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Housing finance agencies in Asia

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Abstract

This paper examines the role of government-supported housing finance agencies in Asia. We estimate the size of the government subsidies received by these agencies, and their distribution among households, financial institutions and the agencies themselves. We have three main findings. The level of government support provided to housing finance agencies in Asia varies, but is generally small relative to the economy. The housing finance agencies have transferred most of the benefit of their government support to either households or financial institutions. Agencies that participate directly in primary housing finance markets have been most successful in passing on their government support to households.

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Housing finance agencies in Asia

Michael Davies, Jacob Gyntelberg and Eric Chan[1]

1. Introduction

Several countries in Asia have established government housing finance agencies to help develop their domestic housing finance markets and associated bond markets. In this paper, we examine the role of these agencies. We consider seven Asian countries – Hong Kong, India, Japan, Korea, Malaysia, Singapore and Thailand. In five of these countries – Hong Kong, Japan, Korea, Singapore and Thailand – the housing finance agencies have a visible involvement in domestic housing finance markets. In India and Malaysia the housing finance agencies have smaller, but still significant roles. Applying techniques already used to quantify US government subsidies, we estimate the size of the subsidies received by housing finance agencies in these seven Asian countries. We also estimate the distribution of the subsidies amongst households, financial institutions and the housing finance agencies themselves. The government subsidies reported in this paper should be regarded as estimates only, as bond and mortgage-backed securities (MBS) markets in Asia are still relatively immature, and the quality of the available data on housing finance agencies' operations varies considerably.

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This paper is an expanded and more detailed companion piece to the article published in the BIS Quarterly Review in December 2006 entitled "The role of Governments in Asian MBS markets". The article in the Quarterly Review focused on the role and mandate of five government housing agencies and their risk management. This paper concentrates on the level of government support received by the housing agencies and how it is distributed for a slightly larger sample of countries.

We present three main findings. First, the estimated level of government support varies across the seven countries, but is generally small relative to the economy. There is considerable government support in Singapore, but the level of government support is quite low in Hong Kong, India, Japan and Korea and negligible in Malaysia.

Second, the housing finance agencies have transferred most of the benefit of their government support to either households or financial institutions. In Hong Kong, Korea, Singapore and Thailand, households receive the bulk of the subsidy, whereas in India and Japan, banks and other financial institutions are the primary beneficiaries.

Third, housing finance agencies that lend directly to households have more influence on housing finance markets and better control over the distribution of their government subsidies than housing finance agencies that focus on providing liquidity to the banking system.

The bulk of the literature on the impact of government housing finance agencies relates to the United States. This no doubt reflects that housing finance agencies have been present in the United States for almost a century, that these agencies have grown to be among the largest US if not global financial institutions, and that US housing finance and MBS markets are by far the largest in the world.

One branch of recent research has centred on quantifying the impact of housing finance agencies on the United States housing market. Hendershott and Shilling (1989), Cotterman and Pearce (1996), Passmore, Sparks and Ingpen (2002), McKenzie (2002) and others focused on estimating the housing finance agencies' impact on mortgage interest rates. They conclude that the housing finance agencies have lowerered interest rates on conforming housing loans in the United States by 20-30 basis points.[2]

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[2] This is the typical spread between conforming loans (which can be purchased by the United States housing finance agencies) and jumbo loans or non-conforming loans (which cannot be purchased by the housing

Another branch of the literature which is the most closely related to this paper has taken a slightly different approach (Congressional Budget Office (2004) and Passmore (2005)). They first estimate the size of the subsidies that Fannie Mae and Freddie Mac receive because of their ambiguous relationship with the Government, and then estimate the proportion of these subsidies that is passed onto borrowers in the form of lower interest rates on conforming housing loans and the share that is retained by the housing finance agencies. They find that housing finance agencies receive large government subsidies, and pass on 30-60 per cent of these subsidies to households.[3]

The paper is structured as follows. The following section presents the government supported housing finance agencies in Asia that are considered in the paper. Section three discusses the contributions to the development of housing finance markets made by these agencies. Section four considers the housing finance agencies' risk management. Section five explains the nature of government support provided to the housing finance agencies. Section six outlines our methodology for estimating the level of government support received by the housing finance agencies. Section seven presents our estimates of the size of the housing finance agencies' government subsidies and their distribution. The final section concludes.

2. Housing finance agencies in Asia and the Pacific

At present several Asian countries, including Bangladesh, Hong Kong, India, Japan, Korea, Malaysia, Pakistan, Singapore, Sri Lanka and Thailand, have active government supported housing finance agencies and other countries in the region are considering establishing such agencies.[4] In this study we focus on the agencies in Hong Kong, India, Japan, Korea,

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finance agencies).

[3] Passmore (2005) found that the (median) present value of the gross subsidy received by Fannie Mae and Freddie Mac was US$149 billion. The Congressional Budget Office (2004) estimated that the subsidy received by the three government sponsored enterprises (Fannie Mae, Freddie Mac and the Federal Home Loan Banks) in 2003 was US$23 billion. The two estimates are not directly comparable because one is a stock and the other is an annual flow.

[4] See Appendix 1 for a list of selected housing finance agencies outside Asia and the Pacific.

Malaysia, Singapore and Thailand.[5] The primary role of the government housing finance agencies in all of these countries is to help develop their domestic housing finance markets and associated bond markets. In five of these countries – Hong Kong, Japan, Korea, Singapore and Thailand – the housing finance agencies participate directly in domestic housing finance markets by providing loans and/or mortgage insurance to households. In the remaining countries – India and Malaysia – the housing finance agencies have smaller, but still significant roles.[6]

In all the countries the housing finance agencies were established in response to concerns that there was a shortage of housing finance in the economy – or that there would be a shortage in the near future. Over time, most of these agencies have been given the additional task of promoting the development of domestic mortgage bond markets. The underlying notion was that bond markets would provide loan originators with an additional source of funding to complement deposits.

In Japan, the Government Housing Loan Corporation (GHLC) was established in 1950 to provide a stable supply of housing finance and improve the quality of the nation's housing stock (Konishi (2002)). The GHLC was wholly owned by the Japanese government. The housing finance agency did not have a formal government guarantee, but market participants generally regard it as having strong implicit government support. The GHLC traditionally

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[5] In Bangladesh, the House Building Finance Corporation was set up by the government in 1973 to increase the supply of housing finance. The housing agency is in part funded via government-guaranteed bonds and government deposits (see Karnad (2004) and www.bhbfc.gov.bd). In Pakistan, the House Building Finance Corporation has been active since 1952 and provides loans to low and middle income families. It is jointly owned by the Pakistan government and the State Bank of Pakistan, and receives direct funding from the central bank (www.hbfc.com.pk). In Sri Lanka, the Housing Development Finance Corporation Bank, which was partially privatised in 2005, has been active since 1984. It provides loans to low and middle income families. It is a regular issuer of bonds and MBS (www.hdfc.lk).

[6] In 2004 and 2005, the years for which government subsidies have been estimated, the Japanese housing agency (Government Housing Loan Corporation) participated directly in the housing market. But since then, the housing agency has refocused and scaled down its operations. In 2007, it was renamed Japan Housing Finance Agency, and the new agency has concentrated on issuing MBSs, rather than directly lending to Japanese households (Fuchita (2006), JHFA (2007)).

focused on providing long-term, fixed-rate housing loans to households through a network of loan originators. The housing finance agency retained these loans on its balance sheet, funding them using a combination of Fiscal Investment and Loan Program (FILP) loans and agency bonds.[7] The housing finance agency also provided insurance services to households who borrowed from private lenders. In 2003, the GHLC began shifting its focus from direct lending to households to developing MBS markets. The housing finance agency started buying mortgages from private financial institutions, and it securitises those mortgages together with its own loans through its 'Monthly' MBS program. It also began offering credit guarantees on MBSs issued by banks and other financial institutions. In April 2007, the GHLC was replaced by Japan Housing Finance Agency (JHF). The JHF is wholly government owned and specialises in securitising housing loans that are originated by private financial institutions. The agency does not lend directly to Japanese households.[8] Its other responsibilities are managing (including servicing and securitising) GHLC's existing loan book, providing mortgage insurance to private financial institutions, and advising households on the most appropriate mortgage.

The Korea Housing Finance Corporation (KHFC) was set up in 2004 to ensure that households had access to long-term housing finance (KHFC (2005)). It is jointly owned by the Bank of Korea (82 per cent) and the Korean government 18 per cent. The KHFC has a formal government guarantee, with the *Korea Housing Finance Corporation Act* requiring the government to cover the agency's annual losses. The KHFC offers 30-year fixed-rate mortgages to households through a network of mortgage originators. It funds these mortgages by issuing KHFC-guaranteed MBSs. The housing finance agency also provides mortgage insurance to households who borrow from banks and other financial institutions. Prior to KHFC's establishment, most private lenders only offered 3-5 year mortgages, though they have since lengthened the maturity of their loans.

In Malaysia, Cagamas Berhad was established in 1986 under the Companies Act to help

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[7] The FILP is a government program that makes loans and investments for public purposes. The GHLC received FILP loans from the Japanese government to help fund their home loans to individuals.

[8] The agency will only provide direct loans for disaster mitigation and urban rehabilitation, as these market segments cannot be profitably serviced by private financial institutions. See Ministry of Land, Infrastructure and Transport (2006).

rectify a shortage of housing finance in Malaysia by promoting the development of the secondary mortgage market (Kokularupan (2005)). Malaysian and foreign banks own four-fifths of Cagamas, with the remaining fifth held by Bank Negara Malaysia. Cagamas supports the Malaysian Government's policy of encouraging home ownership, particularly for the lower income households, by providing liquidity to the financial institutions. Cagamas does not receive any government support. Cagamas operates solely in the secondary mortgage market. It purchases conventional and Islamic housing loans from financial institutions with or without recourse basis, and funds these loans by issuing agency bonds and MBSs. Its bond and MBS issuance thus helps develop the Malaysian private debt securities market. In recent years Cagamas has broadened its loan purchases to include industrial property loans, hire purchase and leasing debts, and credit card receivables.

