.00	0.00	0.86	0.00
Null hypothesis: Spot price does not cause SRU, STF and JRU futures						
Series	SRU		STF		JRU	
	Correlation	GCT - prob.	Correlation	GCT - prob.	Correlation	GCT - prob.
India	0.73	0.03	0.79	0.09	0.73	0.50
Malaysia	0.83	0.07	0.86	0.00	1.00	0.00
Thailand	0.91	0.00	0.98	0.00	0.86	0.00

prob. – probability; GCT – Granger causality test.

Source: Authors' computations using ANRPC (2022) and investing.com (2022)

The correlation coefficients are greater than 0.70; this implies that the spot rubber price series in India, Malaysia and Thailand are highly positively correlated with the SRU, STF and JRU future price series. The probability values for all the null hypotheses of the Granger causality test (GST) are less than 0.01; this indicates that the SRU, STF and JRU futures prices cause the spot rubber price in India, Malaysia and Thailand. From the second half of Table 2, we can reject the null hypothesis at a 95% level that the Indian spot rubber price does cause the STF and JRU rubber future prices and Malaysian rubber price does not cause SRU rubber futures. Hence, with a 95% level, the bilateral causality is reported for Thailand – SRU, Thailand – STF, Thailand – JRU, Malaysia – STF, Malaysia – JRU and India – SRU.

The results of the λ_{trace} and λ_{max} statistics of the Johansen cointegration test for each country's spot rubber price series with the rubber future series of SRU, STF and JRU are reported in sections (A), (B) and (C) of Table 3.

Table 3. Johansen cointegration test estimates

Hypothesised No. Of CE(S)	Unrestricted cointegration rank test (Trace)			Unrestricted cointegration rank test (maximum Eigen value)		
	trace statistic	0.05 critical value	prob.	max. Eigen statistic	0.05 Critical value	prob.
Series A: INDIA; SRU; STF; JRU						
None	89.91	47.86	0.00	46.77	27.58	0.00
At most 1	43.14	29.80	0.00	18.76	21.13	0.10
At most 2	24.39	15.49	0.00	15.54	14.26	0.03
At most 3	8.85	3.84	0.00	8.85	3.84	0.00
Series B: Malaysia; SRU; STF; JRU						
None	339.53	47.85	0.00	289.89	27.58	0.00
At most 1	49.63	29.79	0.00	29.69	21.13	0.00
At most 2	19.94	15.49	0.01	12.14	14.26	0.11
At most 3	7.80	3.84	0.01	7.80	3.84	0.01
Series C: Thailand; SRU; STF; JRU						
None	128.25	47.86	0.00	76.74	27.58	0.00
At most 1	51.50	29.80	0.00	31.30	21.13	0.00
At most 2	20.20	15.49	0.01	12.30	14.26	0.10
At most 3	7.90	3.84	0.00	7.90	3.84	0.00

CE – Cointegration equation

Source: Authors' computations using ANRPC (2022) and investing.com (2022)

The trace statistics of 89.91 is greater than the 5% critical value of 47.86; this continues until at most 3; this rejects the null hypothesis that there is no cointegration. The same situation is found in sections (B) and (C). This confirms that at a 95% confidence level, the trace statistic has identified 4 cointegration equations for each rubber price series with SRU, STF and JRU futures series. Hence the probability values for all the trace statistics in Table 3 are less than 0.05.

The statistical values of the maximum eigenvalue are presented in the last three columns of Table 1. The maximum eigenvalue statistics of only none in series (A), until at most 1 in series (B) and (C), are greater than the critical value at the 5% level. Hence, at 95 % level, 1 cointegration equation between Indian (A) rubber spot with SRU, STF and JRU futures; 2 cointegration equations between Malaysian and Thailand (B) and (C) rubber spot with SRU, STF and JRU futures is identified by the max eigenvalue statistics.

The Johansen cointegration test results indicate that the Indian, Malaysian and Thailand spot rubber prices and SRU, STF and JRU rubber futures are cointegrated with 4 cointegrating vectors. Hence, the analysis is extended to VECM rather than VAR. The statistical estimates of the VECM model are shown in Table 4, where ECT is the measure of speed adjustment to restore the equilibrium in the case of disturbances.

