

Economic Watch

Financial Systems & Regulation

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Economic Analysis

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Macroprudential measures on mortgage lending. Country experiences

- **Macroprudential policy: key to rein in the financial cycle**

One of the main lessons of the recent crisis is that the influence of financial factors on the economic cycle was understated. When systemic risks emerge it is too late for traditional economic policies to act. Macroprudential policy has been widely used to address systemic risks in the financial sector and thus help policymakers to smooth the economic cycle. The empirical evidence points to real estate bubbles as one of the most important drivers of banking crises and systemic risk.

- **Keeping the mortgage market controlled is of extreme importance**

Three basic types of macroprudential measures are being applied in many countries: 1) credit-related; 2) liquidity-related; and 3) capital-related. These different tools aim at mitigating systemic risks arising from 1) excessive credit and asset price growth; 2) excessive leverage; 3) systemic liquidity risk; and 4) risks related to large and volatile capital flows. The link between macroprudential policy and the mortgage market is clear, as many economic crises have been originated in the real estate sector, and downturn episodes tend to be more profound and tend to last longer when combined with banking crises and/or the formation of asset price bubbles.

- **Large differences between countries in the selection of measures**

Domestic authorities have designed and calibrated the instruments according to their specific circumstances. Five relevant considerations: 1) the use of a combination of tools was usually preferred to single instruments. As a general rule, when credit-related instruments are used to address risks generated by excessive credit growth, it may require to limit funding risks with liquidity-related instruments and to provide a cushion with capital-related instruments. 2) Macroprudential instruments are designed to target specific goals. This makes them more precise and potentially more effective than macro policy. 3) Making countercyclical adjustments of macroprudential instruments is a common practice. The adjustments are gradual to facilitate a progressive impact of the instruments, but in fact, in some cases they also reflect the need to proceed cautiously on a trial and error basis. 4) Typically, the design and calibration of the instruments used are based on discretion and judgment, as opposed to rules. 5) Implemented in coordination with macroeconomic policies.

- **Effective, with important caveats**

Macroprudential tools have generally been effective to reduce systemic risk in the financial sector, either over time or across institutions and markets. However, macroprudential policy measures have important drawbacks: availability of data; social costs and distortions in the functioning of the markets; and the calibration of the instruments may be difficult. Certain pre-conditions should be in place: a strong regulatory and supervisory framework and sound macroeconomic policies. The benefits of macroprudential policy should be weighed against these costs. All in all, if macroprudential tools and monetary and/or fiscal policy measures are implemented together the results to be obtained may be stronger.

1. The role of macroprudential policies to rein in the financial cycle

Macroprudential policy can be characterized as the set of regulations and tools aimed at ensuring financial stability by preventing the build-up of asset price bubbles and financial system imbalances. Macroprudential tools have been used for a long time to address systemic risks, both in developed and emerging countries, but only recently in the aftermath of the financial crisis they adopted an explicit role in managing financial cycles, when macroprudential policy became a G-20 priority amid an intense debate around its optimal architecture and toolkit design. Since then several new macroprudential authorities have been created around the world with the mandate of preventing and mitigating systemic risks by actively managing the financial cycle.

One of the most interesting aspects of financial cycles is that they can develop dangerous imbalances underneath a seemingly stable macroeconomic surface so that when a macro or financial shock occurs, it spreads quickly through the highly interconnected markets. When this happens, it is often too late for fiscal policy and even monetary policy to control the situation. Nonetheless, if these traditional economic policies are used in conjunction with active macroprudential policy measures the results can be much more encouraging.

Macroprudential policy also seeks to reconcile microprudential regulation and supervision with the overarching goal of financial stability. Microprudential supervision, already contributes to financial stability by ensuring the safety and soundness of individual banks but, by dismissing the aggregate negative impact that the accumulation of individual decisions (taken in response to microprudential requirements) can have over the financial system, it remains largely blind to systemic imbalances. Macroprudential policy tries to fix this by adopting a dual approach: on the one hand, it aims to track and control the evolution of systemic risk and its procyclical nature (the time dimension). On the other hand, it tries to identify how risks are allocated within the financial system (the cross-sectional dimension). This explains why most of the tools that have been and are being used with a macroprudential purpose are indeed microprudential tools that have been calibrated to achieve systemic goals such as mitigating bubbles, capital inflows or outflows, and credit booms.

