

The Continuity Of ASEAN-6 Capital Market Integration Evaluation: The VECM and Granger Causality Approach

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Abstract

This study examines the co-integration relationships among stock indices in the Association of Southeast Asian Nations (ASEAN), with attention to potential changes in market dynamics following the implementation of the ASEAN Economic Community (AEC) in 2015. Rather than formally testing for structural breaks, this research employs a two-period comparative framework to assess differences in long-run equilibrium and short-run dynamics before and after the AEC. Using weekly composite stock price indices from six ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam), the analysis is divided into two periods: pre-AEC (2011–2016) and post-AEC (2017–2024). The study applies a Vector Error Correction Model (VECM), threshold cointegration tests, and Granger causality analysis to capture both symmetric and asymmetric adjustments as well as directional relationships. The results indicate that co-integration persists among five markets, excluding Vietnam, with asymmetric short-run adjustments and symmetric long-run convergence. Furthermore, the post-AEC period shows a stronger and more extensive pattern of bidirectional causal linkages, suggesting an increase in financial integration across the region. Overall, the findings suggest that the period following the AEC is associated with stronger regional financial interconnectedness, rather than providing definitive evidence of a structural break. This study underscores the relevance of regional policy initiatives in shaping capital market dynamics and offers insights into how economic integration may be reflected in financial market relationships.

KEYWORDS

ASEAN capital market integration; cointegration; vecm, composite stock price index.

Introduction

Regional economic strength is important in maintaining stability and the region's competitiveness due to globalization and free markets. Like Europe with the "European Union," the Association of Southeast Asian Nations (ASEAN) is also trying to create market integration through a fairly long process. Starting from the ASEAN Free Trade Area (AFTA) in 1993, which successfully reduced trade tariffs between countries, continued with the vision to create a single market through the ASEAN Economic Community (AEC) (Ishikawa, 2021a; Shimizu, 2021). ASEAN (Association of Southeast Asian Nations) has worked on market integration for over 15 years. However, significant progress has yet to be made. Although there has been some advancement, such as a considerable reduction in tariffs (Ishikawa, 2021b), achieving complete market integration is still challenging due to high economic, regulatory, infrastructure, and currency gaps among ASEAN member countries. Hence, the issue of ASEAN market integration is still a concern for researchers, as they need to find trends and determine how fellow ASEAN member countries are connected. Establishing the AEC has created a single market and production base, opening up opportunities for trade and business within the region (Prajanjo, 2022). Furthermore, ASEAN's goal is to achieve capital market integration by

2030 (Nguyen & Nguyen, 2021; Wolff, 2022) as the next stage of achieving the AEC's vision.

Regional market integration has attracted significant attention (Kuznetsov, 2018; Robiyanto et al., 2021) due to its relevance for investors seeking diversification opportunities in ASEAN markets (Do et al., 2016). While prior studies generally find evidence of increasing integration, their results remain inconclusive regarding the direction and stability of causal relationships across markets. Moreover, most studies do not explicitly assess the impact of major policy initiatives, such as the ASEAN Economic Community (AEC) 2015, and instead rely on extended observation periods without identifying structural changes (Bi, 2021). Therefore, a clear gap remains in understanding whether ASEAN market integration is driven by gradual developments or by policy-induced shifts. This study addresses this gap by examining causal linkages and treating AEC 2015 as a structural breakpoint to evaluate its impact on regional capital market integration. Indeed, several studies have examined the integration of ASEAN capital markets to understand the interrelationships between capital markets. However, the varying observation periods and the ever-changing global economic situations have led to inconclusive findings. For example, based on the period 1990-2000 (Click & Plummer, 2005; Phylaktis & Ravazzolo, 2005), it was found that ASEAN capital market integration needed to be completed. Another study found that except for Vietnam, stock markets in five other countries (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) have been integrated (Do et al., 2016) from 2000 – 2006. Using a different point of view, Robiyanto (2018) and Boubakri & Guillaumin (2015) found that ASEAN capital markets integration strengthened after the global financial crisis of 2008 compared to the previous period (Qizam et al., 2015). The strengthening of ASEAN capital market integration after the global financial crisis of 2008 was also confirmed by various studies using data from 2009 - 2022 (Le et al., 2022; Robiyanto et al., 2021; Yu et al., 2010).

The present study aims to offer a distinct perspective on ASEAN capital market integration by addressing key gaps in the existing literature. While prior studies generally confirm strong and increasing integration among ASEAN stock markets, particularly around the 2008 global financial crisis (Le et al., 2022; Robiyanto et al., 2021; Yu et al., 2010), they largely rely on static frameworks or extended sample periods without explicitly examining the role of policy-induced structural changes. As a result, it remains unclear whether observed integration reflects gradual market development or discrete shifts driven by institutional milestones.