Table 4. Estimated results of the VECM model

	Coefficient	Std. Error	t-Statistic	prob.
Dependent variable: Spot price of rubber in India				
ECT	-0.02	0.00	-6.19	0.00
D(INDIA(-1))	-0.27	0.02	-12.33	0.00
D(JRU(-1))	0.02	0.02	1.47	0.14
D(SRU(-1))	0.09	0.03	3.09	0.00
D(STF(-1))	0.10	0.04	2.80	0.01
C	0.01	0.07	0.13	0.90
Dependent variable: Spot price of rubber in Malaysia				
ECT	-0.39	0.04	-10.37	0.00
D(MALAYSIA(-1))	-0.14	0.03	-4.21	0.00
D(JRU(-1))	0.01	0.01	0.72	0.47
D(SRU(-1))	0.08	0.02	3.51	0.00
D(STF(-1))	0.21	0.04	5.54	0.00
C	0.01	0.06	0.09	0.93
Dependent variable: Spot price of rubber in Thailand				
ECT	-0.10	0.01	-8.92	0.00
D(THAILAND(-1))	0.10	0.03	3.98	0.00
D(JRU(-1))	0.00	0.01	0.24	0.81
D(SRU(-1))	0.21	0.03	7.69	0.00
D(STF(-1))	0.11	0.03	3.65	0.00
C	0.02	0.07	0.29	0.77

ECT – Error correction term, D – first difference, -1 – first lag

Source: Authors' computations using ANRPC (2022) and investing.com (2022)

The ECT coefficients for the spot price equations of India, Malaysia and Thailand are -0.02, -0.39 and -0.10, respectively; the reverse correction mechanism is evident in the systems because these ECT coefficients are negative and significant at a 99% level. This implies that the deviation from the long-term equilibrium in the spot rubber price equation system of India, Malaysia, and Thailand will be restored by about 2%, 39% and 10 %, respectively within a day.

The coefficients for the first lag of the spot rubber price in India, Malaysia and Thailand are -0.03, -0.14 and 0.10. These coefficients indicate that today's price of rubber in India and Malaysia is negatively correlated with yesterday's price; a % increase in today's price would decrease tomorrow's price by 3 and 14%, respectively, in India and Malaysia. Contrarily, in the Thailand market, a % increase in today's rubber price would increase tomorrow's price by 10%.

For India, Malaysia and Thailand, the coefficients for spot rubber prices with SRU rubber futures are 0.09, 0.08 and 0.21, respectively. These coefficients for SRU are positive and significant at 99%, which implies that the price of SRU rubber futures leads to the spot price of rubber in India, Malaysia and Thailand. A % increase in SRU rubber futures price in SGX would increase the spot rubber price in India, Malaysia and Thailand by 9%, 8% and 21%, respectively. Similarly, a % increase in today's STF rubber futures price in SGX would increase tomorrow's price of spot rubber in India, Malaysia and Thailand by 10, 21 and 11%, respectively. The constant – intercept for all the system equations and the positive coefficients with JRU rubber futures to all the spot price markets are not significant, even at a 90% level.

6. Conclusion

This study examines the price transmission process in the global rubber spot and futures markets. Based on the available daily data in the official portal of the Association of Natural Rubber Producing Countries (ANRPC), the daily price series of rubber in India, Malaysia and Thailand were selected as samples for the study. For the same tenure, the daily price of the SRU and STF rubber futures traded in SGX and JRU rubber futures traded in TOCOM were gathered.

The correlation and the Granger causality tests revealed that the spot and future prices in the global markets are highly correlated. The selected rubber futures cause the spot rubber prices in India, Malaysia and Thailand. The results of the Granger causality test revealed a two-way causality between Thailand – SRU, Thailand – STF, Thailand – JRU, Malaysia – STF, Malaysia – JRU and India – SRU series. Johansen's cointegration test results confirmed the cointegration equations between the selected spot and future price series, which justified applying the VECM.

The negative and significant error correction terms of the VECM equations for India, Malaysia and Thailand revealed that the corrections from the spot price series would restore equilibrium deviations in the long run. The significant coefficients of the VECM equations

confirmed that the previous day's price of SRU and STF futures will positively cause today's spot price of rubber in India, Malaysia and Thailand. These results indicate that the SRU and STF futures price will lead the spot price of rubber in India, Malaysia and Thailand.

This study will contribute to the segment of literature concerning rubber pricing, price transmission and the causality between the spot and futures price series in the world rubber market. The existing literature on the topic has discussed the price determinants and the country-specific short-term and long-term forecast models; However, these studies have not discussed or analysed the linkage between the spot and futures prices in the global or domestic rubber markets. Hence, this new contribution would help the rubber growers, traders, and regulators of the global rubber-producing and consuming counties in decisions related to pricing and trading activities.

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