



# 4

## Financial Integration

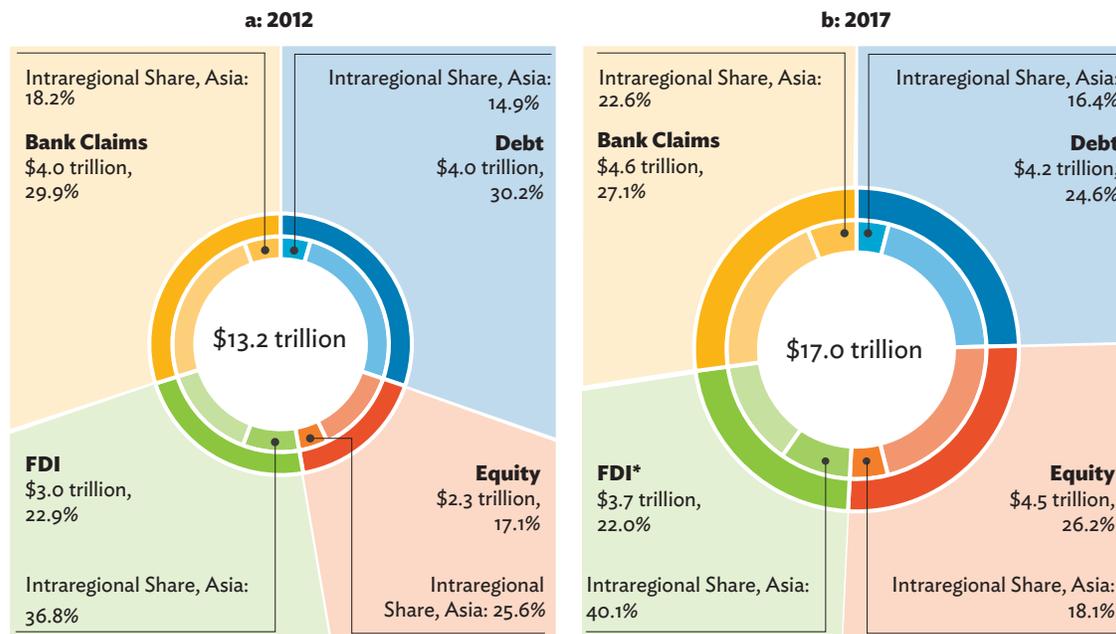


## Asia's Cross-Border Financial Assets and Liabilities

Asia's cross-border financial linkages continue to grow and strengthen, underpinning the region's growing degree of financial integration, both within and outside the region.<sup>17</sup> Total cross-border asset holdings grew by \$3.8 trillion between 2012 and 2017. The largest part of the increase came from equity investment, which increased by \$2.2 trillion.

Asia's cross-border asset holdings continued to increase between 2012 and 2017 (Figure 4.1).<sup>18</sup> Assets grew by \$3.8 trillion over the period, from \$13.2 trillion in 2012 to \$17.0 trillion in 2017. The region's cross-border assets continue to be predominantly from outside the region, as assets held outside the region account for more than 75% of total cross-border assets. Meanwhile, the intraregional share has increased for all asset classes except portfolio equity, with the share of intraregional assets increasing slightly from 22.7% in 2012 to 23.7% in 2017. The category of portfolio equity holdings increased its share of total cross-border assets significantly over the past 5 years. In particular, while it was only 17.1% in 2012, it increased to 26.2% in 2017. Over the same period, the share of portfolio debt investment decreased from 30.2% in 2012 to 24.6% in 2017, indicating that

**Figure 4.1: Cross-Border Assets—Asia**

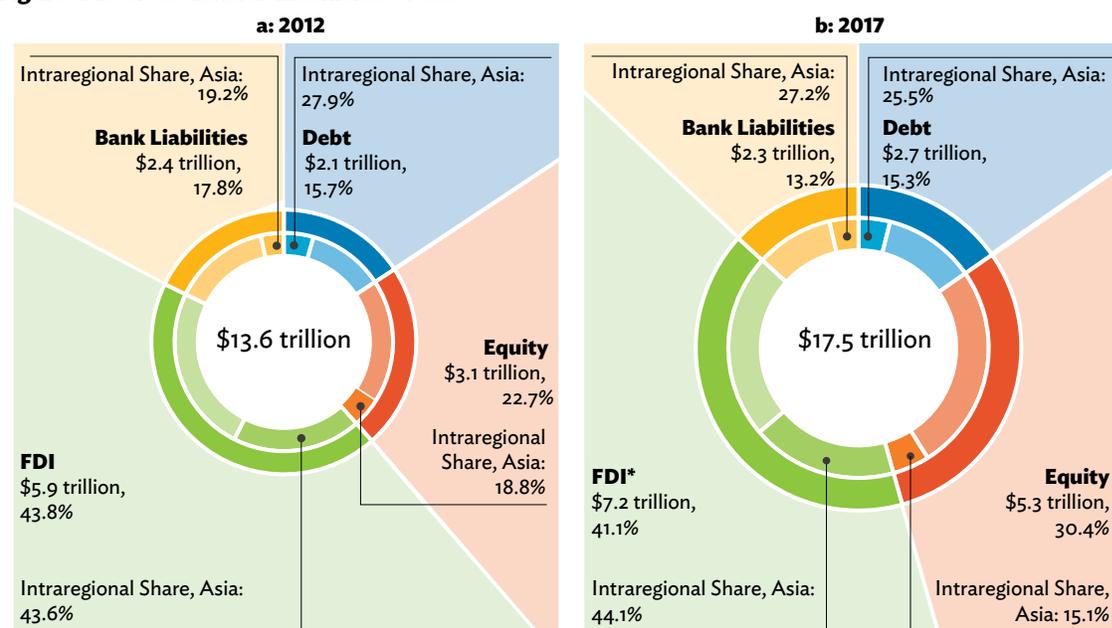


\* = data are for 2016, FDI = foreign direct investment.

Notes: FDI assets refer to outward FDI holdings. Bank assets refer to bank claims of Asian economies. Asia includes ADB regional members for which data are available. Sources: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018); International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018); and International Monetary Fund. Coordinated Direct Investment Survey. <http://data.imf.org/CDIS> (accessed February 2018).

<sup>17</sup> Asia refers to the 48 Asia and the Pacific members of the Asian Development Bank (ADB), which includes Japan and Oceania (Australia and New Zealand) in addition to the 45 developing Asian economies.

<sup>18</sup> Throughout this chapter, Asia's cross-border asset holdings refer to the stock of outbound portfolio debt, portfolio equity, and foreign direct investment (FDI), as well as cross-border bank claims. Asia's cross-border liabilities refer to the stock of inward portfolio debt, portfolio equity, and FDI, as well as cross-border bank liabilities.

**Figure 4.2: Cross-Border Liabilities—Asia**

\* = data are for 2016, FDI = foreign direct investment.

Notes: FDI assets refer to outward FDI holdings. Bank assets refer to bank claims of Asian economies. Asia includes ADB regional members for which data are available.

Sources: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018); International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018); and International Monetary Fund. Coordinated Direct Investment Survey. <http://data.imf.org/CDIS> (accessed February 2018).

the increase in cross-border equity holdings outpaced portfolio debt holdings. Meanwhile, Asia's cross-border bank claims account for 27.1% of Asia's cross-border assets, the largest share in 2017, while the share of Asia's cross-border debt assets was 30.2%, the biggest share in 2012.

**Asia's cross-border liabilities increased by \$3.9 trillion from 2012 to 2017. Foreign direct investment remains the largest source of cross-border liabilities, with intraregional foreign direct investment increasing both in volume and by share.**

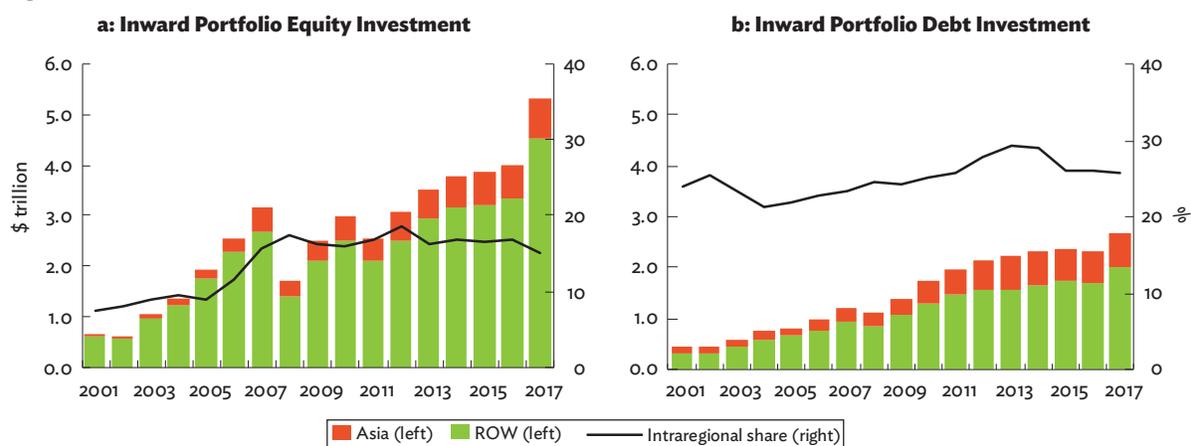
Cross-border liabilities also continued to increase, with total liabilities rising by \$3.9 trillion, from \$13.6 trillion in 2012 to \$17.5 trillion in 2017 (Figure 4.2). Foreign direct investment (FDI) accounted for over 40% of total cross-border liabilities for both periods, followed by equity investment, accounting for 30.4% in 2017, up from 22.7%

in 2012, a large increase over past years. As with cross-border assets, Asia's cross-border liabilities remain more linked to the rest of the world. Over the past 5 years, the share of liabilities from outside the region rose to 69.8% in 2017 from 68.9% in 2012. The intraregional share of Asia's cross-border liabilities increased for bank lending by 8 percentage points, while the shares of portfolio debt and equity fell between 2012 and 2017.

## Inward Portfolio Investment<sup>19</sup>

**Portfolio equity investment into Asia reached \$5.3 trillion in 2017, far exceeding the region's inward debt investment of \$2.7 trillion. Inward portfolio equity investment grew at an average annual rate of 12.1% over the past 5 years, with particularly strong growth in 2017 (32.0%).**

<sup>19</sup> Portfolio investment data are based on stock data from the Coordinated Portfolio Investment Survey of the International Monetary Fund. For outward portfolio investment, due to unavailability or lack of comparable data, the following economies were excluded from the calculations: Aruba, the Bahamas, Barbados, Curaçao and Sint Maarten, Liberia, the Netherlands Antilles, Peru, Uruguay, and Vanuatu. The PRC is also excluded due to lack of comparable data for 2001–2014.

