

# Special Topics on Bond Markets

## Bond Market Development and Bank Diversification

Diversification is widely believed to enhance resilience and help reduce risks from concentrating in certain types of business activities.<sup>9</sup> For the banking industry, diversification in asset and liability portfolios, as well as income sources, helps reshape risk–return profiles and build greater resilience to shocks.

Existing banking literature has extensively studied the impact of diversification on banks' financial strength and resilience. For example, in the United States, greater diversification in income sources is found to improve banks' long-term performance and financial strength (Baele, De Jonghe, and Vander Venet 2007; Shim 2019). In Italy, banks with greater income diversification witnessed higher risk-adjusted returns (Chiorazzo, Milani, and Salvini 2008). Similarly, bank diversification is found to be positively associated with better bank performance and financial stability in many emerging markets (Meslier, Tacneng, and Tarazi 2014; Moudud-Ul-Huq et al. 2018; Nguyen, Skully, and Perera 2012; Sanya and Wolfe 2011). Nevertheless, as diversification aims to reduce risks from concentrating in certain assets or income sources and to enhance stability and resilience, it does not necessarily improve bank performance and valuation in absolute terms. For example, the improvement of bank performance from diversification is limited in Germany (Hayden, Porath, and Westernhagen 2007), and in Italy, it depends on the risk level of banks (Acharya, Hasan, and Saunders 2006). Bank diversification is also found to reduce profits in the People's Republic of China (Berger, Hasan, and Zhou 2010). Laeven and Levine (2007) document a “diversification discount” in financial conglomerates' valuation when they engage in multiple activities, including both lending and nonlending financial services. However, the diversification discount for banks decreases over time and practically vanished after the global financial crisis, as shown in Guerry and Wallmeier (2017).

Bond market development is particularly relevant to bank operations. Banks are the major source of indirect debt financing, particularly for the private sector and households, while bond markets serve as the primary provider of direct debt financing to both the public and private sectors, including the banking industry. Bond markets provide more options for banks in terms of their asset and liability portfolios, but they also compete with banks for big corporate borrowers who can directly raise financing in the bond market and large-deposit clients such as government agencies, institutional investors, and wealthy individuals who prefer stable cash flows. Bond markets also offer banks more income sources beyond a traditional depositing and lending business, such as investment, brokerage, and underwriting. Bond market development is found to boost bank stability in emerging markets (Cagas, Park, and Tian 2021), and it also enhances banks' profit efficiency in Asia and the Pacific (Park, Tian, and Wu 2020). This study extends existing knowledge and investigates the implication of bond market development on banks' asset and income diversification.

Bond market development offers diversification opportunities to banks. Banks can diversify asset portfolios by holding multiple assets classes, including loans and securities, which can cover broader sectors and geographic locations. Banks can diversify liability portfolios by selling deposits as well as corporate bonds, commercial paper, and senior debentures to build a funding source with desired cost and maturity profiles. Bond markets offer income diversification potential via services, such as advisory and underwriting from bond issuances, as well as brokerage and investment from bond trading.

To investigate how bond market development empirically affects bank diversification in Asia and the Pacific, this study constructed a comprehensive sample consisting of 926 banks from 27 economies in the region over the period 2004–2017 (**Appendix Table**).

<sup>9</sup> This write-up was prepared by Qiongbing Wu (associate professor) in the School of Business at the Western Sydney University in Australia.

The data come from multiple sources including Fitch Connect, Bloomberg, the World Bank's World Development Indicators, the International Monetary Fund's World Economic Outlook Database, and the Heritage Foundation. Following existing literature (Curi, Lozano-Vivas, and Zelenyuk 2015; Meslier, Tacneng, and Tarazi 2014; Sanya and Wolfe 2011), this study utilizes the Herfindahl-Hirschman Index (HHI) that takes into account the distribution of asset types and income sources to measure a bank's asset (*Asset\_div*) and income (*Income\_div*) diversifications, as shown in equation (1):

