

Resisting financial globalisation in Asia¹

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I. Introduction

Financial globalisation is often treated as a providential fact. Resistance to the spread of global financial enterprises and financial prices across national borders is taken to be futile. “There is no alternative” is a widely embraced hypothesis, shared by many critics as well as proponents of financial globalisation.

Yet analyses of financial globalisation in Asia find that it is lower or increasing more slowly than that observed for the rest of the world or other emerging markets. Ahuja, et al (2007) show that emerging Asia international balance sheet is growing more slowly relative to GDP than that of advanced economies—with no trend evident vis-à-vis trade. Lowe (2007) reports that Asian gross capital flows in relation to GDP are only two-thirds global levels. Indices of controls on capital inflows and outflows for emerging Asia register at high levels in relation to those for Latin America or Eastern Europe (IMF (2007, p 14)).

This paper assesses the extent of resistance to financial globalisation in China, India, Korea and Thailand. We first measure the market share of foreign banks in the broadly defined banking markets of these four economies. Then the sway of global financial markets is assessed by a comparison of offshore and onshore fixed income and equity prices, building on Otani and Tiwari (1981), Frankel (1992), Levy Yeyati, Schmukler and Horen (2006), Peng, et al (2008), and Ma and McCauley (2007 and 2008). Persistent and substantial gaps between the onshore and offshore market prices of the same underlying asset suggest market segmentation

Asian economies have resisted financial globalisation by limiting the role of foreign banks. The response in Korea and Thailand to the Asian financial crisis of 1997-98 differed from the response in Mexico to its crisis: foreign banks there now extend the bulk of bank credit. How much the limited role of foreign banks will shelter the Asian economies from the recent intensification of global financial turmoil remains to be seen. Evidence to date suggests that the most open of the four economies, Korea, has been most put to the test.

Asian economies have also resisted financial globalisation by systematically breaking the links between offshore financial markets that non-residents can readily access and onshore markets. In all four cases, offshore currency and fixed income markets have developed, but the authorities have inhibited, regularly or at times, the arbitrage transactions that would allow prices in these offshore markets to converge to their onshore counterparts. While non-resident investors can take positions in the renminbi, the rupee, the won and the baht, and while residents or the offshore affiliates of residents may take the other side of the non-

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resident positions to some extent, non-residents can end up trading at prices quite different from those onshore. The upshot is that the influence of global financial developments, perhaps even the current turmoil, is to some extent attenuated.

The paper is organised as follows. The next section discusses the role of foreign banks in the four economies, suggesting that policy may have affected vulnerability to changes in global funding markets, albeit at a cost. Section III presents evidence on the gap between foreign exchange and fixed income prices of instruments traded on and offshore. Section IV presents similar evidence on equity markets. Section V concludes.

II. The role of foreign banks

This section first compares the market share of foreign banks in a broadly defined banking market in the four economies to that in other emerging market economies in Latin America and Central Europe. The finding is that the major Asian economies outside of Japan (like Japan) have relatively low foreign bank shares. Then we review the evidence through mid-2008 of instability in the extension of credit by foreign banks since the onset of the financial turmoil

To compare the role of foreign banks in different economies requires some care. The usual measure looks at the domestic books of domestic and foreign banks.² The focus may be further narrowed by analysing only domestic currency deposits or loans. The problem with such measures, however, is that they ignore offshore banking. Cross-border loans and deposits can be significant, especially where reserve requirements, deposit insurance premia and the like are imposed on domestic deposits but not on foreign deposits. Since foreign banks are likely to have a larger share in such offshore deposits and credit, narrowing the analysis to strictly domestic banking aggregates is likely seriously to understate the role of foreign banks (McCauley and Seth (1992)).

To measure the foreign bank share, we combine domestic bank credit as reported in the IMF's *International Financial Statistics* with the BIS international banking statistics. The BIS compiles the international banking data based on reports from central banks, who in turn depend on reports from their respective banks. It should be recognised that this procedure does not treat as foreign some banks that are generally viewed as foreign in domestic discussions. Two cases can be distinguished: banks owned by private equity firms and those held by nonbank financial firms.³

Private equity firms bid for failed banks in the wake of the Japanese and Asian financial crisis. Thus, the Lone Star private equity fund came to be the major holder of the Korean Exchange Bank (KEB). To Koreans, KEB is a foreign-owned bank. However, the private equity firm does not report to the Federal Reserve, as would a bank holding company. As a result, that KEB's won loans are not included in the BIS data as those of a foreign bank and the foreign bank share is lower than if foreign ownership per se were the defining feature.

Foreign banks play important roles in all four Asian economies but in none of them does the foreign bank share in a broadly defined bank credit market reach a quarter (Table 1). This is

² Lowe (2007) examines local currency claims as a fraction of foreign banks' total foreign claims. Despite the difference in measures from that used here, he concludes "while this ratio has increased significantly over the past decade, it remains lower than in many other areas of the world".

³ Nonbank financial firms headquartered outside of Asia have built up banking operations in Asian economies. Some of these remain nonbank financial firms, for instance, GE Money is the biggest issuer of credit cards in Thailand. In other cases, for instance in the Philippines, GE Money Bank offers deposits, as well as consumer loans. These, too, would not be counted as foreign banks in the BIS data, and so on this account our measure would understate to some extent the foreign bank presence.

Claims of BIS reporting banks in relation to total bank credit

At end-March 2008

	International claims ¹		Local claims in local currencies	Local claims/ international claims ²	Local claims/ domestic bank credit ³	Foreign bank credit/total bank credit ⁴
	Total	On non-banks				
	in billions of US dollars			Ratio	in percentages	
All countries ⁵	22,855	11,360	11,387	0.50	16	28
Asia-Pacific	2,171	1,167	1,865	0.86	9	14
Australia	312	151	362	1.16	26	34
China	229	122	72	0.31	1	4
Hong Kong SAR	185	110	221	1.20	66	80
India	145	97	82	0.56	10	20
Indonesia	53	47	18	0.33	12	36
Japan	609	289	467	0.77	5	7
Korea	247	119	158	0.64	15	24
Malaysia	54	41	68	1.28	28	41
New Zealand	32	21	212	6.54	97	98
Philippines	25	19	7	0.30	12	34
Singapore	201	96	92	0.46	41	70
Taiwan, China	58	39	69	1.19	10	16
Thailand	22	16	38	1.68	14	19
EMEA ⁶	876	670	691	0.79	28	47
Czech Republic	51	40	147	2.86	111	118
Hungary	108	88	48	0.44	39	81
Poland	120	105	162	1.35	59	79
Russia	204	134	48	0.23	8	25
South Africa	34	21	77	2.30	30	36
Turkey	121	92	51	0.42	14	30
Latin America ⁷	323	255	588	1.82	26	34
Argentina	21	19	18	0.85	26	42
Brazil	121	86	206	1.70	14	19
Chile	39	27	60	1.53	47	58
Mexico	87	80	256	2.95	64	69
Venezuela	10	10	22	2.09	34	44
North America	3,552	2,447	3,768	1.06	23	32
Canada	345	120	185	0.54	7	12
United America	3,207	2,327	3,583	1.12	26	35
Western Europe ⁸	15,934	6,822	4,475	0.28	16	33
Euro area	10,466	4,666	2893	0.28	13	28
France	1,935	612	243	0.13	5	17
Germany	1,922	831	657	0.34	12	24
Italy	1,266	660	522	0.41	16	32
Netherlands	1,293	602	267	0.21	13	32
Switzerland	855	215	30	0.04	3	22
United Kingdom	3,727	1,582	1,216	0.33	23	43

¹ BIS reporting banks' cross-border claims in all currencies and their foreign affiliates' local claims in foreign currencies (from the consolidated banking statistics). ² BIS reporting banks' local claims in local currencies as a ratio of their international claims. ³ BIS reporting banks' local claims in local currencies as a percentage of all commercial banks' local claims on non-banks. ⁴ BIS reporting banks' international claims on non-banks plus their local claims in local currencies, as a percentage of reporting banks' cross-border claims on non-banks plus all commercial banks' local claims on non-banks. ⁵ Sum of the regions shown in the table. ⁶ Eastern Europe, Middle East and Africa; countries shown plus Algeria, Bulgaria, Cyprus, Egypt, Israel, Morocco, Romania, the Slovak Republic and Tunisia. ⁷ Countries shown plus Columbia, Ecuador, Peru and Uruguay. ⁸ Euro area and countries shown plus Denmark, Iceland, Norway and Sweden.

Sources: Central bank of the Republic of China (Taiwan); IMF; BIS.

Table 1

below the foreign bank shares in all of central and eastern Europe and below that share observed in the major economies of the Western Hemisphere except for Brazil and Canada.

Even among the major economies of Asia and the Pacific, the foreign bank share in the four economies is on the low side. Among the four economies, the foreign bank share ranges from 4% in China through about 20% for Thailand and India, to 24% in Korea. These shares fall below the median in the region of 34%, as represented by Australia or the Philippines. Only Japan and Taiwan, China (henceforward, Taiwan) join our four economies on this side of the regional median.