**Figure 4.3: Inward Portfolio Investment—Asia**

ROW = rest of the world.

Note: Asia includes ADB regional members for which data are available.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

Inward portfolio equity investment reached \$5.3 trillion in 2017—with an average annual growth rate of 12.1% over the last 5 years (Figure 4.3a), far outpacing growth in inward portfolio debt investment, which averaged 4.9% over the same period. Favorable equity market conditions in 2017 coupled with global investors' search for higher returns due to subdued return-on-debt in 2017 drove the strong increase. Strengthening global linkages have seen equity investment grow particularly from outside the region, primarily from the United States (US) and the European Union (EU). Consequently, the intraregional share has fallen gradually from 18.8% in 2012 to 15.1% in 2017. Meanwhile, portfolio debt investment into Asia rose to \$2.7 trillion in 2017, after slightly decreasing in 2016. The US and the EU remained the primary portfolio debt investors into Asia, while the intraregional share of Asian investors dipped to 25.5% in 2017 from 29.3% in 2013 (Figure 4.3b).

**International holdings of Asian portfolio equity assets increased by \$1.3 trillion in 2017, exceeding the combined increase of \$954.0 billion over the past 4 years.**

Inward equity investment increased sharply by \$1.3 trillion in 2017 (Figure 4.4a). The majority of the surge came from a rise in US (\$606.2 billion) and EU

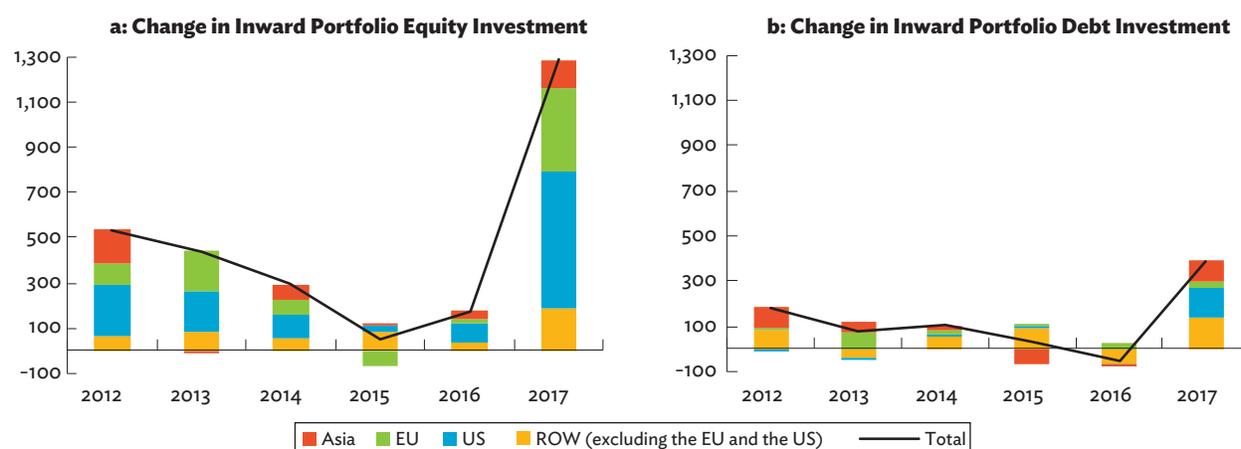
(\$368.3 billion) investments, mainly to East Asia,<sup>20</sup> highlighting the region's strong financial linkages with global equity markets. In contrast, inward portfolio debt investment to Asia increased only by \$390.4 billion in 2017, mainly due to increased investment from the rest of the world (ROW)<sup>21</sup> (\$138.7 billion)—primarily in Japanese debt securities (\$78.1 billion)—the US (\$127.9 billion), and Asia (\$92.6 billion) (Figure 4.4b). Debt investment from the EU also increased, but at a more modest \$31.1 billion, compared with other regions.

Ample global liquidity, favorable economic conditions in the region, and investors' appetite for positive equity returns from Asia based on buoyant market performance in 2017 were behind the boost, but the pace will likely moderate in 2018 due to the regional equity markets' relatively tepid performance. There has also been a shift from debt to equity investment. For example, while the EU reduced \$22.5 billion of its debt investment in Japan, equity investment in that country rose by \$89.7 billion in 2017.

Inward equity investment outstanding from outside the region was \$4.5 trillion in 2017 (Table 4.1). The majority came from the US and the EU, concentrating on Japanese equities. In particular, US investment in Japanese equities reached \$891.0 billion in 2017,

<sup>20</sup> Japan (\$285.3 billion), the Republic of Korea (\$134.5 billion), and the PRC (\$112.3 billion) were among the major beneficiaries of the inward equity investment by the US and the EU in 2017.

<sup>21</sup> For this chapter, computations using the rest of the world (ROW) do not include countries in Asia, the EU, and the US.

**Figure 4.4: Change in Inward Portfolio Investment—Asia** (\$ billion)

EU = European Union, ROW = rest of the world, US = United States.

Note: Asia includes ADB regional members for which data are available.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

followed by the Republic of Korea (\$240.6 billion), Australia (\$196.3 billion), and India (\$180.5 billion). The EU's equity investment in Japan was \$490.8 billion in 2017, followed by the People's Republic of China (PRC) (\$151.0 billion); the Republic of Korea (\$144.5 billion); Hong Kong, China (\$129.7 billion); and India (\$119.3 billion).

The top sources of intraregional cross-border equity holdings are regional financial hubs such as Hong Kong, China; Singapore; and Japan, which account for 78.6% of intraregional equity investment. In contrast to investment from outside of the region, intraregional equity investment is focused on the PRC—with Hong Kong, China contributing \$225.3 billion. Singapore also largely invests in PRC equities (\$84.2 billion), but also

**Table 4.1: Sources of Inward Portfolio Equity Investment—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
Hong Kong, China	262	(4.9%)	204	(6.6%)	▼
Singapore	254	(4.8%)	187	(6.1%)	▼
Japan	116	(2.2%)	73	(2.4%)	▼
Other Asia	172	(3.2%)	115	(3.7%)	▼
Asia's inward portfolio equity investment from Asia	805	(15.1%)	579	(18.8%)	▼
<b>Non-Asia</b>					
United States	2,313	(43.5%)	1,317	(42.8%)	▲
European Union	1,419	(26.7%)	840	(27.3%)	▼
Canada	187	(3.5%)	103	(3.4%)	▲
Other non-Asia	595	(11.2%)	236	(7.7%)	▲
Asia's inward portfolio equity investment from non-Asia	4,514	(84.9%)	2,496	(81.2%)	▲
<b>Asia's total inward portfolio equity investment</b>	<b>5,319</b>	<b>(100.0%)</b>	<b>3,075</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

**Table 4.2: Sources of Inward Portfolio Debt Investment—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
Hong Kong, China	253	(9.4%)	217	(10.2%)	▼
Japan	190	(7.1%)	195	(9.1%)	▼
Singapore	125	(4.7%)	137	(6.4%)	▼
Other Asia	117	(4.4%)	47	(2.2%)	▲
Asia's inward portfolio debt investment from Asia	686	(25.5%)	596	(27.9%)	▼
<b>Non-Asia</b>					
European Union	757	(28.2%)	617	(28.9%)	▼
United States	546	(20.3%)	406	(19.0%)	▲
International Organizations	387	(14.4%)	355	(16.6%)	▼
Other non-Asia	308	(11.5%)	161	(7.5%)	▲
Asia's inward portfolio debt investment from non-Asia	1,998	(74.5%)	1,539	(72.1%)	▲
<b>Asia's total inward portfolio debt investment</b>	<b>2,684</b>	<b>(100.0%)</b>	<b>2,134</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIIS> (accessed September 2018).

in Japan (\$39.4 billion), India (\$30.5 billion), and the Republic of Korea (\$25.9 billion).

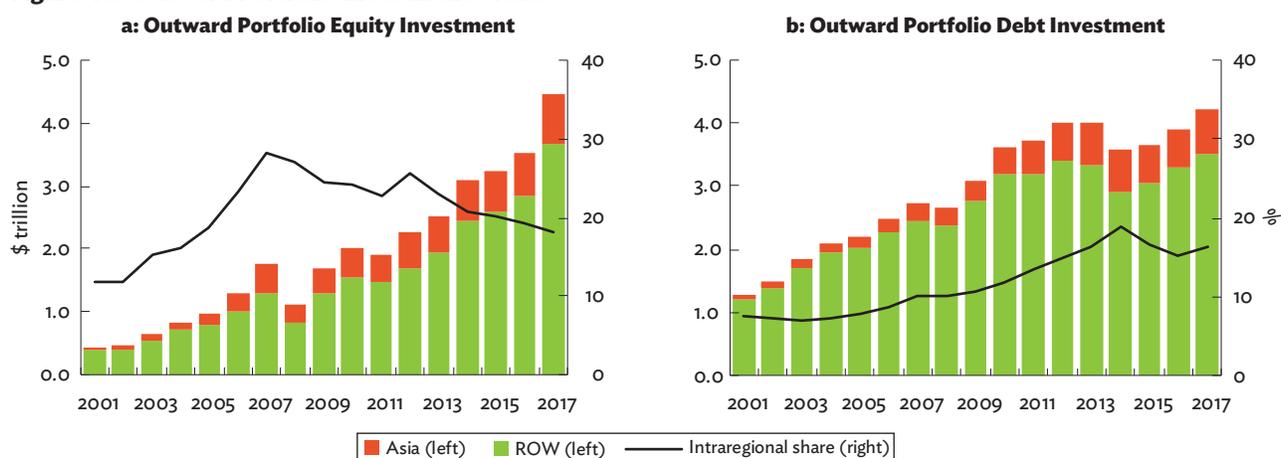
The majority of Asia's intraregional portfolio debt investment outstanding comes from Hong Kong, China; Japan; and Singapore—accounting for 82.9% of the total of intraregional debt investment (Table 4.2). Yet, the share of other Asian economies in the total intraregional debt investment has been increasing—from 7.8% in 2012 to 17.1% in 2017—driven by increased inward debt investment from Australia and the Republic of Korea. Despite a possible risk of PRC deleveraging, the majority of Hong Kong, China's portfolio debt investment goes to the PRC (\$129.5 billion), followed by Japan (\$42.7 billion) and Australia (\$32.8 billion).