$$Asset\_div = 1 - HHI = 1 - \left[ \left( \frac{Net\ loans}{Total\ earning\ assets} \right)^2 + \left( \frac{Other\ earning\ assets}{Total\ earning\ assets} \right)^2 \right] \quad (1)$$

where other earning assets include securities and investments. Total earning assets is thus the sum of net loans and other earning assets. The values range between 0 and 0.5, and by subtracting HHI from 1, a higher value indicates a higher degree of asset diversification. Similarly, income diversification is measured in equation (2):

$$Income\_div = 1 - \left[ \left( \frac{Interest\ income}{Total\ operating\ income} \right)^2 + \left( \frac{Other\ noninterest\ operating\ income}{Total\ operating\ income} \right)^2 \right] \quad (2)$$

where interest income includes interest income on loans and other interest income, and total operating income is the sum of interest income and noninterest operating income. The values again range between 0 and 0.5, with a higher value indicating greater income diversification.

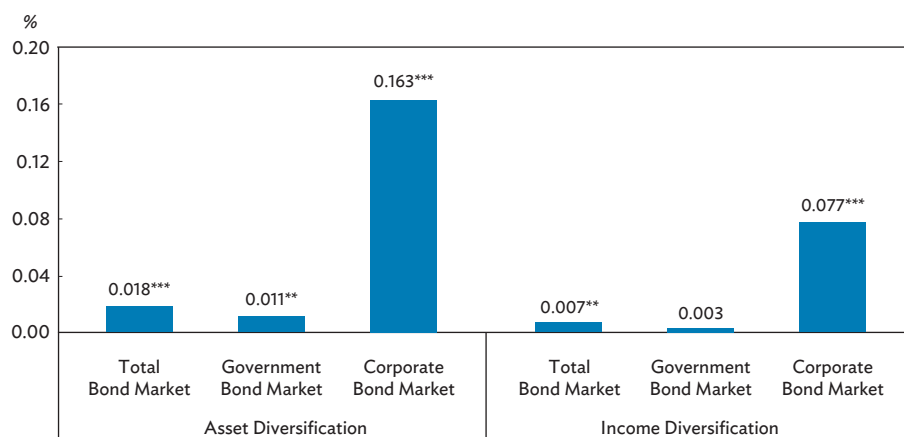
In empirical models, the asset and income diversification measures are regressed on a vector of bond market development indicators—including total bond market size, government bond market size, and corporate bond market size—which are calculated as the value of outstanding bonds as a share of gross domestic product (GDP) in the same sample year. To control for other relevant factors that may influence banks' diversification strategy in terms of assets and income, bank-specific characteristics, banking sector characteristics, and country-specific characteristics, are included in the empirical model specification, as well as bank fixed-

effects and time fixed-effects. The panel regression model is specified in equation (3):

$$Diversification_{i,t} = \alpha + \beta Bond_{i,t} + \gamma X_{i,t} + v_i + \theta_t + \epsilon_{i,t} \quad (3)$$

where  $i$  and  $t$  denote bank  $i$  and year  $t$ , respectively.  $Diversification_{i,t}$  is the indicator of bank asset or income diversification.  $Bond$  is the indicator of bond market development, which includes outstanding total bonds, government bonds, and corporate bonds as a share of GDP.  $X_{i,t}$  is a vector of control variables, which include bank-specific characteristics such as bank size measured as the natural logarithm of total assets and capital as a share of total assets; market attributes such as real GDP growth, the natural logarithm of real GDP per capita, inflation rate, and investment freedom, following Luo, Tanna, and De Vita (2016); and banking sector characteristics such as bank activity restriction index, banking sector's asset concentration, asset diversification, foreign ownership, and government ownership, which are from Barth, Caprio, and Levine (2013) and based on World Bank surveys, following the literature (Doan, Lin, and Doong 2018; Meslier, Tacneng, and Tarazi 2014; Nguyen, Skully, and Perera 2012; Pennathur, Subrahmanyam, and Vishwasrao 2012; Saghi-Zedek 2016).  $v_i$  and  $\theta_t$  represent bank and time fixed-effects, respectively.  $\epsilon_{i,t}$  is the error term.

