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Real Estate Market Dynamics: Impacts on Financial Stability and the Real Economy, and Reciprocal Effects in ASEAN+3

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Abstract

This paper examines the dynamic interconnections between the real estate market, financial stability, and the real economy in the ASEAN+3 region. Using quarterly data from nine economies, a panel vector autoregression model is employed, incorporating impulse response functions and Granger causality tests to analyze these relationships. The findings indicate that negative shocks in the real estate market or the broader economy—such as declining property prices or reduced economic activity—intensify financial stress. Conversely, disruptions in the financial market significantly weaken both the property sector and economic performance. Additionally, the study identifies reciprocal positive influences between the real estate market and the real economy, highlighting their mutual interdependence. The paper provides comprehensive insights into structural vulnerabilities and policy recommendations to mitigate risks and enhance resilience against future shocks.

JEL classification: C33, G10, G18, R30, R38

Keywords: ASEAN+3, real estate market, financial stability, macroeconomic dynamics, panel vector autoregression (PVAR), dynamic relationship

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Abbreviations

ASEAN	Association of South-East Asian Nations (Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam)
ASEAN-5	Indonesia, Malaysia, Philippines, Singapore, Thailand
ASEAN+3	ASEAN plus China (including Hong Kong, China), Japan, Korea
BCLV	Brunei Darussalam, Cambodia, Lao PDR, Vietnam
BIS	Bank for International Settlements
BN	Brunei Darussalam
CN	China
COVID-19	Coronavirus disease 2019
EU	European Union
FSI	Financial stress index
GDP	Gross domestic product
GFC	Global Financial Crisis
HK	Hong Kong, China (hereafter "Hong Kong" for brevity)
ID	Indonesia
JP	Japan
KH	Cambodia
KR	Korea
LA	Lao People's Democratic Republic (PDR)
MY	Malaysia
PH	The Philippines
Plus-3	China (including Hong Kong, China) Japan, Korea
PMI	Purchasing manager's index
Panel VAR or PVAR	Panel vector autoregression
REI	Real estate price index
SG	Singapore
TH	Thailand
VN	Vietnam
U.S.	United States

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I. Introduction

Financial stability can be heavily dependent on real estate markets due to financial institutions' extensive property exposure. Banks and lenders hold substantial real estate assets through property loans and mortgages, tightly linking their stability to property market performance. Strong real estate markets strengthen financial institutions' balance sheets and boost related sectors' stock and debt performance, while market downturns increase default risks and weaken these markets. Major historical crises—such as the 2008 Global Financial Crisis triggered by the U.S. subprime mortgage collapse and Japan's 1990s property bubble burst—demonstrate how real estate market failures can severely undermine financial stability.

Beyond its impact on financial stability, real estate markets are deeply intertwined with the broader economy through multiple channels. Property price changes affect consumer spending via the wealth effect, particularly in developed economies—rising values boost household confidence and consumption, while falling prices typically have the opposite effects. The property sector also drives economic growth through construction investment and job creation. Moreover, real estate generates significant government revenue through property taxes and transaction fees, creating a feedback loop where market growth supports broader economic activity, which in turn increases government income.

The relationships flow both ways, as financial conditions and economic activity could shape real estate markets. Credit availability and costs significantly influence real estate activity and pricing, while property demand is driven by household incomes, corporate expansion, and infrastructure development. Financial stability and economic performance are also mutually reinforcing—financial stress tightens credit conditions and reduces spending, while economic downturns increase default risks and reduce financial institutions' profitability.

These complex interconnections underscore the importance of understanding these relationships for policymakers and stakeholders working to manage systemic risks and promote stability. The potential ripple effects of shocks across these sectors demand careful analysis to develop targeted and effective policy measures that strengthen regional resilience and stability.

Existing literature has extensively explored these relationships. Reinhart and Rogoff (2009) provide a comprehensive analysis of financial crises, highlighting real estate bubble bursts as triggers for financial instability. Claessens et al. (2011) demonstrate that recessions linked to financial disruptions, particularly house price busts, tend to be longer and deeper, while recoveries driven by rapid credit and house price growth are typically stronger. Leamer (2015) emphasizes housing's central role in the business cycle, showing how house price fluctuations impact financial stability, GDP, and broader economic activity through wealth effects, investment, and employment. Hartmann (2015) examines European real estate markets, advocating macroprudential policies like loan-to-value limits to mitigate systemic risks. Deghi et al. (2022) analyze commercial real estate sector misalignments, noting their role in increasing future price correction likelihood and exacerbating financial stability and GDP growth risks.

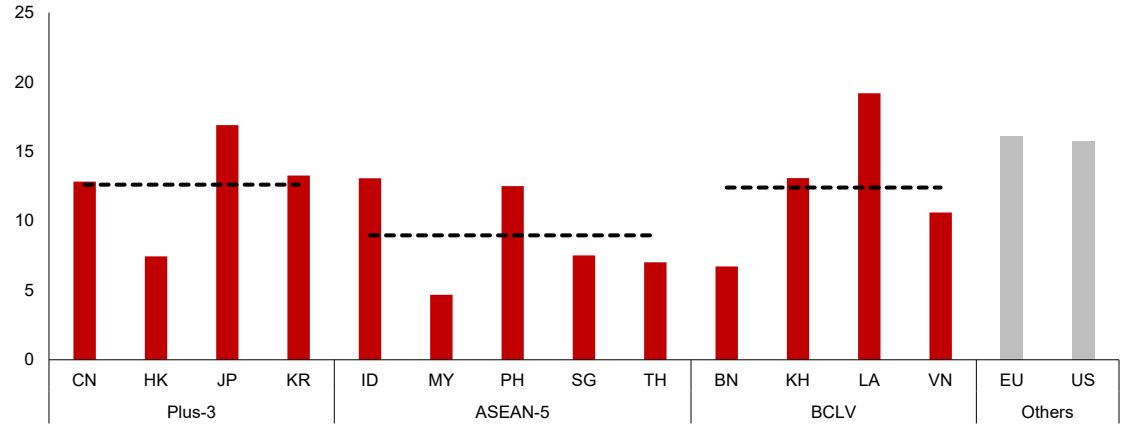
This study contributes to the literature by focusing specifically on the ASEAN+3 region, offering insights tailored to its unique economic and financial structures. Unlike previous research that primarily examines unidirectional relationships, we analyze the reciprocal interconnections among real estate markets, economic activity, and financial stability. Our panel vector autoregression (PVAR) model captures the feedback mechanisms and spillovers between these sectors, providing comprehensive insights for regional policy development.

The paper is organized as follows. Section 2 provides an overview of the real estate sector in ASEAN+3. Section 3 presents the data description and highlights key empirical trends. Section 4 conducts a dynamic analysis. Finally, Section 5 concludes the paper.

II. Overview of the Real Estate Sector in ASEAN+3

In the ASEAN+3 economies, the real estate sector is a crucial component of the real economy. It contributes significantly to GDP, with the gross value added from real estate services and construction industries accounting for approximately 11 percent of total industry gross value added on average (Figure 1). This sector supports economic growth by creating employment, generating wealth-driven demand (wealth effect), increasing the need for building materials, and bolstering various related industries. Notably, the gross value added ratio of the real estate sector is higher in the Plus-3 and BCLV economies than in the ASEAN-5 economies.

Figure 1. Selected ASEAN+3, U.S., EU: The Ratio of Real Estate Sector Value Added to Total Gross Value Added
(Percent)

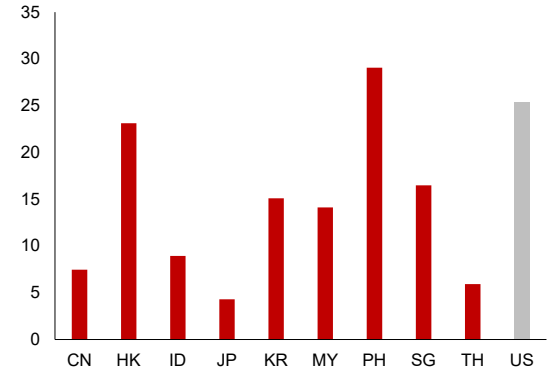


Source: National authorities via Haver Analytics; AMRO staff calculations
Note: The real estate sector includes both real estate services and construction. Due to data availability, the value added for China is based on nominal GDP, while for other economies, it is based on real GDP data. The data for HK, JP, and KH are as of 2022, while the data for the remaining economies are as of 2023. CN = China, HK = Hong Kong, JP = Japan, KR = Korea, ID = Indonesia, MY = Malaysia, PH = the Philippines, SG = Singapore, TH = Thailand, BN = Brunei Darussalam, KH = Cambodia, LA = Lao People's Democratic Republic, VN = Vietnam, EU = European Union, US = United States. The dotted lines are the averages of each subgroup.

The real estate sector represents a significant portion of financial institutions' lending. The share of property-related loans—which includes loans to building and construction, property development and investment, and real estate services—varies across economies, but comprises a substantial share in ASEAN+3, averaging around 15 percent (Figure 2). Additionally, if loans from the demand side, such as mortgage loans, are included, the importance of the property sector in financial intermediation is even greater (Figure 3).[3] This extensive exposure to property-related loans could serve as a conduit for transmitting shocks from the property market to financial institutions.

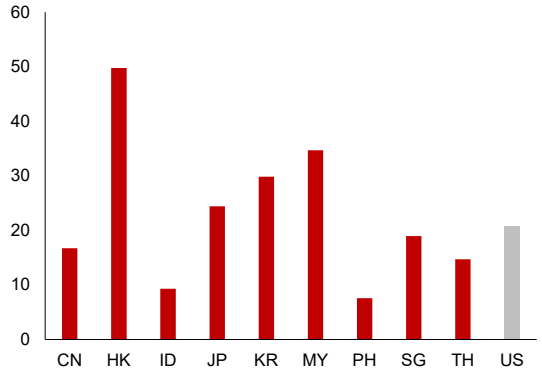
[3] The sources of data collection may vary depending on availability, which may result in differences in the total loan figures presented in Figures 2 and 3. Consequently, directly summing the numbers from these figures to calculate the proportion of property-related loans might not be appropriate due to data consistency issues. However, considering both Figures 2 and 3 together can provide an approximate estimate of the proportion of property sector-related loans.