Outside the region, the EU, the US, and international organizations remain leading sources of portfolio debt investment to Asia. In 2017, investors from the EU flocked to Japan (with investment outstanding of \$255.2 billion) and Australia (\$211.3 billion). Debt investment holdings from the EU also went to Southeast Asian destinations such as Indonesia (\$49.4 billion) and Singapore (\$42.2 billion).

## Outward Portfolio Investment

**Asia's appetite for outward portfolio investment—especially in equities outside the region—continues to rise, resulting in a gradually declining intraregional share in outward equity investment over the past years. Asia's outward equity portfolio investment averaged an annual growth rate of 14.9% over the last 5 years, far outstripping debt investment (1.2%), while the intraregional share of outward debt investment increased for the first time in 3 years.**

Since the sharp decline in equity investment in 2008 and a slight dip in 2011, buoyant market performance has driven regional investor appetite for equities, which increased over the last decade to reach \$4.5 trillion in 2017 from \$3.5 trillion in 2016 (Figure 4.5a). The average annual growth rate over the last 5 years has been 14.9%. Asia's portfolio equity investment to the ROW (excluding the EU and the US) led the rise, reaching \$1.9 trillion in 2017 from \$1.3 trillion a year earlier. Consequently, the intraregional share decreased

**Figure 4.5: Outward Portfolio Investment—Asia**


ROW = rest of the world.

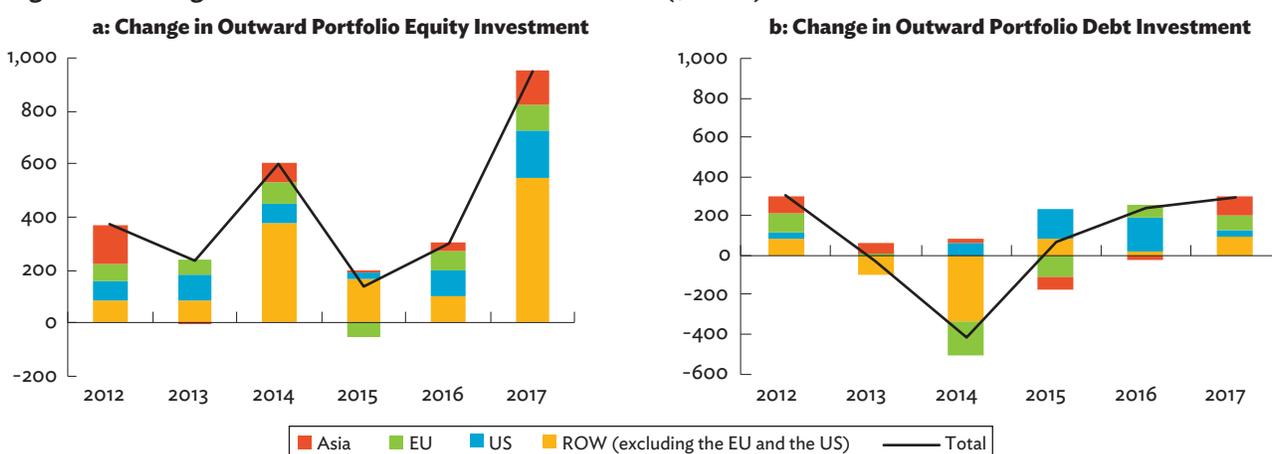
Note: Asia includes ADB regional members for which data are available.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

to 18.1%, down from 25.6% in 2012. Meanwhile, Asia's outward portfolio debt investment outstanding reached \$4.2 trillion in 2017 from \$3.9 trillion in 2016, with a large portion directed toward mature markets such as the US and those in the EU. Asia's intraregional share inched up to 16.4% in 2017 from 15.3% in 2016, the first increase in 3 years (Figure 4.5b).

**Buoyant global equity markets, combined with low returns on debt securities, led to a modest increase in outward debt investment outstanding in 2017, while outward equity investment outstanding grew substantially.**

Fueled by well-performing equity markets globally, Asia's portfolio equity investment rose by \$943.6 billion in 2017, predominantly directed to the ROW (\$541.8 billion), the US (\$179.3 billion), and the EU (\$94.6 billion) (Figure 4.6a). Intra-regional investment increased by \$127.8 billion. Meanwhile, outward portfolio debt investment increased by \$301.8 billion in 2017, driven largely by a rise in Asian holdings of debt securities issued by regional economies (\$92.6 billion) and the ROW (\$96.2 billion), excluding the EU and the US (Figure 4.6b). Debt investment to the US increased modestly, by \$38.0 billion in 2017 as opposed to \$175.5 billion in 2016, indicating investor preference for portfolio equity investment over debt.

**Figure 4.6: Change in Outward Portfolio Investment—Asia (\$ billion)**


EU = European Union, ROW = rest of the world, US = United States.

Note: Asia includes ADB regional members for which data are available.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

**Table 4.3: Destinations of Outward Portfolio Equity Investment—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
China, People's Republic of	348	(7.8%)	256	(11.3%)	▼
Japan	96	(2.1%)	49	(2.2%)	▼
Australia	71	(1.6%)	60	(2.7%)	▼
Other Asia	290	(6.5%)	213	(9.4%)	▼
Asia's outward portfolio equity investment to Asia	805	(18.1%)	579	(25.6%)	▼
<b>Non-Asia</b>					
Cayman Islands	1,263	(28.3%)	295	(13.1%)	▲
United States	1,105	(24.8%)	635	(28.1%)	▼
European Union	633	(14.2%)	388	(17.2%)	▼
Other non-Asia	651	(14.6%)	364	(16.1%)	▼
Asia's outward portfolio equity investment to non-Asia	3,652	(81.9%)	1,682	(74.4%)	▲
<b>Asia's total outward portfolio equity investment</b>	<b>4,457</b>	<b>(100.0%)</b>	<b>2,261</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

**The most preferred portfolio investment destinations outside the region were the Cayman Islands, the EU, and the US. Australia, Japan, and the PRC remained popular destinations for Asia's intraregional outward portfolio investment.**

The largest share of intraregional equity investment holdings was with the PRC (43.3% in 2017), highlighting the prominent role PRC equity markets play in the region. Other popular destinations were Japan and Australia (Table 4.3). The three accounted for 64.0% of the total intraregional portfolio equity investment in 2017, with top investors from Hong Kong, China (\$225.3 billion to the PRC); Singapore (\$39.4 billion to Japan); and Japan (\$29.1 billion to Australia).

Outside Asia, the region continues to invest heavily in Cayman Islands, US, and EU equities. Outward portfolio equity holdings in the Cayman Islands quadrupled over the past 5 years, highlighting the fact that it remains an attractive destination, given its reputation as one of the largest offshore financial centers with favorable tax conditions. The top portfolio equity investors in the Cayman Islands are Japan (\$646.3 billion outstanding) and Hong Kong, China (\$584.8 billion outstanding).

Australia, the PRC, and Japan remained the top three destinations for Asia's intraregional portfolio debt investment in 2017 (Table 4.4). The three accounted for the majority of intraregional debt investment (64.7%), with shares of the PRC and Japan rising. Other notable destinations in 2017 were the Republic of Korea (\$49.2 billion outstanding) and Singapore (\$43.9 billion outstanding).

The top three destinations for Asia's non-regional debt investment were the US, the EU, and the Cayman Islands. Investment to the US increased by \$441.7 billion over the last 5 years, but declined in the EU by \$116.3 billion, due to weak yield performance of European bond markets as the result of the massive asset purchase program by the European Central Bank over recent years. Within the EU, France remains the top destination (\$251.6 billion), followed by the UK (\$207.8 billion) and Germany (\$180.2 billion). Other non-Asian markets include Canada (\$97.0 billion) and international organizations (\$93.5 billion).

**Table 4.4: Destinations of Outward Portfolio Debt Investment—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
Australia	190	(4.5%)	194	(4.9%)	▼
China, People's Republic of	181	(4.3%)	111	(2.8%)	▲
Japan	73	(1.7%)	39	(1.0%)	▲
Other Asia	242	(5.8%)	251	(6.3%)	▼
Asia's outward portfolio debt investment to Asia	686	(16.4%)	596	(14.9%)	▲
<b>Non-Asia</b>					
United States	1,611	(38.5%)	1,170	(29.3%)	▲
European Union	1,069	(25.5%)	1,186	(29.7%)	▼
Cayman Islands	211	(5.0%)	502	(12.6%)	▼
Other non-Asia	612	(14.6%)	544	(13.6%)	▲
Asia's outward portfolio debt investment to non-Asia	3,504	(83.6%)	3,402	(85.1%)	▼
<b>Asia's total outward portfolio debt investment</b>	<b>4,190</b>	<b>(100.0%)</b>	<b>3,997</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIIS> (accessed September 2018).