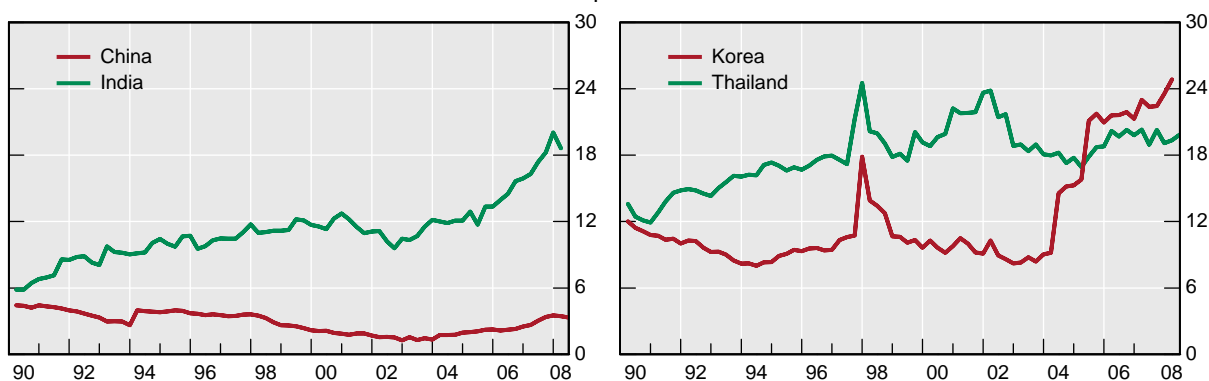
Viewed from Latin America or Central Europe, what is striking is that financial crisis and the resolution of legacy losses in the transition from central planning left the Asian banking systems largely in domestic hands. In contrast, Mexico emerged from its financial crisis with a predominantly foreign-run banking system and today its foreign bank share is 69%. The Czech, Hungarian and Polish banking systems emerged from their transitions largely in the hands of European banks.

While the foreign bank shares are consistently on the low side in the four countries, the underlying trends differ substantially (Graph 1). The share in China is consistently very low, contrary to the expectations of observers who foresaw a rise in the foreign bank share of the Chinese market to one-fifth in the ten years after China's entry into the World Trade Organisation (Ramos (1998)). The share in India rose before the Asian crisis and again in this century. Foreign banks' share of credit spiked in 1997 in Korea and Thailand as the depreciation of the won and baht reduced the dollar value of domestic credit. Then years of paying down dollar debts, only partially offset by the increasing role of foreign banks in won and baht lending,⁴ saw the foreign bank share tending to fall. From 2004, foreign bank

Graph 1

Foreign bank share¹

In per cent



¹ BIS reporting banks' international claims on non-banks plus their local claims in local currencies, as a percentage of reporting banks' cross-border claims on non-banks plus all commercial banks' local claims on non-banks. Measure differs slightly from that in Table 1 owing to the exclusion above of cross-border claims of banks headquartered in the respective country from the foreign bank share.

Sources: IMF; BIS.

acquisition of Korean banks and a rise in dollar interbank credit drove up the Korean share to its current level of almost a quarter.

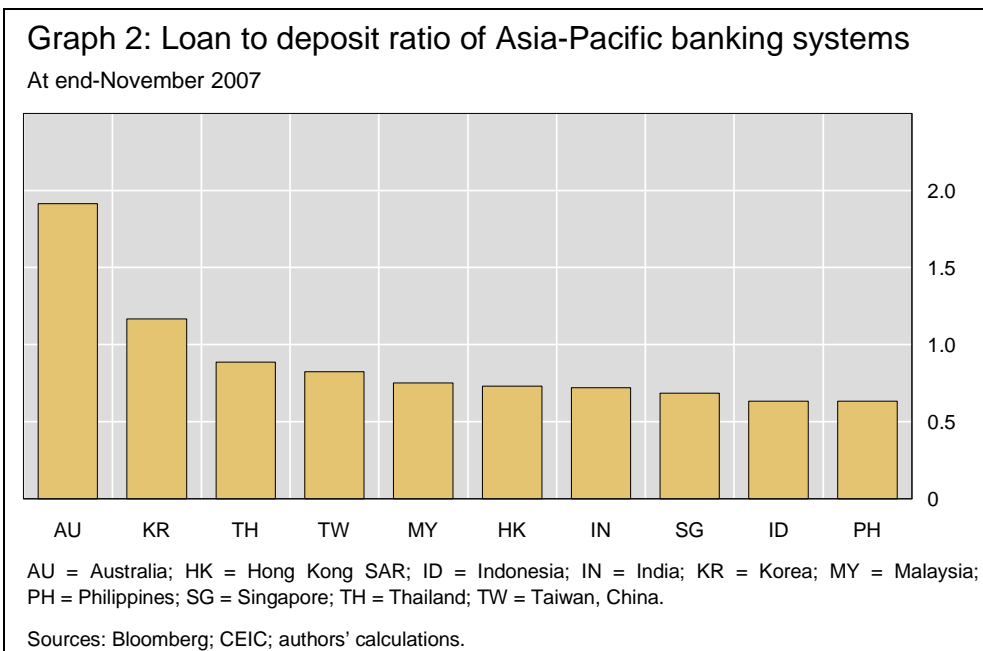
⁴ See McCauley, Ruud and Wooldridge (2003) on the shift from cross-border to local currency banking.

The trends observed in three of the four cases bears on the interpretation of resistance in this paper's title. Resistance to financial globalisation should be understood not as keeping foreign banks out, nor as capping their market share (in the manner of the former Canadian approach). Rather resistance in this area means that a variety of policies have combined to allow only a gradual increase in the role of foreign banks. Despite the disappointment of earlier expectations, a gradual increase in the foreign banks' share of the Chinese market is still widely anticipated.

Resistance to the expansion of foreign banks has both secular and cyclic aspects. Policies to recapitalise the banking systems in crisis-hit Korea and Thailand differed but to some extent had the effect of limiting the role of foreign banks. The chosen approaches to resolving the legacy losses of the state-owned commercial banks in China likewise limited the role of foreign banks to strategic investors in the state-owned banks rather than owners of formerly state-owned banks (Ma (2007)). Branching restrictions are common.

In addition, policy responses to the cycle of strong capital inflows that reached a peak in early 2007 may have curbed the growth of the share of foreign banks (McCauley (2008)). China extended to foreign banks longstanding limits on dollar funding of Chinese banks. India placed limits on the conversion of external commercial borrowing into rupee. Korea sought from April 2007 to limit the build-up of short-term crossborder interbank debt and foreign currency lending to small firms and households. And Thailand tightened existing limits on the bank credit inflows with its unremunerated reserve requirement in late 2006.

It would be wrong to emphasise policy to the exclusion of financial developments. True, the greater openness of the Korean banking market (even in US dollar terms, see below) than those of the most populous Asian economies does reflect policy: Despite the controversy that has surrounded foreign purchases and sales of Korean banks, the overall policy environment has accepted an open capital account. But credit developments in Korea also have played a role in attracting capital inflows and increasing the foreign bank share. Only in Korea have loans grown to exceed deposits (Graph 2).⁵ Of course, foreign banks have not only been drawn to Korea by the buoyant credit growth but have also contributed to it.



⁵ The IMF (2007, pp 23-24) observes in an unrelated sample that rapid credit growth draws in funds from abroad.

Resistance is not cost-free. Many observers have emphasised the benefits of a larger role for foreign banks, with contributions both to development and to stability over the cycle. The Committee on the Global Financial System (2004) emphasised the developmental role of foreign banks in bringing new technology and innovations in products and processes. Strengths were seen in consumer debt and securities markets. Foreign bank competition can raise the game of local banks.

With regard to financial stability, discussions of the role of foreign banks have generally considered a scenario in which the host economy is the origin of some adverse development. Thus, foreign banks were seen as useful not only in helping to recapitalise banks in the wake of financial crises but also in serving as a stabilising force in the event of any new domestic crisis. CGFS (2004, p 14) further advanced the hypothesis that the domestic currency intermediation of foreign banks is robust to global as well as local adverse developments:

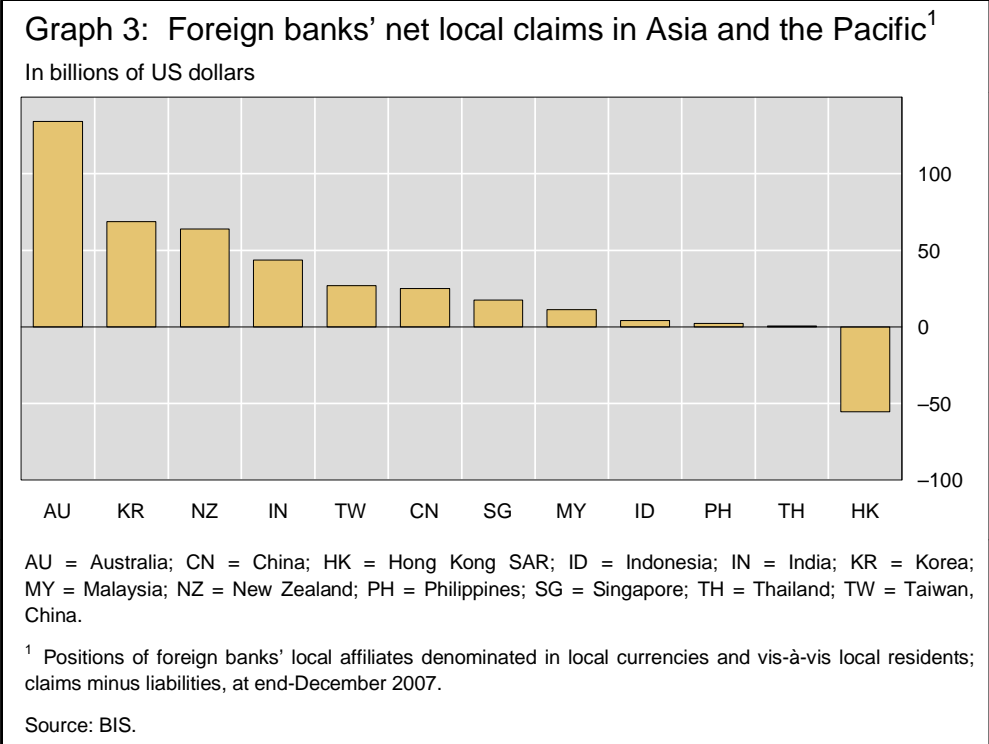
The ability to manage credit risk together with stronger capital positions, access to market or parent funding and diversification of the parent's risks tends to make foreign banks less sensitive to both home and host country business cycles. Consequently, lending to local residents in the local market is likely to be more stable in times of stress than either cross-border lending or the lending of indigenous banks in the markets.⁶

The distinction between cross-border lending and local currency lending can be overdrawn. There is in fact an overlap between them. While foreign banks fund most local currency assets with local currency liabilities, some are funded with dollar borrowing from affiliates ("parent funding") or others that is swapped into local currency liabilities. Foreign banks resort to such funding because they often experience faster growth of their domestic currency assets than of liabilities. For banks focused on retail banking, this reflects greater success in making mortgages and personal loans than of collecting deposits. And for banks focused on securities markets, this may reflect weakness in local repurchase markets that make it difficult to finance holdings of bonds. As a result, foreign bank affiliates tend to have an excess of local currency assets over such liabilities. These can be funded with dollars that are swapped for domestic currency.