Figure 2. Selected ASEAN+3, U.S.: Share of Property-Related Industry Loans in Total Loans
(Percent)



Source: CEIC; Wind; Haver Analytics; AMRO staff calculations
Note: Data as of the end of 2023. Property-related sectors include commercial banks' loans to building and construction, property development and investment, and real estate activity sectors, which may have different coverages across different economies. For the U.S., data for commercial real estate (including construction and land development) is shown. CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia, PH = the Philippines; SG = Singapore; TH = Thailand; US = United States.

Figure 3. Selected ASEAN+3, U.S.: Share of Housing/Mortgage Loans in Total Loans
(Percent)



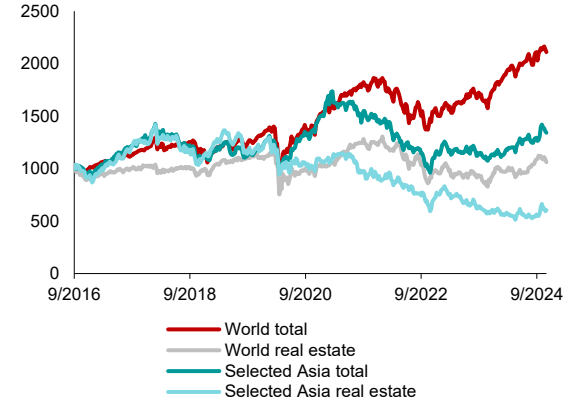
Source: CEIC; AMRO staff calculations
Note: Data as of the end of 2023. Housing/mortgage loans represent household loans for purchasing homes, land, or other types of real estate from banks, mortgage companies, or other financial institutions for the owner's occupation or investment purposes. The sources of data collection may differ across countries. For HK and JP, data are sourced from licensed banks while for ID, KR, PH, TH, and U.S., data are sourced from commercial banks. For the U.S., data for residential real estate loans is shown. For the remaining economies, the loan data also include information from other financial and non-financial institutions. Due to differences in data coverage and availability, the total loan data used in this figure may differ from those shown in Figure 2. CN = China; HK = Hong Kong; ID = Indonesia; JP = Japan; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; US = United States.

The real estate market can affect the financial market through both the stock and debt markets in related sectors. The real estate sector occupies only a small portion of the total stock market capitalization,[4] and since the COVID-19 pandemic, its correlation with the overall stock index has declined (Figure 4). This trend might suggest the limited influence of the real estate sector on the broader stock market. However, tail risks arising from the property sector can still pose significant threats. As observed during the GFC, extreme events in the property sector can trigger severe financial market volatility, potentially leading to sharp declines across the broader stock market.

In the ASEAN+3 region, the real estate sector's impact on the debt market could be more substantial than its impact on the stock market. Corporate debt is typically one of the primary financing sources for property developers, aligning with the capital-intensive, cash-flow-driven nature of real estate projects. As of the end of 2023, property and construction sector debt accounted for 16.3 percent of total corporate debt in ASEAN+3 economies. One example of the potential spillover effects from the real estate debt market could be seen in the 2022 credit crunch in Korea, following a property developer's debt default. In October of that year, corporate bond spreads in Korea surged to their highest levels since the GFC (Figure 5).

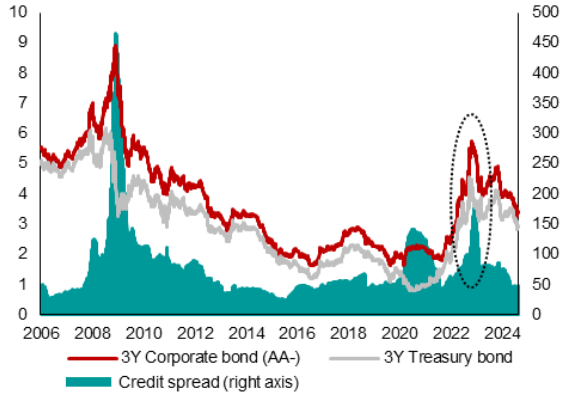
[4] As of the end of September 2024, the weight of the real estate sector is 2.3 percent in the MSCI World Index and 2.4 percent in the FTSE World Index.

Figure 4. World and Selected Asia: Total Stock Index and Real Estate Stock Index
(Index, 2 September 2016 = 1000)



Source: MSCI Indices via Bloomberg Finance L.P.; AMRO staff calculations
Note: For selected Asia, proxies of ASEAN+3, MSCI AC Asia ex-JP indices are used. The indices include securities from eight ASEAN+3 economies (e.g. China, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Philippines, and Thailand), India, and Taiwan Province of China. Stock indices are recalibrated to a baseline of 1000 on 2 September 2016, to facilitate comparisons.

Figure 5. Korea: Example of Spillovers from a Real Estate Shock to Corporate Bond Market
(Percent; Basis point)



Source: Korea Financial Investment Association via CEIC; AMRO staff calculations
Note: Credit spread is calculated by subtracting the 3-year Treasury bond yield from the 3-year corporate bond (AA-) yield.

III. Data Description and Empirical Trends

A. Data

The Financial Stress Index (FSI) is used to measure the degree of stress in the financial system and monitor financial stability, while changes in the real estate price index (REI) are used to assess the condition of the real estate market. To gauge the real economy, changes in gross domestic product (GDP) or the purchasing managers' index (PMI) are utilized. Two sets of data—monthly and quarterly—are employed, considering their respective advantages and disadvantages (Table 1).

This paper primarily employs quarterly data due to its broader availability across a larger number of economies in the ASEAN+3 region, enabling more comprehensive regional analysis. While monthly data provides higher frequency and minimizes information loss, its limited coverage—especially for REI data—is a significant constraint. Additionally, GDP, a widely used indicator in analyzing the real economy, is predominantly available on a quarterly basis with a longer time span, making it more suitable for robust time series analysis. For additional insights, an analysis using monthly data is provided in Appendix 5. The quarterly data sample comprises nine economies—China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, and Thailand— spanning the period from Q3 2005 to Q2 2023. The detailed data descriptive statistics are provided in Appendix 1. The dataset is unbalanced due to some missing REI data for certain economies. For REI and GDP, year-over-year growth rates are applied, while for FSI, actual values are used since they inherently include growth rate components such as stock market returns. A unit root test was conducted to verify the stationarity of the time series variables, ensuring that the data is appropriate for analysis and does not lead to spurious results (Appendix 2).

Table 1. Comparison of Monthly and Quarterly Data Sets Utilized in the Study

Frequency	Components	Advantages	Disadvantages
Monthly	• **FSI**: Sourced from the Asian Development Bank, measures the degree of financial stress covering four major sectors (banking, foreign exchange, equity, and debt market).[5]	• More accurately captures the impact of shocks due to high frequency. • Minimizes information loss by using the original data without adjustment. • Improves the accuracy of time series models.	• Monthly REI data is only available for a limited number of economies (Plus-3 economies and Thailand), which restricts the analysis for broader regional economies. • For the analysis of the real economy, GDP is more commonly used.
	• **Monthly REI**: Sourced from national authorities via CEIC, reflecting property market conditions. Changes in the real estate price index from the previous month are used.		
	• **PMI**: Sourced from S&P Global via Haver Analytics, gauges trends in the real economy. Changes in the PMI from the previous month are used.		
Quarterly	• **FSI**: Quarterly FSI is calculated by taking the average of the above monthly FSI over three months.	• Quarterly REI data is available for a larger number of economies (Plus-3 and ASEAN-5 economies), enabling analysis across a broader regional scope. • GDP data is available over a longer time span than PMI data for many economies.	• Averaging in FSI data can lead to a loss of information or detail, potentially obscuring patterns that are only visible with higher-frequency data. • With fewer observations, the ability to capture the impact of shocks is limited.
	• **Quarterly REI**: Sourced from the Bank for International Settlements via Haver Analytics. Year-over-year residential property price growth rates, based on real values, are used.		
	• **GDP**: Sourced from national authorities via CEIC. Year-over-year growth rates, based on real values, are used.		

B. Empirical Trends

As illustrated in Figure 6, the real estate market generally moves in tandem with real economic activity,[6] with REI typically aligning with GDP, albeit with some exceptions. In contrast, financial stress tends to move inversely to the real estate market and real economic activity. Two notable cases highlight these movements: the GFC and the COVID-19 pandemic, both characterized by significant spikes in financial stress and sharp declines in GDP. During the GFC, FSI rose sharply while REI and GDP declined significantly. During COVID-19, GDP dropped sharply before rebounding, while FSI moved in the opposite direction. REI exhibited rather muted behavior during the pandemic and initially deviated from GDP. However, after global and regional interest rate hikes in 2022, the REI declined in line with GDP, while FSI increased.

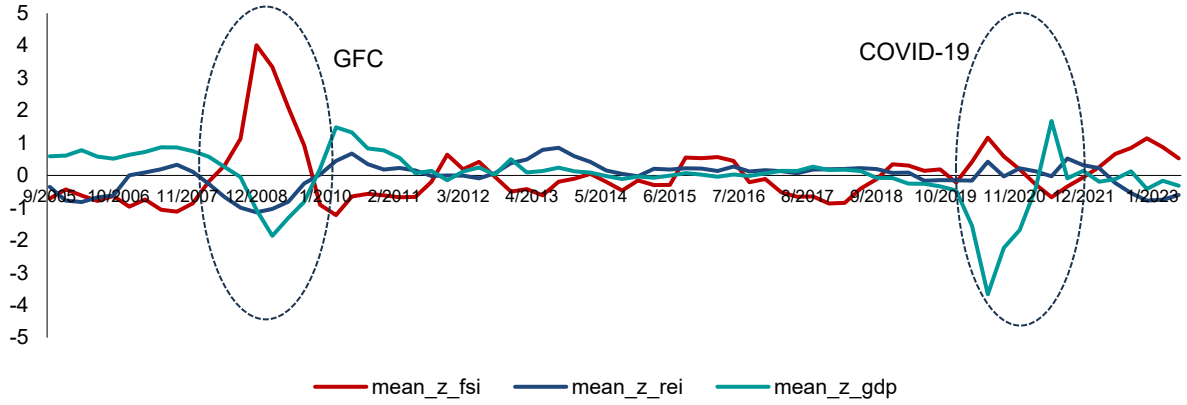
Individual countries exhibit similar patterns, with the GFC and COVID-19 serving as critical points for most economies (Figure 7). During the GFC, the FSI spiked in each economy,

[5] $FSI = Banking\ sector\ beta(\beta) + Stock\ market\ returns + Stock\ market\ volatility + Sovereign\ debt\ spread + Exchange\ market\ pressure\ index$. For more detailed methodologies, refer to Park and Mercado (2014).