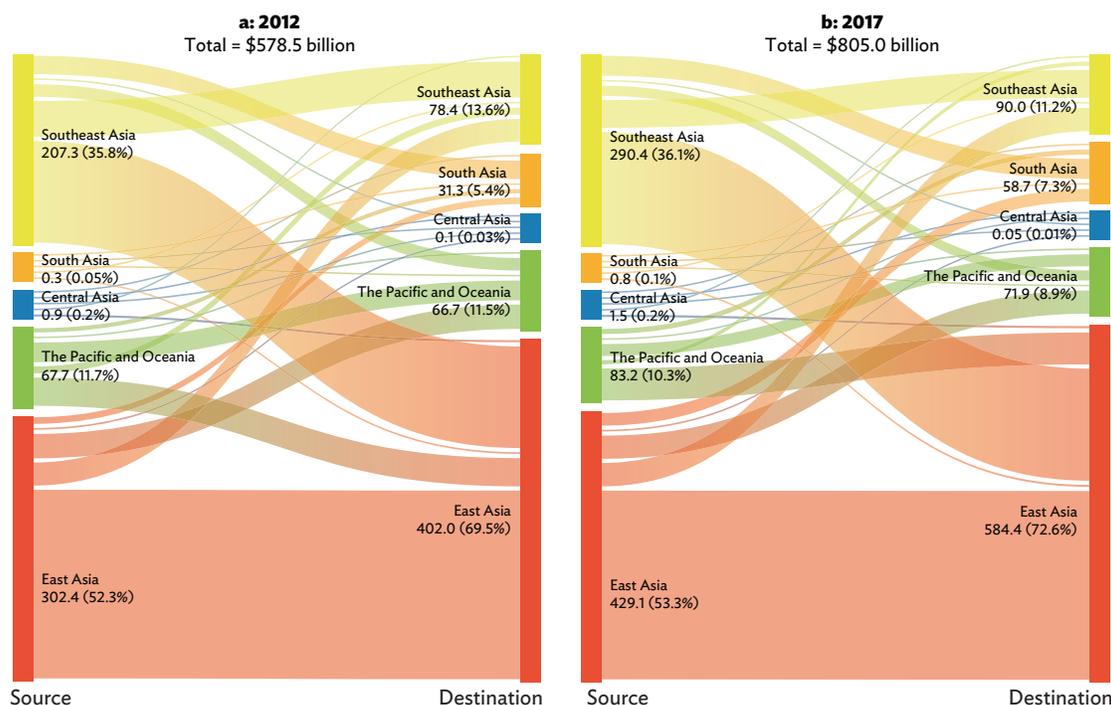
## Inter- and Intra-Subregional Portfolio Investment

**East Asia remains the most prominent subregion as both source and destination for intraregional portfolio investment, while the Pacific and Oceania continues to be a popular destination for intraregional portfolio debt investment.**

Intraregional portfolio equity investment remains concentrated toward East Asia, resulting in a 72.6% share (\$584.4 billion) of total intraregional portfolio equity investment (Figure 4.7). The PRC is the main destination in the subregion, accounting for 59.6% of intraregional equity investment to East Asia. Southeast Asia is next largest (11.2%), with a considerable amount of intraregional equity investment directed to financial hub Singapore (\$42.4 billion), followed by Indonesia (\$15.7 billion), Thailand (\$11.6 billion), and Malaysia (\$9.4 billion).

East Asia also continues to account for the largest share of intraregional portfolio debt investment (Figure 4.8), largely due to significant investment in the PRC. In 2017, debt investment to East Asia accounted for 48.9% of total intraregional investment outstanding, up by 7.0 percentage points from its 2012 share. Intraregional debt investment into the Pacific and Oceania remained strong at \$199.2 billion in 2017, mainly from the high debt investment into Australia. However, the share of the subregion fell from 34.4% in 2012 to 29.1% in 2017. Meanwhile, investment to South Asia decreased by \$13.2 billion in 2017.

There was a marked rise in outward debt investment in the Pacific and Oceania, which more than tripled from \$13.3 billion in 2012 to \$45.5 billion in 2017. Most came from Australia (\$36.4 billion in 2017). The majority of investment from the region went to Japan (\$18.5 billion), Australia (\$6.7 billion), and Singapore (\$6.7 billion). Recent progress in integrating Asia's payment and settlement systems in tandem with the boost of intra-subregional trade and tourism may further facilitate intraregional financial integration in the future (Box 4.1).

**Figure 4.7: Inter- and Intra-Subregional Portfolio Equity Investment—Asia**

Notes: Numbers in parentheses indicate the percent share of the total. Central Asia includes Kazakhstan. East Asia includes Hong Kong, China; Japan; Mongolia; the People's Republic of China; and the Republic of Korea. The Pacific and Oceania includes Australia, New Zealand, Palau, and Vanuatu. South Asia includes Bangladesh, India, and Pakistan. Southeast Asia includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Asia includes Central Asia, East Asia, the Pacific and Oceania, South Asia, and Southeast Asia.  
Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIIS> (accessed September 2018).

## Box 4.1: Progress in Integrating ASEAN+3 Payment and Settlement Systems for Local Currency Transactions

Intra-subregional trade among members of the Association of Southeast Asian Nations, plus Japan, the People's Republic of China (PRC), and the Republic of Korea (ASEAN+3) continues to grow—accounting for 47% of the group's total trade, comparable to Europe.<sup>a</sup> The high intra-subregional trade share in part stems from the development of sophisticated supply-chain networks within the region. The final destinations of consumption goods used to be primarily the United States (US) and Europe. But today these are shifting more toward Asia—a trend expected to continue as Asia changes from a production base to consumer market.

This is not true for currencies, however. Currencies settled for intraregional transactions remain limited to US dollars (USD). According to the Society for Worldwide Interbank Financial Telecommunication (SWIFT), 85% of intra-ASEAN

commercial flows in 2016 was in USD—followed by the Singapore dollar (6%) and Thai baht (3%) (SWIFT 2017). USD dominates ASEAN+3 transactions as well, given the limited share of the Japanese yen (4% of commercial flows as of July 2018) and the PRC renminbi (1%) as international payment currencies (SWIFT 2018).

The gap between rising intraregional trade and low usage of local currencies for transactions would pose a problem should the shortage of USD for trade be aggravated by financial market conditions. Non-US banks have limited access to USD—which is subject to changes in global dollar funding conditions. ASEAN+3 governments can tap the \$240 billion Chiang Mai Initiative Multilateralization (CMIM) short-term liquidity safety net in times of emergency, and the established surveillance unit—the ASEAN+3 Macroeconomic Research

*Continued on next page*

<sup>a</sup> See Statistical Appendix.

**Box 4.1** *continued*

Office. However, the available support pales against the value of constantly expanding intraregional trade. Therefore, it is important to further develop, improve, and integrate the region's financial market infrastructure to facilitate cross-border local currency transactions.

To promote local currency use in cross-border payments, the central banks of Indonesia, Malaysia, and Thailand agreed to create local currency settlement frameworks—between Bank Negara Malaysia and the Bank of Thailand (launched March 2016), between Bank Negara Malaysia and Bank Indonesia, and between the Bank of Thailand and Bank Indonesia (both launched December 2017). Under these frameworks, the central banks appoint local banks and grant foreign exchange flexibility in facilitating local currency settlement for bilateral trade of goods and services.

For example, the framework between Bank Negara Malaysia and the Bank of Thailand allows Thai businesses to engage in financing and deposit transactions with appointed banks in Malaysian ringgit more easily and efficiently—and vice versa in Thai baht. The framework allows these banks to offer a range of financial services—including hedging, financing, and deposit-taking. The appointed banks are required to provide direct foreign exchange quotes between the two local currencies involved in buying and selling.

There has also been progress in facilitating cross-border investment transactions in local currency between the PRC and Hong Kong, China. In particular, Stock Connect links the Hong Kong Stock Exchange with the Shanghai (since November 2014) and Shenzhen (since December 2016) stock exchanges. These links were created to allow the PRC and Hong Kong, China investors to trade stocks across markets using the trade and clearing facilities of their respective exchanges. Today, Stock Connect covers over 2,000 eligible stocks listed on the three exchanges. In August 2018, average daily turnover (buy + sell trades) reached CNY20,093 million (northbound) and HKD10,804 million (southbound).<sup>b</sup>

Following the success of Stock Connect, Bond Connect between the PRC and Hong Kong, China was introduced in July 2017. Bond Connect allows overseas investors to invest in PRC domestic bonds without having to apply under the foreign investor quota. While investment remains limited from Hong Kong, China to the PRC (northbound), 425 international institutional investors have joined Bond Connect as of the end of August 2018, with trading volume reaching CNY81 billion in August 2018 (Bond Connect Company 2018).

ASEAN members are also working to improve their retail payment systems and move beyond borders. In Thailand, a new interbank real-time payment system (PromptPay) was launched in January 2017, allowing registered customers to transfer funds through mobile phone—using only the mobile number or national identification number of the recipient, resulting in significantly lower remittance fees. At first the system was only available to individuals, but it eventually expanded in March 2017 to include business-to-business services. As of May 2018, the system attracted more than 40 million users with over 173 million transactions, including THB700 billion (\$22 billion) in money transfers (Hornbluss 2018). Thai commercial banks started to abolish the current interbank funds transfer fees to encourage customers to move to the more efficient digital banking platform.

Similarly, Singapore's PayNow system (launched in July 2017) allows customers of participating banks to send and receive Singapore dollars almost instantaneously by using their mobile number or Singapore National Registration Identity Card. PayNow began accepting business-to-business transactions in August 2018.

In November 2017, the Bank of Thailand and Monetary Authority of Singapore announced that they were exploring linking PromptPay and PayNow to allow users in both countries to transfer money to each other using mobile phone numbers rather than through the traditional banking network. Malaysia is also considering joining. Strong intra-subregional trade and tourism makes it natural to consider linking retail payment systems—which enhances financial integration and inclusion as well.

Technology plays an important role in enhancing the efficiency of cross-border payment and settlement systems. However, technological advances alone are not a panacea. Understanding relevant regulations and requirements across all network jurisdictions is essential. Also, technologies used must be harmonized and standardized to ensure interoperability when making cross-border transactions. For example, while Quick Response Codes (QR codes) are used in many countries, QR code generation often varies by country- or company-specific circumstances—creating multiple codes at the time of payment. Standardization would reduce vulnerabilities in data security—currently, the lack of an agreed security protocol and experience in sharing security threats could lead to more data breaches. Likewise, standardizing competing blockchain and distributed ledger systems is becoming more urgent. Data in one blockchain system may not be linked with others, while differences in operational requirements may reduce system

*Continued on next page*

<sup>b</sup> Based on data from Hong Kong Stock Exchange. [www.hkex.com.hk](http://www.hkex.com.hk) (accessed September 2018).