Unlike existing studies, this paper treats the ASEAN Economic Community (AEC) 2015 as a theoretically grounded structural breakpoint rather than a mere chronological division. From the perspective of regional economic integration and financial convergence theory, major policy initiatives such as AEC are expected to reduce market segmentation, enhance regulatory harmonization, and improve cross-border capital mobility. These changes can increase market efficiency, accelerate information transmission, and strengthen financial linkages across countries.

As a result, AEC 2015 is likely to alter both long-run equilibrium relationships and short-run market dynamics among ASEAN stock markets (Mitra, 2017). By lowering barriers to investment and facilitating greater economic coordination, the integration process may intensify co-movement and interdependence among markets.

Therefore, this study goes beyond simply extending the observation period by explicitly testing whether AEC 2015 represents a structural shift that changes the pattern and intensity of market integration, rather than functioning only as a temporal breakpoint in the sample. In addition, prior

research provides limited and dated evidence on causal linkages among ASEAN stock markets, with relatively little attention to how these relationships evolve over time. This study addresses this gap by incorporating Granger causality analysis to capture the direction and dynamics of inter-market linkages before and after AEC 2015. By doing so, it refines the understanding of ASEAN financial integration from a static concept into a dynamic process characterized by evolving interdependencies. Overall, this study contributes to the literature by linking policy-driven structural change with evolving causal patterns, thereby offering a more nuanced assessment of ASEAN capital market integration and its progress toward the AEC 2030 vision.

Methods

This study applies a Vector Error Correction Model (VECM) to examine ASEAN stock market integration using weekly data from six countries (Engle & Granger, 1987). Unit root tests and the Johansen cointegration test are conducted, with an intercept included in the cointegration equation. The optimal lag length is determined using multiple information criteria (AIC, SIC, and HQ), with the final selection based on the majority indication across criteria; in cases where AIC and FPE suggest a higher lag while SIC favors a more parsimonious specification, the chosen lag reflects a balance between goodness-of-fit and parsimony and is confirmed through residual diagnostic tests.

To capture potential nonlinear adjustments, a threshold cointegration approach is employed following a two-regime specification (Lestari et al., 2022). Specifically, the error correction term (ECT) derived from the long-run cointegration equation is used as the threshold variable. A threshold value is determined endogenously through a grid search procedure that minimizes the sum of squared residuals across candidate threshold values. The model then allows adjustment dynamics to differ depending on whether deviations from equilibrium lie above or below the estimated threshold. Estimation proceeds by (i) obtaining the long-run cointegration relationship, (ii) constructing the ECT, (iii) estimating the threshold parameter, and (iv) estimating regime-dependent VECM equations. The presence of threshold effects is evaluated using a likelihood ratio (LR) test (with bootstrapped critical values), where rejection of the null hypothesis of linear adjustment indicates asymmetric error correction.

The sample is divided into two sub-periods (2011–2016 and 2017–2024) to facilitate a comparative analysis of market dynamics before and after the implementation of the ASEAN Economic Community (AEC) in 2015. Finally, Granger causality tests within the VECM framework are used to analyze the direction of short-run relationships among markets. This study consistently adopts the ASEAN Economic Community (AEC) 2015 as the main policy benchmark, as it represents the formal implementation of regional economic integration in ASEAN (Lim, 2015). While AEC was officially launched at the end of 2015, its institutional and market effects are not expected to occur instantaneously due to adjustment processes, regulatory alignment, and gradual responses by market participants.

Therefore, this study defines the post-AEC period starting in 2017 to allow for a transition phase in 2016, during which the initial implementation and market adaptation took place. This approach avoids capturing short-term noise and better reflects the stabilized impact of the policy on financial markets (Oanea, 2015).

The dataset consists of weekly composite stock price indices collected from sources such as Yahoo Finance and official stock exchange websites. The observation period is divided into pre-AEC (January 2011–December 2016) and post-AEC (January 2017–May 2024), with 313 and 386 observations, respectively. The starting point of 2011 is chosen

to reflect the period following the implementation of the ASEAN Trade in Goods Agreement (ATIGA) in 2010, which marked an important precursor to AEC by initiating deeper trade liberalization within the region.

This design ensures both conceptual consistency and empirical relevance in capturing the structural impact of AEC 2015. Our analysis involved four stages. Firstly, we tested for stationarity or unit root using the augmented Dickey-Fuller (ADF) test. Secondly, we conducted Johannsen's cointegration test to examine whether any cointegrated vector existed among the variables in our model, indicating a long-term relationship. After confirming the cointegration relationship, we used VECM and Granger causality tests to investigate the direction and relationship between ASEAN-6 countries. To conduct our analysis, we utilized Eviews-10 software.