[6] To provide a standardized and comparable view across variables, a z-score analysis was used in place of the actual values for FSI, REI, and GDP to illustrate trends. Averaging the z-scores across different economies in the region captures overall regional dynamics in a simplified and interpretable manner, offering a clearer understanding of broader trends in financial stress, real estate markets, and economic activity. This approach reduces the impact of outliers and scale differences, smoothing individual variations and emphasizing common patterns. For summary statistics of the original values of the variables, please refer to Appendix 1.

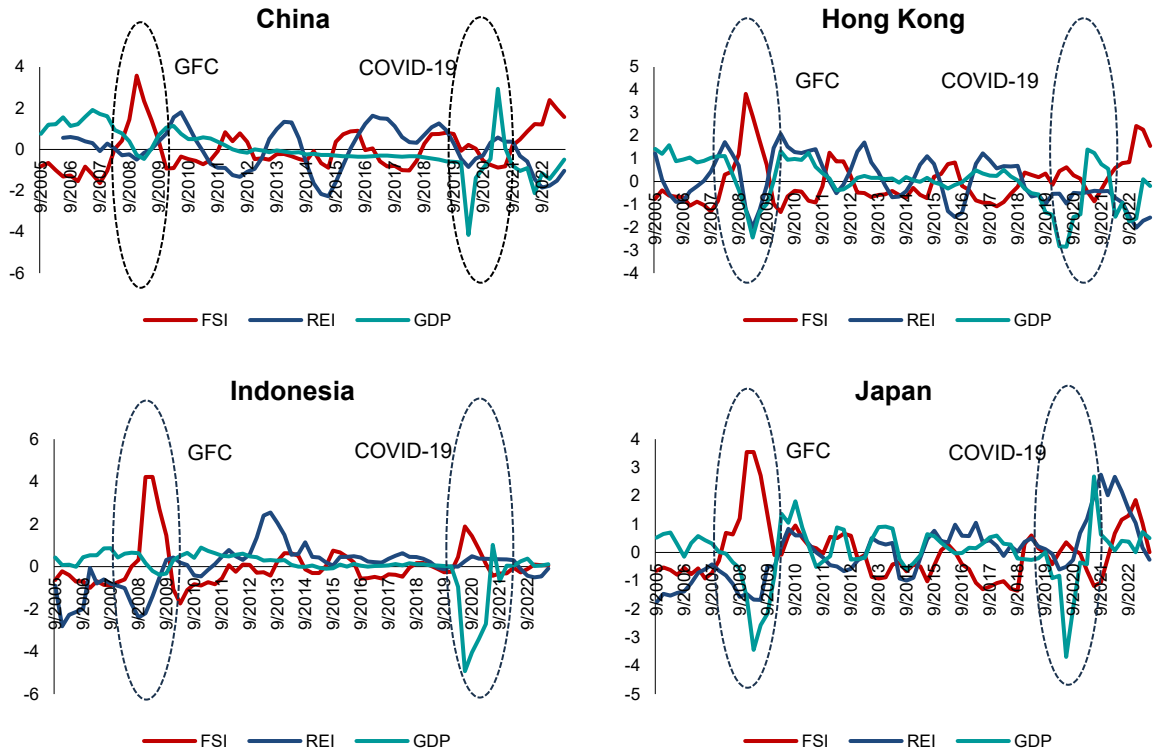
while GDP and REI declined in most cases. During COVID-19, GDP fell sharply across all economies before rebounding post-pandemic, while the FSI moved in the opposite direction. REI exhibited varied trends across economies during COVID-19. Some economies, such as Korea and Thailand, experienced higher REI compared to historical levels, driven by increased demand stemming from government stimulus measures and a preference for larger living spaces during lockdowns. In contrast, others, such as China and Hong Kong, saw lower REI due to tighter regulations or property oversupply. Meanwhile, certain economies exhibited more nuanced patterns, with muted changes or a mix of increases and decreases influenced by a combination of financial conditions, government policies, and GDP growth. However, following the pandemic, a tighter financial environment has generally worsened conditions in the real estate market.

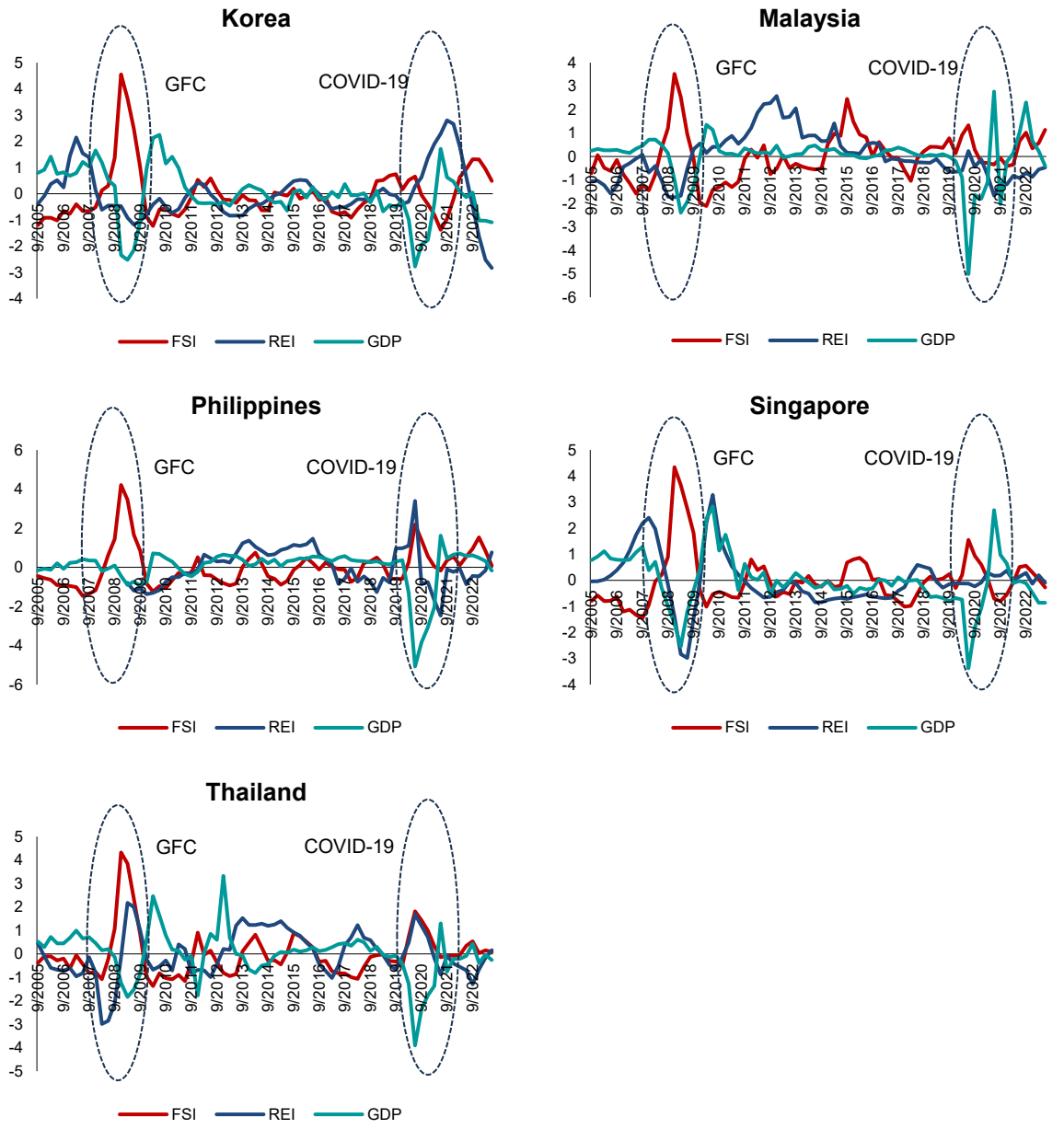
Figure 6. Trends in Mean Z-scores of FSI, REI, and GDP for Selected ASEAN+3 Economies



Source: Asian Development Bank; Bank for International Settlements via Haver Analytics; national authorities via CEIC; AMRO staff calculations
Note: The mean z-score for each variable is calculated by averaging the z-scores of that variable across all selected ASEAN+3 economies, including China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, and Thailand.

Figure 7. Trends in Z-scores of FSI, REI, and GDP for Individual ASEAN+3 Economies





Source: Asian Development Bank; Bank for International Settlements via Haver Analytics; national authorities via CEIC; AMRO staff calculations
Note: The Z-score for each variable is calculated by subtracting its period-average mean from the observed value and dividing by its standard deviation over the same period.

The empirical trends of the key variables—financial stress (FSI), real estate market activity (REI), and economic performance (GDP)—suggest potential relationships among them that warrant further analysis. While some country-specific differences exist, the observed trends across most ASEAN+3 countries are similar enough to justify a regional-level analysis. To explore these dynamics, a Panel Vector Autoregression (PVAR) model was introduced. This enables the study to capture region-wide patterns and interactions efficiently, avoiding the complexity and lengthiness of presenting individual country analyses. The next section presents an in-depth examination of these relationships using the PVAR framework. Dynamic analyses were conducted to capture the lagged effects between variables, offering a comprehensive view of their interactions over time.