Results are presented in **Figure 23**, which shows that bond market development has a significant and positive impact on banks' asset and income diversification. When total bond market size as a share of the economy's GDP increases by 1%, the average bank's asset diversification increases by 0.018, which equals 4.5% of the sample mean of 0.396. This impact is much stronger for corporate bond markets than for government bond markets, with a 1% larger corporate bond market as a share of GDP associated with a 0.163 increase in banks asset diversification, which is 41.2% of the sample mean, while a 1% larger government bond market is associated with a 0.011 (2.8%) increase in banks' asset diversification. Turning to income diversification, a 1% increase in the overall bond market as a share of GDP is associated with an average of 0.007 greater income diversification of banks, which is 1.6% of the sample average of 0.426. This impact is largely driven by the corporate bond market. While the government bond market has a positive but insignificant impact on banks' income diversification, a 1% larger corporate bond market is associated with a 0.077 (18.1%) gain in income diversification on average.

**Figure 23: Impact of Bond Market Development on Banks' Asset and Income Diversification**

Note: \*\*\* and \*\* represent statistical significance at 1% and 5%, respectively.  
Source: Author's calculation.

The results indicate that bond market development has a significant and positive effect on both bank asset diversification and income diversification, even when controlling for economy-, banking-industry-, and bank-specific factors. Both government bonds and corporate bonds are alternative investment assets for banks outside of their traditional lending business. Government bonds in a deep government bond market can store liquidity while generating yields. Corporate bonds offer similar features as loans but also provide diversification opportunities for more sectors and geographic locations. Thus, in an economy with a large bond market, banks are able to access more investments tools and income sources to diversify their assets and income from traditional lending business, which leads to a higher proportion of nonloan assets and noninterest income, on average, in banks' financial statements. This evidence is more pronounced for corporate bond markets, which points to the important role of corporate bonds in promoting bank asset and income diversification and reshaping banks' risk-return profile.

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**Appendix Table: Sample Economies  
and the Number of Banks**

Economy	No. of Banks	No. of Observations
China, People's Republic of	168	1,103
Japan	108	475
Indonesia	104	776
India	62	483
Viet Nam	49	257
Bangladesh	41	248
Malaysia	39	230
Philippines	36	298
Kazakhstan	32	281
Pakistan	28	168
Nepal	27	93
Cambodia	25	174
Australia	24	152
Thailand	24	241
Hong Kong, China	21	174
Sri Lanka	21	126
United Arab Emirates	20	177
Uzbekistan	19	142
Korea, Republic of	14	80
New Zealand	10	82
Lao People's Democratic Republic	10	51
Singapore	9	90
Bahrain	9	73
Mongolia	9	53
Myanmar	8	18
Tajikistan	6	34
Papua New Guinea	3	26
<b>Total</b>	<b>926</b>	<b>6,105</b>

Source: Author's compilation.

## Risk and Return Spillover in ASEAN Bond Markets

Over the last 2 decades, the bond markets of emerging economies have attracted significant attention from the global investment community due to several factors.<sup>10</sup> First, emerging markets have grown and continue to grow rapidly. Second, since the 1990s, bond markets have become a major source of financing for businesses in emerging markets. Finally, the transparency and liquidity of emerging bond markets have improved significantly (Agur et al. 2019; Ahmad, Mishra, and Daly 2018; Hyun, Park, and Tian 2017). The rapid development of bond markets in emerging economies offers global investors higher yields in the global low-interest rate environment that has prevailed since the global financial crisis. They also provide alternative investment opportunities with diversification and risk management benefits.