McCauley and Zुकunft (2008) argued that this "local currency funding gap" can turn into a vulnerability for emerging market economies in the event of strains in international interbank markets. Global banks under intense funding pressure may resort to liquidation of local currency assets in order to repatriate the dollars. In aggregate, this vulnerability ranges from sizeable in the case of Korea to small in the case of Thailand (Graph 3).⁷

⁶ Consistent with this claim, McGuire and Tarashev (2008) find evidence that international bank credit decelerates in response to distress in lending banking systems (as measured by falling share prices or heightened risk of default) while local currency claims do not.

⁷ The gap shown of Graph 3 reappears on Graph 4 as the difference between the dotted line and the top of the shaded area at the bottom of Graph 4.

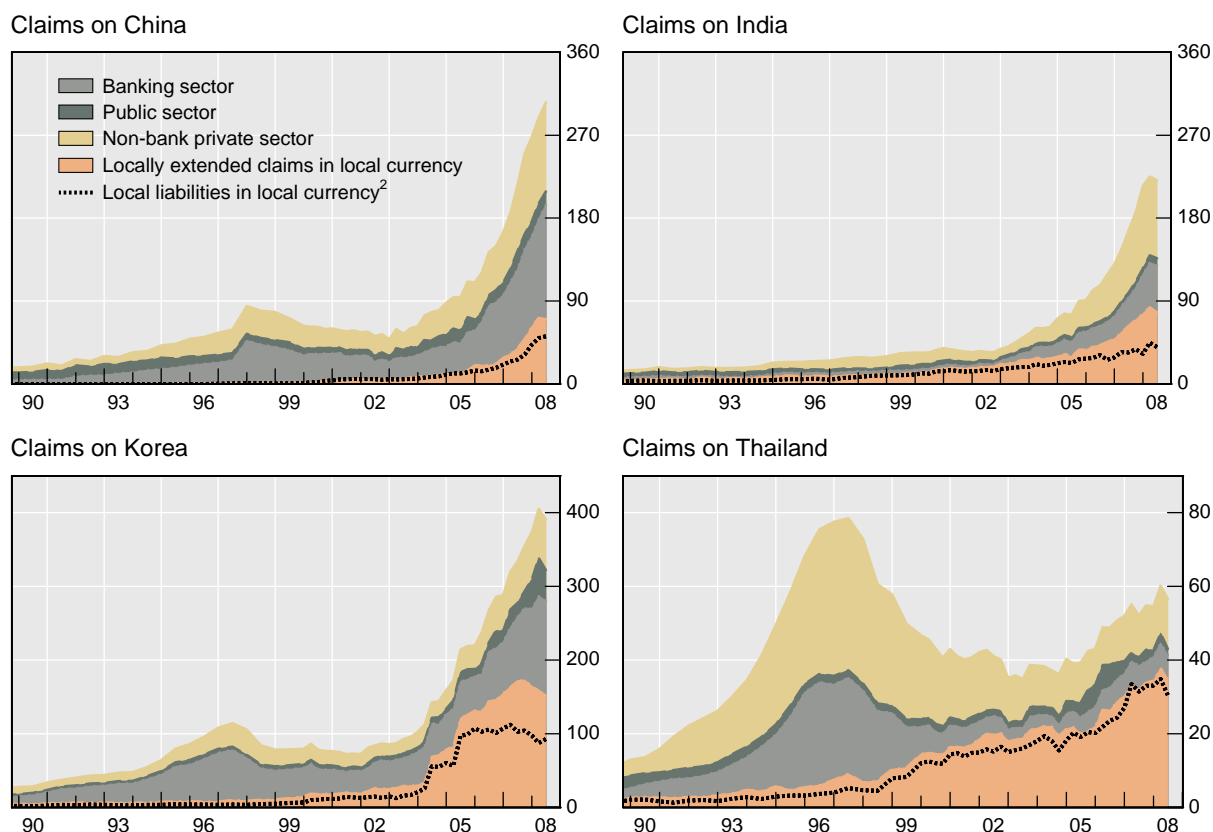


The turmoil in international financial markets since August 2007, and particularly its intensification since the failure of Lehman Brothers in September, is testing the hypothesis of greater stability in domestic currency lending by foreign banks. In the now-available data, it might at first appear that lending to local residents in the local market has declined in all four economies (Graph 4, shaded area at bottom). Indeed, it appears that this decline has led an overall decline in India, Korea and Thailand. However, the sharp decline of the rupee, won and baht in the first and second quarters of 2008 would seem to account fully for these declines as measured in US dollars. Through the first half of 2008, at least, foreign banks' at most slowed their lending to Chinese, Indian, Korean and Thai residents in local currency.

Graph 4

Foreign banks' claims on China, India, Korea and Thailand¹

In billions of US dollars



¹ Foreign claims are divided into international claims (cross-border claims in all currencies and locally extended claims in foreign currencies), and locally extended claims in local currencies; international claims are broken down into claims on the non-bank private, public and banking sectors. No sectoral breakdown is available for LCLC. Data through end-June 2008.

Sources: IMF *International Financial Statistics*; BIS consolidated banking statistics on an immediate borrower basis.

The global financial turmoil is also testing the stability of the international interbank claims on these countries, mostly US dollar-denominated. Recall that the contraction of these claims lay at the centre of the Asian financial crisis. What is striking is how global banks' claims on banks in China and Korea continued to grow into 2008. Notwithstanding the Chinese and Korean measures to limit interbank inflows and the strains on global banks' funding, foreign banks kept increasing their claims on China and no more than levelled off their claims on banks in Korea in the second quarter of 2008.

More recent events suggest a reversal of such flows in September-October, at least with respect to Korea. The announcement by the Korean authorities in mid-October of broad provision of dollar funding through foreign exchange swaps and guarantees for maturing Korean bank liabilities suggests a very serious withdrawal.

III. Integration of foreign exchange and fixed income markets

This section reports direct tests of foreign exchange and fixed income market segmentation in the four economies. To varying extents and at various times, the authorities have adopted policies to hamper cross-border arbitrage. Such controls on the free movement of capital can give rise to gaps between onshore and offshore market prices of the same underlying financial assets. These can be large and persistent. The price gaps measured below permit a test to the null hypothesis that the absence of effective capital controls allows sufficient cross-border arbitrage to ensure a convergence of the onshore and offshore market prices of the same instrument.

To test this hypothesis across different financial markets, we first define the onshore-offshore price gaps consistently so that a positive value of the price gap indicates inflow pressure for that particular market. In this section, we examine the following three financial markets in turn: the forward foreign exchange market, the money market, and the bond market. In the next section, we analyse the integration of stock markets.

The global financial market turbulence since the summer of 2007 requires that we take seriously a second alternative hypothesis, at least for observations since August 2007. A finding of different prices onshore and offshore might indicate the presence of effective capital controls. But another possibility is that liquidity pressures, balance sheet constraints and perceived credit risks are impeding the arbitrage. After all, in this period, deviations of covered interest parity as it is conventionally measured are evident in the major markets (Baba et al (2008)). In the graphs below, we have shaded the period 7 August 2007 to date.

1. The foreign exchange forward market

Foreign exchange for forward delivery is traded on- and offshore in all four currencies. According to the BIS triennial foreign exchange market survey, the markets are most developed in Korea (Table 2). Only India makes available data on forward transactions entered into by domestic dealers, and these data show the offshore forward market for the rupee traded somewhat more actively than the onshore forward market. All four economies still uphold the real demand principle for foreign exchange hedging in the domestic market and require documentary evidence of underlying transactions (Tsuyuguchi and Wooldridge (2008), annex A). The Chinese onshore forward market did not come into existence until several years ago. Owing to prohibitions on delivery of the Chinese renminbi, the Indian rupee and the Korean won offshore, offshore forward transactions in all three currencies settle in US dollars and are therefore termed nondeliverable forwards (NDFs).⁸ Moreover, only in Korea are domestic banks allowed to transact in the offshore nondeliverable forward market; the Chinese and Indian authorities prohibit such transactions. The baht can be delivered offshore but the Thai banking system is restricted in its extension of credit to non-residents. In the wake of the unreimbursed reserve requirements of December 2006 to March 2008, a non-deliverable market for offshore forwards has developed for the Thai baht as well. The upshot is that, by design at least, the onshore and offshore forward markets are segmented except in Korea.

⁸ For a more detailed discussion of the Asian NDF markets, see Ma et al (2004) and Debelle et al (2006). Also, see Misra and Behera (2006) for a study on the Indian rupee NDF market and Ma and McCauley (2007) for the Chinese renminbi NDF market.