IV. Dynamic Analysis: Panel Vector Autoregression (PVAR) Model

A. Model and Methodology

The PVAR model provides a robust framework for analyzing the dynamic interdependencies and feedback loops among multiple variables over time, allowing each variable to be influenced by its own past values as well as by the past values of other variables in the system. By modeling these dynamic interactions across entities within a panel framework, the PVAR provides insights into how shocks to one variable propagate through others over time.

$$\begin{aligned}
\mathrm{FSI}_{it} &= \alpha_i + \beta_{1i}\mathrm{FSI}_{it-1} + \beta_{2i}\mathrm{FSI}_{it-2} + \beta_{3i}\mathrm{REI}_{it-1} + \beta_{4i}\mathrm{REI}_{it-2} + \beta_{5i}\mathrm{PMI}_{it-1} + \beta_{6i}\mathrm{PMI}_{it-2} + \varepsilon_{1it} \\
\mathrm{REI}_{it} &= \alpha_i + \beta_{7i}\mathrm{FSI}_{it-1} + \beta_{8i}\mathrm{FSI}_{it-2} + \beta_{9i}\mathrm{REI}_{it-1} + \beta_{10i}\mathrm{REI}_{it-2} + \beta_{11i}\mathrm{PMI}_{it-1} + \beta_{12i}\mathrm{PMI}_{it-2} + \varepsilon_{2it} \\
\mathrm{GDP}_{it} &= \alpha_i + \beta_{13i}\mathrm{FSI}_{it-1} + \beta_{14i}\mathrm{FSI}_{it-2} + \beta_{15i}\mathrm{REI}_{it-1} + \beta_{16i}\mathrm{REI}_{it-2} + \beta_{17i}\mathrm{PMI}_{it-1} + \beta_{18i}\mathrm{PMI}_{it-2} + \varepsilon_{3it}
\end{aligned} \tag{2}$$

Where

- FSI_{it} = Financial stress index for country i at time t.
- REI_{it}= Year-over-year growth rate of the real estate price index for country i at time t.
- GDP_{it}= Year-over-year growth rate of gross domestic product for country i at time t.
- $\mathrm{FSI}_{it-1}, \mathrm{FSI}_{it-2}, \mathrm{REI}_{it-1}, \mathrm{REI}_{it-2}, \mathrm{GDP}_{it-1}, \mathrm{GDP}_{it-2}$ = Lagged values[7] of the respective variables for country i at time $t-1$ and $t-2$
- α_i = Dependent variable-specific panel fixed effects
- $\beta_{1i} \ldots \beta_{18i}$ = Coefficients of the lagged variables for each country i
- $\varepsilon_{1it,}\varepsilon_{2it}, \varepsilon_{3it}$= Idiosyncratic error terms

Using the PVAR model, Impulse Response Functions (IRFs) were calculated without imposing assumptions about the contemporaneous causal ordering of variables to explore how shocks to one variable influence the others over time. For robustness, orthogonalized IRFs under Cholesky decomposition with different variable orders were also employed, but the results showed no significant differences.

B. Main Findings

To maintain conciseness, the main findings will focus on the selected ASEAN+3 group (9 economies), with results for other subgroups, such as ASEAN-5 and Plus-3, included in

[7] The selection of 2 lags for the PVAR model was determined using the Moment Model Selection Criteria (MMSC) developed by Andrews and Lu (2001), specifically the MAIC, MBIC, and MQIC. The MAIC criterion strongly favored the 2-lag specification, with a much lower value (e.g., lag 1: 34.8, lag 2: 20.4, lag 3: 33.1, lag 4: 31.6), indicating a significant improvement in model fit compared to other lag lengths. While MBIC and MQIC suggested a simpler 1-lag specification, the difference in their values between lag 1 and lag 2 was very slight, making the choice of lag 1 less definitive. Longer lags, such as 3 or 4, were not supported by any of the criteria, as their values were substantially worse. Given the strong preference for lag 2 under MAIC, the 2-lag model was chosen to capture richer dynamics and ensure a more comprehensive understanding of the relationships among the variables without overburdening the model. Furthermore, the dataset's size and structure (604 observations across 9 panels) provide sufficient degrees of freedom to support the inclusion of 2 lags, ensuring robust and reliable estimation.

Appendix 3. While some variations exist across panel groups, the main findings reflect generally similar results overall.

The findings suggest that the financial market, the real estate market, and real economic activities are closely interconnected, with significant mutual influences. Disruptions in the financial market negatively affect both the real estate market and the broader economy: as financial stress increases, real estate price growth and GDP growth decline. Conversely, positive shocks in the real estate market and the real economy help alleviate financial market stress. The relationship between the real estate market and the real economy is generally positive, with each supporting the other's growth.

FSI shock

- Impact on itself: Financial stress reinforces itself strongly in the short term, stabilizing in the medium term but resulting in a lasting cumulative increase in stress levels. This effect is statistically significant in the IRF until the fourth quarter and remains statistically significant for more than three years in the cumulative impulse response function (CIRF).
- Impact on REI: The REI declines sharply initially, with recovery observed after the fourth quarter; however, the cumulative impact remains negative until the seventh quarter, indicating persistent adverse effects on the real estate market. This effect is statistically significant in the IRF until the second quarter and in the CIRF until the third quarter.
- Impact on GDP: GDP experiences a significant short-term drop, with recovery after the fourth quarter. The cumulative impact remains negative, reflecting a prolonged drag on economic growth. This effect is statistically significant in the IRF until the third quarter and in the CIRF until the sixth quarter.

REI shock

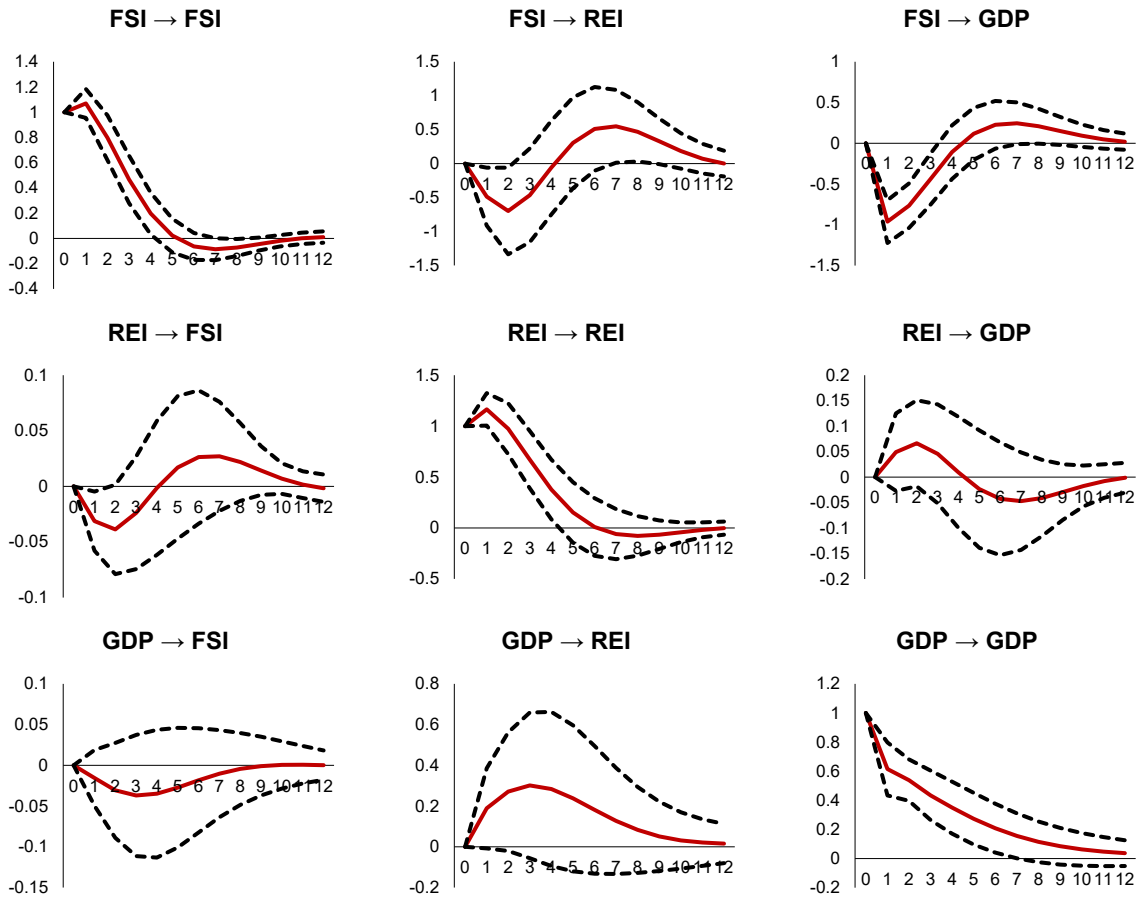
- Impact on FSI: A rise in real estate prices reduces financial stress in the short term, with this relief accumulating over time to support medium-term financial stability. The effect is statistically significant up to the second quarter in the IRF and the third quarter in the CIRF.
- Impact on itself: The real estate market sees a strong, self-reinforcing positive effect, which tapers but leaves a lasting cumulative boost in price levels. The effect is statistically significant in the IRF until the fourth quarter and remains statistically significant for more than three years in the CIRF.
- Impact on GDP: GDP enjoys moderate growth in response to the shock gradually diminishing over time, with a sustained cumulative positive impact until the ninth quarter, indicating that real estate growth supports economic performance. However, the effect is not statistically significant in either the IRF or the CIRF.

GDP shock

- Impact on FSI: GDP shocks reduce FSI, implying that economic growth tends to help alleviate financial stress. This stabilizing effect on FSI is modest but persistent, showing a sustained, long-term influence on financial stability. However, this effect is not statistically significant in either the IRF or CIRF.
- Impact on REI: GDP shocks positively influence REI, indicating that economic growth supports higher real estate prices. This effect is relatively strong in the first few quarters and stabilizes afterward, but it is not statistically significant in either the IRF or CIRF.

- Impact on itself: GDP shows a strong positive response to its own shock, which gradually decreases but remains positive over time. This self-reinforcing effect is statistically significant in the IRF until the seventh quarter and remains statistically significant for more than three years in the CIRF.