Local currency (LCY) bonds outstanding in six Association of Southeast Asian Nations (ASEAN) economies expanded significantly from USD216.9 billion in 2000 to USD1,965.7 billion in 2021.<sup>11</sup> The average share of foreign holdings in these markets grew from 0.03% in 2003 to 15.2% in 2021. ASEAN economies are more connected with the rest of the world than ever before as their financial markets receive increasing attention from global investors. As such, it is interesting to know how closely ASEAN bond markets are linked with major Asian and global bond markets. However, such knowledge is limited in the literature. This paper adds to the literature by deriving a risk spillover measure based on the characteristics of static and dynamic spillover models. It empirically evaluates how the bond markets of Indonesia, Malaysia, the Philippines, and Thailand, which are collectively referred to as ASEAN-4, receive or send shocks among each other and with major Asian bond markets and global bond markets. By examining the strength and direction of return and risk spillovers between ASEAN-4 and major Asian and global advanced bond markets, this study provides new evidence on the level of integration of ASEAN-4 bond markets with regional and global bond markets.

Using the Diebold and Yilmaz (2014) spillover framework, this study constructs the return and conditional volatility (risk) network connectedness, between January 2012 and January 2022, among ASEAN-4 LCY bond markets and major Asian (the People's Republic of China [PRC], India, Japan, and the Republic of Korea) and major non-Asian advanced (the European Union [EU], the United Kingdom [UK], and the United States [US]) LCY bond markets. Panels A and B of **Figure 24** show the 10% strongest links for the return and conditional volatility (risk) network connectedness series during the sample period, respectively. There is strong inter-market connectedness among the underlying LCY bond markets. Specifically, major non-Asian advanced LCY bond markets (US, EU, and UK) exhibit strong interconnectedness with each other. Notably, the largest links are flowing from the US market for maturities of 7 years and 10 years. However, we do not observe significant collective return and volatility connectedness between ASEAN-4 bond markets and major Asian and global advanced bond markets, although some economy pair volatilities are exceptions. These include EU–Philippines, US–Indonesia, Republic of Korea–Philippines, PRC–Philippines, and Japan–Malaysia.

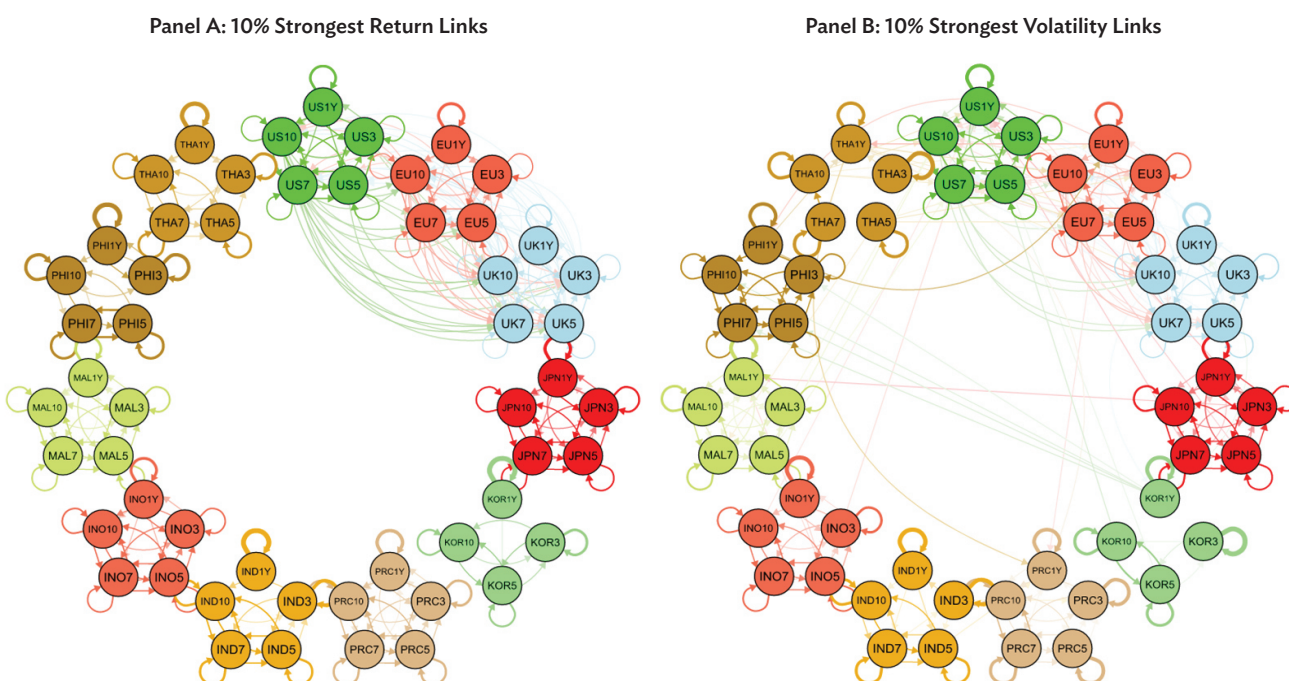
While there is some volatility connectedness among major Asian bond markets—particularly between the PRC, the Republic of Korea, and Japan—both return and volatility linkages within ASEAN-4 remain low. Moreover, major Asian bond markets—such as the PRC, India, Japan, and the Republic of Korea—do not exhibit close return and risk spillover effects with non-Asian advanced bond markets. This evidence indicates that ASEAN bond markets generally are not integrated with major regional and global advanced bond markets, while the bond market integration levels within broader Asia and between Asia and non-Asian advanced bond markets are also low. The lack of integration suggests that the exposure of ASEAN-4 and other Asian bond markets to global shocks may be limited. From an investment perspective, the low level of integration indicates that emerging Asian bond markets offer diversification potential as well as relatively higher yields for global investors.