The Hong Kong Mortgage Corporation (HKMC) was established by the Hong Kong Monetary Authority in 1997 to promote wider home ownership in Hong Kong by increasing the availability of housing finance and to help develop domestic bond markets (Yam (1996)). The HKMC is wholly owned by the Government through the Exchange Fund.[9] The housing finance agency does not have a formal government guarantee, but it has access to additional equity capital and a revolving debt facility from the Exchange Fund. The view from market participants is that the HKMC has a strong implicit government guarantee. The HKMC initially focussed on increasing the supply of housing finance in the economy by purchasing pools of mortgages from banks and other loan originators – thereby providing them with an alternative, more stable source of funding over the business cycle than deposits. It funds these loan purchases by issuing agency bonds and MBSs. Over recent years the HKMC has broadened its role in the Hong Kong housing finance market. It has established a large mortgage insurance program, which allows banks to offer loans with a maximum loan-to-valuation ratio of 95 per cent without taking on additional credit risk. It has also expanded its loan purchases to include other household debt and some commercial loans.

The Indian National Housing Bank (NHB) was established in 1988 to promote a sound and cost-effective housing finance system and to help alleviate housing shortages, particularly in rural areas (Reside et al (1999)). It is wholly owned by the Reserve Bank of India, and has a formal government guarantee via the *National Housing Bank Act (1987),* which states that

[9] The Hong Kong Exchange Fund is made up of the fiscal reserves and foreign currency reserves of the Hong Kong government (www.info.gov.hk/hkma/eng/exchange/).

the housing finance agency can request the Government to guarantee their bonds. The NHB provides funding to banks and housing finance companies (HFCs) by granting them loans, which are secured against specific pools of mortgages, and is also the prudential supervisor of HFCs. The housing finance agency funds its lending by issuing bonds and by borrowing from the Reserve Bank of India. The NHB is currently in the process of establishing the Mortgage Credit Guarantee Company, a joint venture between the NHB and several private and supranational entities, to provide mortgage insurance services in India. The NHB is also helping to develop India's MBS market by providing credit enhancements and trustee services for privately issued MBSs.

In Singapore, the Housing Development Board (HDB) was set up in 1960 and tasked with providing Singaporeans with good quality, affordable housing (HDB (2006)). The HDB is statutory board under the Ministry of National Development and is wholly government owned and has a formal government guarantee (*Housing and Development Act*). The HDB provides housing finance to low- and medium-income households at concessionary interest rates. Prior to 2003, it also provided housing finance at market rates to high income households. The housing finance agency funds its lending by borrowing from the Singaporean government and from banks, and by issuing bonds.

In Thailand, the Government Housing Bank (GHB) was established in 1953 to provide housing finance to Thai citizens, focusing on low and medium income households (GHB (2006)). The GHB is wholly owned by the Ministry of Finance and has a formal government guarante on its bonds via the *Government Housing Bank Act*. The GHB offers residential mortgages, standard deposit account services and assists households that are in financial distress to restructure their housing loans. Three-quarters of GHB's funding comes from deposits from government, private companies and households. The housing finance agency obtains the balance of its funding by issuing Government guaranteed bonds in the domestic market and offshore.

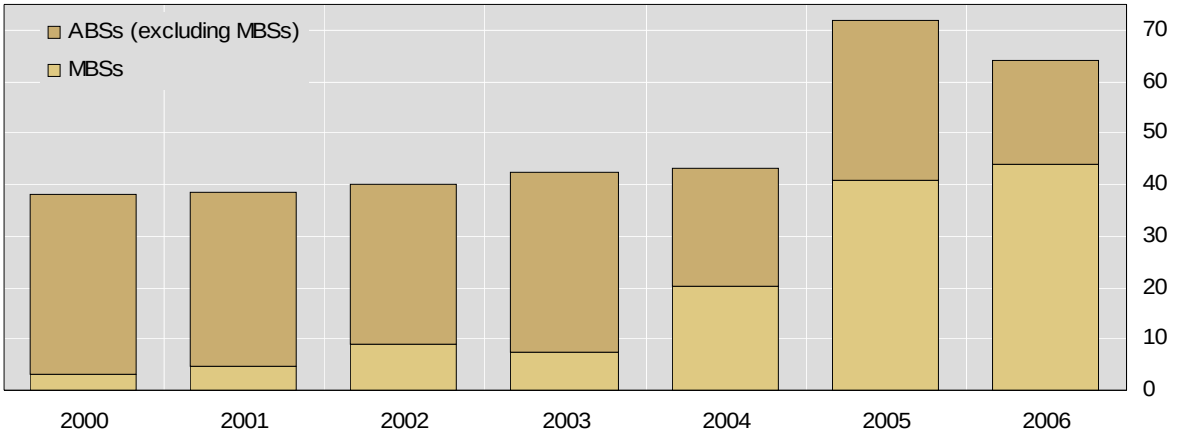
3. The contributions of Asian housing finance agencies

Many of the sample countries have recorded significant growth in the securitisation of mortgages over the past few years (Graph 1). Between 2000 and 2006, annual MBS issuance increased from $3 billion to $44 billion. This growth has been significantly faster than the growth in issuance of other ABSs (Gyntelberg and Remolona (2006) and Dalla (2006)). In several countries, the housing finance agencies have led this growth. In Hong Kong, India, Japan, Korea and Malaysia, the outstanding of housing agency MBSs has risen more quickly than privately issued MBSs (Table 1). In Hong Kong, India, Korea and Malaysia, housing finance agency MBSs account for the bulk of outstanding MBSs. The

housing finance agencies' issuance of MBSs has served to increase investor familiarity with the product. The longer-term objective is to gradually create a benchmark yield curve for the pricing of private MBSs. In a few countries, housing finance agencies have also been among the largest non-government bond issuers, and their bond issuance has generally grown faster than the bond market as a whole.

Domestic issuance of ABSs in seven Asian economies[1]

In billions of US dollars



[1] Hong Kong SAR, India, Japan, Korea , Malaysia, Singapore and Thailand.

Sources: Dealogic; HSBC; Moody's Investors Service; Standard & Poor's; Thomson Financial Securities Data; national rating agencies. Graph 1

Many of these housing finance agencies have also contributed to the development of their domestic MBS markets by working with governments to develop legislation which has removed legal, tax and regulatory impediments to securitisation. They have also improved the availability of good historical data on rates of non-payment and prepayment on housing loans, and have encouraged financial institutions to standardise their loan documentation.

But despite the housing finance agencies' efforts, domestic MBS markets are still not fully developed in any of the countries we consider. In Singapore and Thailand, no housing loans have been securitised. In Hong Kong, India and Korea only 1% of housing loans are securitised, while in Japan and Malaysia this proportion is 5–6%. As a result, in all of the countries there is limited liquidity in secondary MBS markets.

Size of bond and MBS markets[1]

Amount outstanding; in billions of US dollars

	Date	MBS		Bonds				MBS + Bonds
		Housing agency	Private	Housing agency	Financial and corporate[2]	Government	Non-resident	Share of housing agency debt securities[3]
Hong Kong SAR	Dec 01	0.0	0.1	2.6	8.2	6.8	3.6	14.7
	Mar 06	0.6	0.0	4.0	10.8	8.8	4.0	19.0
India	Jun 02	0.1	n.a.	5.3	0.0	134.8	0.0	3.9
	Jun 05	0.2	n.a.	28.4	15.8	243.8	0.1	9.9
Japan	Mar 02	1.5	6.1	16.6	1,314.1	3,166.3	57.0	0.4
	Mar 06	27.2	60.4	33.1	1,211.9	5,501.8	57.1	0.9
Korea	Dec 01	1.5	n.a.	0.0	213.2	65.8	0.2	0.5
	Dec 05	8.3	n.a.	1.5	356.7	226.0	0.0	1.7
Malaysia	Dec 01	0.0	0.0	5.6	36.0	30.9	0.0	7.7
	Dec 05	1.5	0.0	6.4	47.4	50.4	0.2	7.5
Singapore	Mar 01	0.0	n.a.	1.6	7.5	21.7	1.5	5.1
	Mar 06	0.0	n.a.	2.7	2.6	35.5	2.9	6.7
Thailand	Dec 01	0.0	0.0	1.3	13.6	18.5	0.1	3.9
	Dec 05	0.0	0.0	1.8	23.6	48.8	0.2	2.4

[1] Excluding money market instruments. [2] Excluding housing agency bonds and MBSs as well as private MBSs. [3] As a percentage of total bonds and MBSs.

Sources: Citigroup; government housing agencies; BIS; authors' calculation. Table 1

Housing finance markets

In their respective housing finance markets, the agencies have broadened the range of loan types that are available to borrowers. In particular, several agencies have focused on introducing longer-term fixed rate loans.[10] This has stimulated private lenders to lengthen the maturity of their loan contracts and to introduce more sophisticated products that combine features from fixed and floating rate loans. In Korea, the KHFC's provision of 30-

[10] This is similar to the United States, where the Construction Finance Corporation pioneered the 30-year fixed rate mortgage in the 1930s (Jones (1951)).

year fixed rate mortgages likely contributed to banks and other financial institutions lengthening the maturity of their housing loans from 3 years to 20-30 years.[11] In Japan, the GHLC was the main provider of long-term fixed rate mortgages. And the JHF (GHLC's successor) uses securitisation to transfer the interest rate and prepayment risk of long-term fixed rate housing loans to capital markets, thereby allowing private financial institutions to offer these loans to households. Interestingly, the HKMC offered long-term fixed rate mortgages in 2001, but there was only limited demand for them as Hong Kong households have a preference for floating rate loans and the local banks did not market them aggressively.