Figure 8. Selected ASEAN+3: Impulse-response Function (Impulse → Response)



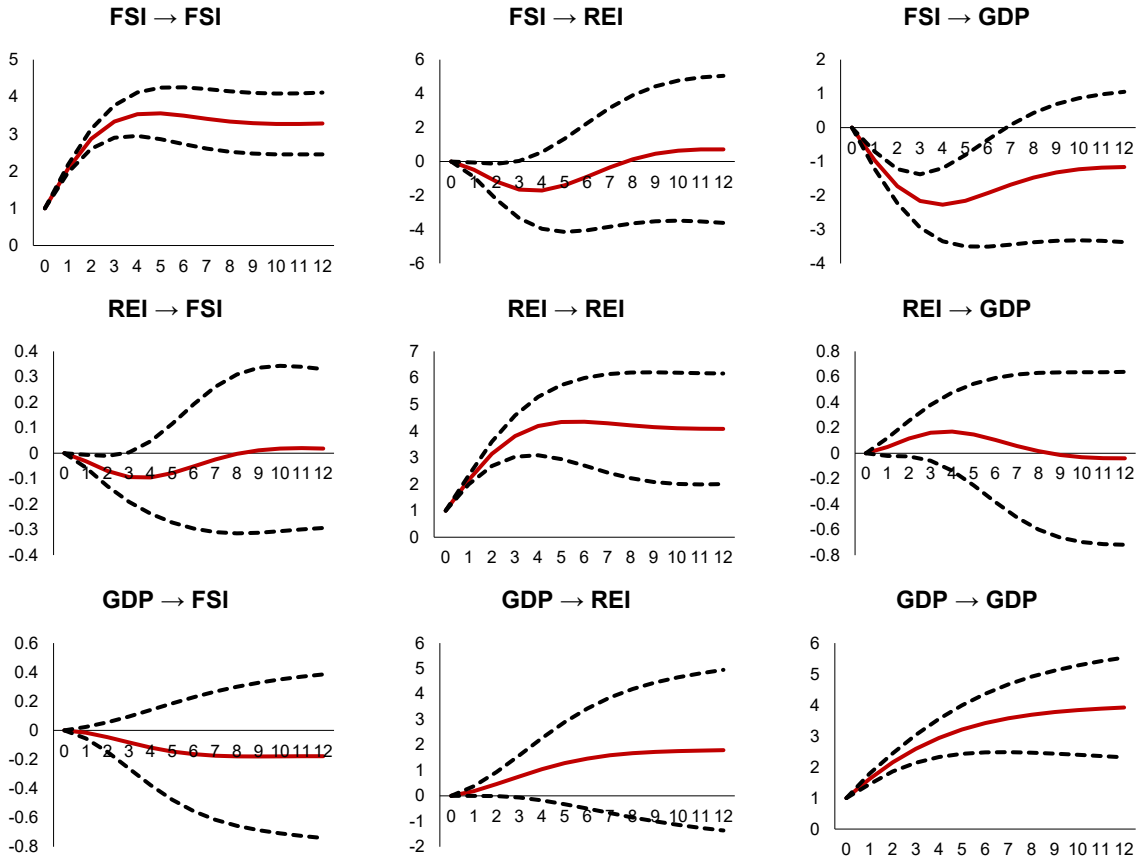
Source: Asian Development Bank; national authorities via CEIC; AMRO staff calculations
Note: FSI = Financial Stress Index; REI = Year-over-year growth rate of real estate price Index; GDP = Year-over-year growth rate of gross domestic product. The first variable is an impulse factor and the second variable is a response factor. An increase in FSI indicates heightened financial market stress, while an increase in REI indicates rising real estate prices and a higher GDP reflects a more favorable economic environment. The dotted lines are 95 percent confidence intervals. The x-axis represents quarters following a shock and the y-axis represents the magnitude of the response variable. The magnitude of the shock corresponds to a one-unit increase in the impulse variable.

Table 2. Selected ASEAN+3: Panel VAR Results on FSI, REI, and GDP

Dependent variable / Independent variable	FSI	REI	GDP
FSI L1.	1.0698***	-0.4872**	-0.9609***
	(0.0586)	(0.1986)	(0.1395)
FSI L2.	-0.3768***	0.5719***	0.8787***
	(0.0446)	(0.2002)	(0.1386)
REI L1.	-0.0313**	1.1648***	0.0491
	(0.0146)	(0.0913)	(0.0354)
REI L2.	0.0320*	-0.4070***	-0.0510
	(0.0177)	(0.0798)	(0.0339)
GDP L1.	-0.0155	0.1889*	0.6151***
	(0.0180)	(0.1010)	(0.0844)
GDP L2.	0.0013	-0.0730	0.1357**
	(0.0142)	(0.0702)	(0.0692)

Source: AMRO staff calculations
Note: L1 and L2 represent one lagged and two lagged, respectively. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

Figure 9. Selected ASEAN+3: Cumulative Impulse-response Function (Impulse → Response)



Source: Asian Development Bank; national authorities via CEIC; AMRO staff calculations
Note: FSI = Financial Stress Index; REI = Year-over-year growth rate of real estate price Index; GDP = Year-over-year growth rate of gross domestic product. The first variable is an impulse factor and the second variable is a response factor. An increase in FSI indicates heightened financial market stress, while an increase in REI indicates rising real estate prices and a higher GDP reflects a more favorable economic environment. The dotted lines are 95 percent confidence intervals. The x-axis represents quarters following a shock and the y-axis represents the magnitude of the response variable. The magnitude of the shock corresponds to a one-unit increase in the impulse variable.

Table 3. Selected ASEAN+3: Results of Granger Causality Test

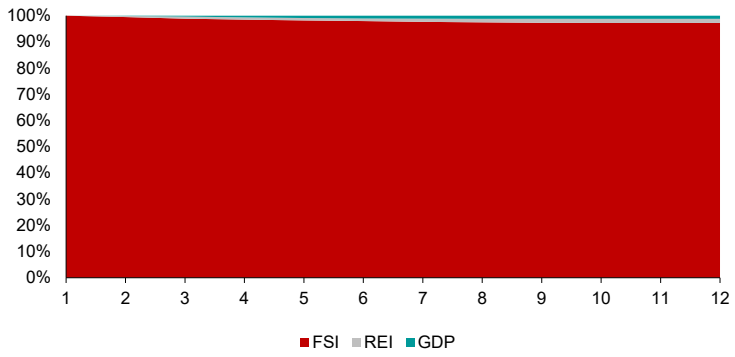
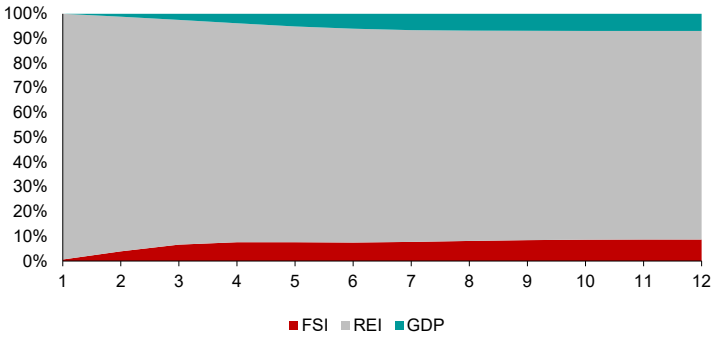
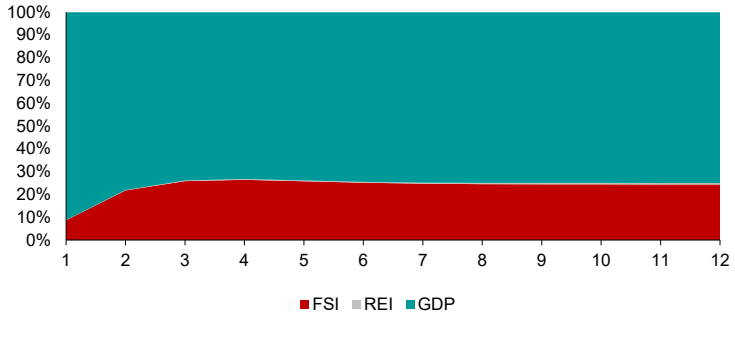
Equation variable	Excluded variable	Chi-squared	P-value(Prob>Ch2)
FSI	REI	4.602	0.100*
	GDP	0.738	0.691
	ALL	5.553	0.235
REI	FSI	8.325	0.016**
	GDP	3.555	0.169
	ALL	10.498	0.033**
GDP	FSI	50.063	0.000***
	REI	2.304	0.316
	ALL	58.503	0.000***

Source: AMRO staff calculations
Note: H0 (Null hypothesis) — Excluded variable does not Granger-cause Equation variable. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

The Granger causality test results reveal informational predictive relationships among the variables. REI demonstrates predictive power for FSI at a 10 percent significance level, suggesting that changes in the real estate market provide valuable information for forecasting shifts in financial market stress. Conversely, heightened financial stress is also

statistically significantly associated with fluctuations in real estate prices, while GDP does not provide significant predictive ability for REI. However, the combined informational contribution of FSI and GDP on REI is significant, highlighting their joint influence on real estate dynamics. FSI also shows a strong informational relationship with GDP, emphasizing its importance in understanding economic activity. Furthermore, the combined informational content of FSI and REI significantly relates to GDP, suggesting that both financial market stress and real estate market conditions are important in understanding real economy dynamics.

Figure 10. Selected ASEAN+3: Forecast Error Variance Decomposition

Response Variable	Forecast Error Variance Decomposition by Impulse Variables
FSI	
REI	
GDP	

Source: AMRO staff calculations

Forecast error variance decomposition reveals the proportion of each variable's forecast error variance that is explained by shocks originating from itself and from other variables over time, providing insights into the relative importance of each variable's shocks (Figure 10).

- **FSI**: The variance in FSI is predominantly explained by its own shocks, maintaining around 97 percent by the 12th quarter, with minimal contributions from REI (1.6 percent) and GDP (1.2 percent), indicating limited external influence on financial stability.
- **REI**: The variance in REI is mostly self-explained, decreasing from 99 percent initially to 84 percent by the twelfth quarter, with a growing influence from FSI (8.7 percent) and a moderate contribution from GDP (6.9 percent), showing increasing sensitivity to financial stress and economic conditions over time.
- **GDP**: The variance in GDP is largely due to its own shocks, dropping from 91 percent to 75 percent by the twelfth quarter, while FSI's influence grows significantly to 24 percent, highlighting the impact of financial stability on economic performance, with only a minor contribution from REI (0.7 percent).

While the PVAR analysis in this paper provides valuable insights, it may have limitations. First, there is potential for omitted variables that could influence the observed relationship. Second, the proxies used in this analysis, such as the financial stress index and real estate price index, may not fully capture the complexities of their respective sectors. For instance, while the financial stress index includes variables that indirectly reflect credit conditions, it does not explicitly measure them, which could limit its explanatory power for developments in the real estate market and economic activity. Third, the analysis relies on lag structures and linear relationships, which may not fully capture the complexities or nonlinearities inherent in these interactions. Future studies could address these limitations by exploring additional factors, refining methodologies, and incorporating more comprehensive data to enhance the robustness and applicability of the findings.