**Box 4.1** continued

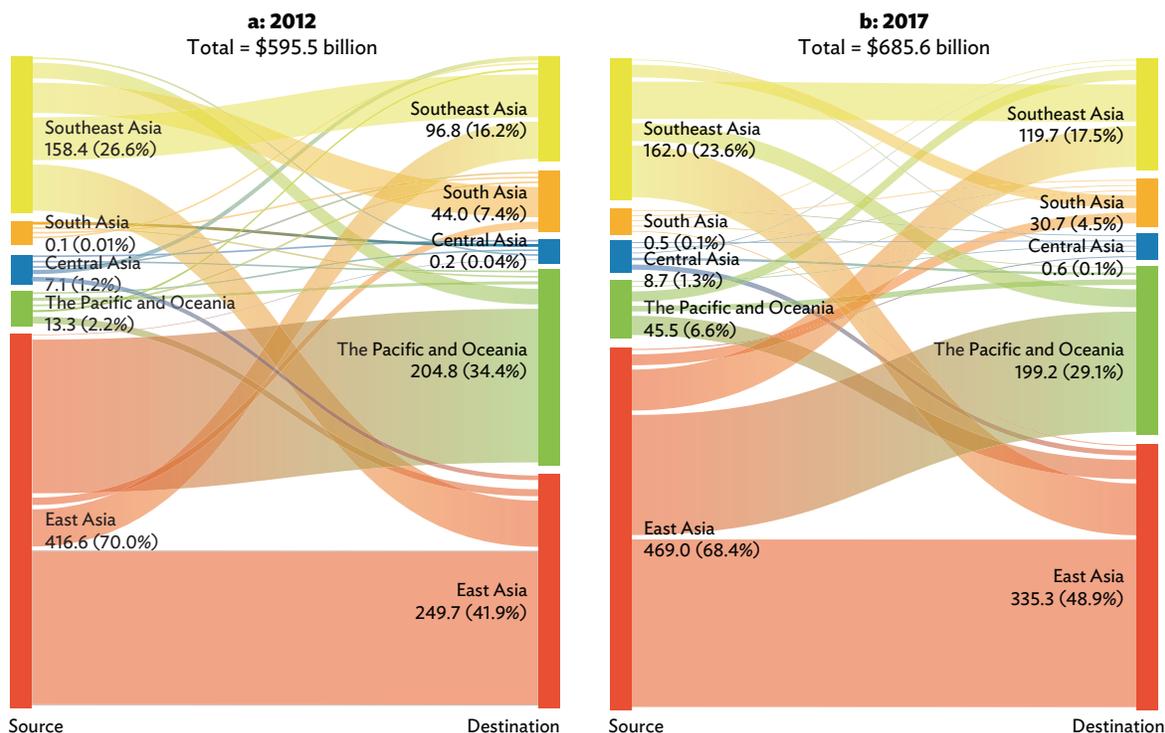
scalability. Even minimum coordination and standardization can benefit all users and reduce future costs.

To promote standardization and harmonization, coordination among stakeholders in all relevant jurisdictions is indispensable. Information sharing and a common understanding of various regulations across jurisdictions are also required. ADB’s experience with the ASEAN+3 Bond Market Forum (ABMF)—under the Asian Bond Markets Initiative—is a case in point. The ABMF was established in 2010 as a common platform to foster

standardization of market practices and harmonization of regulations relating to cross-border bond transactions across the region. Published bond market guides for ASEAN+3 markets allow public authorities, academics, and market professionals to comprehensively understand and compare markets. The ABMF continues to promote awareness of standardization and international standards to ensure interoperability of payment and settlement infrastructure, thereby advancing financial integration in the region.

Source: ADB.

**Figure 4.8: Inter- and Intra-Subregional Portfolio Debt Investment—Asia**



Notes: Numbers in parentheses indicate the percent share of the total. Central Asia includes Kazakhstan. East Asia includes Hong Kong, China; Japan; Mongolia; the People’s Republic of China; and the Republic of Korea. The Pacific and Oceania includes Australia, New Zealand, Palau, and Vanuatu. South Asia includes Bangladesh, India, and Pakistan. Southeast Asia includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Asia includes Central Asia, East Asia, the Pacific and Oceania, South Asia, and Southeast Asia.

Source: ADB calculations using data from International Monetary Fund. Coordinated Portfolio Investment Survey. <http://data.imf.org/CPIS> (accessed September 2018).

## Bank Holdings<sup>22</sup>

**Asia's cross-border bank claims, along with its intraregional share, continued to grow in 2017. Rising intraregional shares of bank claims and bank liabilities point to an increasing role of regional bank lending.**

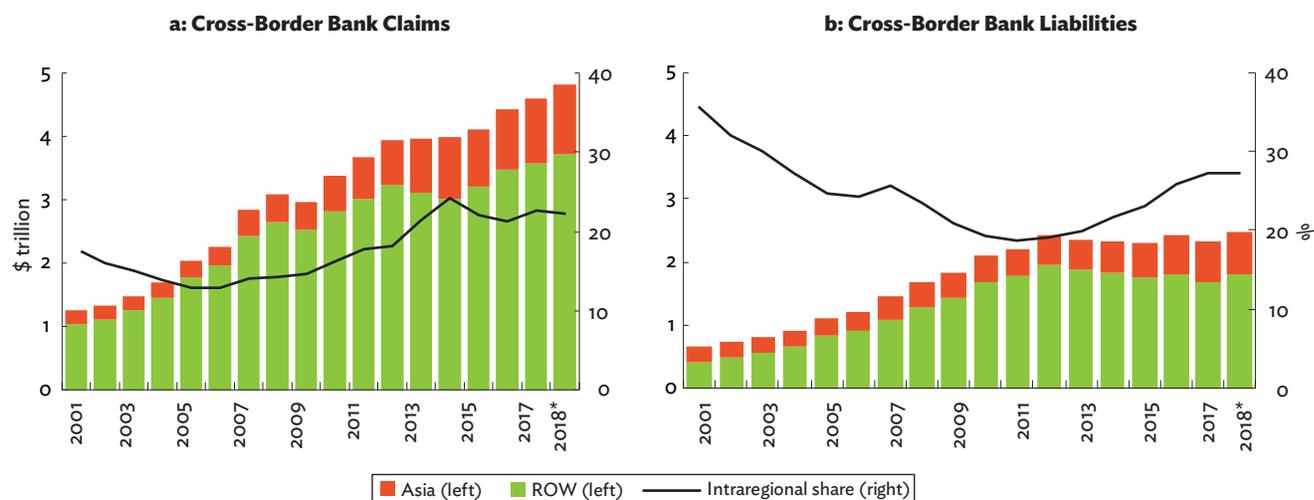
Asia's cross-border bank claims rose to \$4.6 trillion in 2017 from \$4.4 trillion in 2016 (Figure 4.9a). While the majority of Asia's claims remain on countries outside the region, the share of intraregional bank claims rose to 22.6% in 2017 from 21.4% in 2016. Asia's cross-border bank liabilities slightly decreased from \$2.4 trillion in 2016 to \$2.3 trillion (Figure 4.9b) in 2017. However, data from the first quarter in 2018 suggest an increase in cross-border bank liabilities, more than equal the 2017 decrease. The region's bank liabilities largely come from outside the region, but the intraregional share of Asia's cross-border bank liabilities rose from 18.8% in 2011 to 27.2% in 2017, suggesting the region's demand for cross-border bank financing is increasingly met regionally.

**In tandem with the sizable rise in global international banking activities in 2017, Asia's bank claims within the region and the rest of the world increased during the year.**

Asia's bank claims within the region and the rest of the world (ROW) increased strongly in 2017 (Figure 4.10a). The increase was predominantly driven by growing overseas bank lending by Japanese banks—the largest foreign lenders globally—especially to Asia (Hong Kong, China; Australia; and India) and the ROW (particularly the Cayman Islands, Bermuda, and Switzerland).<sup>23</sup> As a result, Japan's cross-border bank claims outstanding rose from \$3.4 trillion in 2016 to \$3.6 trillion in 2017. Intraregional bank claims rose by \$94.1 billion, while bank claims on the ROW rose by \$153.3 billion. These helped offset a contraction in Asia's bank claims on the US, which fell by \$71.5 billion. In the first quarter of 2018, however, Asia's bank claims on the US rebounded.

Asia's cross-border bank liabilities decreased by \$107.9 billion during 2017, mainly due to a drop in

**Figure 4.9: Cross-Border Bank Holdings—Asia**



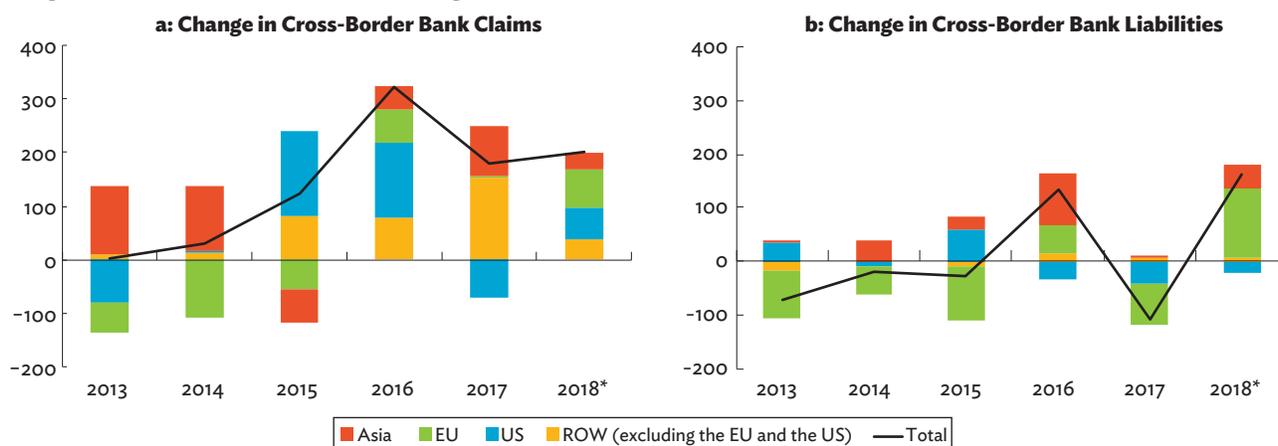
\* = data are as of end-March 2018, ROW = rest of the world.

Notes: Asia's reporting economies include Australia; Japan; the Republic of Korea; and Taipei, China. Asian partner economies include ADB regional members for which data are available.

Source: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018).

<sup>22</sup> Bank holdings are based on the Locational Banking Statistics from the Bank for International Settlements (BIS). Asia's reporting economies include Australia; Japan; the Republic of Korea; and Taipei, China. Meanwhile, Hong Kong, China and the Philippines are excluded due to unavailable or lack of comparable data.

<sup>23</sup> See Statistical Release in: BIS. International Banking Statistics at end-December 2017.

**Figure 4.10: Cross-Border Bank Holdings—Asia** (\$ billion)

\* = data are for the first quarter, EU = European Union, ROW = rest of the world, US = United States.

Notes: Asia's reporting economies include Australia; Japan; the Republic of Korea; and Taipei, China. Asian partner economies include ADB regional members for which data are available.

Source: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018).

claims from the EU (by \$78.5 billion) and the US (by \$42.0 billion) (Figure 4.10b)—in tandem with the progress in the US monetary policy normalization, including the impact on Asian borrower demand and global creditor supply for cross-border dollar lending due to the strengthening of the US dollar. This trend continued in the first quarter of 2018 for the US, while

the EU increased its bank lending to the region once more, due to increased bank liabilities with the UK.