<sup>10</sup> This write-up was prepared by Gazi Salah Uddin (professor) in the Department of Management and Engineering at the Linköping University in Sweden. The content is based on Uddin, Gazi Salah, Muhammad Yahya, Donghyun Park, Axel Hedström, and Shu Tian. 2022. "Bond Market Spillover Network During the Global Pandemic: What We Learn from ASEAN-4 Markets." SSRN Working Paper. [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4113778](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4113778).

<sup>11</sup> The six ASEAN economies include Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam.



**Figure 24: Return and Volatility Connectedness Network among ASEAN-4, Major Asian, and Global Bond Markets, January 2012–January 2022**



Notes: The total connectedness network is estimated using the Diebold and Yilmaz (2012, 2014) framework. THA, PHI, MAL, and INO refer to Thailand, the Philippines, Malaysia, and Indonesia, respectively. US, EU, UK, JPN, KOR, PRC, and the IND correspond to the United States, the European Union, the United Kingdom, Japan, the Republic of Korea, the People's Republic of China, and India, respectively. 1Y, 3Y, 5Y, 7Y, and 10Y refer to bond maturities at these years.

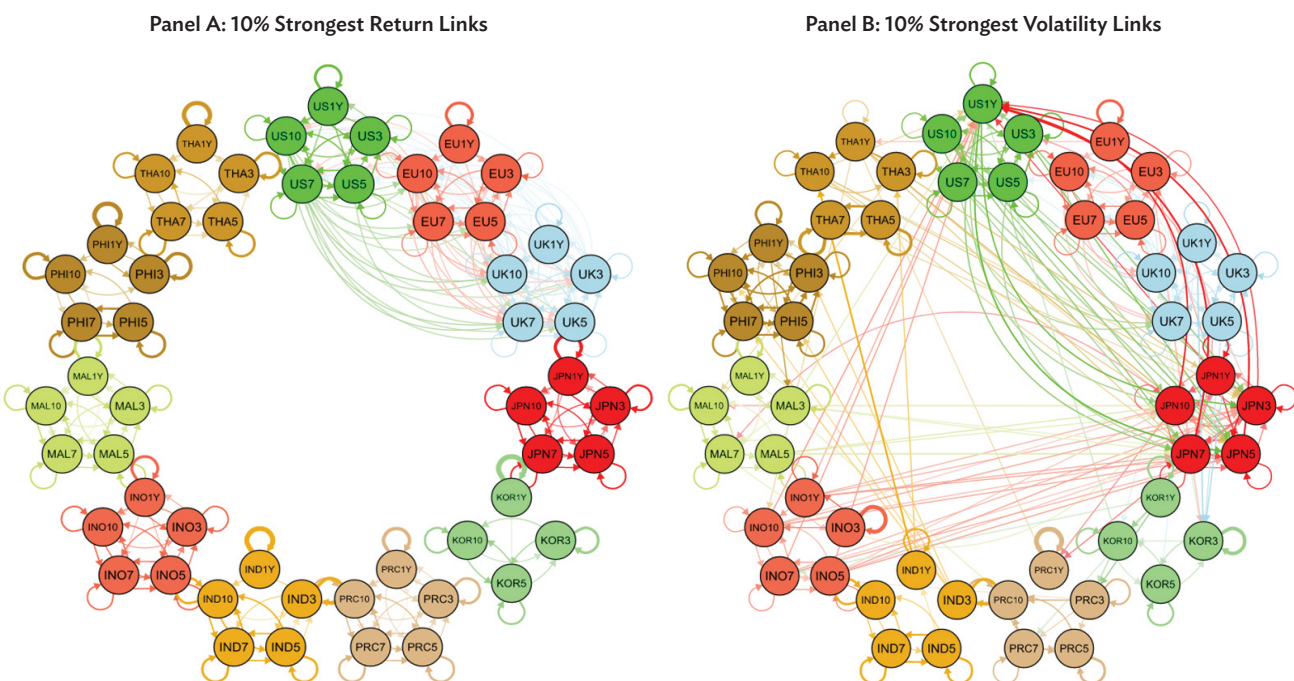
Source: Authors' estimations based on Bloomberg data and utilizing the Diebold and Yilmaz (2012, 2014) framework.

To further clarify whether ASEAN-4 bond markets serve as a good diversification option during crisis, this study focuses on the coronavirus disease (COVID-19) period—from January 2020 to January 2022—when global investment sentiment and liquidity conditions shifted rapidly. Panels A and B of **Figure 25** show the 10% strongest links for return and conditional volatility (risk) network connectedness during the COVID-19 period, respectively. During this period, volatility spillover was more strongly interconnected compared to the overall sample estimation. Especially, we see a stronger volatility spillover between Japan and the three global advanced bond markets (EU, UK, and US) and in some Asian market pairs such as US–Indonesia. But