V. Conclusion

This paper uses PVAR models to explore the interconnections among ASEAN+3's financial market, real estate market, and real economic activities. The analysis reveals how shocks in one sector can spread to others, highlighting key interlinkages and impacts. The findings show that financial stress significantly and negatively affects both the real estate market and economic activities. In contrast, booms in the real estate market and economic activity help mitigate financial market stress. Additionally, the real estate market and the real economy mutually reinforce each other. These patterns hold true for the ASEAN+3 region as a whole, as well as within the Plus-3 and ASEAN-5 subgroups.

The results underscore the need for a comprehensive policy approach that addresses the intertwined nature of the financial market, real estate market, and real economic activities. Policy recommendations include:

- **Strengthen the financial stability framework**: Proactively monitor spillovers from the financial sector to other sectors (and vice versa), and conduct stress tests that account for interlinkages among financial markets, real estate markets, and the real economy. Such measures can better identify and mitigate systemic vulnerabilities.
- **Address real estate market vulnerabilities**: Enhance the soundness of financial sectors exposed to the property market to prevent negative impacts on financial stability. This may include diversifying business models of financial institutions with heavy real estate exposure, tightening regulatory oversight, and ensuring timely government intervention to avert systemic risk when spillovers are anticipated.

- **Foster economic resilience to mitigate financial stress**: Strengthening economic activity can lessen the impact of financial stress on both the broader economy and real estate markets. Separately, policies that encourage more broad-based and sustainable growth can act as a buffer against sector-specific vulnerabilities by diversifying economic drivers and reducing reliance on any single sector. By promoting balanced and resilient growth, economies are better equipped to withstand shocks and maintain resilience across multiple sectors, thereby limiting the ripple effects of financial stress.

While this study sheds light on the interconnected dynamics of the financial market, real estate market, and real economy in the ASEAN+3 region, it could have inherent limitations as discussed in Section IV. The findings are based on the available data, which may have certain gaps and limitations in supporting fully comprehensive research and analysis. Additionally, the modeling assumptions and proxies may not fully capture the complexities of these interactions. Future research could benefit from refining methodologies considering the limitations suggested in the previous chapter, incorporating additional factors where necessary, and leveraging more comprehensive datasets.

Appendix 1. Statistics of Data

Table A1.1. Main Statistics of Quarterly Data (2005Q3 – 2023Q2)

	Mean	Std. Dev.	Min.	Max.	Num. Obs.
FSI					
China	-0.568	1.782	-3.476	5.813	72
Hong Kong	-0.041	1.932	-2.616	7.351	72
Indonesia	-0.515	1.196	-2.592	4.534	72
Japan	-1.030	1.879	-3.568	5.631	72
Korea	-0.513	1.663	-2.805	7.059	72
Malaysia	-0.556	1.110	-2.901	3.357	72
Philippines	-0.737	1.433	-2.840	5.295	72
Singapore	-0.334	2.130	-3.432	8.917	72
Thailand	-0.837	1.562	-2.979	5.916	72
Overall	-0.570	1.675	-3.568	8.917	648
REI					
China	1.043	3.687	-7.330	7.700	69
Hong Kong	5.897	10.429	-15.100	27.620	72
Indonesia	-1.681	3.295	-10.940	6.710	72
Japan	0.590	2.819	-4.380	8.330	72
Korea	1.318	3.910	-9.760	12.270	72
Malaysia	3.217	3.727	-3.260	12.830	72
Philippines	2.800	6.324	-12.850	24.280	58
Singapore	3.119	9.451	-25.040	34.100	72
Thailand	1.563	3.854	-9.950	9.950	72
Overall	1.972	6.209	-25.040	34.100	631
GDP					
China	8.076	3.611	-6.900	18.700	72
Hong Kong	2.418	4.158	-9.424	9.003	72
Indonesia	4.943	2.086	-5.324	7.078	72
Japan	0.563	2.784	-9.703	8.031	72
Korea	3.309	2.136	-2.626	8.110	72
Malaysia	4.505	4.276	-16.926	16.332	72
Philippines	5.039	4.321	-16.907	12.042	72
Singapore	4.721	4.893	-11.800	18.600	72
Thailand	2.748	3.823	-12.177	15.468	72
Overall	4.036	4.173	-16.926	18.700	648

Appendix 2. Panel Unit-root Test Result

1. Levin-Lin-Chu (LLC) unit-root Test

- H0: Panels contain unit roots
- H1: Panels are stationary

Table A2.1. Results of Levin-Lin-Chu unit-root test

	Statistics		P-value
	Unadjusted t	Adjusted t*	
FSI	-12.6175	-9.4068	0.000***
REI	N/A	N/A	N/A
GDP	-10.9401	-7.3721	0.000***

Source: AMRO staff calculations.
Note: Asterisks (***) denote significance levels at 1 percent.

The Levin-Lin-Chu (LLC) unit-root test results indicate that the FSI and GDP are stationary, as the null hypothesis of panels containing unit roots is rejected with highly significant statistics. However, for REI, the LLC test could not produce valid results due to the unbalanced nature of the data. To address this limitation, alternative unit-root tests—Im-Pesaran-Shin (IPS) and Fisher-type tests—have been conducted.

2. Alternative unit-root tests

(1) Im-Pesaran-Shin (IPS)

- H0: All panels contain unit roots
- H1: Some panels are stationary

Table A2.2. Results of IPS Test

	Statistic		P-value	Fixed-N exact critical values		
				1%	5%	10%
FSI	t-bar	-2.8745		-2.150	-1.970	-1.880
	t-tilde-bar	-2.7334				
	Z-tilde-bar	-4.5685	0.000***			
REI	t-bar	-2.3274		(Not available)		
	t-tilde-bar	-2.2318				
	Z-tilde-bar	-2.7332	0.003***			
GDP	t-bar	-3.7308		-2.150	-1.970	-1.880
	t-tilde-bar	-3.4023				
	Z-tilde-bar	-7.0241	0.000***			

Source: AMRO staff calculations
Note: Asterisks (***) denote significance levels at 1 percent.

(2) Fisher-type

- H0: All panels contain unit roots
- H1: At least one panel is stationary

Table A2.3. Results of Fisher-type Test

	Statistics		P-value
FSI	Inverse chi-squared(18)	55.0910	0.000***
	Inverse normal	-4.9754	0.000***
	Inverse logit t(49)	-5.0180	0.000***
	Modified inv. chi-squared	6.1818	0.000***
REI	Inverse chi-squared(18)	37.4745	0.005***
	Inverse normal	-2.9230	0.002***
	Inverse logit t(49)	-2.9304	0.003***
	Modified inv. chi-squared	3.2458	0.001***
GDP	Inverse chi-squared(18)	104.9196	0.000***
	Inverse normal	-7.9778	0.000***
	Inverse logit t(49)	-9.246	0.000***
	Modified inv. chi-squared	14.4866	0.000***

Source: AMRO staff calculations
Note: Asterisks (***) denote significance levels at 1 percent.

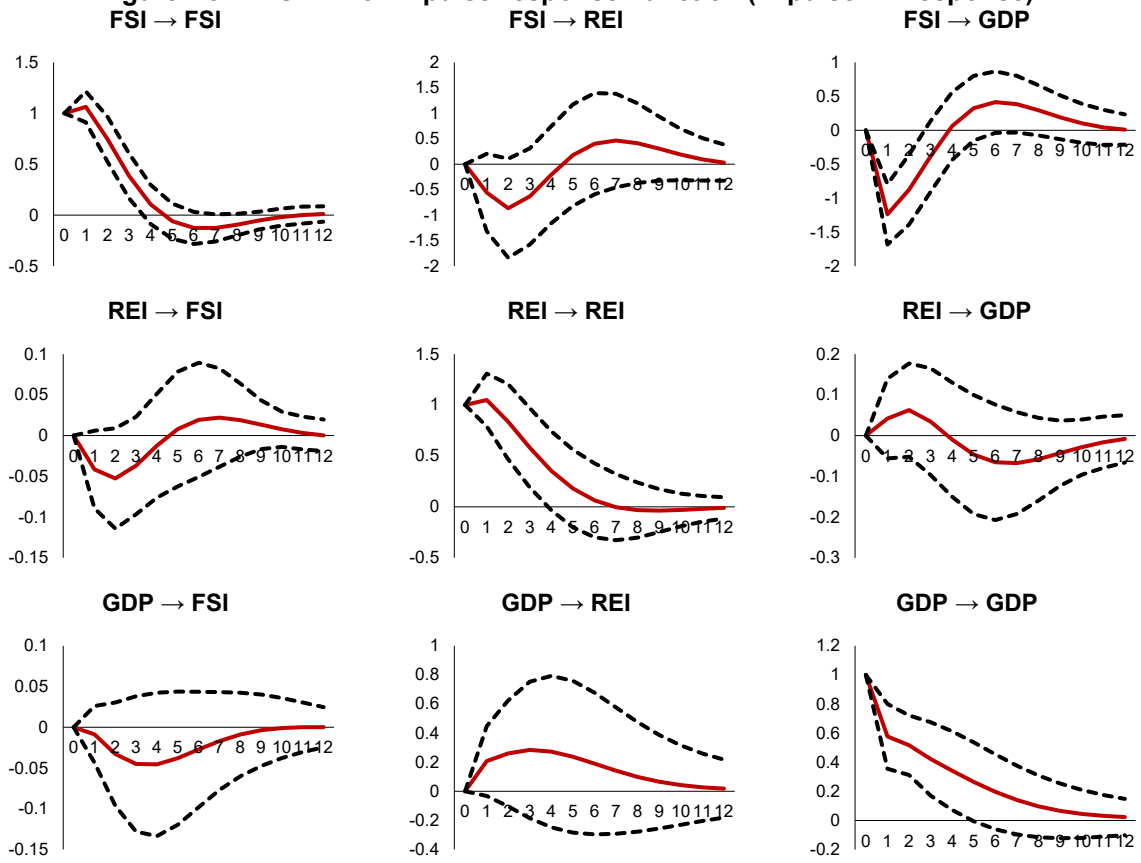
The results from both the IPS and Fisher unit-root tests consistently indicate that the FSI and GDP variables are stationary as shown in the LLC test above. For REI, both tests provide evidence of stationarity in some panels, as the test results support rejecting the null hypothesis. Overall, the panel data indicates stationarity for FSI, REI, and GDP in at least some cross-sections, allowing for PVAR modeling without additional transformations.