This note focuses on the use of macroprudential tools to manage and mitigate real estate bubbles, which have been identified in recent economic history among the most important drivers of banking crises and systemic risk. In this sense, the recent 2007-2008 subprime mortgage crisis has triggered an increased awareness of the importance of systemic risk and financial stability. The depth and length of the crisis illustrates the overarching importance of maintaining the mortgage market under control, especially during growth periods, due to the interconnectedness of international financial markets, which helped to spread the crisis globally, even though the gestation of it was purely local.

2. Different tools for different objectives. The importance of controlling mortgage lending

Traditionally, domestic authorities have used a wide range of tools to address systemic risk in the financial sector, most of which are prudential tools but also a few of them belong to other public policy frameworks (i.e. fiscal, monetary and foreign exchange policy, and even administrative or organizational measures). According to the IMF¹, these tools can be divided into three types of measures, not only limited to the mortgage sector:

- **Credit-related:** caps on the loan-to-value (LTV) ratio, caps on the debt-to-income (DTI) ratio, limits on foreign currency lending, mandatory insurance for riskier loans and caps on credit volume or credit growth.
- **Liquidity-related:** limits on net currency position or net currency mismatch, limits on maturity mismatch, limits on funding gaps, core funding requirements and prudential stability levies/taxes.
- **Capital-related:** countercyclical or time-varying capital requirements (including changes in the risk weight of certain loans), dynamic or time-varying provisions, reserve requirements and restrictions on profit distribution.

Usually a tool (or a combination of tools) is selected to mitigate one, or more than one, of the following broad categories of systemic risk factors:

- Risks generated by excessive credit growth and credit-driven asset price inflation.
- Excessive private sector leverage and the subsequent deleveraging process.
- Systemic liquidity risk (i.e. financial entities are not able to obtain short-term funding).
- Risks related to large and volatile capital flows.

According to this classification of tools and goals, the link between macroprudential policy and the mortgage market is straightforward and of capital importance, more so since a large number of economic crises have been originated in the real estate sector where house price booms seem to be recurring. Furthermore, economic downturn episodes tend to be more profound and more protracted when combined with banking weaknesses/crises and/or the formation of asset price bubbles.

1: International Monetary Fund, 2011. "Macroprudential policy: What instruments and how to use them?" IMF Working Paper No 11/238.

3. Macroprudential tools in the mortgage market. Lessons from country experiences

Focusing on the effectiveness of macroprudential policies in the mortgage market and/or real estate sector, the country experiences analyzed show that:

1. Credit-related instruments may be useful to address systemic risks generated by credit growth or asset price inflation. Of these, LTV² and DTI caps can be either maintained unchanged or adjusted countercyclically. They may be accompanied either by caps on credit growth or term to maturity, or by mandatory insurance for high risk loans. They may also be supplemented by capital-related instruments, such as reserve requirements or dynamic provisioning, should the credit boom become more generalized.
2. If the source of risk is foreign currency lending, the introduction of limits on this type of activity may be of help. Furthermore, a higher capital consumption for this type of lending, as well as the establishment of liquidity-related instruments such as limits on currency mismatch or a stable funding ratio may curtail this activity. These measures have been adopted in Central Eastern European countries (e.g. Poland and Hungary) to curb mortgage lending in foreign currency.
3. The use of capital-related instruments seems to be a good choice to address risks arising from excessive leverage or insufficient volume of own funds. These measures provide a countercyclical buffer through adjustments in the capital requirement, the risk weights of assets, or the provisioning effort, and can cut excessive leverage. If leverage growth is the result of banks' credit expansion, capital-related measures can be supplemented by credit-related instruments to tackle the source of risk.