Most intraregional bank claims were on Hong Kong, China; the PRC—which have almost tripled over the past 5 years; and Singapore (Table 4.5). Together they accounted for over 60% of Asia's lending within the

**Table 4.5: Destination of Cross-Border Bank Claims—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
Hong Kong, China	229	(5.0%)	147	(3.7%)	▲
China, People's Republic of	225	(4.9%)	80	(2.0%)	▲
Singapore	197	(4.3%)	188	(4.7%)	▼
Other Asia	392	(8.5%)	306	(7.7%)	▲
Asia's cross-border bank claims on Asia	1,043	(22.6%)	720	(18.2%)	▲
<b>Non-Asia</b>					
United States	1,277	(27.7%)	1,129	(28.6%)	▼
European Union	1,193	(25.9%)	1,342	(33.9%)	▼
Cayman Islands	747	(16.2%)	373	(9.4%)	▲
Other non-Asia	351	(7.6%)	390	(9.9%)	▼
Asia's cross-border bank claims on non-Asia	3,569	(77.4%)	3,234	(81.8%)	▼
<b>Asia's total cross-border bank claims</b>	<b>4,612</b>	<b>(100.0%)</b>	<b>3,954</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase.

Source: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018).

**Table 4.6: Sources of Cross-Border Bank Liabilities—Asia** (\$ billion)

	2017		2012		**
	\$ billion	% share	\$ billion	% share	
<b>Asia</b>					
Hong Kong, China	256	(11.1%)	160	(6.7%)	▲
Singapore	135	(5.8%)	133	(5.5%)	▲
China, People's Republic of	75	(3.2%)	27	(1.1%)	▲
Other Asia	164	(7.1%)	142	(5.9%)	▲
Asia's cross-border bank liabilities to Asia	630	(27.2%)	462	(19.2%)	▲
<b>Non-Asia</b>					
European Union	825	(35.6%)	1,083	(44.9%)	▼
United States	680	(29.3%)	673	(27.9%)	▲
Cayman Islands	66	(2.9%)	70	(2.9%)	–
Other non-Asia	118	(5.1%)	123	(5.1%)	–
Asia's cross-border bank liabilities to non-Asia	1,689	(72.8%)	1,950	(80.8%)	▼
<b>Asia's total cross-border bank liabilities</b>	<b>2,319</b>	<b>(100.0%)</b>	<b>2,412</b>	<b>(100.0%)</b>	

\*\* = direction of change in share, ▼ = decrease, ▲ = increase, – = no change.

Source: ADB calculations using data from Bank for International Settlements. Locational Banking Statistics. <https://www.bis.org/statistics/bankstats.htm> (accessed August 2018).

region. Other notable increases in intraregional cross-border bank claims over the last 5 years were on Japan (by \$29.2 billion), Thailand (by \$15.1 billion), and India (by \$13.9 billion). For Hong Kong, China, the largest source of lending was Japan (\$142.5 billion), followed by Taipei, China (\$39.8 billion) and Australia (\$27.4 billion).

The US, the EU, and the Cayman Islands remain top destinations for Asia's non-regional bank claims. Japan remains the largest source of Asian bank lending to the US, accounting for almost 90% (\$1.1 trillion). This is only topped globally by the UK, which has the largest bank claims on the US (\$1.3 trillion).

Asia's bank claims on the Cayman Islands doubled over the past 5 years, increasing from \$373.0 billion in 2012 to \$747.0 billion in 2017. The majority of the increase can be attributed to Japan, which almost doubled its claims from \$362.1 billion to \$700.8 billion. Australia's claims on the Cayman Islands in 2017 were \$27.4 billion, 28 times as large as its claims of less than \$1 million in 2012.

Hong Kong, China; Singapore; and the PRC are the main sources of intraregional bank liabilities in Asia (Table 4.6). They have increased over the past 5 years along with their share to total bank liabilities. The top

sources of bank lending outside the region were the EU, the US, and the Cayman Islands. However, Asia's liabilities decreased significantly to both the EU (by \$259.0 billion) and the Cayman Islands (\$4.0 billion), while US liabilities increased by \$7.0 billion between 2012 and 2017.

## Analysis Using Price Indicators

### Equity

**On average, Asia's equity return correlations with the region and globally remained largely stable as US interest rates continued to normalize. East Asia's correlations with Asia and the world are rising, highlighting the increasing interconnectedness of its financial markets with the region as well as with global markets.**

Comparing the post-global financial crisis (GFC) and US monetary policy normalization periods, Asia's equity

**Table 4.7: Average Simple Correlation of Stock Price Index Weekly Returns—Asia with Asia and World**

Region	Asia				World			
	Pre-GFC Jan 1999– Sep 2007	Post-GFC Jul 2009– Dec 2015	MP Normalization Jan 2016– Aug 2018	**	Pre-GFC Jan 1999– Sep 2007	Post-GFC Jul 2009– Dec 2015	MP Normalization Jan 2016– Aug 2018	**
Central Asia	0.09	0.20	0.16	▼	0.02	0.24	0.15	▼
East Asia	0.35	0.47	0.50	▲	0.42	0.56	0.60	▲
Southeast Asia	0.33	0.41	0.41	–	0.34	0.49	0.45	▼
South Asia	0.14	0.18	0.18	–	0.15	0.18	0.20	▲
Oceania	0.38	0.53	0.48	▼	0.55	0.70	0.56	▼
<b>Asia</b>	<b>0.28</b>	<b>0.36</b>	<b>0.36</b>	–	<b>0.36</b>	<b>0.42</b>	<b>0.41</b>	▼

\*\* = direction of change in simple correlation between post-global financial crisis, and monetary policy normalization periods, ▼ = decrease, ▲ = increase, – = no change, GFC = global financial crisis, MP = monetary policy.

Notes: Central Asia includes Georgia, Kazakhstan, and the Kyrgyz Republic. East Asia includes Hong Kong, China; Japan; Mongolia; the People's Republic of China; the Republic of Korea; and Taipei, China. Southeast Asia includes Indonesia, the Lao People's Democratic Republic, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam. South Asia includes Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Oceania includes Australia and New Zealand. Asia includes Central Asia, East Asia, Oceania, South Asia, and Southeast Asia.

Sources: ADB calculations using data from Bloomberg; CEIC; Haver; International Monetary Fund. World Economic Outlook. <https://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx> (accessed September 2018); and Stooq. <https://stooq.com/q/?s=^sti> (accessed September 2018).

return correlation with the region and the world largely remained constant—and at moderate levels (Table 4.7). Subregionally, there has been a clear upward trend of East Asia's equity return correlation, both within Asia and the world, and across all periods, highlighting a growing integration of East Asia's equity markets, both within Asia and globally. Average correlations of Central Asian equity markets with Asia and the world have decreased recently.

### Dynamic conditional correlations of Asian and global equity markets remain high as Asia's equity markets continue to integrate globally.

Equity return dynamic conditional correlations (DCC) between Asia and the world remain higher than the rest, supported by the high equity return DCC between Asia and the EU, and between Asia and the US (Figure 4.11)—underpinning Asia's equity market integration globally. Intra-Asia equity return DCC and between Asia and Japan have also risen during exceptional events—such as the US stock market correction in February 2018, followed by the imposition of US tariffs on imports triggering responses from advanced economies. The Asia-PRC DCC registered a large fall in June 2018, as PRC stock markets continued to fall under pressure as trade tensions between the US and other economies, especially the PRC, continued.

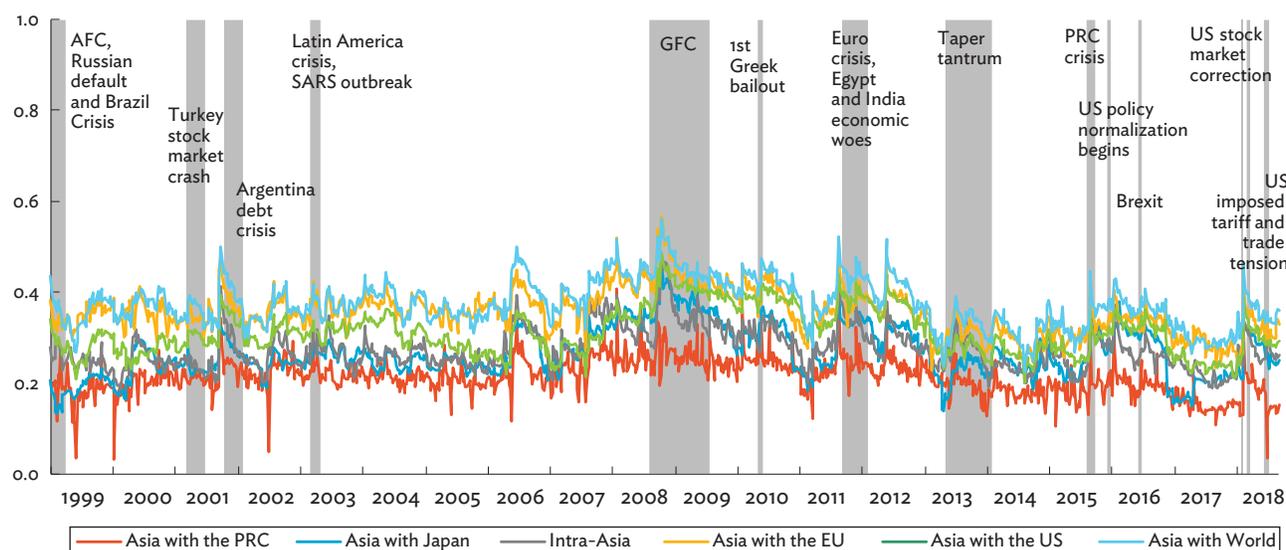
## Debt

### Contrary to the stable average correlations of Asia's equity market returns, Asia's bond return correlations with global markets have increased substantially.

Recent rate hikes from the US Federal Reserve could have led to increased correlations between Asia's bond markets returns with the world compared with the post-GFC period (from 0.21 to 0.44) (Table 4.8). Except for Australia, the PRC, India, Malaysia, and the Republic of Korea, all other Asian economies have seen increased bond return correlations with Asia during the normalization period as compared with the post-GFC period. Moreover, correlations of all Asian markets have increased with global markets. By correlation level, Singapore currently has the highest correlation with Asia (0.56) and global bond markets (0.64), underlining its important role as one of the region's highly integrated financial centers.