Table 2: Forward foreign exchange transactions

April 2007, daily average, in billions of US dollars

	Total		Of which, offshore	
	Forward	Swap	Forward	Swap
Chinese renminbi	4.6	1.1
Indian rupee	5.8	6.3	3.4	...
Korean won	10.0	8.8
Thai baht	0.8	4.3

Note: ... denotes not available.

Sources: Tsuyuguchi and Wooldridge (2008), table 6. Table 2

Moreover, these economies manage the pace and forms of dollar inflows and outflows to varying extents. Thus, local traders in the four economies may face onshore dollar yields at times considerably different from the dollar Libor prevailing offshore. So, while traders in offshore NDF markets price off the international dollar Libor,⁹ onshore forwards are priced off onshore dollar yields.

In sum, restrictions on participation in domestic forward markets, limits on offshore deliverability of the currency, non-participation by domestic banks in the offshore NDF markets, limits on cross-border credit in the domestic currency and idiosyncratic local pricing of dollar deposits can all give rise to gaps between the forward premiums onshore and offshore for the home currency, scaled by the corresponding spot exchange rate. We measure:

$$\text{Forward premium gap} = (F - \text{NDF})/S$$

where F is the onshore forward rate, NDF the offshore non-deliverable forward rate (the offshore forward in the case of the Thai baht), and S the spot rate. On the one hand, cross-border arbitrage could force the forward premium gap to converge to zero. On the other hand, a persistently positive value of the forward premium gap would indicate underlying appreciation and inflow pressure under binding capital controls. In other words, since the exchange rate is expressed in terms of domestic currency per US dollar, a domestic forward rate in excess of the offshore forward rate means that the domestic currency is more valuable offshore. We not only test the hypothesis that the gap is zero but also examine the evolution of the gap over time, looking at both the 3- and 12-month forward contracts.

Sizeable gaps between onshore and offshore forwards are evident for the renminbi, rupee and baht (Graph 5).¹⁰ Currencies in the region tended to trade more strongly offshore than onshore in 2006 and into 2007.

⁹ But see below for swap market pricing and Libor during the financial turbulence since August 2007.

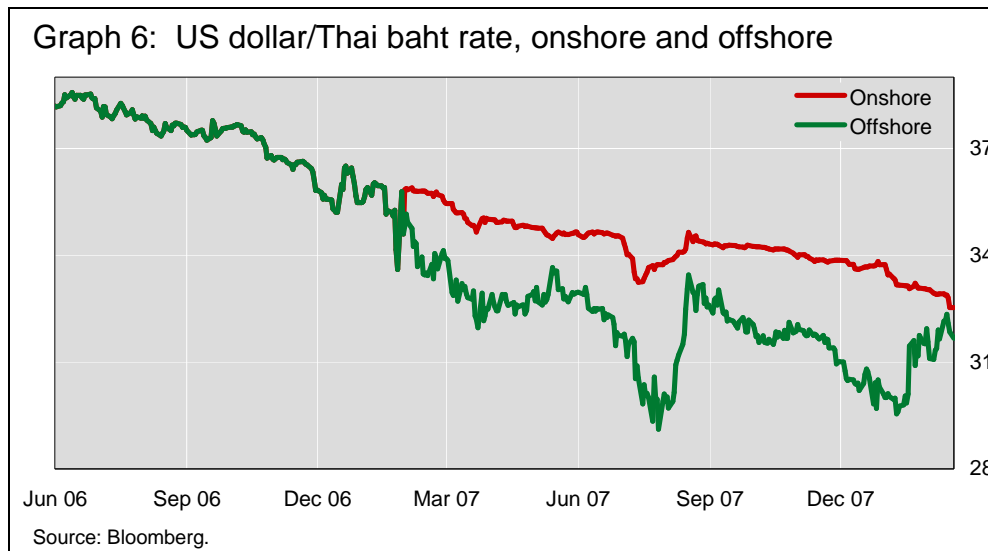
¹⁰ Calculated as the difference between onshore forwards and offshore non-deliverable (deliverable for Thailand) forwards divided by the spot exchange rate. Period after 7 August 2007 is shaded in light grey. For Thailand the period of the unremunerated reserve requirement (from 18 December 2006 to 3 March 2008) is shaded in dark grey. Sources: Bloomberg; authors' calculations.

Graph 5: Price gap between foreign exchange forwards onshore and offshore

In per cent



The gap between onshore and offshore Thai baht forwards during the period of the unremunerated reserve requirement stands out in this comparison. This is consistent with the fact that during much of this period the spot baht traded offshore at a two- or three-baht premium to the baht onshore (Graph 6). In other words, baht for delivery offshore were often as much as ten percent more expensive than baht traded onshore.¹¹ However one evaluates the Thai measures of December 2006, it is hard to avoid the conclusion that they effectively split onshore and offshore markets.



Recall that the gap is measured as onshore less offshore, so that a positive reading indicates a stronger domestic currency offshore than onshore and pressure for appreciation. Such was the case in 2006 and going into 2007 for all but the well fairly well arbitrated Korean won.

In the most recent period since the failure of Lehman Brothers, however, offshore forward exchange rates have tended to trade weaker against the surging dollar than onshore forward exchange rates. This is even true of the renminbi. NDFs and options thereon came in October to price in a depreciation of the renminbi against the US dollar.¹²

¹¹ This observation is sufficient evidence of the segmentation of the on- and offshore foreign exchange markets. Given that the nondeliverable currencies do not have an offshore spot market, a comparison of the forwards is necessary for the sake of comparability.

¹² See Lye and Chia (2008), "CNY under pressure".

2. The money market

Second, we examine the onshore and offshore money market yield gap on the home currency. With sufficient cross-border arbitrage, the onshore money market yield (r) and offshore yield (i) on placements of a given maturity in the home currency should be much the same. If binding capital controls deny access by foreign investors to onshore placements, however, the money market yields they face offshore may differ substantially and persistently from those prevailing onshore.

We define the onshore-offshore yield gap as the onshore yield less offshore yield on the home currency ($r-i$). The null of a zero yield gap is the covered interest parity condition based on the notion that, in the absence of capital controls, cross-border arbitrage ensures the convergence of onshore and offshore yields in the same currency. The approach to the hypothesis testing follows that by Otani and Tiwari (1981), Frankel (1992), and Ma and McCauley (2008). Offshore yields are not directly observable, but are inferred from forwards using the methodology in Ma, et al (2004). We back out the offshore domestic yield on the assumption that US dollar Libor is the relevant dollar rate.¹³

Absent capital controls, the forward exchange rate of the home currency is linked by arbitrage to its spot rate and the interest rate differential between the home currency and the dollar through the covered interest parity

$$F = S(1+r)/(1+r^{\$}),$$

where r is the onshore interest rate on the home currency and $r^{\$}$ the dollar interest rate. When there are no cross-border restrictions, borrowing and lending ensure that the above holds. However, when capital controls bind, non-residents may not have full access to onshore credit or placements, giving rising to NDFs (offshore forwards in the case of the Thai baht).

$$\text{NDF} = S(1+i)/(1+r^{\$})$$

where i is the NDF-implied yield on the home currency offshore. By definition, i is not constrained by the zero lower bound and can be substantially negative. When the onshore-offshore yield gap ($r-i$) differs significantly from zero, markets on the same currency are segmented. Furthermore, both the size and sign of the yield gap could also inform about the degree and direction of market pressures on the domestic currency. A positive yield gap suggests market pressure for inflow and currency appreciation.

We look at both the 3-month and 12-month maturities of the onshore-offshore yield gap for the four currencies. Because the offshore forwards tend to enjoy a deeper market at longer terms than onshore interbank markets, we juxtapose the offshore yields derived from forwards quoted by banks with onshore yields as measured by central bank or government paper in the cases of China and India, giving rise to possible mismatch in credit risk.¹⁴ However, since the onshore yields tend to be higher than offshore yields during the period concerned, any difference in the credit risk profiles of obligors would work against our finding of significantly positive yield gaps. In Korea and Thailand, we use bank rates for both onshore and offshore rates.

¹³ Whereas the forward premium gap measured above makes no assumptions about the dollar interest rates embodied in the forwards, here we assume that US dollar Libor is embedded in the offshore forward. This turns out not to be an innocent assumption in very strained global financial markets (Baba et al (2008)).

¹⁴ Onshore yields are estimated by the one-year PBC bills for China and 3-month and 12-month T-bill rates for India. For a more detailed discussion of liquidity and credit matching, see Ma and McCauley (2007).

Gaps between offshore and onshore money rates have been large and variable in China, and narrower in India and Korea (Graph 7).¹⁵ Renminbi offshore NDFs have often traded at such levels of renminbi strength that negative offshore interest rates were implied. In other words, offshore positioning for renminbi appreciation was often such a “crowded” trade that offshore players in effect paid interest to be long renminbi.

Indian NDF-implied interest rates have shown more moderate divergences from onshore rates. From 2005 to the onset of the global financial turmoil, offshore yields tended to converge to onshore yields in the rupee, perhaps reflecting the growing importance of multinational Indian firms with offshore as well as onshore treasury operations (Ma and McCauley (2008)). The positive correlation between the money yield gaps in China and India is notable but it remains unexplained.

Korean and Thai money markets have not generally shown as strong evidence of segmentation. Though it is difficult to see given the scale of Graph 7, Korean offshore yields fell considerably below onshore yields with the measures of April 2007 that sought to slow the build-up of short-term international interbank debt (McCauley and Zuckert (2008)). The pressure of forward selling of US dollar by the Korean corporate sector meant that foreign banks could swap dollars into won and pay won interest rates below benchmark won money rates.¹⁶ During the period of the unremunerated reserve requirement, the divergence of Thai baht money rates reached absolute levels otherwise only seen in the renminbi money market.