Similar objectives but different approaches

Despite their common objectives, the approaches used by the housing finance agencies to achieve these objectives have differed considerably (Table 2). Four of the agencies – the GHLC, the GHB, the HDB and the KHFC – distribute their own loans to households, either directly or via banks and other loan originators. They thus compete fully in the housing finance market by offering loans to any household that satisfies their lending criteria. In addition to their direct lending, the GHLC offered mortgage insurance and purchased mortgages from other lenders for its MBS programme. (In April 2007, GHLC was replaced by the JHF, which focussed on securitising loans originated by private financial institutions rather than lending directly to households.) The KHFC provides guarantees on loans that are used to fund deposits for Chonsei leases.[12] The remaining agencies – the HKMC, Cagamas and the NHB – do not lend directly to households. The HKMC and Cagamas purchase already originated mortgages from banks and other lenders. The NHB lends directly to banks and finance companies, with the loans secured against specific pools of mortgages. The

[11] When the KHFC was founded in March 2004, only 25% of housing loans had maturities of greater than 10 years. By December 2005, the proportion of loans with maturities of over 10 years had doubled to 50% (See KHFC (2006)).

[12] Chonsei is a lease contract, where rather than paying a periodic rent for the right to use real property, the tenant pays an up-front deposit for the use of the property with no requirement for periodic rent payments. Thus, the "rent" received by the landlord is the investment return on the Chonsei deposit. At the end of the contract, the landlord returns the tenant's Chonsei deposit (Zhu (2006)).

HKMC also has a large mortgage insurance division, and the NHB is in the process of establishing the Mortgage Credit Guarantee Company, a joint venture between the housing finance agency and several private and supranational entities, to provide mortgage insurance services.

Housing finance agencies' involvement in MBS markets also differs. Cagamas, the HKMC and the KHFC issue their own MBSs for which they guarantee interest and principal payments. Cagamas and the KHFC also hold the first-loss tranche of their own MBSs. These three agencies do not provide credit enhancements for privately issued MBSs. The GHLC issues its own MBSs, for which it guarantees interest and principal payments, and in addition provides credit enhancements for MBSs issued by others. The NHB provides credit enhancements and trustee services for privately issued MBSs, but does not issue its own MBSs. Neither the GHB and nor the HDB participates in MBS markets.

Housing agencies' business lines

	Agency	Issues MBSs	Private MBS enhancement	Own loan products	Purchases mortgages from banks	Mortgage insurance
Hong Kong SAR	HKMC	Yes	No	No	Yes	Yes
India	NHB	No[1]	Yes[2]	No	No[3]	No
Japan	GHLC	Yes	Yes[2]	Yes	Yes	Yes
Korea	KHFC	Yes	No	Yes	Yes[4]	No[5]
Malaysia	Cagamas	Yes	No	No	Yes	No
Singapore	HDB	No	No	Yes	No	No
Thailand	GHB	No	No	Yes	No	No

[1] Only issues MBSs on behalf of private financial institutions. [2] The GHLC provides credit wraps for private MBSs, NHB provides credit wraps and purchases part of the subordinated tranche. [3] The NHB lends directly to banks, with the loans secured against specific pools of mortgages [4] As of September 2006 the KHFC had not purchased loans from banks. [5] The KHFC provides a guarantee on deposits for Chonsei loans.

Sources: government housing agencies; National central banks; BIS. Table 2

In recent years, the supply of housing finance provided by banks has increased in our sample countries. Over the same period, several of the agencies have broadened their activities. The HKMC has broadened its loan purchases to include other household debt and some commercial loans. It has also expanded its mortgage insurance programme and increased the maximum loan-to-value ratio on insured loans to 95%. Cagamas has also broadened its loan purchases. The NHB has started providing credit guarantees on private MBSs, and is establishing a mortgage insurance company.

In contrast to the other housing agencies, the HDB and the GHB have not started new

business lines, although the HDB has made it easier for households to obtain loans. And in Japan, the GHLC has reduced its direct lending and has focused on buying mortgages from banks and issuing MBSs. Moreover, the replacement of the GHLC with the JHF in April 2007 largely reflects the government's desire to reduce its role in the Japanese economy.

4. Risk management by housing finance agencies

Housing finance agencies manage a variety of risks associated with domestic housing loans. These can include credit, interest rate and prepayment risks. For securitised loans, loans for which the housing finance agencies have provided mortgage insurance and credit enhancements on private MBSs, the agencies are required to manage only credit risk.[13] For loans held on balance sheet, housing agencies are usually viewed as managing all financial risks, with the exception of Cagamas, which has recourse to the bank that sold it the loan if the borrower defaults, and hence only manages interest and prepayment risk.

The extent to which housing finance agencies manage the risks of domestic housing loans varies across Asia. The Singaporean and Thai housing finance agencies manage all of the financial risks on about 40% of housing loans in their respective countries (Graph 2). The Hong Kong and Japanese housing finance agencies manage some or all of the financial risks on roughly 25% of domestic housing loans. The remaining countries manage some or all of the financial risks on about 10% of housing loans. The housing finance agencies manage this financial risk by either hedging it with a third party, transferring it to bond and MBS investors or retaining it within their organisation.

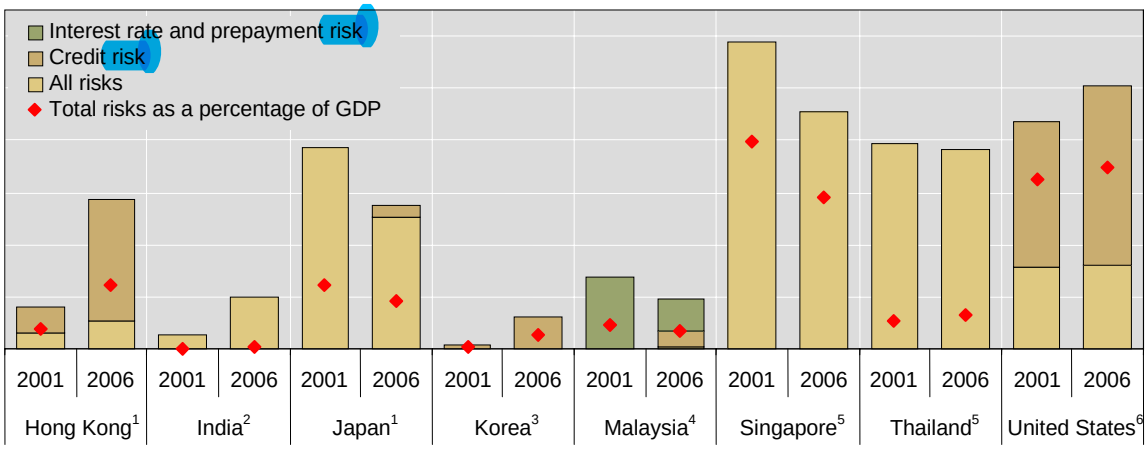
The agencies in Hong Kong, India and Korea have all increased the share of credit risk that they manage. In Hong Kong, the HKMC's share of the credit risk on housing loans has quadrupled over the past five years, mainly due to the growth in the provision of mortgage insurance. In Korea, the KHFC's share of credit risks on housing loans has also risen strongly, reflecting the growth in its mortgage insurance and MBS programmes. In India, an increase in the NHB's direct lending to banks and other financial institutions has seen it

[13] When private financial institutions securitise loans, the credit risk is often transferred to the ABS investor. In contrast, government housing agencies in Asia and in other parts of the world, typically retain the credit risk on securitised loans.

managing additional risks. In contrast, the GHLC has scaled back its direct lending operations ahead of its restructuring, and consequently the share of the credit risk on Japanese housing loans it manages has fallen. The HDB's withdrawal from providing finance to high income households in 2003 has caused its share of the credit risk on Singaporean housing loans to fall. The HKMC is the only agency which actively hedges credit risk. Roughly half of the credit risk from its mortgage insurance operations have been reinsured (HKMC (2006)). All of the other housing finance agencies retain the credit risk within their organisations.

Risk managed by housing agencies

Percentage of total housing loans



[1] The HKMC and the GHLC assume all risks on loans held on their balance sheets, and credit risk on their MBS issuance and mortgage insurance operations. [2] The NHB assumes all risks on its loans to banks and housing finance companies, and credit risk on the MBSs that it guarantees. [3] The KHFC assumes credit risk on its MBS issuance and mortgage insurance operations. For 2001, data are for the Korea Mortgage Corporation. [4] Cagamas assumes interest rate risk and prepayment risk on loans (with recourse to the originating bank) held on its balance sheet, and credit risk on its MBS issuance. [5] The HDB and the GHB assume all risks on loans held on their balance sheets. [6] Freddie Mac and Fannie Mae assume all risks on loans and MBSs held on their balance sheets, and credit risk on their MBS issuance.

Sources: Government housing agencies; national central banks; Bloomberg; BIS calculation. Graph 2

In Hong Kong and India, the housing finance agencies have also increased the share of prepayment risk they manage. The available evidence suggests that these housing finance agencies retain this risk. The GHLC has started securitising its outstanding portfolio of housing loans, thereby reducing the share of prepayment risk it holds. JHF has continued this process. The share of prepayment risk held by Cagamas has also fallen, reflecting a decrease in its share of Malaysian housing loans. In Korea, the agency issues MBSs and thus transfers prepayment risk to bondholders. In Thailand and Singapore, the housing finance agencies' share of prepayment risk has fallen in line with their share of the domestic mortgage market.

Lastly, the agencies in Hong Kong and India have increased the share of interest rate risk

they manage, while the shares of interest rate risk managed by housing agencies in the other countries have declined. All of the housing agencies appear to hedge a significant share of the interest rate risks that they manage.