Result and Discussion

Preliminary analysis

Table 1 presents the descriptive statistics of the composite stock price indices for the six ASEAN countries. The reported mean values indicate differences in index levels across markets; however, these figures are not intended to reflect relative market performance or strength, as they are influenced by differences in base values and scaling.

Table 1 presents the descriptive statistics of the logged composite stock price indices across ASEAN countries. However, due to differences in base values, index composition, and scaling, the reported mean levels cannot be directly interpreted as indicators of relative market performance across countries (Olokoyo et al., 2020). Instead, these values primarily reflect the general magnitude of each index rather than comparative growth or returns.

The composite stock price index captures overall market movements by aggregating price changes of constituent stocks, regardless of firm size or market capitalization. Therefore, while the data provide useful insight into the behavior and distribution of each market index, they should not be used to infer which markets perform better.

To assess relative performance more accurately, analysis

based on returns or growth rates would be more appropriate, as these measures are comparable across markets and better reflect changes in market value over time. As the first step, two tests were conducted in this study to determine the stationarity of our variables: the Augmented Dickey-Fuller Test (ADF) and the Philips-Perron (PP) test. The ADF test checks whether a unit root exists in all model variables at a given time (t). According to Table 2, all data is stationary at the first difference (I(1)). The ADF unit root tests indicate that the series LnINA, LnSING, LnMAL, LnPHI, LnTHA, and LnVTN are stationary at 1%, 5%, and 10% critical values with a p-value of 0.000. This result suggests that the variables are integrated at the same level and suitable for the cointegration test, a preliminary prerequisite for normality distribution data. This test can establish short and long-term relationships among variables.

To determine the optimal lag length, this study employs several information criteria, including Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn (HQ). While SC and HQ tend to select a more parsimonious model at lag 1, AIC and FPE indicate lag 2 as the optimal choice, as shown in Table 3.

In this study, greater weight is given to AIC and FPE in selecting the lag structure. This choice is consistent with time-

Table 1. Descriptive Analysis of composite index price of ASEAN-6

Country	Panel A (n=313)		Panel B (n=386)	
	Mean	Std. Dev.	Mean	Std. Dev.
lnSING	8.0361	0.0667	8.0364	0.0868
lnINA	8.3324	0.1855	8.6909	0.1190
lnMAL	7.3925	0.1064	7.3873	0.0741
lnPHI	8.5927	0.2812	8.8775	0.1048
lnTHA	7.1044	0.2238	7.3537	0.0925
lnVTN	6.3241	0.1470	6.9226	0.2370

Notes: Panel A: Pre-AEC period (2011–2016); Panel B: Post-AEC period (2017–2024). The ASEAN Economic Community (AEC) 2015 is used as the policy benchmark for period classification. Ln denotes the natural logarithm.

Table 2. Results of Unit Root Test

Panel	Variable	Order	ADF test		P-P test	
			t-Statistic	p-value	t-Statistic	p-value
A	lnINA	Level	-2.488	0.119	-2.495	0.118
		First difference	-20.866	0.000	-20.746	0.000
	lnMAL	Level	-2.124	0.235	-2.121	0.237
		First difference	-17.885	0.000	-17.968	0.000
	lnSING	Level	-2.179	0.214	-2.380	0.148
		First difference	-15.990	0.000	-15.901	0.000
	lnPHI	Level	-1.876	0.343	-1.885	0.339
		First difference	-18.986	0.000	-18.938	0.000
	lnTHA	Level	-2.278	0.180	-2.278	0.180
		First difference	-18.162	0.000	-18.155	0.000
B	lnVTN	Level	-1.543	0.511	-1.568	0.498
		First difference	-16.800	0.000	-16.785	0.000
	lnINA	Level	-2.357	0.155	-2.398	0.143
		First difference	-19.417	0.000	-19.416	0.000
	lnMAL	Level	-1.519	0.523	-1.671	0.445
		First difference	-18.206	0.000	-18.213	0.000
	lnSING	Level	-2.643	0.085	-2.656	0.083
		First difference	-18.165	0.000	-18.124	0.000
	lnPHI	Level	-2.553	0.104	-2.657	0.083
		First difference	-19.910	0.000	-19.910	0.000
	lnTHA	Level	-2.548	0.105	-2.494	0.118
		First difference	-21.310	0.000	-21.404	0.000
	lnVTN	Level	-1.892	0.336	-1.877	0.343
		First difference	-17.188	0.000	-17.188	0.000

Note: Panel A = pre-AEC agreement (2011-2016), Panel B = post-AEC Agreement (2017-2024)

series literature, where AIC and FPE are preferred in relatively small samples and in systems such as VAR/VECM, as they better capture the dynamic structure and reduce the risk of underfitting. Selecting too few lags may omit important short-run dynamics, which is particularly critical in Johansen cointegration and VECM frameworks.