Country policymakers have designed and calibrated the selected macroprudential instruments to their specific circumstances, taking into consideration the source of risk, the ability of the financial system to deal with it (or circumvent the macroprudential measures) and the system's capacity to bear the cost of additional regulation and supervision. Five considerations are relevant:

- **Single instrument vs. set of tools:** The use of a variety of instruments enables to address the same risk from different angles or different risks at the same time. A combination of instruments reduces the banks' capacity to dodge all the measures and provides a greater assurance of effectiveness.

Caps on LTV and DTI, for example, complement each other in limiting the cyclicity of collateralized lending, with the LTV addressing the wealth or savings aspect, and the DTI the recurring income aspect of the same risk. In this respect, caps on LTV and DTI ratios, for example, have been used together, combined with limits on maturity tenors, in **Israel, Hong-Kong** and **Korea**, and with mandatory insurance for loans with LTV in excess of the general limit in **Hong-Kong** and **Canada**.

Some other times, social and other developing aspects are taken into account when the instruments are calibrated, for example in **Canada**, where the first introduction of macroprudential measures (in the form of mandatory insurance for high LTV mortgages) was passed after World War II to facilitate returning soldiers access to houses in favorable conditions.

As a general rule, when credit-related instruments are used to address risks generated by excessive credit growth, it seems to be useful to limit funding risks with liquidity-related instruments and to provide a cushion with capital-related instruments. A good example of

² In order to introduce LTV caps, it is crucial to ensure that real estate appraisers, in charge of valuing the property used as collateral (the denominator) are independent and their methodology is rigorous.

this combination of policies was found in **New Zealand**, where all types of macroprudential tools are being used to keep mortgage lending under control: credit-related tools (LTV limits), liquidity related tools (core funding ratio) and capital-related tools (countercyclical capital buffer and sector-specific capital requirements).

On the other hand, **Sweden** chose to use a single macroprudential tool (increases in the risk weight of domestic mortgages in the calculation of regulatory capital ratios) to rein in growing risk signals in the domestic mortgage market.

The use of multiple instruments may impose a higher cost on banks and are harder to calibrate and communicate, so it is important to choose instruments that minimize the cost and plan the implementation carefully in order to avoid unnecessary costs on the financial sector.

- **Broad-based measures vs. targeted measures:** Macroprudential policy's goals are typically narrower than monetary policy's goals, and the ability of macroprudential instruments to target specific types of activities is another advantage that makes them more precise and potentially more effective.

It is typical that many different instruments, chiefly credit-related, are used together and calibrated during the cycle to target specific risks. Some countries apparently target specific tools for specific objectives, whereas other countries apply the instruments broadly with little differentiation.

The distinction between specific tools and broader or general tools can be found in **Sweden**. In November 2013 Swedish authorities were considering two types of measures: 1) raise the risk-weight floor for domestic mortgages, and 2) introduce a countercyclical capital buffer. The purpose of the countercyclical buffer is to force banks to accumulate extra capital during boom periods so that it can be used during recessions. When banks do this they must set aside capital for all types of lending, not only mortgages, so if banks try to compensate for this higher capital requirement by raising lending rates there is a risk that all lending rates will be increased, not just mortgage rates. Thus, if the goal is to reduce the risk associated with household indebtedness, it seems more accurate to focus on mortgages. So, the Swedish authorities decided to raise the risk-weight floor of domestic mortgages from 15% to 25%.

Further examples of narrow-target measures are caps on LTV and DTI ratios that have been applied according to the loan size, the location and the value of the property in **Hong-Kong** and **Korea**. On the other hand, the use of a countercyclical capital buffer and a core funding ratio in **New Zealand** are examples of broad macroprudential instruments, in the sense that they affect all lending activity in the country.

However, the targeted approach requires more granular data, has a higher administrative cost and may be more susceptible to circumvention. A cost-benefit analysis should be in place when considering a targeted approach to macroprudential policy measures.