Note that the direction of the yield gaps points to pressure for inflows, with offshore rates generally below onshore rates. The exception seems to be Thailand during the period of unremunerated reserve requirements, when interest rates were indeed higher in the thin offshore market than onshore. However, recall from above that the offshore forwards, despite embodying these high interest rates, nevertheless traded at a more appreciated level against the US dollar than the onshore forwards. Thus, the evidence of the previous section trumps, and there were pressures for inflows into Thailand and evidence of binding measures to stem them.

It might be noted that the period of intensified strains in international financial markets since Lehman’s failure has tended to raise offshore implied yields relative to onshore yields, signalling pressure for outflows and downward pressure on the currencies. This is consistent with observations above that offshore forwards have recently traded at more depreciated levels than onshore forwards.¹⁷

¹⁵ Plotted are weekly data for China and India; daily for Korea and Thailand. For China: 3-month (12-month) NDF for Chinese renminbi, 3-month Chibor (one-year PBOC bill auction yield), and 3-month (12-month) Libor. For India: 3-month (12-month) NDF for Indian rupee, 91-day (364-day) treasury bill implicit yield, and 3-month (12-month) Libor. For Korea: 3-month (12-month) NDF for Korean won, 3-month CD (12-month Koribor), and 3-month (12-month) Libor. For Thailand: 3-month (12-month) onshore swap implied interest rates, and 3-month (12-month) offshore swap implied interest rates. Period after 7 August 2007 is shaded in light grey. For Thailand the period of the unremunerated reserve requirement (from 18 December 2006 to 3 March 2008) is shaded in dark grey. Sources: Bank of Thailand; Bloomberg; CEIC; authors’ calculations.

¹⁶ Equivalently, Korean banks had to pay up relative to dollar Libor to obtain the dollars that Korean firms were in effect borrowing.

¹⁷ To the extent that the dollar Libor that we are using to infer offshore rates is unrepresentative, that is, lower than dollar interest rates implied by swaps against major currencies (Baba et al (2008), Baba and Packer (2008)), then the inferred offshore rates are also too low. That would mean that the divergences between on and offshore rates shown in the most recent period on Graph 7 are understated.

Graph 7: Onshore money market yield less offshore NDF-implied yield

In basis points



3. The bond market

Bonds or debt securities beyond 12-month tenor can behave and be regulated quite differently from the short-term money market. Access to the domestic bond markets by foreign investors has been heavily restricted hitherto in China and India. In case of China, foreign investors have no access to China's dominant inter-bank bond market, with the only exception of the Asian Bond Fund II (ABF2). Qualified foreign institutional investors officially have had access to the stock exchange bond markets since 2002 but for some "technical difficulties" had been barred from participating in this tiny market until September 2007.¹⁸ The combined holding by foreign banks and investors of local bonds is no more than 1% of China's domestic bonds outstanding. In India's case, the Reserve Bank of India (RBI) caps the holdings of local-currency government and corporate bonds by foreign institutional investors (FII), currently at \$3.2 billion and \$1.5 billion, respectively, or just a combined total of less than 1.2% of the domestic bond market of some \$400 billion. The bond markets in Korea and Thailand have generally been in principle open to foreign investment. Owing to withholding taxes, only recently (and as a result of the price gaps measured below) have foreign investors taken a substantial stake in Korean bonds (Kim (2007) and McCauley and Zukunft (2008)).

Given these restrictions, foreign investment in these fixed income markets often takes place in a virtual manner, in the form of receive positions in cross-currency swaps. In such swaps, the investor receives a fixed coupon over an agreed period in exchange for making payments of US dollar Libor.

The liquidity of the government bond markets differs across the countries and that of the offshore derivative markets perhaps differs even more. The cross-currency swap markets generally grew rapidly between April 2004 and April 2007, quadrupling in the Indian rupee and the Korean won, and establishing itself in the renminbi. Only in the baht did cross-currency swap transactions decline, with April 2007 falling squarely within the period of the unreimbursed reserve requirements.

Table 3: Government bond and cross-currency swap market transactions

Daily average, in millions of US dollars

	Government bond		Currency swap	
	April 2004	April 2007	April 2004	April 2007
Chinese renminbi	2,228	7,986	4	133
Indian rupee			97	411
Korean won			246	1,303
Thai baht			246	59

Note: Chinese government bond transactions sum interbank spot, OTC, interbank collateral repo and interbank buy/sell.... denotes not available.

Sources: China Government Securities Depository Trust & Clearing Co., Ltd., BIS, Triennial Survey (2005, 2007).

¹⁸ The bond trading volume of the Shanghai Stock Exchange averages 5% of China's inter-bank bond market. For the ABF2, see Ma and Remolona (2005). For a more general discussion of the Asian local-currency bond markets, see McCauley and Jiang (2004).

We measure the onshore and offshore bond yield gap as the onshore government bond yield less the offshore non-deliverable cross-currency swap rate (NDS). Again, a positive onshore-offshore bond yield gap indicates inflow pressure in the bond market. We focus on the three-year tenor in constructing the onshore-offshore bond yield gap, mainly because of a better matching between onshore and offshore market liquidity. The exception is Thailand, where we use the five-year maturity. The onshore bond yields for all four economies are measured by the yields on the local-currency government bonds, due to illiquid onshore corporate bond markets in all but Korea (BIS (2006)).¹⁹

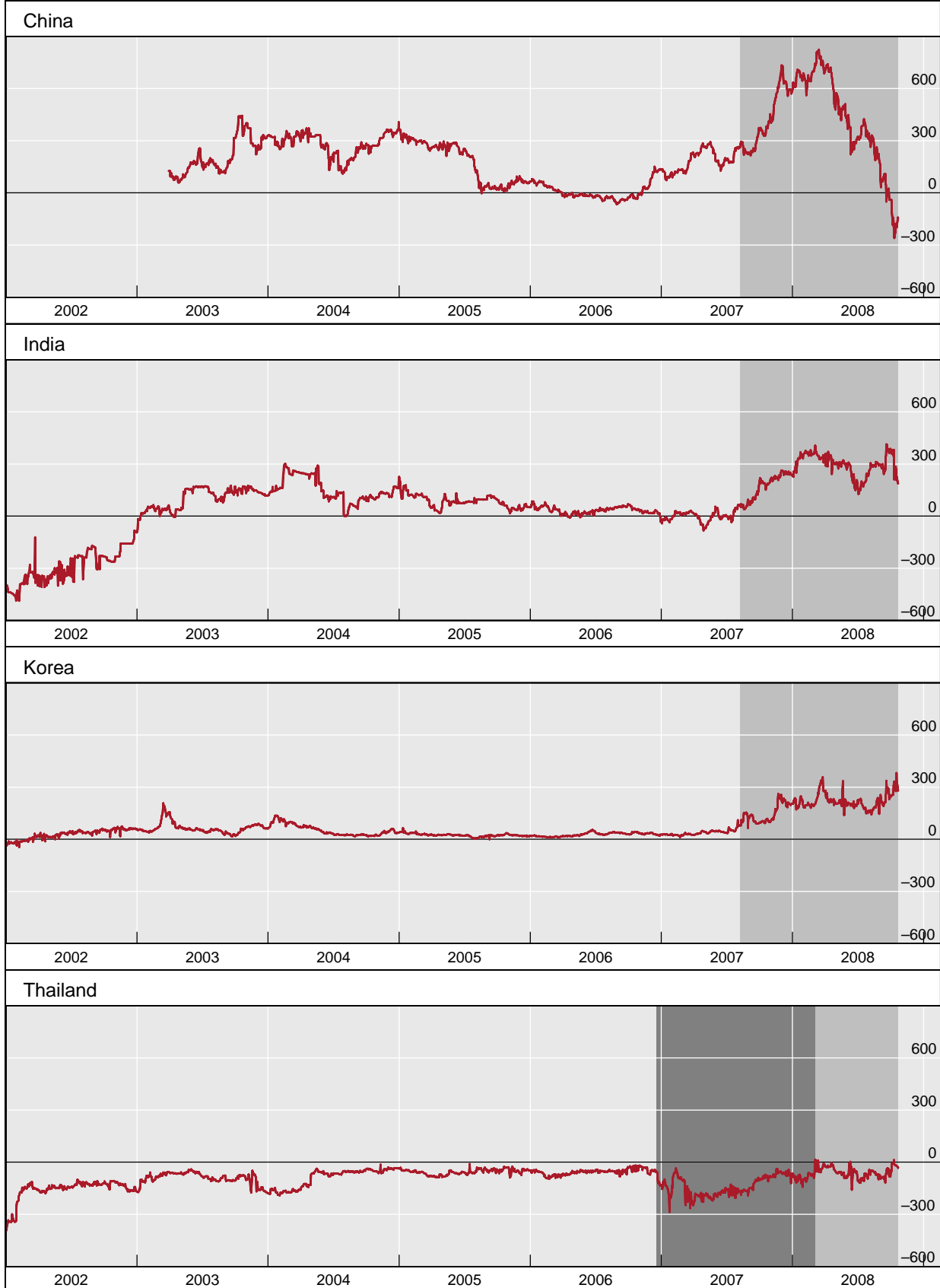
The profile of the bond yield differentials generally resembles that of the money yield differentials (Graph 8).²⁰ Again, offshore renminbi rates have tended to be below onshore rates, sometimes by huge margins. Rupee offshore yields had been converging to government bond yields until the financial turbulence. Korean offshore yields fell below onshore yields with the measures of April 2007 and the gap has since widened. Thai offshore yields tended to exceed their onshore counterparts during the period December 2006 to March 2008.

¹⁹ Similar to the case of the money market, given that the onshore bond yields tend to exceed the offshore bond yield in the period investigated, our estimates should understate the actual onshore-offshore bond yield gap due to credit risk mismatch between the onshore government bonds and the offshore private issuers. Again, the credit mismatch generally works against our findings of positive bond yield gaps.