5. Government support

Formal government support for the housing finance agencies varies across our sample, from outright guarantees and full government ownership to no guarantee and limited government ownership (Table 3). In India, Korea, Singapore and Thailand the housing finance agencies have an explicit government guarantee and are wholly owned by their governments (either directly or via the central bank). In Korea, the law requires the government to cover losses in excess of the KHFC's capital reserves (see the Korea Housing Finance Corporation Act). The Singaporean government is also required to cover the HDB's losses (Housing Development Board annual report). In India, the NHB can request the government to guarantee its bonds (National Housing Bank Act of 1987). At present, only some NHB bonds have an explicit government guarantee, but both types of bonds trade at similar prices, suggesting that market participants perceive the NHB as being backed by the Indian government. The Thai Government automatically guarantees GHB's bonds.

Government support for housing agencies

Country	Government ownership		Government guarantee	
	Government	Central bank	Government view	Market view
Hong Kong SAR	100	--	No[1]	Yes
India	--	100	Yes	Yes
Japan	100	--	No	Yes
Korea	18	82	Yes	Yes
Malaysia	--	20	No	No
Singapore	100	--	Yes	Yes
Thailand	100	--	Yes	Yes

[1] No formal guarantee, but significant government support.

Sources: BIS; central banks; housing agencies; private market participants Table 3

In Hong Kong and Japan, the housing finance agencies do not have a government guarantee but they are wholly owned by the government. It is clear that the HKMC enjoys a high level of government support, with the housing finance agency having access to additional callable equity capital and a revolving credit facility, as well as having various

government officials and senior personnel of the Hong Kong Monetary Authority on its board. The extent of government support for the GHLC is a little more ambiguous. The Malaysian government owns only a fifth of Cagamas – the remainder being held by Malaysian and foreign banks – and the housing finance agency does not have a government guarantee.

Market perception of government support

Generally, there is a high level of agreement between the formal level of government support and the market perception thereof. The market perception of government support is reflected in credit rating and bond market prices, and these two indicators are broadly consistent for all countries.

For India, Korea, Singapore and Thailand, which have explicit guarantees, the market simply takes this as given. When rated, the housing finance agencies have the same credit ratings as their respective governments.[14] The spreads on housing finance agency bonds and MBSs over government bonds are, according to market participants, a reflection of their smaller size, and the prepayment risk on MBSs (Table 4). Yields on housing finance agency debt and MBSs are well below yields on other financial institutions' bonds.[15]

In Japan and Hong Kong, where the agencies are wholly owned by the government but do not have a formal government guarantee, the market view is that they have strong implicit government guarantees. Both agencies have the same credit ratings as their respective governments, and upgrades and downgrades to the sovereign credit ratings have been reflected immediately in the housing finance agencies' ratings.[16] In Japan, GHLC bonds trade at yields that are 10 basis points higher than yields on Japanese government bonds. The GHLC MBS spread of around 40 basis points is attributed to their prepayment risk. In Hong Kong, HKMC bonds and MBSs trade at yields that are 50 basis points higher than

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[14] The Housing Development Board (HDB) in Singapore is not rated.

[15] In India, yields on the senior tranches of agency MBSs and private MBSs are similar. But private MBSs have a large subordinated tranche (10–20 % of the value of the loan pool), whereas agency MBSs do not have a subordinated tranche.

[16] For rating agency views on the HKMC, see Chan et al (2005) and Wa et al (2005). For rating agency views on the GHLC, see Ogawa (2006) and Sonoda et al (2006).

yields on Hong Kong government bonds. This probably reflects the smaller size and lower liquidity of the HKMC bonds.

In the case of Malaysia, the market view is that Cagamas does not have a government guarantee. This is consistent with the formal level of government support. The domestic rating agencies state that Cagamas's AAA credit rating reflects the high quality of its loan assets and the quality of its shareholders, which include several large Malaysian and international banks as well as Bank Negara Malaysia (Kokularupan (2005)). Consistent with the absence of government support, Cagamas bonds trade at yields that are roughly 60 basis points higher than yields on Malaysian government bonds – the largest spread differential of all the housing finance agencies. Reflecting their much higher liquidity, yields on Cagamas bonds are, however, lower than yields on bonds issued by other AAA-rated financial institutions. Cagamas MBSs trade at a spread of around 15 basis points above Cagamas bonds, despite having significant over-collateralisation and thus lower credit risk. A possible explanation for this is that these bonds are smaller in size and thus less liquid.

Yield spreads on MBS and agency bonds

Spreads on five-year sovereign bonds, in basis points[1]

	Agency bonds	Agency MBSs	Bonds issued by financials	MBSs issued by financials
Hong Kong SAR	49	50–55	55–60	…
India	50	70	102	70
Japan	11	39	27	55
Korea	15[2]	25	38	…
Malaysia	57	71	94	…
Singapore	47	-	66	-
Thailand	19[3]	-	96[3]	-

[1] Rounded average spreads for 2006. [2] Spread for MBS bond with bullet maturity. [3] Spreads on three-year sovereign bonds.

Sources: Asian Bond Online; Asian Development Bank; Barclays; Bloomberg; GHLC; HSBC; KIS Pricing; Mitsubishi UFJ Securities; R&I Japan; BIS.

Table 4

6. Quantifying the size and distribution of government support

To determine the impact of government sponsored housing finance agencies on primary housing finance markets in Asia, we collected detailed data on the operations of housing finance agencies and other financial institutions for seven Asian countries for the sample period January 2004 to December 2005. The data that were used in this working paper have been sourced from a broad range of organisations and where possible, have been cross-checked against a few sources to ensure their accuracy. But the relative immaturity of bond

markets and housing finance markets in Asia means that the quality of the available data on the operations of the housing finance agencies varies (See Appendix 2). Hence the government subsidies reported in this paper should be seen as estimates only.

To estimate the size of government subsidies received by housing finance agencies and their distribution we consider the net present value of cash flows, following a methodology similar to that used in the study by the US Congressional Budget Office in 2004. We take as our starting point that housing finance agencies' subsidies are derived from two main sources: an explicit or implicit government guarantee, which allows them to issue bonds and MBSs at lower yields than other financial institutions; and direct government benefits such as grants, tax exemptions and favourable regulatory treatment. The US Congressional Budget Office (CBO) methodology was initially used to estimate the value the benefits the Government Sponsored Enterprises (GSEs) received from their special status as well as how much of this subsidy was passed on to borrowers (see Box).

Following CBO (2004) we assign the subsidy impact on cash flows to the year in which they were earned and not the year that the subsidy was received. Cash flows received in future years are discounted using the appropriate government bond yield. Hence, the present value of gross subsidies (*S*) is calculated as:

$$S = \sum_{t=1}^{n} \frac{(r^{FI} - r^{HA})D^{HA} + (m^{FI} - m^{HA})MBS^{HA}}{(1+d_t)^t} + Ex$$

where *r* is the average yield on bonds and *m* is the average yield on mortgage-backed securities, with the superscript indicating whether the yield is for financial institutions (*FI*) or housing finance agencies (*HA*). The yields are based on the average maturity of bonds and MBSs issued in that year. D^{HA} and MBS^{HA} represent, respectively, the amount of bonds and mortgage-backed securities issued by housing finance agencies, and *Ex* is the value of grants, tax exemptions and other benefits received by housing finance agencies. The discount rate *d* is taken from the corresponding country's sovereign yield curve.

When considering how the subsidies are distributed among households, financial institutions and the housing finance agencies themselves, we assume that housing finance agencies pass on part of the subsidies to households via a lower mortgage rate. The present value of the subsidies received by homeowners (S^B) can therefore be expressed as:

$$S^B = \sum_{t=1}^{n} \frac{(g^{FI} - g^{HA})M}{(1+d_t)^t}$$

where g^{FI} and g^{HA} are the average lending rates for mortgages withdrawn from financial institutions and housing finance agencies respectively, *M* is the amount of mortgages funded by the housing finance agencies, and *n* is the average life of the mortgage.

We further assume that financial institutions benefit from lower funding costs by selling mortgages to housing finance agencies or borrowing from them at attractive interest rates. The present value of the subsidies received by financial institutions (S^{FI}) is expressed as:

$$S^{FI} = \sum_{t=1}^{n} \frac{(r^{FI} - b^{HA})B}{(1+d_t)^t}$$

where *b* is the rate at which housing finance agencies purchase mortgages from (or lend to) financial institutions, *B* is the amount of funding provided by the housing finance agency, and *n* is the average maturity of this funding. Finally, it is assumed that the housing finance agencies retain the remaining portion of the subsidies (S^{HA}) that are not captured by homeowners and financial institutions. Hence,

$$S^{HA} = S - S^{B} - S^{FI}$$

While the basic approach of this paper is similar to those used in the United States studies, the methodology is adjusted to account for the different structures of Asian and United States mortgage markets. In the United States, the residential mortgage market is divided into two parts – conforming loans (loans that can be purchased by the United States housing finance agencies) and non-conforming loans. By comparing the interest rates that are charged on conforming residential mortgages with the interest rates that are charged on similarly risky non-conforming loans (typically "jumbo" loans), researchers are able to estimate the proportion of the government subsidy that is passed onto United States households. But several of the mortgage markets in our sample of Asian countries are different from those in the United States. In Hong Kong, India and Malaysia, the mortgage market is not segmented. Banks and other financial institutions provide all of the housing loans in these countries. The housing finance agencies provide liquidity to the banking system, either by purchasing housing loans from financial institutions (Hong Kong and Malaysia), or by making direct loans to them (India).

In Singapore, the HDB only provides housing loans to low- and medium-income households, with private banks and finance companies lending to high-income households. In Japan and Korea, the housing finance agencies compete reasonably directly with the private banks – the housing agencies offer 30-35 year fixed-rate loans while the private banks offer medium term (10-20 year) variable-rate loans. Only in Thailand are the housing loans offered by the housing finance agency and private banks directly comparable – they both offer 15-20 year variable rate loans.