- **Fixed measures vs. time-varying adjustments:** It is usually helpful to adjust macroprudential instruments across the cycle. Dynamic provisioning (in most cases) and the Basel III capital conservation buffer are self-adjustable instruments designed to be built-up during booms and used during recessions in order to limit the severity of the cycle.

Other instruments like DTI or LTV caps, ceilings on credit growth and capital requirements may need to be adjusted during the cycle at the discretion of the policymaker. Generally speaking, a rules-based approach entails less risk than a discretionary approach. Especially when a number of different instruments are used it may be impossible to select objective rules for their adjustment. However, when discretion is necessary it is very important to avoid frequent and ad-hoc changes in the calibration of the measures, base them on sound and

transparent principles, and explain the rationale publicly to enhance transparency and effectiveness.

We found that making countercyclical adjustments of macroprudential instruments is a common practice. Instruments aimed at credit growth are adjusted frequently, basically to give the instruments a progressively larger countercyclical impact, but in fact, in some cases they also reflect the need to proceed cautiously on a trial and error basis. Capital-related measures, such as countercyclical capital requirements and dynamic provisioning, are designed to provide a buffer through the cycle, but some countries have adjusted them at different phases of the cycle to increase their countercyclical impact.

As already mentioned, a clear example is **Sweden**, where the capital requirement for domestic mortgages was adjusted during the crisis through increases in the contribution of this type of loans to risk weighted assets.

Actually, macroprudential instruments typically have an adjustable nature in all the countries analyzed (to see in detail please go to the appendix of this document), among which the best examples are **Hong-Kong** and **New Zealand**. In **Hong-Kong**, limits to affordability ratios through caps on LTV have been in force since the 1990s, with clear differences between the different types of properties and the value of the properties used as collateral, typically combined with other macroprudential measures such as mandatory mortgage insurance. These measures have had several rounds of adjustments since their introduction according to the different phases of the business cycle. In the case of **New Zealand**, we would like to highlight the use of LTV caps in a dynamic way. In this country high LTV mortgages are not automatically banned, but limited, in the sense that only 10% of new mortgages of each bank may be granted with a LTV ratio in excess of 80%.

- Typically, **the design and calibration of the instruments used are based on discretion and judgment, as opposed to rules**. The implementation of the instruments is in most cases a learning-by-doing process, in which judgment on what instruments are to be used and how to calibrate them is often formed by trial and error, depending on the type of shock the system is facing.

Most of the countries studied have adopted a discretionary approach to macroprudential policy measures. The exception is the use of rules-based dynamic provisioning in **Spain** and other countries in Latin America where the amount of provisions was the result of the application of a formula established well before the start of the crisis.

The main problem of this “rules-based” approach is that the calibration of the formula that determines the amount of provisions is always complicated and the recent financial crisis proved that dynamic provisions in Spain were not sufficient to cope with the consequences of the recession as they underestimated the actual risk of real estate exposures.

- **Coordination with other policies**: In general, macroeconomic policies should always be the primary tool to use when the source of systemic risk is domestic demand imbalances. Macroprudential policy should be used as a complement to traditional macroeconomic policies.

On the other hand, macroprudential policy is more effective to target systemic risks in the financial sector and should be used primarily to increase its resilience. In any event, mechanisms should be established to address coordination challenges and limit any potential policy conflicts.

In **Korea**, the aim in the years previous to the financial crisis was to stabilize house prices, mainly in the capital region. The set of tools used to accomplish this goal included adjustments in LTV and DTI caps, moral suasion, subsidies to house financing, changes in taxes, direct support to the domestic construction sector and government supply of new

dwellings. All these policies had a clear impact on the volume of new houses built and sold, as well as on house prices.

The following table summarizes the main characteristics of the macroprudential policies implemented in the countries studied.