²⁰ Offshore yields are derived from three-year offshore non-deliverable cross-currency swap (five-year offshore deliverable for Thailand). Onshore yields are the three-year Treasury bond yield (five-year for Thailand). Period after 7 August 2007 is shaded in light grey. For Thailand the period of the unremunerated reserve requirement (from 18 December 2006 to 3 March 2008) is shaded in dark grey. Sources: Bloomberg; author's calculations.

Graph 8: Yield gap between onshore and offshore bond markets

In basis points



IV. Integration of equity markets

In contrast to the three fixed-income markets discussed above, the four economies welcome, more or less cautiously, equity portfolio inflows. There are two basic routes for portfolio equity inflows — one is to let foreign equity investors directly into the domestic stock markets, and the other is to raise proceeds through overseas listing of domestic companies. Since the Asian financial crisis, Korea and Thailand have opened their equity markets to foreign portfolio flows, so both routes are open. For its part, China caps portfolio inflows via the Qualified Foreign Institutional Investor (QFII) scheme, while approving listings “offshore” in Hong Kong (and to a lesser extent New York). The Indian authorities have opened their equity markets to inflows and outflows by registered Foreign Institutional Investors (FII), imposing neither quota nor minimum investment period.²¹

Unlike the case of Korea and Thailand, the authorities of China and India have placed limits on the ability of market participants to buy and sell the same shares traded onshore and offshore. The Chinese authorities have opted to leverage on Hong Kong’s superior regulatory and market infrastructure by having most of its blue chip companies list there first (as “H-shares”).²² Some of these H-share companies subsequently have been also listed on the Shanghai Stock Exchange (as “A-shares”) as well as in New York as ADRs. Chinese policymakers attempt to prohibit domestic investors from buying the shares listed offshore, thereby seeking to ensure that foreign portfolio investors trade with each other and thus cannot collectively effect a net portfolio capital outflow. Prominent Indian public companies have chosen to list locally (“M shares”) first and later to seek overseas listings in the form of American depository receipts (ADRs). In contrast to the Chinese authorities, Indian policymakers have allowed portfolio capital outflows both in the form of sale of the shares traded as ADRs to domestic residents (so-called flow-back to the domestic market) and sales by FIIs of shares bought directly in India. But they have limited the stock of ADRs outstanding to the amounts marketed overseas in order to limit foreign ownership. Thus, the limits placed by the Chinese and Indian authorities reflect different preoccupations. The Chinese authorities seek to limit the foreign share *and* to prevent capital outflows, while the Indian authorities seek to limit the foreign share but allow capital outflows.

As a result of restrictions on the creation and destruction of offshore-traded shares, the M, A, H and ADR shares of a same cross-listed Chinese or Indian company enjoy identical rights and benefits but can trade at different prices onshore and offshore. According to the law of one price, with unimpeded cross-border arbitrage, the share price premium/discount should converge near zero, after allowing for frictions such as tax, currency risks, different trading zones and liquidity (Levy Yeyati, et al, 2006). However, if there are restrictions on equity portfolio flows, fungibility and/or foreign ownership, such price differentials could be persistently large. Thus a test of market integration is a test of the null hypothesis that the cross market premium is zero. In addition, we also estimate the direction of premium and the speed of price convergence across markets.

We define cross-market stock price premium/discount as the logarithm of the ratio of *overseas to local market prices*. A positive value indicates an overseas market premium and thus an inflow pressure on the local stock market. The appendix describes the data for Chinese and Indian shares. Following Peng, Miao and Chow (2007), we estimate the following equation.

²¹ The quota for China’s QFII scheme is about \$10 billion as of end 2007. The P-note scheme, whereby registered FII can provide access to non-registered FIIs to the Indian local stock market, was the only way to sell Indian stocks short but was restricted in October 2007 and frozen from April 2008.

²² For a more systematic discussion of Hong Kong’s role as an international financial centre for China, see McCauley and Chan (2008).

$$\Delta q_{i,t} = \alpha + \beta q_{i,t-1} + \sum \varphi_n \Delta q_{i,t-n} + \varepsilon_{i,t}$$

where $q_{i,t}$ is the logarithm of the overseas-local share price ratio for the cross-listed companies, Δ is the first difference operator.²³ As a measure of the average cross market share price premium, $\alpha = 0$ would suggest that the price gap has a zero mean and the share prices of cross-listed companies equalise. On the other hand, $\alpha \neq 0$ would imply long-run or persistent premium/discount. An estimated $\beta \geq 0$ would mean the price gap $q_{i,t}$ is non-stationary, implying persistent or explosive price divergence. On the other hand, $\beta < 0$ indicates price convergence, with the speed of convergence given by the half-life of a shock to the premium as $-\ln(2)/\ln(1+\beta)$. Therefore, while $\alpha = 0$ and $\beta < 0$ can be interpreted as long-term price equalisation, $\alpha \neq 0$ and $\beta < 0$ represent a case of non-explosive but persistent cross-market share price premium.

The price gap between domestic- and offshore-traded equities bears out the difference between the openness of the Korean and Thai equity markets, on the one hand, and the more cautious opening of the Chinese and Indian equity markets, on the other (Graph 9).²⁴ We have invested relatively little in the Korean and Thai markets, selecting one prominent telecom share (SK Telecom and Advanced Info Services, respectively) to make the point that the New York price differs but little and briefly from the Seoul or Bangkok price.

For China and India, however, our evidence on the onshore-offshore stock prices suggests persistently large gaps, albeit of opposite signs. Hong Kong (or New York) shares of the multiple-listed Chinese companies trade at a steep discount to their identical twins in Shanghai. For the period of 2000-07, the stock prices of Chinese companies traded in Shanghai command an average 40% premium over those traded in either Hong Kong or New York (Table 4). By contrast, the New York enjoys a premium of 17% on average over Mumbai for the dual-listed Indian companies.²⁵ Such price differentials are remarkably large when benchmarked to those for the Korean or Thai equities.

²³ n stands for the number of lags to be determined by Campbell and Perron (1991)'s top-down t-test approach.

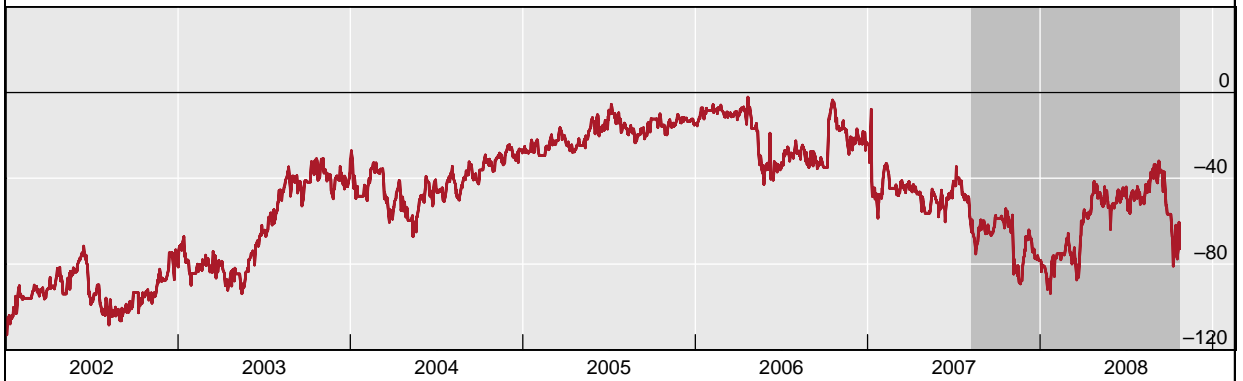
²⁴ Notes for Graph 9: ¹Calculated as the log difference between overseas share prices and their equivalent domestic share prices. ²Average of 9 companies weighted by market capitalisation. ³Average of 11 companies weighted by market capitalisation. ⁴SK Telecom. ⁵Advanced Info Services PLC. Note: Period after 7 August 2007 is shaded in light grey. For Thailand the period of the unremunerated reserve requirement (from 18 December 2006 to 3 March 2008) is shaded in dark grey. Sources: Bloomberg; authors' calculations.

²⁵ Much remains to be explored as to why the cross-market stock price premiums for the dual-listed Indian companies have been so persistently large until recently. The qualification and registration required for FIIs do not seem to be a sufficient impediment for such an observed onshore-offshore price gaps for India. Other possible restrictions may include limited fungibility, foreign exchange rate risk and foreign ownership ceiling. For discussion of this subject, see RBI (2003); Hansda and Ray (2002 and 2003).