The different market structures mean that the method used to estimate the size of the interest rate saving that is received by households varies across the seven countries. In Japan, Korea, Singapore and Thailand we have used the spread between the housing finance agencies' mortgage rates and banks and other financial institutions' mortgage rates.

Where necessary, we have used fixed-floating interest rate swaps (of the appropriate maturity) to convert floating–rate housing loans into fixed-rate housing loans. This calculation implicitly assumes that housing agency and private lenders' housing loans are equally risky. This is a reasonable assumption for Japan, Korea and Thailand because the housing finance agency and private lenders compete for the same borrowers and have similar lending standards, but it maybe less valid for Singapore, where the housing finance agency only lends to low- and medium-income households.[17] In Hong Kong, India and Malaysia, where the mortgage market is not segmented, we have relied on discussions with housing finance agencies, central banks and market participants to evaluate the housing finance agencies' impact on mortgage rates.

The housing finance agency bond spreads are spreads at issuance where available. However, data limitations mean that we have had to rely on secondary market spreads in a number of cases. To account for the resulting uncertainty regarding bond spreads at issuance, we have calculated the size of the support for a range of yield spreads. We have added and subtracted 10 basis points relative to our central estimates for all countries except India, for which we have added and subtracted 20 basis points. The amount of debt issued and its maturity are based on actual issuance data. The private financial institution bond spreads are based on entities of comparable credit quality to the housing finance agencies on a standalone basis, ie without government support.[18] These bond spreads are sourced from the secondary bond market.

[17] For Japan, data on securitised loans from Standard and Poor's and Mitsubishi UFJ Securities suggest the agency and private bank loans have similar characteristics.

[18] The rating agencies do not provide standalone ratings for the housing finance agencies, so we have relied on market liaison and our own judgment to identify financial institutions that are of similar credit quality to the housing finance agencies.

US subsidy estimates

The methodology employed to estimate the size and distribution of government support was chosen to yield estimates consistent with those of the US Congressional Budget Office (CBO).[1] The CBO estimated the federal subsidy provided through and to three federally-chartered housing agencies: Fannie Mae, Freddie Mac and the Federal Home Loan Banks. However, the CBO did not estimate the subsidy of Ginnie Mae, a government housing agency focused on supporting the activities of the US government's own Federal Housing Agency (FHA). Ginnie Mae was excluded because the CBO was asked to discuss the consequences of having subsided housing finance channeled through two shareholder-owned specially charted housing agencies rather than large financial firms.

Fannie Mae and Freddie Mac are considered "government sponsored" because Congress authorized their creation and established their public purposes. Their charter values reflect implicit subsidies that are the extra cash flows derived from packages of exceptional privileges not available to other large financial institutions. These benefits include an exemption from state and local taxes and access to a line of credit from the US Treasury. Since the early 1990s, Congress has legislatively mandated the GSEs to meet targets for minimum shares of housing finance. One target involves the percentage of homes financed by them for families with incomes at or below area median incomes.

When asked to comment on what was the purpose of its estimates, the CBO noted that it was asked to estimate the value of the benefits that the GSEs receive from their special status and of this amount how much is passed through to mortgage borrowers. The CBO also commented that such information should be useful in evaluating if the same benefits could be delivered to home buyers even if shareholders received less. It noted mechanisms (such as restrictions on the size of retained portfolios) that would reduce subsidy amounts received by shareholders but leave the activities of the GSEs largely unchanged.[2]

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[1] See Federal Subsidies for the Housing GSEs, CBO Testimony on 23 May 2001 by Director Dan L. Crippen, at www.cbo.gov. [2] Appendix A of the CBO study *Federal Subsidies and the Housing GSEs* (May 2001) at www.cbo.gov.

7. Findings

Size of the government subsidies

For most of the selected Asian countries the level of government support given to housing finance agencies is small in absolute terms and relative to GDP. In all countries except Singapore, the level of government support given to housing agencies is below 0.1% of GDP (Table 5). In Singapore, the subsidy is roughly 0.5% of GDP. The variation in the size of the estimated subsidies reflects the relative importance of the different business lines and the nature of government support.

Estimated size of government subsidies to housing agencies in 2005

Country	Estimated range for subsidy[1]	Main subsidy channel
Hong Kong SAR	0.000–0.003	Bonds/loans
India	0.006–0.009	Bonds/loans
Japan	0.002–0.007	Bonds
Korea	0.015–0.025	MBSs
Malaysia	0.000	-
Singapore	0.459–0.498	Subsidy/loans
Thailand	0.038–0.081	Bonds/loans
Memo: United States[2]	*0.210*	*MBSs and bonds*

[1] As a percentage of GDP. [2] Data are for 2003.

Sources: Congressional Budget Office; IMF; national central banks, housing agencies; BIS. Table 5

By comparison, the CBO (2004) estimate that the US housing finance agencies received government subsidies equivalent to 0.2% of GDP. When comparing the US estimates with those found for the Asian agencies, it is however important to keep in mind that today the US housing agencies are publicly traded companies with dispersed public shareholdings, while the Asian housing finance agencies are government agencies.[19]

[19] Appendix 5 provides a brief historical overview of how the US agencies became publicly traded and privately owned companies.

Who benefits?

The beneficiaries of the government subsidy differ across countries. In Hong Kong, Korea, Singapore and Thailand, households receive the bulk of the subsidy, while in India, financial institutions receive most of the benefits (Table 6). In Japan, the situation is more complex with financial institutions receiving most of the subsidy if one focuses on new lending, and the GHLC receiving more than half of the subsidy if existing mortgages are included. In almost all countries, the housing finance agency retains very little of the subsidy.

Beneficiaries from government support to housing finance agencies	
Hong Kong SAR	Households
India	Financial institutions
Japan	Financial institutions, Households
Korea	Households
Malaysia	-
Singapore	Households
Thailand	Households
Memo: United States	*Households, housing agencies*

Source: See Table 5. Table 6

In Korea, almost the entire subsidy is passed on to households through lower interest rates on their mortgages. In addition to providing households with lower cost mortgages, the KHFC has been able to broaden the range of mortgage types that are available in Korea. The KHFC and the financial institutions receive very little of the subsidy. Similarly, in Singapore, all of the government support flows through to households through lower mortgage interest rates. The main difference between the two countries is that in Singapore the housing finance agency's concessionary interest rates are only available to low and medium income households, whereas in Korea the housing agency can lend to any household. In Thailand, much of the housing finance agency's subsidy is passed on to households through lower interest rates on their mortgages, with low-income households benefiting most. GHB's depositors also benefit from the government subsidy through higher deposit rates.

In Japan, the housing finance agency retains over half the estimated subsidy if both new and existing mortgages are included. This in part reflects losses stemming from lending in the 1980s and 1990s (Appendix 3). For new lending, financial institutions and the GHLC each receive about 45% of the subsidy, with households receiving the remaining 10%. However, the fact that households were allowed to refinance their loans with little or no financial penalty during the mid-1990s when interest rates were falling suggests that they benefited

significantly from the government support of the GHLC.

Due to the structure of the housing finance markets and the available data it is not possible to estimate the distribution of the subsidy for Hong Kong and India. In particular, we cannot differentiate between mortgages that are financed by the housing finance agencies and mortgages that are financed by other financial institutions, and hence cannot determine how much of the estimated subsidy is distributed to households. Nonetheless, discussions with market participants in each of the countries have provided some indication of the distribution of the subsidy. In India, it appears that the housing finance agency transfers most of the estimated subsidy to banks and other financial institutions by providing them with low cost loans. In Hong Kong, HKMC's mortgage insurance operations may have broadened the range of households that can obtain housing finance.

Financial market development

In several of the countries considered, the housing finance agencies appear to have helped develop domestic MBS and housing finance markets. In the MBS market, they have worked with governments to eliminate structural impediments to securitisation and have initiated more systematic issuance of MBSs. In several of the primary housing finance markets, they have broadened the range of loan types available to borrowers by introducing longer-term fixed rate loans. In some markets, they have also provided liquidity to the banking system – either by purchasing housing loans from financial institutions, or by making direct loans to them – though their capacity to provide stable funding for loan originators over the whole economic cycle has not yet been tested. Housing finance agencies also appear to have helped improve household access to loans in some countries.

Broadening of mandates and financial stability

From a financial stability perspective there are aspects of some of the Asian housing finance agencies' operations that may require close monitoring if the trends seen in recent years continue. One aspect is the recent broadening of Asian housing finance agencies' mandates as they try to remain relevant in an environment where banks have increased their supply of housing finance. This has arguably resulted in housing finance agencies holding more risks, particularly credit risk in Hong Kong, India and Korea. As housing finance agencies increase their activities, their risk management requirements will also grow and thus become more challenging. In Japan, Singapore and Thailand, the housing finance agencies' shares of the financial risks associated with housing loans have fallen over recent years, but they are still significant.

8. Conclusion

In Asia, government-supported housing finance agencies have played a constructive role in the development of domestic residential mortgage and bond markets. And in most countries, they have not required large government subsidies to fulfil this mandate. In all countries except Singapore, the level of government support given to housing finance agencies is below 0.1% of GDP. The housing finance agencies have also managed to transfer most of the benefit of their government support to either households or financial institutions. Agencies that participate directly in primary housing finance markets appear to have been most successful in passing on their government support to households.

However, many of the housing finance agencies have a large or rapidly growing presence in their domestic housing markets which could give rise to policy concerns going forward. One risk is that the government subsidised housing agencies will distort competition, crowd out private lenders and mortgage insurers, and ultimately hinder market development. This occurred in Japan, and was one of the reasons why the GHLC's role was refocused away from direct lending towards supporting securitisation of mortgages originated by private lenders. Also, in many countries it has proven less easy for governments to scale back their involvement in markets than to introduce it (see Higgs (1985)). Interestingly, very few of the government-owned Asian housing agencies have explicitly outlined exit strategies from their respective housing finance markets.