Table 1
Case studies: summary of macroprudential policy instruments

	Target	Period analyzed	Tools			Combination Vs single	Target specific types of activities	Fixed measures Vs Time-varying	Discretionary Vs rules	Institution
			Credit	Liquidity	Capital					
Canada	Control mortgage lending risk	Since 1950s	LTV, maturity of mortgages with >80% LTV capped at 25y, and mandatory insurance for high LTV loans	No	Annual stress test of insured mortgages	Combination	Yes	Time-varying	Rules-oriented	Canada Mortgage and Housing Corporation
Sweden	Control excessive risk of domestic mortgages	2013	No	No	Increase in the minimum risk weight for mortgages	Single	Yes	Time-varying	Rules-oriented	Riksbank and Finansinspektionen
Hong Kong	Control excessive risk level of the mortgage market	Since 1990s	LTV, DTI and mandatory mortgage insurance	No	No	Combination	Yes	Time-varying	Discretionary	Hong Kong Monetary Authority
South Korea	Control excessive risk level of the mortgage market	Since 2002	LTV and DTI	No	No	Combination	Yes	Time-varying	Discretionary	Korean Financial Supervisory Service (FSS)
New Zealand	Escalation of house prices and rise in residential mortgage lending	2013	LTV (in the form of both speed limits and outright limits)	Core funding ratio of 75%	Countercyclical capital buffer and Sector-specific capital requirements	Combination	Yes	¿?	Discretionary	Bank of New Zealand and Ministry of Finance
Israel	Limit the growing share of housing loans on banks BS	Since 2010	LTV, DTI, limits of variable rate mortgages and prohibition of mortgages with maturity of >30y	No	Additional provisions and RWA charge for high DTI loans	Combination	Yes	¿?	Rules-oriented	Bank of Israel

Source: BBVA Research

4. Advantages and caveats. The effectiveness and costs of macroprudential policy

According to the country experiences reviewed, the use of macroprudential tools has produced positive results in controlling the sources of systemic risk identified in each country, and the effectiveness of the tools does not seem to depend on the stage of economic development or type of exchange rate regime.

Economies with fixed or managed exchange rates, where room for interest rate policy is limited, facing large capital inflows or having thin financial markets and a bank-dominated financial system tend to use macroprudential instruments more extensively, but the instruments seem equally effective when used by countries with flexible exchange rate regimes and the use of macroeconomic policies is unencumbered. Macroprudential policies are used by both emerging and advanced economies, although in the latter they can be somewhat intrusive in some cases. Nonetheless, if the use of traditional macroeconomic policy tools is limited (for instance, if a country is part of a trade area or economic union, and thus is unable to apply monetary policy measures and/or the room for flexible fiscal policy measures is reduced), the advantages that may result from a combination of macroeconomic and macroprudential policy measures is higher.

However, important caveats/drawbacks apply to these conclusions:

- Data availability and quality of the information: Firm-specific data are preferable since many of the macroprudential instruments are aimed at the balance sheet of financial institutions, but these are not always available or consistent over time or across countries.
- There are costs involved in using macroprudential instruments, as is the case with regulation more generally, and the benefits of macroprudential policy should be weighed against these costs. These costs include, among others, monitoring costs and compliance costs.
- Calibrating the instruments may be difficult, which could limit growth unnecessarily or generate unintended distortions if not done appropriately. For instance, a large proportion of the population may be ruled out of the mortgage market if they fail to comply with strict LTV or DTI criteria, regardless of their repayment capacity over the life of the loan.
- Furthermore, compliance with macroprudential tools can be circumvented by financial entities. This may result in shadow banking entities taking advantage of activities previously carried out by regulated banks but abandoned once the macroprudential measures are implemented. On the other hand, banks can be tempted to circumvent macroprudential measures focused on mortgage lending by offering unsecured loans to the same clients. These practices increase the overall risk of the banking system.
- Another caveat applies exclusively to LTV caps. When discussing LTV, a key aspect is the way the property value (denominator of the ratio) is determined by real estate appraisers, given that the amount of the loan depends on the value assigned to the property, and thus the risk of each entity and, in the end, of the whole banking sector depends heavily on the appraisers' activity, among other things. Each country analyzed determines in a different way how their real estate appraisers are organized, so a detailed explanation of their activities falls outside the scope of this paper, especially if we try to make an international comparison. Nevertheless, real estate appraisers remain a point of concern due to several reasons: how is their activity supervised, and by which authority? Do appraisers depend in any way on lenders? How are the appraisers' fees determined and who pays them, i.e. is there a conflict of interest in the appraisers' activity? Are the value appraisals biased in any respect? All these caveats affect LTV caps, and may dent the credibility and effectiveness of this measure from a macroprudential perspective.