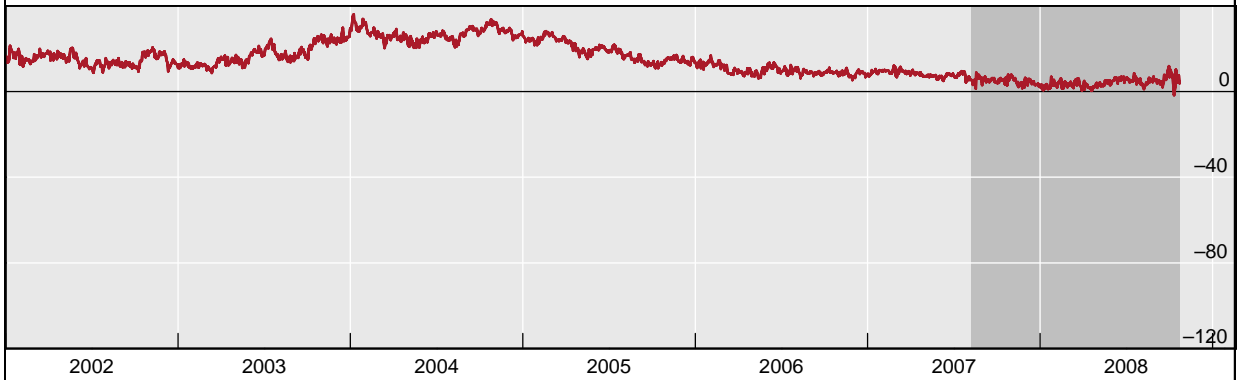
Graph 9: Price gap between offshore and onshore equity markets¹

In per cent

China²



India³



Korea⁴



Thailand⁵

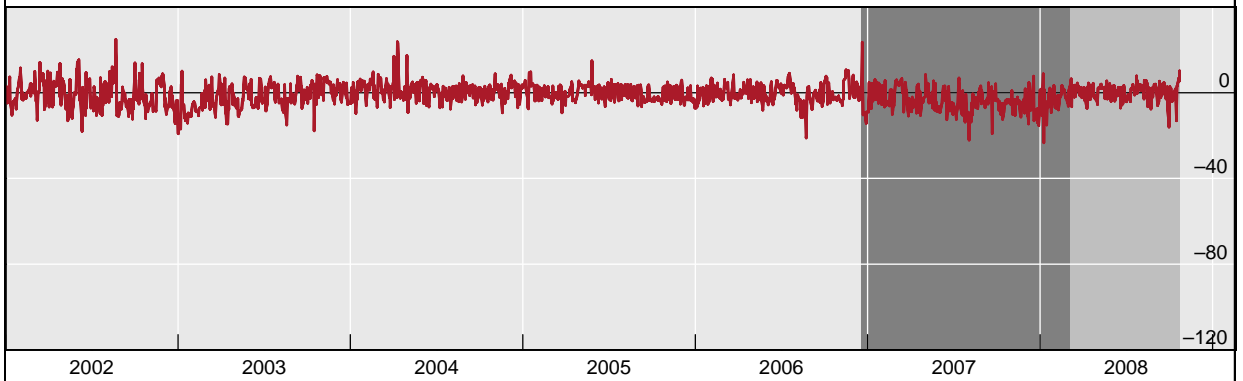


Table 4: Premium of overseas shares prices to local share prices		
In per cent		
	Simple average	Weighted average
China, H-A, 40 dual-listed companies	-54.0	-43.8
China, H-A, 9 triple-listed companies	-48.7	-43.9
China, ADR-A, 9 triple-listed companies	-48.5	-43.9
China, ADR-H, 9 triple-listed companies	-0.1	-0.1
ADR-Indian, 11 dual-listed companies	12.5	16.9

Note: Daily average. Price gap is calculated as the log difference between overseas share price and local share price. The sample period is between 19 April 2000 and 30 June 2008. For ADR-Indian the sample starts on 30 May 2000.

Sources: HKMA; Bloomberg; authors' calculations.

Differences between China and India point to the greater financial integration of the Indian equity market. The cross-market price gaps for Indian companies not only are about half of their Chinese counterparts, but also they show faster convergence. The estimated half life of divergence from New York prices averages 31 days for Mumbai but 112 days for Shanghai (Table 5).²⁶ The inference is that cross-border arbitrage has been hampered for Indian shares and has remained virtually absent for the Chinese equity market.

The upshot is that portfolio equity flows quite freely into and out of the Korean and Thai equity markets; portfolio equity flows with limits into the Indian market but freely out of it; and portfolio equity hardly flows at all into or out of the Chinese equity market. At a time of global financial turmoil, the more relevant direction is out, and at such times openness of the Asian equity markets other than that of China casts the region into the role of unintended liquidity provider to global investors.

Oddly enough, when the largest and most heavily traded equity markets in the world are under stress, global investors' positions are liquidated in some of these smaller and less liquid markets. This is evident from the juxtaposition of the implied volatility of the Standard and Poor's index (the "VIX") and net purchases of equities in a number of Asian economies that strains in the major markets are associated with net selling of Asian equities (Graph 10). In particular, since the low of the VIX this year reached in May 2008, nonresidents have sold \$50 billion of Asian equities. When the going gets tough, international investors sell risky Asian equities for dollars.

²⁶ Peng et al (2008) estimate a half-life convergence of some 40 days for A-H dual-listed Chinese companies. The difference could be caused by different estimation periods.

Table 5: Share price premium and convergence of cross-listed Chinese and Indian firms

	H-A premium 40 dual-listed companies	H-A premium 9 triple-listed companies	ADR-A premium 9 triple-listed companies	ADR-H premium 9 triple-listed companies	ADR-India premium 11 dual-listed companies
	(1)	(2)	(3)	(4)	(5)
A	-0.286*** (0.036)	-0.440*** (0.092)	-0.431*** (0.096)	-0.075*** (0.014)	0.224*** (0.033)
B	-0.003*** (0.000)	-0.005*** (0.001)	-0.006*** (0.001)	-0.513*** (0.011)	-0.022*** (0.002)
Φ_1	-0.030*** (0.005)	-0.026** (0.011)	-0.061*** (0.012)	-0.183*** (0.010)	-0.255*** (0.009)
Φ_2	-0.052*** (0.005)	-0.045*** (0.010)	-0.048*** (0.011)	-0.079*** (0.009)	-0.159*** (0.008)
Half-life (days)	260.0	128.1	112.8	1.0	30.9
Adjusted R ²	0.005	0.005	0.009	0.337	0.088
DW statistics	1.997	1.977	1.983	2.036	2.059
# of observations	45,008	7,857	7,358	13,718	12,970

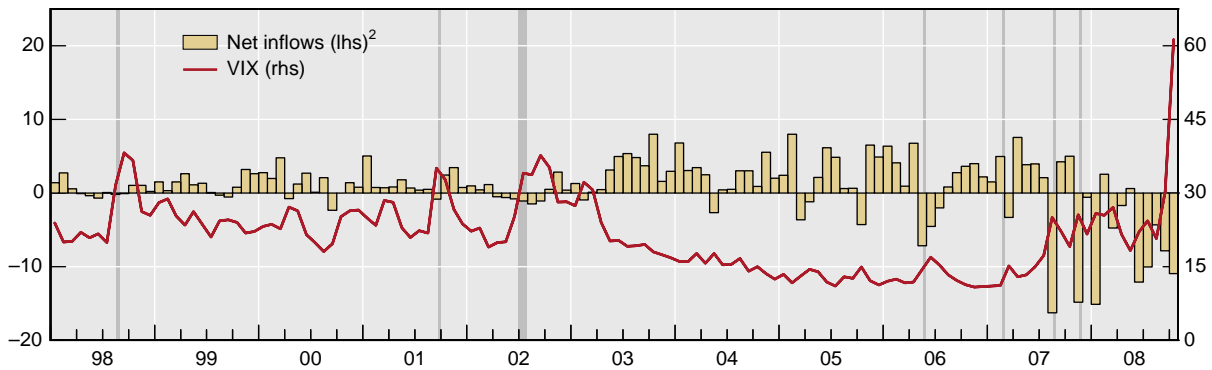
Note: The estimation equation is $\Delta q_{i,t} = \alpha_i + \beta q_{i,t-1} + \sum \varphi_n \Delta q_{i,t-n} + \varepsilon_{i,t}$, where $q_{i,t}$ is the logarithm of the overseas-local share price differential for the cross-listed companies, Δ is the first difference operator, and n stands for lags to be determined by Campbell and Perron (1991)'s top-down t-test approach.

Daily panel data of Asian closings and New York opening of the same day. The sample period is between March 15, 1999 and June 30, 2008. Standard errors are shown in parenthesis. *** indicates 1% significance; ** indicates 5% significance; * indicates 10% significance.

Sources: HKMA; Bloomberg; authors' estimations.

Graph 10

Global Volatility and Asian net equity inflows¹



Note: shaded areas refer to seven episodes of rising volatility since 1998: the Russian default (Aug 1998), September 11 (Sept 2001), June – July 2002, the May 2006 sell-off, the February 2007 sell-off, the Bear Sterns hedge fund woes in August 2007, and the subprime-related sell-off in November 2007.

¹ Net foreign purchases of equities in India (data start in 1999), Indonesia, Korea, the Philippines, Taiwan (China) and Thailand. ² In billions of US dollars.

Sources: Bloomberg; CEIC; Korean Stock Exchange; Philippines Stock Exchange; BIS calculations.

Such sustained selling, among other pressures, tends to put downward pressure on the exchange rate (Chai-anant and Ho (2008); Gyntelberg et al (2008)). In response, the Asian central banks sooner or later enter the foreign exchange market to sell US dollars.

If we step back, we can see that global private investors are allowed in this process to swap risky assets for safe assets while domestic private investors do a mirror-image swap. After the central bank sells dollars, it sells a low-risk dollar (or euro) investment from its reserve portfolio. Thus, global investors have exchanged risky Asian equities for a low-risk asset suitable for reserve holdings. For its part, the central bank's sale of dollars against domestic currency, other things equal, represents an incipient decline in the monetary base, which the domestic desk at the central bank offsets as a matter of course. In Asia, a sustained decrease in reserve holdings means that the central bank reduces its interest-bearing liabilities. The central bank has thereby "grossed down" and shows a lower level of reserves and a lower level of domestic currency liabilities. For their part, domestic private investors have exchanged a safe claim on the central bank for the Asian equity formerly held by global investors.

It is worth noting how different this regularity of emerging markets taking back their equity risk at times of high volatility is from the textbook image of international diversification. In that world two economies exchange claims on each other's harvest. With imperfect correlation of harvests, consumption in each country can be more stable through time. In this image, each side takes an outright long position in each other's harvest. In the real world, global investors want exposure to emerging market equities in good times and want to cash out in bad times. This resembles more a call option on the emerging market harvest than a long position. This is the international risk sharing that India, Korea and Thailand participate in, and in which China resists participation.