Therefore, lag 2 is selected as the optimal lag length for subsequent analysis. To ensure the robustness of this specification, stability testing was conducted using the AR roots. The results show that all inverse roots lie within the unit circle, indicating that the VAR model satisfies the stability condition and that the chosen lag structure is appropriate for the Johansen cointegration and VECM estimation (see Figure 1).

Johansen tests for cointegration

The Johansen cointegration test is a statistical method utilized to ascertain the presence of cointegrated vectors among the variables in a given dataset, thereby determining a long-run relationship between the variables. Table 5 illustrates the presence of five cointegrating equations in panels A and B, expressing the relationships between the variables. This outcome indicates that the ASEAN-6 capital

markets have long-term effects on each other. Panel A presents data before the AEC 2025 agreement. It reports the results for VARs with one lag. In comparison, Panel B pertains to data on the composite stock price index after the AEC 2025 agreement and reports the results for VARs with two lags. Consequently, the empirical analysis of the two-panel data revealed no significant disparity in cointegrating vectors in both panels, representing the periods before and after the AEC 2025 agreement.

Analyzing the coefficients in the cointegrating vector provides valuable insight into the long-term interconnections among these markets. In this study, the cointegrating vectors are standardized around Singapore, which holds the highest capitalization among the ASEAN-6 market. Normalizing all cointegrating vectors around Singapore can be readily reconfigured as if the Singapore stock index were the dependent variable and the other variables were independent. A representative cointegrating vector is considered, as the coefficients exhibit similarity across all models (See Table 5).

Panel A, $\ln SING = 0.34 \ln INA - 0.74 \ln MAL - 1.57 \ln PHI + 0.83 \ln THA - 0.21 \ln VTN$

Panel B, $\ln SING = 0.58 \ln INA + 0.39 \ln MAL - 1.23 \ln PHI + 0.07 \ln THA + 0.04 \ln VTN$

Table 3. Results of VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria for Panel A						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	4818.211	NA	8.87e-22	-31.447	-30.567	-31.095
2	4852.013	64.93544*	8.74e-22*	-31.46191*	-31.02174*	-31.28583*
3	4867.719	29.55185	1.01e-21	-31.314	-29.993	-30.786
4	4882.711	27.61643	1.17e-21	-31.176	-29.415	-30.471
5	4901.234	33.39027	1.31e-21	-31.061	-28.860	-30.180
6	4923.135	38.61526	1.44e-21	-30.968	-28.327	-29.912
7	4940.231	29.46827	1.64e-21	-30.844	-27.762	-29.611
8	4960.233	33.68773	1.83e-21	-30.738	-27.217	-29.330
VAR Lag Order Selection Criteria for Panel B						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	5925.599	NA	1.09e-21	-31.245	-30.86906*	-31.09551*
2	5966.715	79.61452	1.06e-21*	-31.271*	-30.521	-30.974
3	5987.417	39.42757	1.15e-21	-31.191	-30.064	-30.743
4	6011.430	44.96839	1.22e-21	-31.127	-29.625	-30.531
5	6035.548	44.39815	1.30e-21	-31.064	-29.186	-30.319
6	6056.633	38.14290	1.41e-21	-30.985	-28.732	-30.091
7	6107.675	90.71079	1.31e-21	-31.065	-28.436	-30.021
8	6141.310	58.70523*	1.33e-21	-31.052	-28.048	-29.860