Appendix 3. Results of PVAR for Each Subgroup (Based on Quarterly Data)

In the main text, we presented the PVAR results for the overall ASEAN+3 group, which includes both ASEAN-5 and Plus-3 economies. To explore the differences between these two subgroups, a separate PVAR analysis was conducted for each.

1. ASEAN-5

Figure A3.1. ASEAN-5: Impulse-response Function (Impulse → Response)



Source: Asian Development Bank; national authorities via CEIC; AMRO staff calculations
Note: FSI = Financial Stress Index; REI = Year-over-year growth rate of real estate price index; GDP = Year-over-year growth rate of gross domestic product; The first variable is an impulse factor and the second variable is a response factor. An increase in FSI indicates heightened financial market stress, while an increase in REI indicates rising real estate prices and a higher GDP reflects a more favorable economic environment. The dotted lines are 95 percent confidence intervals. The x-axis represents quarters following a shock and the y-axis represents the magnitude of the response variable. The magnitude of the shock corresponds to a one-unit increase in the impulse variable.

Table A3.1. ASEAN-5: Panel VAR Results on FSI, REI, and GDP

Dep. variable / Indep. variable	FSI	REI	GDP
FSI L1.	1.0630***	-0.5568	-1.2364***
	(0.0746)	(0.3813)	(0.2236)
FSI L2.	-0.4179***	0.5681	1.1780***
	(0.0653)	(0.3601)	(0.2129)
REI L1.	-0.0417*	1.0491***	0.0418
	(0.0220)	(0.1283)	(0.0501)
REI L2.	0.0357	-0.2969***	-0.0570
	(0.0257)	(0.1041)	(0.0478)
GDP L1.	-0.0087	0.2078*	0.5778***
	(0.0184)	(0.1263)	(0.1077)
GDP L2.	-0.0100	-0.0827	0.1633*
	(0.0167)	(0.0805)	(0.0871)

Source: AMRO staff calculations
Note: Note: L1 and L2 represent one lagged and two lagged, respectively. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

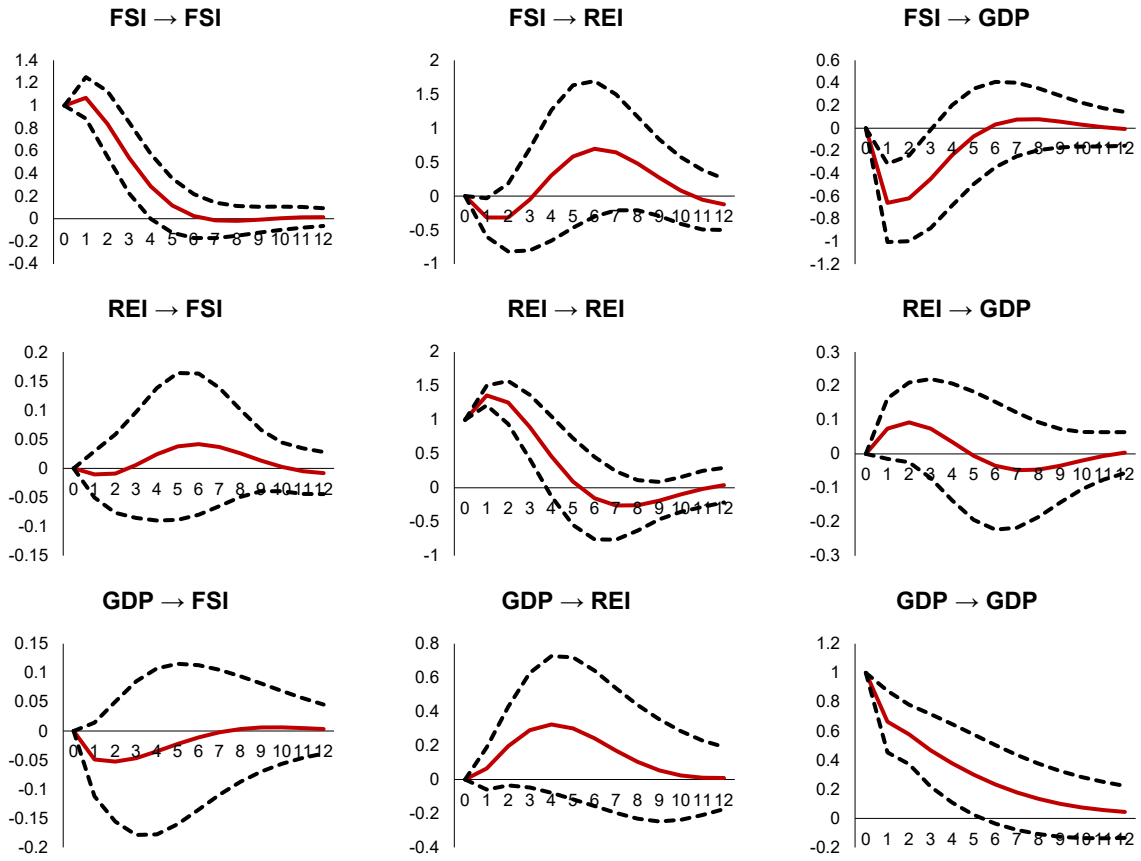
Table A3.2. ASEAN-5: Results of Granger Causality Test

Equation variable	Excluded variable	Chi-squared	P-value(Prob>Ch2)
FSI	REI	3.951	0.139
	GDP	0.656	0.720
	ALL	6.653	0.155
REI	FSI	2.592	0.274
	GDP	2.760	0.252
	ALL	5.511	0.239
GDP	FSI	34.883	0.000***
	REI	1.500	0.472
	ALL	37.986	0.000***

Source: AMRO staff calculations
Note: H0 (Null hypothesis) — Excluded variable does not Granger-cause Equation variable. Asterisks (***) denote significance levels at 1 percent.

2. Plus-3

Figure A3.2. Plus-3: Impulse-response Function (Impulse → Response)



Source: Asian Development Bank; national authorities via CEIC; AMRO staff calculations
Note: FSI = Financial Stress Index; REI = Year-over-year growth rate of real estate price index; GDP = Year-over-year growth rate of gross domestic product; The first variable is an impulse factor and the second variable is a response factor. An increase in FSI indicates heightened financial market stress, while an increase in REI indicates rising real estate prices and a higher GDP reflects a more favorable economic environment. The dotted lines are 95 percent confidence intervals. The x-axis represents quarters following a shock and the y-axis represents the magnitude of the response variable. The magnitude of the shock corresponds to a one-unit increase in the impulse variable.

Table A3.3. Plus-3: Panel VAR Results on FSI, REI, and GDP

Dependent variable / Independent variable	FSI	REI	GDP
FSI L1.	1.0683***	-0.3149**	-0.6593***
	(0.0934)	(0.1530)	(0.1785)
FSI L2.	-0.3391***	0.4919***	0.5466***
	(0.0617)	(0.1884)	(0.1781)
REI L1.	-0.0103	1.3605***	0.0744*
	(0.0198)	(0.0719)	(0.0420)
REI L2.	0.0198	-0.6032***	-0.0647
	(0.0241)	(0.0760)	(0.0419)
GDP L1.	-0.0489	0.0654	0.6647***
	(0.0368)	(0.0644)	(0.1111)
GDP L2.	0.0329	0.0486	0.0983
	(0.0280)	(0.0694)	(0.0914)

Source: AMRO staff calculations
Note: Note: L1 and L2 represent one lagged and two lagged, respectively. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

Table A3.4. Plus-3: Results of Granger Causality Test

Equation variable	Excluded variable	Chi-squared	P-value(Prob>Ch2)
FSI	REI	0.683	0.711
	GDP	2.471	0.291
	ALL	3.361	0.499
REI	FSI	7.047	0.029**
	GDP	3.277	0.194
	ALL	10.769	0.029**
GDP	FSI	13.646	0.001***
	REI	3.136	0.208
	ALL	19.910	0.001***

Source: AMRO staff calculations
Note: H0 (Null hypothesis) — Excluded variable does not Granger-cause Equation variable. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

ASEAN-5 experiences a stronger negative impact from FSI shocks on both REI and GDP compared to Plus-3, with slower recovery in REI but faster recovery in GDP. In response to REI shocks, ASEAN-5 shows a stronger negative financial impact with slower recovery than Plus-3, while the positive impact on GDP is weaker for ASEAN-5. For GDP shocks, both ASEAN-5 and Plus-3 exhibit similar durations of long-term impacts, with negative effects on FSI and positive effects on REI.

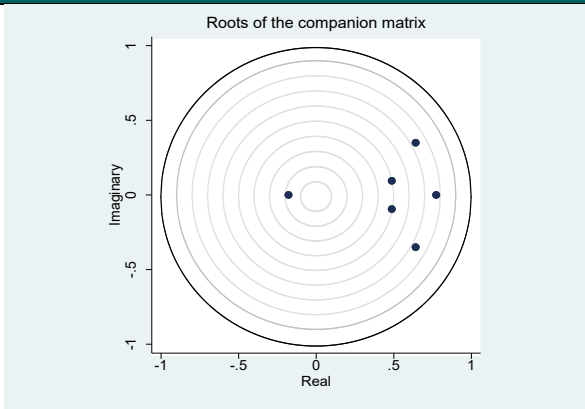
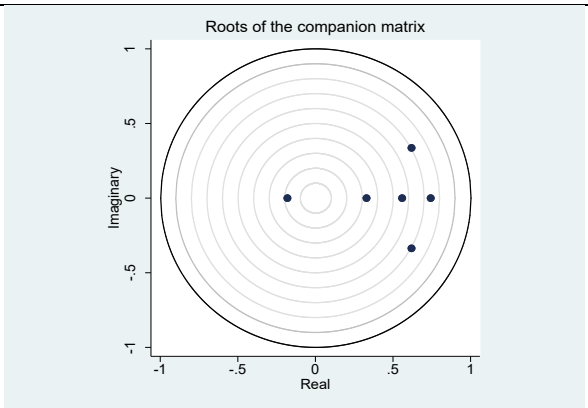
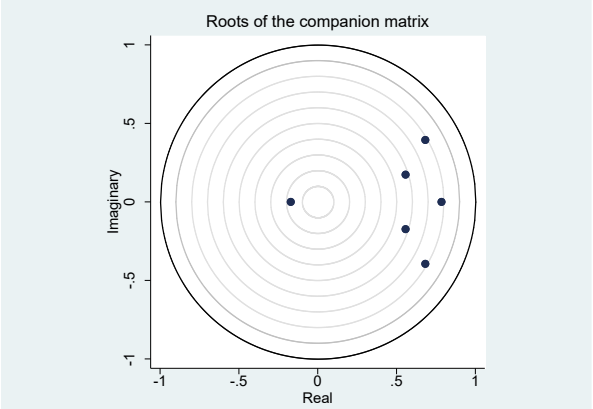
The Granger causality test results reveal similarities between ASEAN-5 and Plus-3 groups, with one notable distinction. For ASEAN-5, FSI and the combination of FSI and REI Granger-cause GDP at a 1 percent significance level, indicating that financial stress plays a critical role in forecasting economic activity. Similarly, in the Plus-3 group, FSI and the combination of FSI and REI also Granger-cause GDP at a 1 percent significance level, reinforcing the importance of financial stress in driving economic outcomes. However, unlike in ASEAN-5, FSI Granger-causes REI at a 5 percent significance level in Plus-3, suggesting stronger financial-real estate linkages in these economies. Overall, Plus-3 displays a more interconnected dynamic between financial and real estate markets, while both groups highlight the significant impact of financial stress on economic activity.