### Progress in US monetary policy normalization coincides with a rise in bond return dynamic conditional correlations.

Bond return DCC between Asia and the world, as well as with Asia's selected partner economies rose sharply (except the PRC) in July 2017, as several major central

**Figure 4.11: Conditional Correlations of Equity Markets—Asia with Select Economies and Regions**

AFC = Asian financial crisis, EU = European Union, GFC = global financial crisis, PRC = People's Republic of China, SARS = severe acute respiratory syndrome, US = United States.

Note: Asia includes Australia; Bangladesh; Georgia; Hong Kong, China; India; Indonesia; Japan; Kazakhstan; the Kyrgyz Republic; the Lao People's Democratic Republic; Malaysia; Mongolia; Nepal; New Zealand; Pakistan; the Philippines; the PRC; the Republic of Korea; Singapore; Sri Lanka; Taipei, China; Thailand; and Viet Nam.

Sources: ADB calculations using data from Bloomberg; CEIC; and Stooq. <https://stooq.com/q/?s=^sti> (accessed May 2018); and methodology by Hinojales and Park (2010).

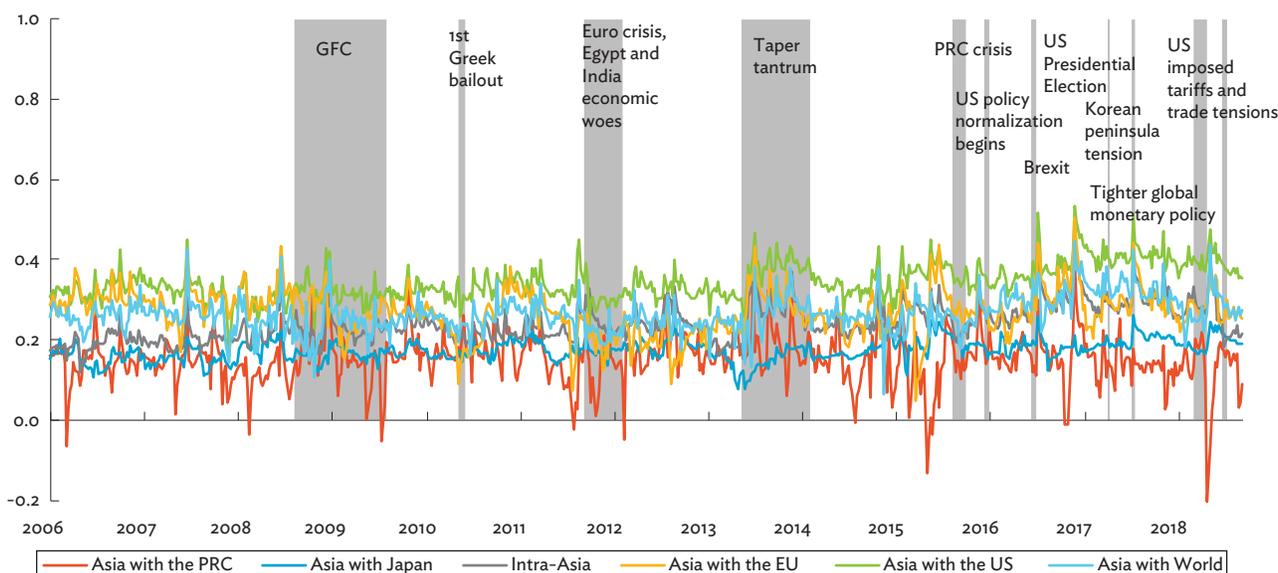
**Table 4.8: Average Simple Correlation of Weekly Bond Return Index—Asia with Asia and World**

Economy	Asia			**	World			**
	Pre-GFC Jan 2005– Sep 2007	Post-GFC Jul 2009– Dec 2015	MP Normalization Jan 2016– Aug 2018		Pre-GFC Jan 2005– Sep 2007	Post-GFC Jul 2009– Dec 2015	MP Normalization Jan 2016– Aug 2018	
Australia	0.38	0.46	0.41	▼	0.41	0.36	0.57	▲
PRC	0.01	0.30	0.21	▼	0.04	0.03	0.18	▲
India	0.06	0.21	0.14	▼	0.23	-0.07	0.07	▲
Indonesia	-0.15	0.23	0.26	▲	0.02	0.25	0.44	▲
Japan	0.19	0.25	0.33	▲	0.28	0.41	0.47	▲
Republic of Korea	0.15	0.47	0.45	▼	0.37	0.23	0.54	▲
Malaysia	0.22	0.44	0.31	▼	0.13	0.15	0.45	▲
Philippines	–	0.21	0.39	▲	–	0.14	0.48	▲
Singapore	0.29	0.49	0.56	▲	0.27	0.44	0.64	▲
Thailand	0.20	0.39	0.47	▲	0.29	0.19	0.53	▲
<b>Asia</b>	<b>0.16</b>	<b>0.34</b>	<b>0.35</b>	▲	<b>0.23</b>	<b>0.21</b>	<b>0.44</b>	▲

\*\* = direction of change in simple correlation between post-global financial crisis and monetary policy normalization periods, ▼ = decrease, ▲ = increase, – = no data available, GFC = global financial crisis, MP = monetary policy, PRC = People's Republic of China.

Notes: Values refer to the average of pair-wise correlations. Weekly returns are computed as the natural logarithm difference between weekly average of daily bond return index for the current week, and the weekly average of the daily bond return index from the previous week. All bond return indexes comprise local currency government-issued bonds.

Sources: ADB calculations using data from Bloomberg; and International Monetary Fund. World Economic Outlook. <https://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx> (accessed September 2018).

**Figure 4.12: Conditional Correlations of Bond Markets—Asia with Select Economies and Regions**

EU = European Union, GFC = global financial crisis, PRC = People's Republic of China, US = United States.

Note: Asia includes Australia, India, Indonesia, Japan, Malaysia, the Philippines, the PRC, the Republic of Korea, Singapore, and Thailand.

Sources: ADB calculations using data from Bloomberg and methodology by Hinojales and Park (2010).

banks surprised markets by releasing non-dovish comments (Figure 4.12). Increases in DCC could also be observed during major episodes such as the 2016 US presidential election, the “Brexit” referendum, and rising trade tensions among major trading partners in 2018. A surprise cut of 100 basis points by the People’s Bank of China on the reserve requirement ratio on 17 April 2018 coincided with a sudden drop in bond yields. This in turn could have caused the bond return DCC between Asia and the PRC to drop significantly during the period.

## Financial Spillovers

**The sensitivity of Asian equity and bond markets to global shocks has risen during monetary policy normalization, highlighting the region’s strong degree of integration with global financial markets, as well as reflecting uncertainties surrounding the changes in global financial conditions.**

The period of US monetary policy normalization, characterized by US policy rate hikes—and several central banks in emerging markets tightening monetary

policy coincides with increased sensitivity to global shocks of Asia’s bond and equity markets (Figures 4.13, 4.14).<sup>24</sup> Hence, uncertainties surrounding changing global liquidity conditions lead to this observed increased sensitivity to global shocks. This increasing sensitivity to external shocks is further underscored by elevated exposure to international investors especially from outside the region. Non-regional holdings of Asian portfolio assets grew between 2016 and 2017 from \$3.4 trillion to \$4.5 trillion in equity and from \$1.7 trillion to \$2.0 trillion in debt, highlighting a continuation of the integration of the region’s financial markets globally.

Thus, the region’s policy makers should closely monitor financial risks and market volatilities, while remaining vigilant to safeguard financial stability by strengthening macroeconomic and financial fundamentals, enhancing national and regional economic surveillance, employing appropriate macroprudential measures, reinforcing national and regional financial safety nets, and deepening capital market development. The region should also leverage recent regulatory technology and fintech developments to help promote financial stability and resilience (Box 4.2).

<sup>24</sup> For example, Hong Kong, China (began to raise the policy rates in late 2016) and the Republic of Korea (raised the rates in late 2017). Indonesia, the Philippines, and India raised policy rates multiple times as of September 2018.

## Box 4.2: Fostering Financial Stability through Regulatory Technology

Following the 2008/09 global financial crisis, regulatory and compliance requirements imposed upon banks and other financial institutions became more complex, cumbersome, and lengthy. In addition, substantial fines and penalties were introduced for noncompliance. In the United States, considerable post-crisis fines were levied on banks, while annual spending by financial institutions on compliance was estimated at more than \$70 billion.<sup>a</sup> Consequently, regulatory fees and the cost of compliance have emerged as principal concerns for the industry.

Technological advances offer a potential means to mitigate these considerable costs. In particular, RegTech—a contraction of “regulatory” and “technology”—has emerged as a promising way to facilitate the adherence of financial institutions to growing compliance and reporting obligations. RegTech includes technology-based systems that facilitate data collection and generate reports conforming to the format and schedules imposed by regulatory bodies. Its applications range from effective processing of “Big Data” to strengthening cybersecurity and the enhancement of macroprudential supervision.

Although RegTech is closely linked to fintech—the utilization of technology in the delivery of financial solutions—the two differ. Fintech encompasses a myriad of emerging platforms, spanning peer-to-peer lending to robo-advice, and encompassing payments and credit scoring. In contrast, the potential of RegTech is not confined to increasing efficiency; it can provide a better tool for rethinking and reshaping the ways in which regulation and finance work. RegTech applications can be as follows:

### 1. Big Data

Post-crisis regulations require the generation of masses of reports and data. Yet regulators typically lack the capacity to analyze the data received. For instance, suspicious transaction reports are produced as part of anti-money laundering and know-your-customer requirements but are rarely utilized and confined to being used to further prosecution measures after a fraudulent transaction has already taken place. Thus, regulators are unable to curb criminal activity permeating financial systems. RegTech offers a means for analyzing these data

sets so that informed and timely decisions can be made and appropriate action taken.

### 2. Macroprudential policy

This comprises the most promising area for using RegTech. The global financial crisis clearly illustrated the need to put in place early warning systems to stem the buildup of financial vulnerabilities and risks that could possibly lead to new crisis episodes. For instance, Big Data and new data sets can be leveraged to identify alarming patterns—such as financial volatilities. Early identification can help regulators nip emerging problems in the bud and respond proactively, circumventing the problem of learning only after the fact. Ultimately, RegTech should allow for close to real-time monitoring of capital flows, enabling regulators to curb crises before they unfold.