- In addition, certain pre-conditions should be in place for the successful implementation of macroprudential policy. A strong regulatory framework is essential, along with high-quality supervision, and good macroeconomic policies. An appropriate institutional framework for macroprudential policy is also vital.
- Finally, important questions remain unanswered, including the issues posed by regulatory or cross-border arbitrage, data gaps that prevent a more careful analysis of the cross-sectional dimension of systemic risk, and the side-effects of applying macroprudential instruments. The relationship between macroprudential policy and microprudential regulation also needs to be further clarified in order to ensure close coordination between the oversight of the whole financial system and that of its individual components in order to adequately capture systemic risk.

In this vein, the inefficiencies derived from the use of macroprudential policy as stabilization tool, especially those that result in any type of exclusion of certain groups of homeowners from the financial market can be curbed if these macroprudential tools are used in combination, or together with other measures that fall within the scope of monetary or fiscal policy.

For example, the combination of caps of LTV and mandatory insurance for loans with LTV in excess of the general limit in **Hong-Kong** and **Canada**, has allowed a large number of homeowners access to the mortgage market even though they did not qualify according to the first general threshold of a certain LTV cap. Furthermore, this was accomplished without incurring additional losses in the banking sector. On the other hand, **Korea** has proven that in order to promote financial stability it is helpful to combine macroprudential tools and macroeconomic measures.

All in all, the use of macroprudential policy tools by domestic authorities (as demonstrated in the case studies included in this paper) has been effective to reduce systemic risks in the banking sector, although in some cases the introduction of these measures has produced certain distortions in the functioning of the banking sector. Nevertheless, the overall conclusion is positive, i.e. the introduction of macroprudential tools has been positive for the banking systems' financial stability.

However, the objectives to be accomplished by macroprudential policy measures should be confined to the control of systemic risks stemming in a country's banking system, especially if they are not used in isolation but rather in combination with other macroprudential tools. The use of this type of policy measures may be ineffective to tackle other risks outside the financial sphere given that macroprudential policy measures are applied only within the "official" financial system. Anyway, when macroprudential tools and monetary and/or fiscal policy measures are implemented together the results to be obtained may be deeper and more far-reaching.

Appendix: case studies

1. Israel: debt-to-income, variable rates proportion and maturity caps

Israel adopted the first set of macroprudential measures back in 2010, and adjusted them during the following years:

- July 2010: Requirement for banks to make additional provisions for housing loans with high loan-to-value ratios.
- October 2010: Requirement for a higher capital provision for floating-interest loans granted with a high loan-to-value ratio.
- May 2011: Limiting the adjustable-interest-rate component of housing loans to one-third of the total loan for loans with maturity of more than five years.
- November 2012: Limiting LTV ratio in housing loans to 75% for first-home buyers, 50% for investors and 70% for home upgrades.
- February 2013: Change of the risk weights for capital charge, and increase in the allowance for credit losses in respect of housing loans.

More recently, Israel focused on tackling certain alarming signals detected in the housing market. On August 21, 2013, the Supervisor of Banks of Israel issued a draft guidance to reduce the risk posed by the public taking out mortgages under conditions that could endanger the future repayment of the loans and, as a result, the risk for the banking system inherent in such loans. The main decisions included in the draft, to be applied to mortgages issued as of September 1, 2013, are:

- Banks shall not approve a mortgage if its monthly payment exceeds 50% of the borrower's monthly income. Loans with a monthly payment between 40% and 50% of the borrower's monthly income will have a risk-weighting of 100% in the calculation of regulatory capital ratios.
- Banks shall not approve a mortgage if the portion of the loan at variable interest rates exceeds two-thirds of the amount of the loan. This limitation is to be applied irrespective of the duration of the loan, and comes in addition to the already existing restriction that limits to one-third the portion of a mortgage granted at variable interest rates for a maturity period of less than 5 years.
- Banks shall not approve mortgages with maturity period in excess of 30 years.