overall, spillover between developing Asian bond markets and the three global advanced bond markets remains limited. Risk spillover between Japan and Thailand, Japan and Indonesia, and the PRC and Thailand became stronger, as it did between the PRC, Japan, and the Republic of Korea. Overall, for global investors, developing Asia's bond

markets still presented diversification opportunities for risk management purposes during the COVID-19 period.

Meanwhile, descriptive statistics in general show that positive returns were observed during the COVID-19 period for longer maturity bonds in the Republic of Korea, Malaysia, the Philippines, and Thailand. Thus, the low level of interconnectedness between emerging Asian bond markets and major global advanced bond markets provides a portfolio diversification opportunity as well as a good risk–return profile, particularly for longer maturity bonds. This study shows global bond investors that a diversification strategy of mixing developed and emerging bond markets could be helpful in hedging risks during market turbulence. A potential implication for regulators is the importance of acting early against potential financial risk spillovers in the face of global shocks. An example of this can be seen in the US Federal Reserve currently tightening faster than major Asian central banks.

**Figure 25: Return and Volatility Connectedness Network among ASEAN-4, Major Asian, and Global Bond Markets, January 2020–January 2022**



Notes: The total connectedness network is estimated using the Diebold and Yilmaz (2012, 2014) framework. THA, PHI, MAL, and INO refer to Thailand, the Philippines, Malaysia, and Indonesia, respectively. US, EU, UK, JPN, KOR, PRC, and the IND correspond to the United States, the European Union, the United Kingdom, Japan, the Republic of Korea, the People's Republic of China, and India, respectively. 1Y, 3Y, 5Y, 7Y, and 10Y refer to bond maturities at these years.

Source: Authors' estimations based on Bloomberg data and utilizing the Diebold and Yilmaz (2012, 2014) framework.

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