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Appendix 1 - Government supported housing finance agencies in selected countries

In **Canada**, the government established Canada Mortgage and Housing Corporation (CMHC) in 1945 to help alleviate an acute housing shortage. The housing agency is wholly government owned and has a formal government guarantee. It provides mortgage insurance for individual housing loans, and guarantees mortgage-backed securities (CMHC (2006)).

The **Jordan** Mortgage Refinance Company (JMRC) is a joint venture between the government of Jordan (20 per cent), the Central Bank of Jordan (18 per cent) and private banks. JMRC was established in 1997, with the twin objectives of: providing liquidity to the banking system by lending to banks secured against housing loans and developing Jordan's domestic bond market. The agency does not have a formal government guarantee, but private bond investors rank ahead of the government if the agency is declared bankrupt (Chiquier et al (2004)).

In **Mexico**, the government runs the country's two largest mortgage lenders - Instituto del Fondo Nacional de la Vivienda para los Trabajadores (Infonavit) and Sociedad Hipotecaria Federal (SHF). Infonavit and SHF have been the most active in Mexico's securitisation market and maintain a dominant presence in mortgages even as the industry has grown (Skelton (2006)). The government established Infonavit in 1972 to manage a workers housing fund and promote their housing rights. Infonavit finances mortgages for workers via a mandatory 5 percent payroll deduction. At the end of September 2006, the agency held a loan portfolio of more than US$40 billion.[20] SHF was created in 2001 to spur development of the secondary mortgage market by guaranteeing credits and creating a central database on borrowers, loans and mortgage-backed securitizations. The Mexican government explicitly guarantees SHF's obligations through 2009. The agency held $8.8 billion in directly funded home loans at year-end 2005. Through partial guarantees, SHF has assumed a significant amount of the credit risk in securitized mortgage pools, lowering issuers' transaction costs and reducing the credit enhancements needed to meet a particular rating standard. In addition to originating mortgages, SHF has been a major funding source for Mexico's mortgage finance companies, who receive 35 percent of their funding from government

[20] Infonavit issued its first mortgage-backed security in 2004, with $68.2 million in 12-year bonds. The agency followed with a series of 20-year bonds backed by low-income mortgage portfolios.

sources.

In the **Netherlands**, the government owned and guaranteed Nationale Hypotheek Garantie (NHG) insures households against the risk that they will be unable to service their mortgage due to 'structural repayment problems' such as unemployment, long-term illness or divorce (Van Dijkhuizen (2005)). Since 1998, NHG has also insured households against falls in house prices – if the borrower is forced to sell their home at a loss because of a structural repayment problem, the agency will make up the shortfall.

In **Sweden**, the National Housing Credit Guarantee Board (BKN) is a national government agency under the Ministry of Sustainable Development.[21] BKN administers government credit guarantee programmes for housing development. The government is fully responsible for BKN debt.[22] BKN's guarantee compensates the lender for losses on a guaranteed loan due to the borrower's inability to service the loan. The main principle is that the property must be sold if the lender wants to be compensated through the BKN guarantee. The primary role of the BKN is to promote housing policy and to work for effective guarantee provision for the financing of housing development by running its guarantee operations in a business-like way within existing regulations. Government credit guarantees can be provided for loans advanced by financial institutions operating in Sweden.

In **Switzerland**, the Pfandbriefzentrale[23], is one of two institutions with the right to issue mortgage bonds (Pfandbriefe). The Pfandbriefzentrale is the issuing agency for the Swiss cantonal (regional) banks, of which most benefit from outright guarantees or implicit guarantees from cantonal governments (Moody's Investor Service (2005b)).

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[21] In Swedish the name is Statens **B**ostads**k**redit**n**ämn, thus BKN.

[22] As of 31 December 2005 BKN's guarantee stock for new construction and renovation amounted to 32 000 new dwellings and 17 000 renovated dwellings, with an aggregate guarantee amount of SEK 7.1 billion. New construction accounted for 84 per cent of the guarantee amount and renovation for 16 per cent .

[23] The other is the Pfandbriefbank Schweizerischer Hypothekarinstitute, which is the Pfandbrief issuer for private banks. The Pfandbriefbank does not receive government support, and has no government guaranteed or owned banks among its owners (Moody's Investor Service (2005a)).

Appendix 2 – Data

The data used in this working paper are sourced from a broad range of organisations including: housing finance agencies, central banks, supranational organisations, commercial banks, ratings agencies and private data services (Bloomberg and CEIC Data). Admittedly, there are concerns over the quality of the available data on Asian housing finance markets and bond markets. Where possible, the data have been cross-checked against a few sources to ensure their accuracy.

Data on the yields on government, housing finance agency and private financial institutions' local currency debt are mainly obtained from Bloomberg. These Bloomberg data are complemented with pricing data from housing finance agencies, central banks and private market participants. Yields on government bonds are readily available, but yields on housing finance agency and private financial institutions' local currency debt are scarce. Because pricing data are generally available for only a few housing finance agency and financial institution bonds and for only part of the sample period, we have used average yields for each calendar-year to minimise the impact of these data limitations on our results.

Data on the mortgage interest rates charged by housing finance agencies and other financial institutions are sourced from Bloomberg, CEIC, housing finance agencies and national central banks. Housing finance agencies' mortgage interest rates are readily available and are transparent, with borrowers paying the headline interest rate. But it is difficult to obtain data on the actual interest rates that are charged by banks and other financial institutions, because they often offer sizeable discounts on their headline interest rates.[24] The HKMC publishes good data on the actual interest rates paid on residential mortgages in Hong Kong, but for the other countries we have combined financial institutions' headline mortgage rates with market estimates of the size of any discounts that are being offered. The housing finance agencies have supplied data on the interest rates at which they supply liquidity to banks and other financial institutions.

Data on housing finance agencies' debt issuance are sourced from the housing finance agencies and from Bloomberg. We have included all types of debt raisings – bonds, loans, short-term debt and MBSs. Data on the housing finance agencies' use of those funds – direct

[24] In India and Japan, banks and other financial institutions offer discounts of up to 2 percentage points (see State Bank of India and Mizuho websites).

lending to households, purchase of residential mortgages from banks and other financial institutions, and loans to financial institutions – are sourced from the housing finance agencies and from central banks. Lastly, information on direct government grants to housing finance agencies is obtained from the agencies' annual reports and from central banks.

Appendix 3 – Details for individual country calculations

Japan

The GHLC's estimated subsidy for new mortgages in 2005 was 0.002–0.007 per cent of GDP; the fifth largest estimated subsidy (relative to GDP) of the seven housing agencies in our sample. This subsidy reflects GHLC's ability to raise debt finance at lower cost than private financial institutions. The GHLC uses three types of debt to fund its operations – "M-series" MBSs, agency bonds and FILP loans. FILP loans account for half of the subsidy. This is because they are the cheapest source of funding (they have the same yields as Japanese government bonds, which is 25 basis points below private sector equivalents) and have very long maturities (an average of 23 years). As discussed in section 7, the subsidy is a function of the amount of debt issued, the size of the interest rate differential, and the average maturity of the debt. The remainder of the subsidy comes from GHLC's issuance of MBSs and agency bonds. These securities trade at yields that are roughly 15 basis points below their private sector equivalents, and have an average maturity of 10 years.

Financial institutions and the GHLC each receive about 45 per cent of the estimated subsidy on new mortgage lending, with households receiving just over 10 per cent of the subsidy. The small share of subsidy received by households is mainly due to the small interest rate differential between mortgages offered by banks and those offered by the GHLC. The interest differential is small because banks have been competing aggressively for housing loans over recent years. Financial institutions receive their share of subsidy via two sources: service fees for managing GHLC funded loans, and interest savings from securitising mortgages through GHLC's Monthly M-series MBS program.

The GHLC also receives substantial direct government subsidies to cover a negative spread of 60-80 basis points between the interest rates on its existing mortgage portfolio and the interest rates on its FILP loans from the government. This negative interest rate spread reflects the lending and funding practises of the GHLC during the 1980s and early 1990s.

Government subsidies received by the GHLC in 2005					
	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
New mortgages					
Source of subsidies					
- Bonds	2.0	10	17	34	27
- FILP loans	1.3	23	25	66	52
- Monthly M-series MBSs	1.8	10	16	27	21
- Total				127	100
Recipient of subsidies					
- Households	5.1	10	3	15	12
- Financial institutions	3.8	10	16	59	46
- GHLC				53	42
- Total				127	100
Existing mortgages					
Source of subsidies					
- S-series MBSs[1]	4.3	10	16	67	2
- Government grants[2]	3.4	1	-	3400	98
- Total				3467	100
Recipient of subsidies					
- GHLC	3.4		-	3467	100

[1] The proceeds from S-series MBSs are used to repay GHLC's FILP loans rather than to finance new residential mortgages. [2] To ensure comparability and methodological consistency these grants are not included in our calculations.

Sources: Bank of Japan; GHLC; Bloomberg; BIS. Table A1

At present, direct government grants account for almost all of the subsidy on existing loans. But to strengthen the financial position of the GHLC ahead of its conversion into the JHF in 2007, the government has reduced prepayment penalties on FILP loans, and the housing finance agency has started to securitise its existing mortgages through the S-series MBS program to repay its FILP loans. As loans are securitised the direct subsidy will decline while the subsidy via the S-series MBSs will increase. To ensure comparability and methodological consistency across countries, the direct subsidy is not included in our base calculation. However, as the GHLC allowed households to prepay their loans with little or no financial penalty when interest rates declined, the subsidy has arguably been passed on to households.