Appendix 4. Stability Test of the VAR Model Using Eigenvalues

This section presents the results of the stability test for the VAR model, conducted by examining the eigenvalues of the companion matrix. The eigenvalue stability condition requires that all eigenvalues of a VAR model have moduli (absolute values) within the unit circle (i.e., less than 1) to ensure stability. A stable VAR model will return to equilibrium after a shock, making it suitable for analysis and forecasting.

The eigenvalue stability condition test confirms that the PVAR model is stable, as all eigenvalues have moduli below 1 across all the subgroups. This result indicates that the model will produce bounded, non-explosive behavior, ensuring reliable forecasts and consistent impulse response analysis.

Figure A4.1. Stability Test Results: Roots of the Companion Matrix for PVAR

Subgroups	Eigenvalues
Selected ASEAN+3	
ASEAN-5	
Plus-3	

Appendix 5. Robustness Test: Monthly Data Analysis

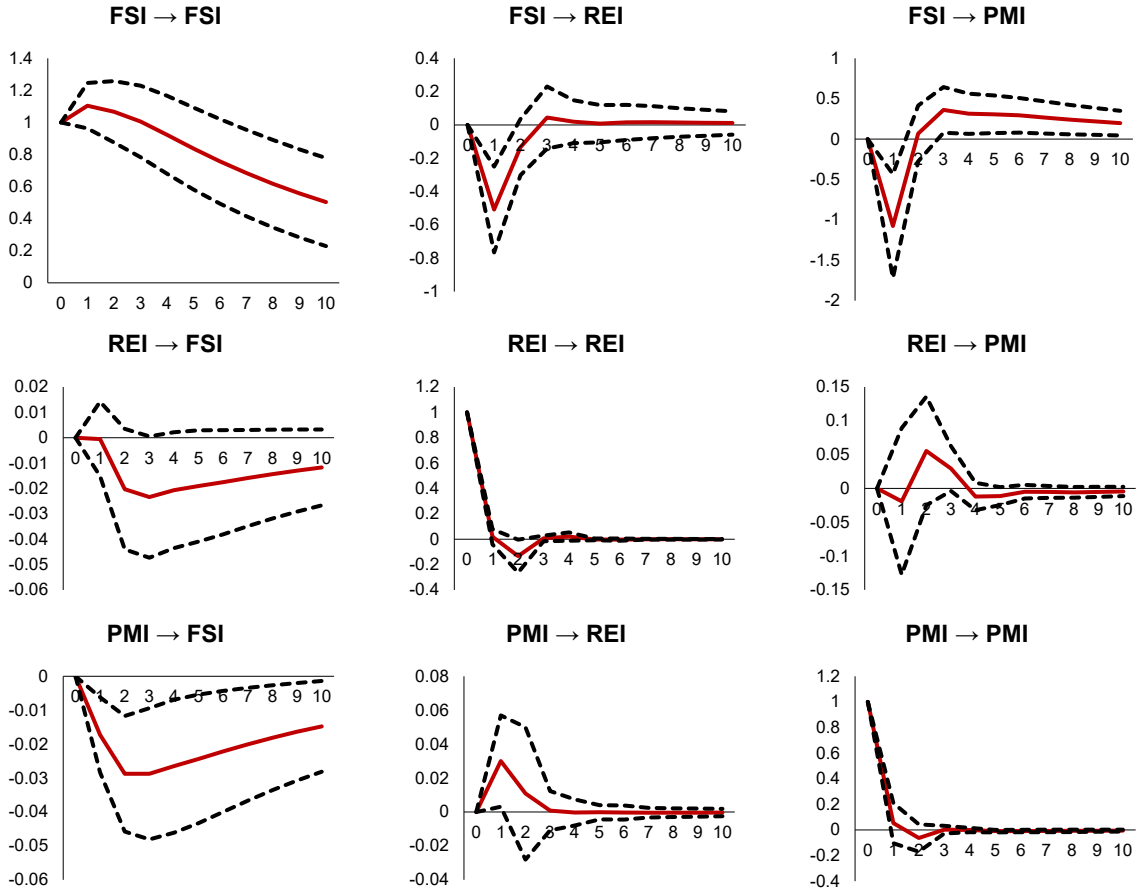
In the main text, quarterly data is used due to its broader availability across all ASEAN+3 economies, its alignment with macroeconomic indicators, and its suitability for capturing medium-term trends and structural dynamics. Here, to complement the quarterly analysis, a monthly data analysis is conducted. Monthly data offers higher-frequency insights, enabling the detection of short-term fluctuations and emerging trends, which are particularly important during periods of financial volatility. Monthly data is available for only a limited set of countries—the Plus-3 economies and Thailand—but these economies play a significant role in driving regional trends, making this additional analysis both meaningful and valuable.

For the monthly data analysis, the original FSI data was used, unlike the quarterly analysis, which employed a 3-month average. For REI, the analysis utilized the monthly changes in real estate indices published by national institutions via CEIC, instead of the year-over-year growth rate of real estate prices provided by BIS for the quarterly data. For real estate activities, the monthly change in the PMI was analyzed as it is available monthly, in contrast to the quarterly GDP growth rate data used in the main analysis.

Since the datasets and panel country composition differ from those used in the quarterly data analysis in the main text, some variations in the results—such as the duration of shocks and Granger causality—were observed. Nonetheless, the overall findings, including the direction and intensity of shocks between variables, remain largely consistent. The results indicate that negative shocks in the real estate market and the broader economy, such as declining property prices or reduced economic activity, exacerbate stress in the financial market. Conversely, disruptions in the financial market adversely impact both the property market and overall economic activity.

- FSI: An FSI shock negatively impacts both REI and PMI, with the effect dissipating within a few months. This reflects how heightened financial stress disrupts real estate markets and economic sentiment, driven by tighter credit conditions and declining demand in the real estate sector and the broader economy.
- REI: A REI shock negatively impacts FSI, with a long-lasting effect despite being statistically insignificant. This is likely due to reduced collateral values and increased vulnerabilities for banks with significant exposure to the real estate market. The impact on PMI is muted, while REI’s own response stabilizes quickly, indicating limited long-term persistence in real estate price movements.
- PMI: A PMI shock leads to a prolonged negative impact on FSI, suggesting that economic activity has a significant influence on financial stress. Its effect on REI is marginal and stabilizes quickly, indicating that changes in economic activity are less impactful on real estate markets than on financial stress.

Figure A5.1 Plus-3 and Thailand: Impulse-response Function (Impulse → Response)



Source: Asian Development Bank; national authorities via CEIC; S&P Global via Have analytics; AMRO staff calculations
Note: FSI = Financial Stress Index; REI = Monthly changes in real estate price Index; PMI = Monthly changes in purchasing manager's index. The first variable is an impulse factor and the second variable is a response factor. An increase in FSI indicates heightened financial market stress, while an increase in REI indicates rising real estate prices and a higher PMI reflects a more favorable economic environment. The dotted lines are 95 percent confidence intervals. The x-axis represents months following a shock and the y-axis represents the magnitude of the response variable. The dotted lines are 95 percent confidence intervals. The magnitude of the shock corresponds to a one-unit increase in the impulse variable.

Table A5.1. Plus-3 and Thailand: Panel VAR Results on FSI, REI, and PMI

Dependent variable / Independent variable	FSI	REI	PMI
FSI L1.	1.1042***	-0.5074***	-1.0758***
	(0.0705)	(0.1307)	(0.3177)
FSI L2.	-0.1719***	0.4695***	1.3044***
	(0.0620)	(0.1537)	(0.3155)
REI L1.	-0.0005	0.0190	-0.0192
	(0.0076)	(0.0327)	(0.0558)
REI L2.	-0.0200**	-0.1331*	0.0562
	(0.0080)	(0.0681)	(0.0427)
PMI L1.	-0.0173***	0.0300**	0.0528
	(0.0058)	(0.0146)	(0.0775)
PMI L2.	-0.0087	0.0000	-0.0838*
	(0.0053)	(0.0204)	(0.0507)

Source: AMRO staff calculations
Note: Note: L1 and L2 represent one lagged and two lagged, respectively. Standard errors are reported in parentheses. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

Granger causality tests show that REI and PMI significantly Granger-cause FSI, which means past values of REI and PMI improve predictions of FSI's future values. Conversely, FSI also significantly Granger-causes REI and PMI (Table A4.2).

Table A5.2. Plus-3 and Thailand: Results of Granger Causality Test

Equation variable	Excluded variable	Chi-squared	P-value(Prob>Ch2)
FSI	REI	6.565	0.038**
	PMI	12.761	0.002***
	ALL	17.757	0.001***
REI	FSI	15.897	0.000***
	PMI	4.255	0.119
	ALL	23.825	0.000***
PMI	FSI	19.431	0.000***
	REI	1.787	0.409
	ALL	19.706	0.001***

Source: AMRO staff estimates

Note: H0 (Null hypothesis) — Excluded variable does not Granger-cause Equation variable. Asterisks (*, **, ***) denote significance levels at 10 percent, 5 percent, and 1 percent, respectively.

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