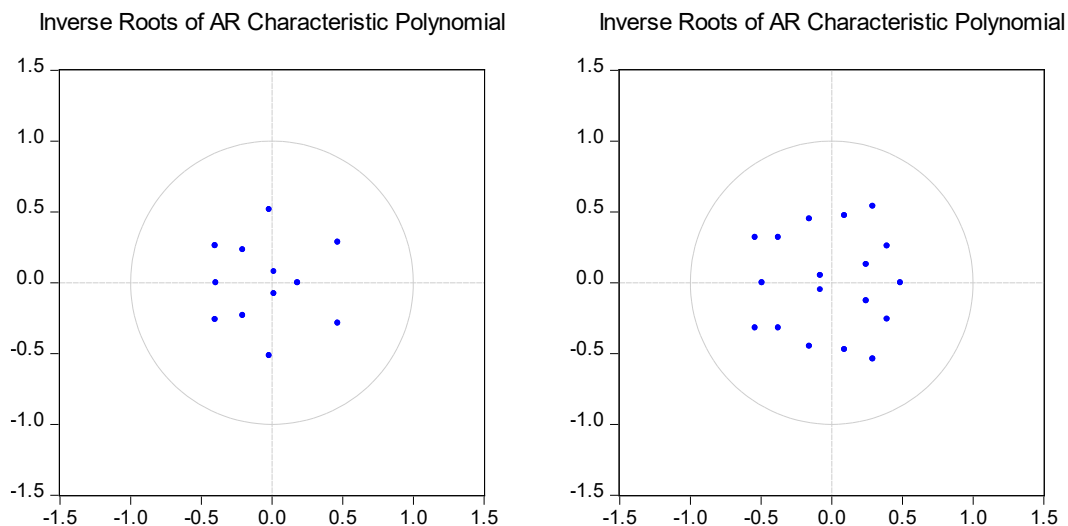


Figure 1. VAR lag stability test

The VECM results show statistically significant long-run associations between Singapore's stock index and those of other ASEAN countries before the AEC 2015 period. For example, changes in the Indonesian and Thai indices are positively associated with Singapore, while changes in Malaysia, the Philippines, and Vietnam show negative associations.

It is important to note that these cointegrating coefficients represent long-run statistical relationships, not direct economic elasticities. They indicate the direction and strength of co-movement over time but do not by themselves identify causal mechanisms. Any discussion of bilateral trade or economic linkages is therefore tentative and should be interpreted as a possible explanation rather than a tested effect.

In the post-AEC 2015 period, the coefficients for Indonesia vary, with some increasing while others decreasing. For example, movements in the Indonesian stock market increase the Singapore capital market by 0.58%, while Malaysia and the Philippines contribute 0.39% and 1.23%, respectively. In contrast, a 1% increase in the Thai capital market affects the Singapore stock exchange by only 0.06%, and Vietnam contributes 0.04%.

These relatively small coefficients in the post-AEC 2015 period suggest that Singapore is only modestly influenced by other regional capital markets. This finding is consistent with Singapore's position as one of the largest and most developed financial markets in the region, which may reduce its sensitivity to external market movements.

The lack of significant impact of the Thailand and Vietnamese capital markets on Singapore's capital market movement during this period can be attributed to several factors. The Thailand and Vietnamese capital markets are relatively smaller and less liquid than the Singapore market. Another possibility is different investment preferences, risk perceptions, and market dynamics. Table A3 (see Appendix) compares results between Panels A and B; the ASEAN financial market has experienced a declining level, even after the AEC 2025 agreement. Using Singapore's point of view, total service exports to other countries and ASEAN countries increased from USD 21.7 billion in 2017 to USD 31.5 billion in 2021, a growth of 45.2%. The country's service imports from ASEAN countries grew by 40.7%, from USD 12.3 billion to USD 17.3 billion. However, Singapore's leading trading partner is not ASEAN. Its total trade in services reached USD 44.8 billion, with service imports amounting to USD 80.4 billion from the US, while the EU and Japan came in second and third place, respectively ([The Singapore Department of Statistics \(DOS\), 2023](#)).

Economic integration is generally associated with positive co-movement among markets ([Click & Plummer, 2005](#)). However, Singapore shows a different pattern, exhibiting an inverse relationship with several ASEAN markets such as Malaysia, Vietnam, and the Philippines.

This finding should be interpreted with caution, as the model does not directly test specific transmission channels such as bilateral trade. One possible explanation is that differences in economic structure and external exposure may contribute to asymmetric responses to regional or global shocks; however, this remains a tentative interpretation. For example, trade interactions between Singapore and Malaysia are substantial, but variations in trade balance and exposure could be associated with differing market reactions under certain conditions ([The Observatory of Economic Complexity \(OEC\), 2023](#)).

Nevertheless, this interpretation remains tentative, and further analysis incorporating trade variables or other transmission mechanisms would be necessary to confirm the underlying causes of this inverse relationship. Despite being a smaller market than Indonesia and Malaysia, the relatively

large coefficients associated with the Philippines are somewhat unexpected, as larger markets might be anticipated to exert stronger influence on Singapore.

One possible explanation is that market influence is not determined solely by economic size or bilateral trade volume but may also reflect differences in financial openness, investor behavior, or the degree of market synchronization. For instance, in 2021, the Philippines exported goods worth \$6.19 billion to Singapore, while Singapore exported \$7.58 billion to the Philippines—figures that are notably smaller than Singapore's trade with Malaysia and Indonesia. This suggests that trade intensity alone may not fully explain the observed relationships.