### 3. Cybersecurity

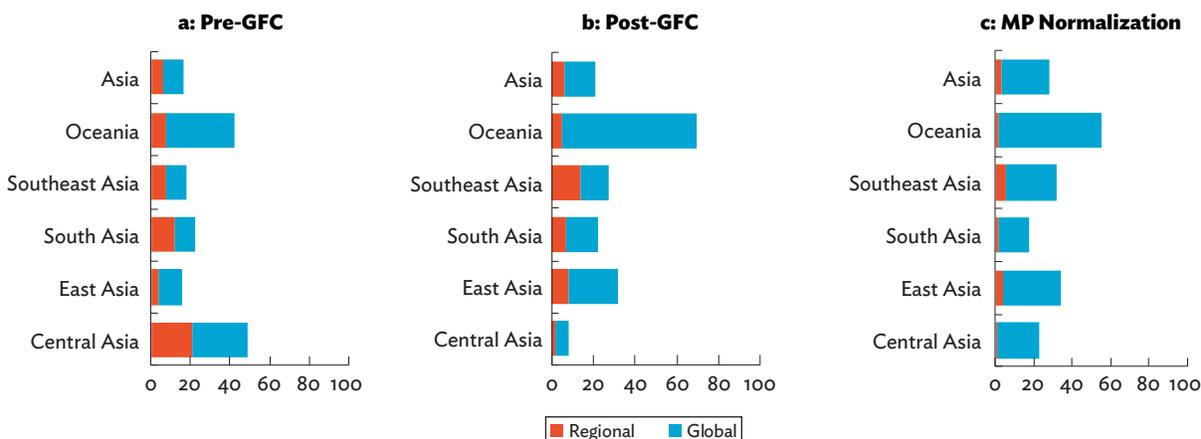
Cybersecurity is one of the most prominent areas for the application of RegTech, as digital transformation has increased the vulnerability of financial systems to attacks, theft, and fraud. The 2016 Bangladesh central bank cyber-heist underscored the vulnerabilities in existing frameworks as not only data, but money (\$81 million), was taken. Proper regulations must be in place to ensure the soundness and security of financial systems.

### 4. RegTech and regional financial cooperation

To better manage risks, multiple regulatory bodies require institutions to frequently report massive amounts of data. Apart from strengthening national regulatory capacities, possible cooperation among the region’s regulators could lead to more streamlined RegTech applications that also address growing financial interconnectedness and help identify cross-border risks. RegTech can be used to support the strengthening of regional cooperation in building appropriate policy and regulatory frameworks, such as the harmonization of regulatory standards or guidelines for digital transformation and data sharing.

<sup>a</sup> A Report on Global RegTech: A \$100-Billion Opportunity—Market Overview, Analysis of Incumbents and Startups (April 2016) as cited in Arner, Barberis, and Buckley (2017).

Sources: ADB; and Arner, Barberis, and Buckley (2017).

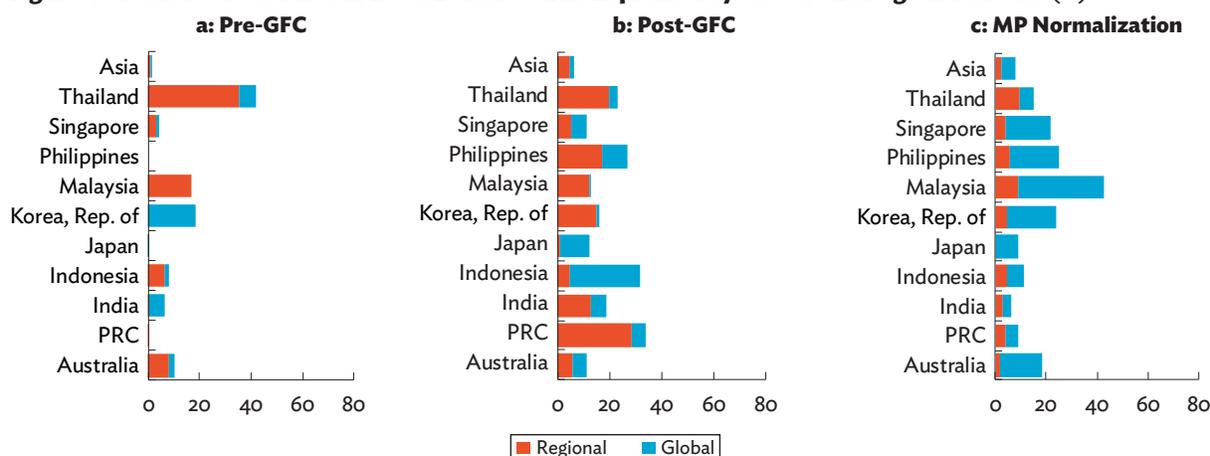
**Figure 4.13: Share of Variance in Local Equity Returns Explained by Global and Regional Shocks (%)**

GFC = global financial crisis, MP = monetary policy.

Pre-GFC = January 1999 to September 2007, Post-GFC = July 2009 to December 2015, MP Normalization = January 2016 to August 2018.

Notes: Asia includes Central Asia, East Asia, Oceania, South Asia, and Southeast Asia. Central Asia includes Georgia, Kazakhstan, and the Kyrgyz Republic. East Asia includes Hong Kong, China; Japan; Mongolia; the People's Republic of China; the Republic of Korea; and Taipei, China. Oceania includes Australia and New Zealand. South Asia includes Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Southeast Asia includes Indonesia, the Lao People's Democratic Republic, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam.

Sources: ADB calculations using data from Bloomberg; CEIC; and International Monetary Fund. World Economic Outlook. <https://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx> (accessed September 2018); and methodology by Lee and Park (2011).

**Figure 4.14: Share of Variance in Local Bond Returns Explained by Global and Regional Shocks (%)**

GFC = global financial crisis, MP = monetary policy, PRC = People's Republic of China.

Pre-GFC = January 2005 to September 2007, Post-GFC = July 2009 to December 2015, MP Normalization = January 2016 to August 2018.

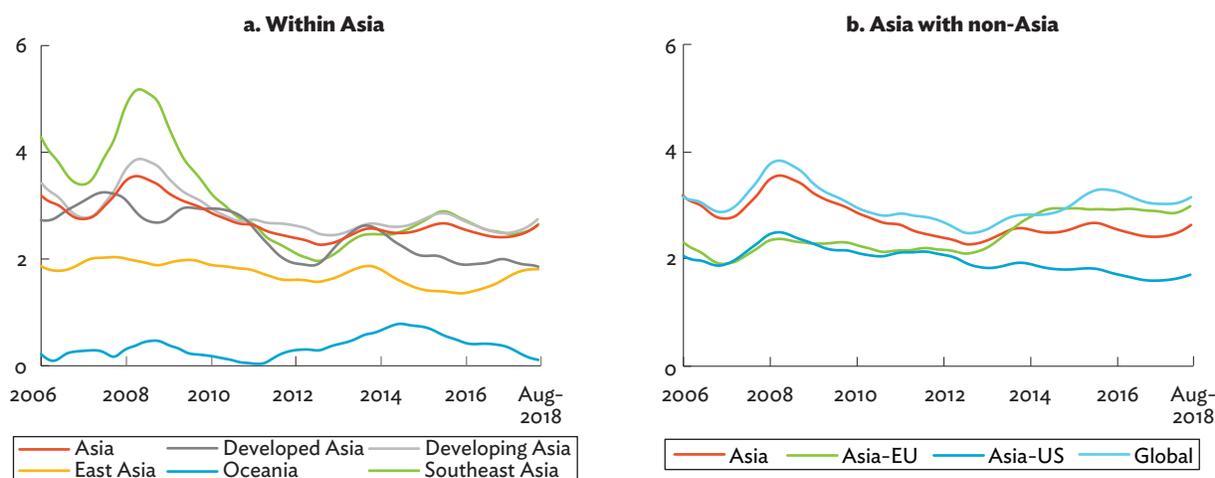
Notes: Asia includes Australia, India, Indonesia, Japan, Malaysia, the Philippines, the PRC, the Republic of Korea, Singapore, and Thailand.

Sources: ADB calculations using data from Bloomberg; and International Monetary Fund. World Economic Outlook. <https://www.imf.org/external/pubs/ft/weo/2018/01/weodata/index.aspx> (accessed September 2018); and methodology by Lee and Park (2011).

### Asian bond yields converged both within Asia and with non-Asia in 2016 and 2017, but signs of divergence began to appear in 2018.

Since the 2013 “taper tantrum,” intra-Asia 10-year government bond yields in developed Asia and Oceania have continued to converge (Figure 4.15a). In contrast, East Asian yields have been diverging since the beginning of 2017. Unlike for other economies in the subregion,

PRC bond yields were rising for most of 2017, triggered by tighter regulations and monetary conditions in the PRC to contain financial risks stemming from elevated levels of debt. But Asia as a whole saw bond yields diverge after the 2013 taper tantrum and slowly converge since the US monetary policy normalization in 2016 and 2017.

**Figure 4.15:  $\sigma$ -Convergence of 10-Year Government Bond Yields—Asia**

EU = European Union, US = United States.

Notes:

- (i) Values refer to the unweighted mean of individual economy's  $\sigma$ -convergence, included in the subregion. Each economy's  $\sigma$ -convergence is the simple mean of all its pairwise standard deviation. Data are filtered using Hodrick-Prescott method.
- (ii) East Asia includes Hong Kong, China; Japan; the People's Republic of China; the Republic of Korea; and Taipei, China. Southeast Asia includes Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Oceania includes Australia and New Zealand. Developed Asia includes Japan and Oceania. Developing Asia includes East Asia excluding Japan and Southeast Asia. Asia includes developed Asia and developing Asia. Global includes Asia, Colombia, the EU, Mexico, and the US.

Sources: ADB calculations using data from Bloomberg; CEIC (accessed September 2018); and methodology by Espinoza, Prasad, and Williams (2010); and Park (2013).

Moreover, Asia's local currency bond yields continued to converge more to US bond yields during 2012–2017 (Figure 4.15b). This trend even remains below Asia's intraregional dispersion. The Asia–EU yield dispersion was nearly as narrow as the Asia–US yields until the end of 2012, before Asia's bond yields began to diverge from the EU's. The Asia–EU yield dispersion is even higher than Asia's own  $\sigma$ -convergence since the end of 2014. In 2018, the Asia–US yield dispersion started to rise, reflecting investor sentiment of flight-to-quality assets due to deepening uncertainties and risks driven by global financial market conditions and trade tensions among major trading partners.

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