V. Conclusions

The larger Asian economies have to varying extents resisted the globalisation of their banking systems. While the share of foreign banks in a broadly defined banking market has generally risen, the result is nothing like the shares seen in many emerging markets.

The limited role of foreign banks mirrors and is reinforced by limits on cross-border financial activity, which produce onshore-offshore price differences. These gaps (Table 6) line up in inverse order to the foreign bank shares of banking markets. For China, significant segmentation has spanned all markets, and it has not obviously lost force through time. For India, segmentation is observed as widely, but it is weaker than in China and has tended to attenuate over time. For Korea and Thailand, resistance to financial globalisation has tended to be reserved for more of a circuit-breaker role in the fixed income markets and has generally been eschewed with regard to the equity market.

Table 6: Average absolute value of onshore-offshore gaps				
In basis points				
	China	India	Korea	Thailand
Twelve-month forward, % of spot	1.45	0.58	0.38	...
Three-month yield, basis points	367	182	85	157
Twelve-month yield, basis points	375	144	92	94
Bond yield, basis points	234	142	65	95
Equity price, per cent	50	14	4	4

Sources: Tables A1-A4.

Just before the failure of Lehman Brothers, Deputy Governor Nijathaworn (2008) said:

...on the issue of liquidity and financing, banks in Thailand are predominantly domestic-owned. Hence, they rely more on deposit funding rather than external funding. Domestic funding is a more stable source of funding and is not affected by the turmoil. This feature will help cushion Thai banks from the effects of the global credit crunch.

This statement could be made almost equally for the Indian banking system and with even greater force for the Chinese banking system. It was less true of the Korean banking system.

Recall that the Korean authorities had recognised the risk of a build-up of short-term international interbank liabilities in the spring of 2007. They took measures to curb their growth, against the opposition of foreign banks in Korea. Yet Korea entered the third quarter of 2008 with \$129 billion in international interbank liabilities and another \$59 billion in dollar funding of foreign banks' won claims (Graph 4). In the event, the Korean authorities found that holding a large sum of foreign exchange reserves was not sufficient to maintain financial stability. They mobilised these reserves, announcing \$100 billion in guarantees of rollovers of maturing bank debt and \$30 billion in foreign exchange swaps (Bank of Korea (2008)).

Thus far, the central banks of China, India and Korea have cut policy rates in response to the financial turmoil. The RBI has allowed Indian banks to extend credit to equity mutual funds hit by redemptions by individual shareholders, which could be seen as a response to sales by global investors. But while Korea has intervened to provide dollar funding, the four Asian economies have not to date recapitalised their banks or offered blanket deposit guarantees.

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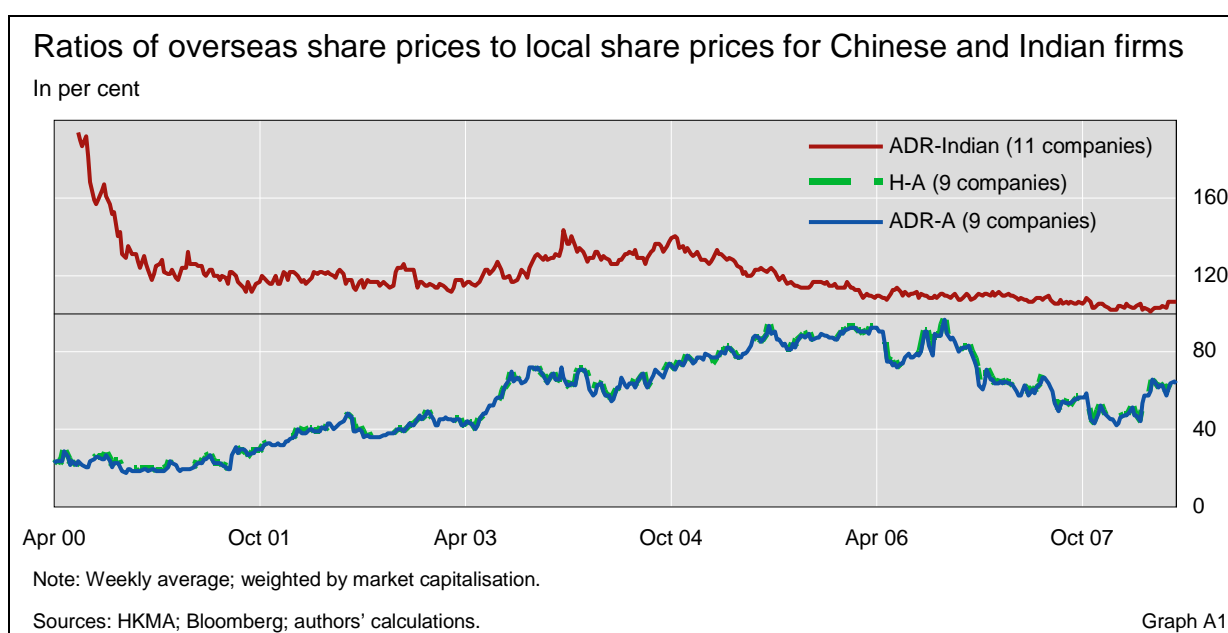
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Appendix: Stock share prices data

The cross-market share price premium is defined as the log of the ratio of overseas to local prices expressed in US dollars. The price premium is adjusted for the number of shares that each ADR share is equivalent to. To minimise the trading hour gaps, the daily data on stock share prices of cross-listed Chinese and Indian companies will be the local Asian closing and New York ADR opening of the same day. Data for regression covers 1999 and June 2008 and is an unbalanced panel because of the number of the cross-listed companies increases over time.

The price premium is calculated as the average of the price premium of each individual company weighted by its current market capitalisation. Current market capitalisation is the sum of a company's market capitalisation in both local (A shares) and overseas (H shares) markets. For India shares, only the local market capitalisation is used.



Summary statistics of the forward price gap								
As per cent of spot price								
	China		India		Korea		Thailand	
	3M	12M	3M	12M	3M	12M	3M	12M
Maximum	1.69	3.82	1.84	2.55	5.27	5.21	11.47	9.87
Minimum	-0.75	-0.44	-1.40	-2.52	-4.54	-2.87	-2.67	-4.15
Average of absolute value	0.49	1.45	0.30	0.58	0.37	0.38	3.89	2.94
Annualised volatility	5.91	14.93	6.22	11.78	11.60	11.77	58.34	52.13
Onshore/offshore correlation	1.00	0.99	1.00	1.00	1.00	1.00	0.66	0.74

Calculated as the difference between onshore forwards and offshore non-deliverable forwards divided by the spot exchange rate. Sample period is between 1 January 2002 and 12 September 2008. For China sample starts on 19 May 2005. For Thailand sample starts on 27 December 2006.

Sources: Bloomberg; author's calculations. Table A1

Summary statistics of the money market interest rate gap								
In basis points								
	China		India		Korea		Thailand	
	3M	12M	3M	12M	3M	12M	3M	12M
Maximum	1886	1277	687	395	740	800	133	133
Minimum	-37	21	-620	-341	-571	-78	-1565	-676
Average of absolute value	367	375	182	144	85	92	157	94
Annualised volatility	2170.48	1909.83	1604.37	1226.50	2065.69	1553.32	4184.95	2116.55
Onshore/offshore correlation	-0.34	-0.43	0.65	0.67	0.09	0.21	0.68	0.79

Note: Weekly data for China and India; daily for Korea and Thailand. For China: 3-month (12-month) NDF for Chinese renminbi, 3-month Chibor (one-year PBOC bill auction yield), and 3-month (12-month) Libor. For India: 3-month (12-month) NDF for Indian rupee, 91-day (364-day) treasury bill implicit yield, and 3-month (12-month) Libor. For Korea: 3-month (12-month) NDF for Korean won, 3-month CD (12-month Koribor), and 3-month (12-month) Libor. For Thailand: 3-month (12-month) onshore swap implied interest rates, and 3-month (12-month) offshore swap implied interest rates. Sample period is between 1 January 2002 and 12 September 2008. For China 12-month sample starts on 28 May 2003. For Korea 12-month sample starts on 26 July 2004.

Sources: Bank of Thailand; Bloomberg; CEIC; author's calculations. Table A2

Summary statistics of the bond market yield gap

In basis points

	China	India	Korea	Thailand
Maximum	824	406	358	16
Minimum	-67	-487	-45	-392
Average of absolute value	234	142	65	95
Annualised volatility	2997.96	2803.66	1039.88	909.24
Onshore/offshore correlation	-0.43	0.52	0.64	0.85

Offshore yields are derived from three-year offshore non-deliverable cross-currency swap (five-year offshore deliverable for Thailand). Onshore yields are the three-year Treasury bond yield (five-year for Thailand). Sample period is between 1 January 2002 and 12 September 2008. For China sample starts on 28 March 2003.

Sources: Bloomberg; authors' calculations.

Table A3

Summary statistics of the equity market price gap¹

In per cent

	China ²	India ³	Korea ⁴	Thailand ⁵
Maximum	-2.18	35.94	21.94	24.93
Minimum	-113.09	0.31	-8.75	-23.36
Average of absolute value	49.62	14.48	3.80	4.44
Annualised volatility	440.87	126.32	78.04	87.84
Onshore/offshore correlation	0.87	0.98	0.94	0.99

¹ Calculated as the log difference between overseas share prices and their equivalent domestic share prices. ² Average of 9 companies weighted by market capitalisation. ³ Average of 11 companies weighted by market capitalisation. ⁴ SK Telecom. ⁵ Advanced Info Services PLC. Sample period is between 1 January 2002 and 12 September 2008.

Sources: Bloomberg; CEIC; authors' calculations.

Table A4