To further assess the robustness of this finding, an alternative normalization of the cointegrating vector is conducted by using Indonesia—the second-largest market—as the reference variable. This approach allows for a comparison of relative influence across markets under a different scaling assumption. The results remain qualitatively consistent, indicating that the prominence of the Philippines is not solely driven by the initial normalization choice.

Similar patterns have been documented in prior studies. For example, Michael Click & Plummer (2005) find that Thailand exerts a relatively strong influence on Singapore compared to larger markets such as Indonesia and Malaysia. Likewise, [Phylaktis & Ravazzolo \(2005\)](#) report comparable results without identifying a definitive underlying mechanism.

Taken together, these findings suggest that the observed pattern, while unexpected, is not without precedent. However, in the absence of explicit modeling of transmission channels, the interpretation should remain cautious.

Panel A: $\ln INA = 2.97 \ln SING - 2.19 \ln MAL - 4.67 \ln PHI - 0.61 \ln THA + 0.00 \ln VTN$

Panel B: $\ln INA = 1.69 \ln SING - 2.10 \ln MAL + 0.11 \ln PHI + 0.08 \ln THA - 0.00 \ln VTN$

The findings in Table A3 (see Appendix) indicate that the Philippines had the most significant impact on Indonesia in Panel A, but this influence was surpassed by Malaysia in the subsequent period. This outcome is logical, given that Malaysia is Indonesia's primary trading partner compared to the Philippines. The trade value between Indonesia and Malaysia increased from USD 12,006 million to USD 15,429 million in 2022. This results aligns with Click and Plummer's findings concerning the negative impact of Malaysia on the Indonesian stock exchange (Click & Plummer, 2005). Furthermore, the value of Indonesia's imports from Malaysia in 2021 and 2022 amounted to 9,451 million and 12,477 million USD, respectively. An interesting observation that may elucidate this phenomenon is that Indonesia's trade surplus with the Philippines reached USD 11,411 million in 2022. In contrast, the surplus with Malaysia was only USD 2,952 million ([Indonesian Central Bureau of Statistics, 2023](#)). The trade relationship between Indonesia, Malaysia, and the Philippines is characterized by Indonesia typically having a trade surplus with its neighbors, driven by the export of natural resources like copper, coal, nickel, and iron. These resources, abundant in Indonesia, contribute significantly to the trade surplus with Malaysia and the Philippines. In contrast, Indonesia imports electronic products and machinery from Malaysia and the Philippines, indicating a complementary trade dynamic where Indonesia's natural resource exports fulfill the raw material needs of its neighbors while imported manufactured goods meet Indonesia's demand for electronics and machinery.

The cointegration analysis reveals that the stock markets of the ASEAN-6 countries are integrated, with five cointegrating relationships, broadly confirming prior evidence ([Chien et al., 2015](#); [Click & Plummer, 2005](#); [Robiyanto, 2018](#); [Tran et al., 2022](#); [Wu, 2020](#)). However, this study refines earlier findings by showing that the strength and structure of integration are

not static, but evolve in response to policy-driven changes, particularly around the AEC 2015 period. This suggests that ASEAN financial integration is progressing in a dynamic and uneven manner rather than converging uniformly across all markets.

The findings imply that, while the region is on track toward deeper integration, achieving the ASEAN financial integration target for 2030 will depend on sustained policy coordination and efforts to reduce asymmetries among member countries. However, the ASEAN capital market integration is dynamic and closely linked to various economic situations outside the region, as observed before and after the AEC 2025 agreement. This suggests that external economic factors play a significant role in integrating ASEAN capital markets (Mynkin, 2011; Robiyanto, 2018; Wu, 2020). For instance, studies using the 2008 financial crisis as a threshold found decreased capital market integration among ASEAN countries post-crisis (Click & Plummer, 2005; Mynkin, 2011; Robiyanto, 2018; Robiyanto et al., 2021), while Boubakri and Guillaumin (Boubakri & Guillaumin, 2015) found the opposite. Notably, except for Vietnam, the five other countries are involved in these relationships, and the coefficients in the integrating vector are reasonable. However, some puzzles still need to be explored, such as the relatively minor importance associated with the relationship between Indonesia and Malaysia. Despite Malaysia being Indonesia's second-largest trading partner among ASEAN countries after Singapore, there have been several shocks with asymmetric effects in the markets between Ind Despite being a smaller market than Indonesia and Malaysia, the Philippines' largest coefficients appeared unreasonable since the more substantial markets should influence Singapore more than the smaller Philippine market. For instance, in 2021, the Philippines exported goods worth \$6.19 billion to Singapore, while Singapore exported goods worth \$7.58 billion to the Philippines. Notably, this amount is significantly smaller than Singapore's trade with Malaysia and Indonesia. However, Click & Plummer (2005) showed similar results, indicating that Thailand had the most influence on Singapore's stock exchange, surpassing larger markets such as Indonesia and Malaysia (Click & Plummer, 2005). Similar findings were also reported in the study conducted by Phylaktis and Ravazzolo, which lacked a clear explanation for this phenomenon (Phylaktis & Ravazzolo, 2005). To understand the relative sizes and see things from a different angle, we adjust the cointegrating vectors based on a different country. Specifically, we will explore normalization around Indonesia, the second-largest market. This results in a modified representative cointegrating vectoronesia and Malaysia. This suggests that complex dynamics are at play in the integration of ASEAN capital markets, influenced by internal and external economic factors.