Korea

KHFC's ability to raise debt finance at lower cost than private financial institutions accounts for its entire estimated subsidy of 0.015–0.025 per cent of GDP in 2005 (Table A2). KHFC's explicit government guarantee allows it to issue reasonably large quantities of MBSs at yields that are roughly 75 basis points lower than those achieved by private financial institutions. (Private financial institutions' bullet-maturity bonds trade at yields that are 90 basis points higher than those on Korean government bonds. KHFC MBSs trade at 25 basis points over government bonds, but roughly 10 basis points of this spread reflects prepayment risk, which is not present on private financial institutions' bonds.) The average maturity of the MBSs is 6 years, the same maturity as the underlying loans.[25] The KHFC currently does not issue bonds with bullet maturities because it prefers to share the prepayment risk on its mortgages with bond investors. This approach is more expensive for the housing finance agency, but it expected that over the medium-term this policy will improve the risk management skills of Korean banks and other bond market investors. The KHFC is also entitled to receive government grants to cover any financial losses, but the Korean government did not make any payments in the 2004 and 2005 financial years because the housing finance agency was profitable.

To calculate the interest rate differential between KHFC mortgages and private banks' mortgages, fixed-floating interest rate swaps of the appropriate maturity were used to convert the interest rate on private banks' floating rate mortgages into a fixed-rate equivalent. We find that the KHFC charges interest rates that are roughly 65 basis points lower than the interest rates charged by other lenders. Consistent with this, market participants noted that banks and other financial institutions do not offer long-term fixed rate housing loans because they cannot match the pricing offered by the KHFC. Korean banks' funding is also mostly floating rate, so offering fixed rate housing loans would increase the banks' interest rate and prepayment risk. Nonetheless, KHFC's provision of 30 year fixed-rate mortgages has led banks and other financial institutions to lengthen the maturity of their housing loans from 3 years to 20-30 years. When the KHFC was founded in March 2004, only 25 per cent of housing loans had maturities of greater than 10 years. By December 2005, the proportion of loans with maturities of over 10 years had doubled to 50 per cent. (See KHFC (2006)).

[25] The KHFC mortgages have initial maturities of 30 years, but are almost always repaid early.

Almost the entire government subsidy received by the KHFC appears to be passed onto households in the form of lower interest rates on their mortgages. Financial institutions do not receive any of the estimated government subsidy, as they only receive fee income for originating and servicing KHFC loans. One consequence of this is that banks and other lenders market their own loans more aggressively than KHFC loans because their own loans are more profitable. As a result, the KHFC finances only about 5% of Korean housing loans, which is below its target. The KHFC retains only a small proportion of the estimated subsidy.

Government subsidies received by the KHFC in 2005

	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds	0.0		-	0	0
- MBSs	4.0	6	77	160	100
- Total				160	100
Recipient of subsidies					
- Households	4.4	6	66	151	94
- Financial institutions	0.0		-	0	0
- KHFC			16	9	6
- Total				160	100

Sources: Bank of Korea; KHFC; Bloomberg;.BIS. Table A2

The KHFC also runs a sizeable mortgage insurance operation. The main objective of this division is to help low-income households obtain mortgages to rent or purchase a home. Using publicly available data, it is impossible to determine whether the KHFC distributes any of its subsidy to households or financial institutions through its mortgage insurance operation. Nevertheless, Genworth Financial's decision to establish mortgage insurance operation in Korea suggests that the KHFC is not under-pricing its mortgage insurance (see Seo (2006)).

Malaysia

Cagamas is able to raise debts at lower cost than private financial institutions, but this funding advantage is not due to any explicit or implicit government support and hence is not a government subsidy. Yields on Cagamas bonds are roughly 40 basis points below the yields on bonds issued by other AAA-rated private financial institutions and have an average

maturity of 4 years (Table A3). The yield differential is primarily attributable to the greater size and liquidity of Cagamas bonds. Cagamas is the largest private bond issuer in Malaysia, which account for 12 per cent of non-government bond outstandings and 20 per cent of bond market turnover according to Bank Negara Malaysia. Cagamas also benefits from having a strong shareholder base, which includes several large Malaysian and international banks as well as Bank Negara Malaysia (Kokularupan (2005)).

Cagamas' Funding Advantage in 2005

	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds	0.7	4	60	16	43
- MBSs	1.1	5	41	21	57
- Total				37	100
Recipient of subsidies					
- Households[1]	1.5		-	-	-
- Financial institutions	1.0	4	27	10	27
- Cagamas				-	-
- Total				37	100

[1] Cagamas purchased pools of staff housing loans from the Malaysian government.

Sources: Cagamas; Bloomberg; BIS. Table A3

Given the structure of the Malaysian housing market and the available data, it is difficult to fully estimate the distribution of Cagamas' lower funding costs. In particular, it is impossible to estimate the portion of the funding advantage that is distributed to households through lower interest rates on their mortgages. We cannot differentiate between mortgages that are financed by Cagamas and mortgages that are financed by banks and other lenders, as Cagamas does not lend directly to households, it only purchases existing mortgages from other lenders.

We estimate that Cagamas passes on roughly a quarter of its funding advantage to banks and other lenders by purchasing housing loans at the Cagamas Rate, which is almost 30 basis points below these institutions' own funding costs. Cagamas purchases two-thirds of its housing loans from commercial banks and the rest from finance companies and Islamic lenders. Uncertainty regarding the portion of the subsidy distributed to households via lower

interest rates on housing loans prevents us from determining the share of the funding advantage that is retained by Cagamas.

Hong Kong

HKMC's ability to raise debts at lower cost than private financial institutions accounts for its entire subsidy, which is estimated to be less than 0.003 per cent of GDP in 2005. This government subsidy is small because the housing finance agency has only a small funding advantage over other issuers and it issues moderate amounts of bonds and MBSs.

Government subsidies received by the HKMC in 2005

	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds	0.7	4	10	3	97
- MBSs	0.1	4	1	0	3
- Total				3	100
Recipient of subsidies					
- Households	0.0	7	-	-	-
- Financial institutions	0.4		-	-	-
- HKMC				-	-
- Total				3	100

Sources: Hong Kong Monetary Authority; Hong Kong Mortgage Corporation; Bloomberg; BIS. Table A4

Yields on HKMC bonds are roughly 10 basis points below the yields on bonds issued by similarly rated financial institutions (Table A4). This funding advantage partly reflects the housing agency's strong implicit government guarantee. The HKMC has the same credit rating as the Hong Kong government, and upgrades and downgrades to Hong Kong's sovereign rating have been reflected immediately in HKMC's rating. The major rating agencies state that the HKMC receives strong government support – it can call on HK$1 billion of equity capital and HK$10 billion of revolving credit facility from the Hong Kong government – and is therefore unlikely to be allowed to default on its obligations (Chan et al (2005) and Wa et al (2005)). HKMC's funding advantage is also attributable to its favourable tax treatment. Income tax is not levied on HKMC bonds' coupon payments, whereas interest income from other non-government bonds attracts a tax rate of either 7.5 or 15% (Yiping et al

(2006)).

The structure of the Hong Kong housing market makes it difficult to estimate the distribution of HKMC's government subsidy. In particular, it is impossible to estimate the portion of the subsidy that is distributed to households through lower interest rates on their mortgages. This is because we cannot differentiate between mortgages that are financed by the HKMC and mortgages that are financed by banks and other lenders, as the HKMC does not lend to households but only purchases existing mortgages from other lenders. Discussions with market participants suggest that the HKMC has not contributed directly to the sharp fall in mortgage rates over the past few years. However, it has provided an important source of liquidity for foreign banks and smaller local banks (which do not have large deposit bases), thereby making it easier for these institutions to compete in the Hong Kong mortgage market.

While the HKMC does not appear to have lowered the cost of housing finance in Hong Kong, its mortgage insurance division has certainly improved households' access to housing finance. The HKMC insures a fifth of all mortgages in Hong Kong and provides insurance coverage for up to 25% of the property value, thereby enabling banks to increase their lending from 70% to 95% of the property value without incurring additional credit risk. The HKMC hedges roughly half of the credit risk from its mortgage insurance operations with approved reinsurance companies (HKMC (2006)). We have not included HKMC's mortgage insurance operations in our subsidy calculations because it is impossible to determine whether the insurance is offered at market rates or not using publicly available data.

The HKMC purchases the loans from the originating financial institution at face value and pays them only a servicing fee for managing the loans. This suggests that little if any of HKMC's estimated subsidy is passed on to lenders. This funding policy, together with excess liquidity in Hong Kong's banking system, has reduced banks' incentives to sell their mortgage loans to the HKMC.

India

NHB's ability to raise debts at lower cost than private financial institutions accounts for its entire subsidy of 0.006–0.009 per cent of GDP in 2005 (Table A5). NHB's main source of debt finance is its Standard Agency Bonds. These bonds have an average maturity of 3 years, and their explicit government guarantee means that they trade at yields that are roughly 50 basis points lower than those on bonds issued by private financial institutions.

The Indian government has also permitted the NHB to issue special Capital Gains Bonds, which contribute to the majority of the housing finance agency's subsidy. These bonds are tax-exempt and trade at yields that are 150 basis points below those issued by banks and other private lenders. In April 2006, the Indian government removed the NHB from the list of

government agencies that could issue Capital Gains Bonds (Doshi and Bhoumik (2006)). This decision will clearly increase the housing finance agency's funding cost in the future. The NHB does not issue MBSs to fund its own lending, though it does issue MBSs on behalf of private financial institutions. The housing finance agency does not receive direct grants from the Indian government.