Granger causality results

This study used pairwise Granger causality and F-statistics to examine the short-term associations among the series (See Appendix for details). Our findings revealed a bidirectional relationship between Indonesia and Singapore in Panel B data, whereas in the preceding period, there was a one-way relationship from Singapore to Indonesia. Additionally, we observed a one-directional relationship between Singapore and Malaysia in both observation periods, with Singapore Granger causing Malaysia, not vice versa. Furthermore, in the Panel A period, there was only a one-way relationship from Singapore to the Philippines, while in Panel B data, no causal relationship was evident between the two, indicating that after the AEC 2025 agreement, there was no causal relationship between the Philippines and Singapore capital markets. As expected, no causal relationship was found between Vietnam and Singapore in the two observation periods, suggesting that the capital markets of these two

countries are not interconnected (see Figure 2).

Moreover, we observed a two-way relationship between Malaysia and Indonesia in Panel B, indicating that the connection between the two capital markets has strengthened since the AEC 2025 agreement. Conversely, this bi-directional relationship needed to be more evident in Panel A. Additionally, we noted a bi-directional causal relationship between Indonesia and the Philippines in Panel A. However, in Panel B, this relationship became one-directional, with Indonesia influencing the Philippines. These findings suggest a decline in the interaction between Indonesia and the Philippines during the 2016-2024 period compared to 2011-2016, indicating a non-competitive market share. Furthermore, we identified a one-way causal relationship from Indonesia to Thailand in Panel A, while in Panel B, this relationship reversed. This suggests that the relationship between Indonesia and Thailand is dynamic and can change over time. Lastly, in Panel B, we found evidence of a causal relationship between Vietnam and Indonesia, indicating that the Vietnamese capital market has begun to exert influence on the Indonesian capital market. The main commodities Indonesia imports from Vietnam include rice, textiles, yarn, plastics, processed materials, electrical machinery, equipment, and parts (see Figure 3).

For Malaysia, we find that a one-way relationship from Malaysia to the Philippines occurs in panels A and B, meaning that movements in the Malaysian capital market can affect movements in the Philippines capital market but not vice versa. Meanwhile, a one-way relationship between Thailand and Malaysia occurs in Panel B, and there is no causal relationship in Panel A. The new Thai capital market has affected the movement of the Malaysian capital market in the last five years

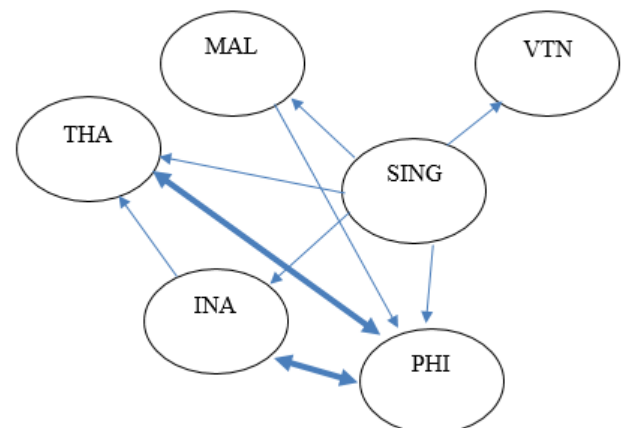


Figure 2. The short-run pattern of causal relations between countries for the 2011 – 2016 period (Panel A).

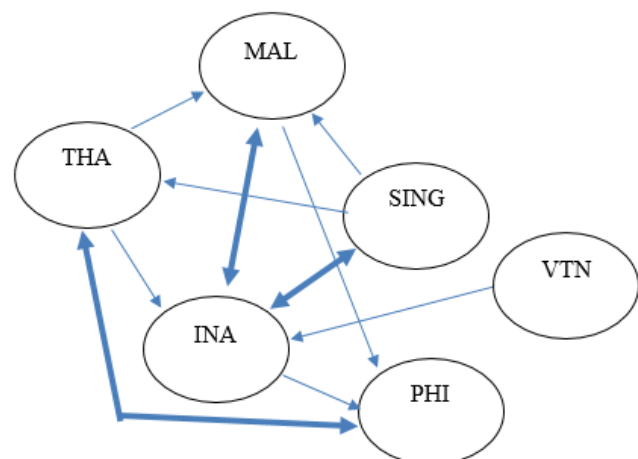


Figure 3. The short-run pattern of causal relations between countries for the 2017 – 2024 period (Panel B).

and not for the previous period. Finally, there is no causal relationship between Malaysia and Vietnam in panels A and B, indicating that the two capital markets are mutually independent and do not influence each other. Furthermore, we find that the causal relationship between Thailand and the Philippines is bidirectional and consistent for Panels A and B. Meanwhile, there is no causal relationship between Vietnam, Thailand, and the Philippines in all observation periods.

All reviewer comment text that was inadvertently inserted into the body of the manuscript has been removed to ensure clarity and proper formatting for resubmission. The manuscript now presents only the intended academic content without embedded annotations or comment blocks.

It is important to emphasize that Granger causality measures statistical predictability, not economic mechanisms. Therefore, any discussion of corporate tax, branding, comparative advantage, or market preferences is speculative and should be treated as tentative contextual interpretation rather than empirically tested. These observations highlight evolving interdependencies among ASEAN markets, but further evidence would be needed to link them to specific economic or policy factors.

Limitations and further study

This research has several limitations that should be considered in interpreting the findings. First, the study examines the economic integration of six ASEAN countries—Indonesia, Singapore, Malaysia, Thailand, the Philippines, and Vietnam. The results indicate that, up to the end of the sample period, Vietnam does not exhibit significant causal relationships with the other markets. However, this finding may be sample-specific and could be revisited in future research using alternative model specifications or extended data periods.

Second, the analysis focuses on aggregate composite stock price indices and does not account for sectoral differences across countries. Given that each market is characterized by distinct sectoral compositions, future studies could provide more granular insights by examining sector-specific indices or industry-level dynamics.

Third, the study employs a two-period comparison, with the later period (2017–2024) overlapping with the global economic disruption associated with the COVID-19 pandemic. While this may influence the observed relationships, the current design does not allow for a direct identification of the causal impact of COVID-19 or other concurrent shocks. As such, any interpretation related to pandemic effects should be treated with caution.

Accordingly, future research could extend the analysis by incorporating longer post-pandemic samples, alternative

empirical strategies, or additional variables to better assess the persistence and evolution of regional financial integration over time.

Conclusion

This study examines ASEAN stock market integration before and after the ASEAN Economic Community (AEC) 2015 using weekly composite stock price indices for 2011–2016 and 2017–2024. The results show that the ASEAN-6 markets remain economically integrated across both periods, with Vietnam exhibiting relatively weaker long-run connections.

Granger causality analysis indicates that short-run interdependencies have evolved over time, with increased bidirectional relationships observed between Thailand–Philippines, Indonesia–Singapore, and Malaysia–Indonesia after AEC 2015. These findings suggest that regional stock markets have become more interconnected, reflecting dynamic integration patterns rather than static long-run co-movement.

The study contributes to the literature by demonstrating that policy-related structural changes, such as AEC 2015, can coincide with shifts in both the strength and direction of inter-market linkages. Implications follow directly from these empirical findings: ASEAN policymakers and investors can use evolving causal relationships to monitor market interdependencies, manage portfolio diversification, and identify potential risk transmission channels across the region.

The main findings of this study lead to the following recommendations. Firstly, policymakers in ASEAN countries can use the findings to evaluate the effectiveness of existing economic policies and identify areas for reform or improvement. The evolving patterns of causal relationships identified in this study can help governments tailor their economic strategies to strengthen ties with key trading partners and enhance regional cooperation. Secondly, investors and financial institutions can utilize the study's insights to make informed investment decisions within ASEAN markets. The changing interconnections between countries can aid in diversifying investment portfolios, managing risks associated with cross-border investments, and taking advantage of emerging opportunities in interconnected markets for investors. Thirdly, businesses operating in ASEAN can employ the study's findings to assess market integration trends and identify potential expansion opportunities. Additionally, the relationships between countries can guide businesses in developing strategic partnerships, supply chain networks, and distribution channels that align with the region's economic dynamics, ultimately enhancing their market reach and competitiveness.

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