Government subsidies received by the NHB in 2005

	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds (Taxable)	0.8	3	52	12	22
- Capital Gain Bonds	0.7	5	150	45	78
- MBSs	0.0		-	0	0
- Total				57	100
Recipient of subsidies					
- Households	-		-	-	-
- Financial institutions	1.7		-	-	-
- NHB				-	-
- Total				57	100

Sources: Reserve Bank of India; National Housing Bank; Bloomberg; BIS. Table A5

The structure of the Indian housing market prevents us from estimating the exact distribution of NHB's subsidy. Similar to Malaysia and Hong Kong, we cannot estimate the portion of the subsidy that is distributed to households through lower interest rates on their mortgages, as we cannot differentiate mortgages that are financed by the NHB from those that are financed by banks and other lenders. This is because the NHB does not lend directly to households; it only lends directly to banks and housing finance companies, with the loans secured against the financial institution's balance sheet and a specific pool of housing loans. The available evidence indicates that the NHB has not lowered mortgage rates, but it has increased the supply of housing finance.

Market participants suggest that the NHB has passed on much of its estimated subsidy to banks and other lenders, with the housing agency's loans priced at a very small spread over its funding costs. NHB loans are a particularly cost effective source of funding for housing finance companies and co-operative institutions, which normally do not have the large and help these institutions compete with banks (which have better access to deposits). However,

data limitations prevent us from quantifying the portion of the estimated subsidy that is passed on to financial institutions.

The NHB is in the process of establishing the Mortgage Credit Guarantee Company in collaboration with several private and supranational entities. This entity will be the first to offer mortgage insurance in India. The main objective of the agency is to protect lenders against default, thereby allowing them to offer lower mortgage interest rates to households.

Singapore

The HDB receives the largest estimated subsidy among the seven housing finance agencies in our sample at 0.46–0.50 per cent of GDP in 2005. Annual grants from the Singaporean government account for three quarters of the total subsidy (Table A6). The HDB receives regular annual grants to help fund its lending operations and at the end of each financial year, the government automatically covers any operating loss to preserve the agency's equity base.

The housing finance agency's ability to borrow from the government and banks under favourable terms as well as raising debts at lower cost than private financial institutions make up the balance of its subsidy. HDB's sizeable funding advantage reflects its explicit government guarantee and its large borrowings. Loans from the Singaporean government have maturities of between 10 and 30 years, and have the same yields as Singapore government bonds. These yields are roughly 30 basis points lower than those achieved by private financial institutions. Loans from private banks are also priced off the Singapore sovereign yield curve, but typically have maturities of one year or less. The HDB also issues a small amount of bonds. These bonds trade at yields that are roughly 20 basis points below the yields on bonds issued by major private financial institutions. The HDB does not issue MBSs.

Government subsidies received by the HDB in 2005					
	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds	0.2	6	20	2	0.3
- Loans	7.1	15	33	123	17.3
- MBSs	0.0		-	0	0
- Government grant				587	82.4
- Total				712	100
Recipient of subsidies					
- Households	1.5	22	291	717	100
- Financial institutions	0.0		-	0	0
- HDB				0	0
- Total				717	100

Sources: Monetary Authority of Singapore; Housing Development Board; Bloomberg; BIS. Table A6

We estimate that the entire government subsidy received by the HDB is passed onto households in the form of lower interest rates on their mortgages. Low and middle income households can borrow from the HDB at interest rates that are 290 basis points below the rates offered by banks and other financial institutions. The housing agency used to offer mortgage loans to high-income households at market interest rates, but it ceased doing so in 2003, thereby conceding this segment of the market to banks and other financial institutions.[26] Financial institutions do not receive any subsidies, nor is any part of the subsidy retained by the HDB.

[26] The housing finance market is closely intertwined with the Central Provident Fund (CPF) – the country's defined contribution pension scheme. Households can use their CPF savings as a deposit for their apartment and households can use their monthly CPF contributions to service their housing loan (McCarthy et al (2001)).

Thailand

GHB's ability to raise debts at lower cost than private financial institutions accounts for half its estimated subsidy of 0.04–0.08 per cent of GDP in 2005 (Table A7). GHB's formal government guarantee allows it to issue reasonably large quantities of bonds at yields that are roughly 80 basis points lower than those achieved by private financial institutions. The housing finance agency does not issue MBSs, but it is considering doing so to broaden its funding base.

The other half of the estimated subsidy is attributable to GHB's lower equity position than comparable private banks. The GHB has an equity-to-assets ratio of 4.7 per cent in 2005, compared with 8.9 per cent for the larger private banks. This smaller equity base reduces GHB's average funding cost because equity investors demand a higher return than bond investors and depositors. The GHB can operate with less equity than other banks because it has a formal guarantee from the Thai government.

Government subsidies received by the GHB in 2005

	Amount (US$ billion)	Average maturity (years)	Interest rate differential (basis points)	Subsidy	
				US$ million	% of total
Source of subsidies					
- Bonds	1.2	5	83	48	47
- Equity				53	53
- Total				101	100
Recipient of subsidies					
- Households					
- deposits	0.7	2	92	13	13
- loans	3.2	15	25	87	87
- Financial institutions	0.0		-	0	0
- GHB				0	0
- Total				101	100

Sources: Bank of Thailand; Government Housing Bank; Bloomberg; BIS. Table A7

Most of the subsidy received by the GHB appears to be passed onto households through lower interest rates on their mortgages. The housing loans have interest rates that are 25 basis points lower than those offered by private lenders. The average maturity of the housing loans is 15 years. Households also receive interest rates on their deposits in the

GHB that are roughly 90 basis points higher than those offered by banks and other lenders. The GHB also assists households that are in financial distress to restructure their housing loans. The housing finance agency was initially assigned this role to help households through the deep economic recession that that the followed the Asian Financial Crisis.

The success of this program has eventually prompted the Thai government to make it a permanent part of the GHB's operations. However, we have not included these operations in our subsidy calculations because it is impossible to quantify the benefits provided to Thai households. Financial institutions do not receive any of the estimated subsidy as the GHB uses its own branch network to originate and service its housing loans. The housing finance agency also does not retain any of the estimated subsidy.

Appendix 4 – Estimates of the size and distribution of government subsidies in 2004

To test the robustness of our main estimates, we have calculated the size and distribution of housing finance agencies' subsidies for 2004 using the same methodology (Tables A8).[27] For most of the housing finance agencies the estimates for the two years are similar, and for the others the differences in the size and/or distribution of the government subsidies can be explained by changes in the housing finance agencies' operations.

Estimated size of government subsidies to housing agencies in 2004

Country	Estimated range for subsidy[1]	Main subsidy channel
Hong Kong	0.003–0.011 (0.000–0.003)	Bonds/MBSs
India	0.004–0.006 (0.006–0.009)	Bonds/loans
Japan	0.011–0.030 (0.002–0.007)	Bonds/MBSs
Korea	0.018–0.022 (0.015–0.025)	MBSs
Malaysia	0 (0)	--
Singapore	0.656–0.707 (0.459–0.498)	Subsidy/loans
Thailand	0.025–0.066 (0.038–0.081)	Bonds/subsidy

[1] As a percentage of GDP. 2005 estimates shown in parenthesis.

Sources: national central banks; government housing agencies; BIS. Table A8

Four of the housing finance agencies in our sample – the HKMC, the NHB, the KHFC, the GHB and Cagamas – received subsidies in 2004 that were similar in size to those received in 2005. The main sources of the estimated subsidies and their distribution amongst the end recipients were also very similar for both years.

The other two housing finance agencies – the HDB and the GHLC – had larger estimated subsidies in 2004 than in 2005. The main sources of the estimated subsidies were also different.

GHLC's estimated subsidy was larger in 2004 because the housing finance agency raised

[27] The data underlying these estimates are available from the corresponding author on request.

more debt and received more FILP loans. Also, a combination of greater direct lending by the GHLC and a larger interest rate differential between the mortgages offered by GHLC and those offered by banks and other financial institutions gave the Japanese households a bigger share of the estimated subsidy. The reduction in GHLC's use of FILP loans and their direct lending to households in 2005 represented a deliberate policy by the Japanese government to retrench their involvement in the economy.

HDB's larger estimated subsidy primarily reflected bigger grants from the Singapore government. Consistent with 2005, households received all of the estimated subsidies.

Appendix 5 – US housing agencies – historical background

The United States government's initial intervention in the housing finance market was a product of the Great Depression. During this time, numerous households defaulted on their loans and many financial institutions failed. The structure of the housing finance market – short-term, bullet repayment loans and a highly fragmented banking system – contributed significantly to the disaster (see Colton (2002)). In the mid-to-late 1930s the government established several agencies to strengthen the housing market.

A system of Federal Home Loan Banks was established in 1932 to provide an additional source of funding to Savings & Loans banks. Home Owners Loan Corporation was established in 1933 to refinance other lenders' delinquent housing loans and introduced long-term, fixed rate mortgages. Federal Housing Administration was established in 1934 to provide mortgage insurance. Federal National Mortgage Association (Fannie Mae) was founded in 1938 to purchase mortgages from banks and other primary lenders.

In the late 1960s, growing public indebtedness forced the United States government to reduce the debt of public corporations. In 1968, the government privatised Fannie Mae and established Government National Mortgage association (Ginnie Mae) – a new, smaller housing finance agency that would only buy Federal Housing Administration and Veterans Administration loans. In 1970 the United States government established Federal Home Loan Mortgage Corporation (Freddie Mac) – another privately owned, but government sponsored housing agency – to compete with Fannie Mae. These two housing finance agencies do not have a formal government guarantee, but their close relationship with the government and their importance to the United States economy has meant that investors regard them as having an implicit government guarantee (Greenspan (2004)).

High and variable interest rates in the 1970s caused financial difficulties for Savings & Loans banks, which funded long-term housing loans with short-term deposits. In 1982 the President's Commission on Housing recommended that Fannie Mae and Freddie Mac should help develop MBS markets so that financial institutions could better manage their interest rate risk (see President's Commission on Housing (1982)). These two housing finance agencies have successfully used their implicit government guarantee to dominate the secondary mortgage market in the United States.