The guidance was issued in view of the recent performance of the housing market in Israel: the growing share of housing loans on the banks' balance sheet; the proportion of mortgages granted with high debt-to-income ratios (17% of total mortgages have a debt-to-income level north of 40%); the increasing proportion of mortgage loans at variable interest rates (72% of the total); and the granting of mortgages with maturity period of more than 30 years.

These features pose a potential threat for the stability of the housing market and contain a future risk for borrowers, who under certain circumstances may fail to meet their obligations, especially if interest rates rise in coming months/years or the economic environment turns negative with the subsequent worsening of the labour market conditions. The occurrence of any of these two risks, or both at the same time, could largely impact the borrowers' payment capacity, thus threatening the stability of the financial system.

In this vein, the measures approved should be regarded favourably as they are directed to tackle the roots of the problems. Furthermore, the data analysed (chart 1) shows that monetary authorities in Israel are adopting preventive measures well before actual problems emerge.

Table 2
Israel housing market main indicators

NIS bn	2006	2007	2008	2009	2010	2011	2012	jun-13	CAGR
Total lending to the private sector	555.3	600.3	660.6	654.9	710.6	771.3	793.8	797.1	5.7%
Variation, year on year		8.1%	10.1%	-0.9%	8.5%	8.5%	2.9%	1.8%	
Housing loans	122.1	133.7	151.0	170.0	194.4	219.1	239.7	250.0	11.7%
Variation, year on year		9.6%	12.9%	12.6%	14.4%	12.7%	9.4%	9.4%	
GDP (current prices)	646.7	683.4	723.0	766.0	813.9	871.8	928.3	945.3	6.0%
Variation, year on year		5.7%	5.8%	5.9%	6.3%	7.1%	6.5%	6.6%	
House prices *	73.6	75.0	84.1	88.8	93.1	97.8	101.0	102.8	
Variation, year on year	-23.6%	1.9%	12.1%	5.6%	4.9%	5.1%	3.3%	3.2%	
Total lending / GDP	85.9%	87.8%	91.4%	85.5%	87.3%	88.5%	85.5%	84.3%	-1.5p.p.
Housing loans / GDP	18.9%	19.6%	20.9%	22.2%	23.9%	25.1%	25.8%	26.4%	+7.6p.p.
Housing loans / Total lending	22.0%	22.3%	22.9%	26.0%	27.4%	28.4%	30.2%	31.4%	+9.4p.p.

* House prices is an index. Average of 2012 = 100 Source: Bank of Israel

According to chart 1, growth in mortgage lending was high for the last six or seven years, with growth rates that almost doubled those of GDP. This increase was not solely due to rises in house prices in the country, so it seems reasonable to assume that growth in mortgage lending in Israel may be driven by new lending. In addition, growth in mortgage lending was not accompanied by growth in other types of lending, which in fact reduced their relative weight in total lending (mainly lending to firms) so that total lending to GDP remained roughly constant throughout the whole period analysed at around 85% of GDP. In any event, both housing lending/GDP and total lending/GDP in Israel are low compared to other countries, especially European. For example, housing lending/GDP is roughly 60% in Spain and 40% in the Euro Zone (26% in Israel).

All in all, the measures adopted in Israel are very prudent given that so far there is no sharp accumulation of credit in the economy, and show the monetary authorities' clear intention to tackle an emerging problem that may become dangerous in the future if new mortgage lending standards are loosened in search for higher volumes of credit in a low-rate environment.

2. Sweden: minimum risk weight of domestic mortgages

The Swedish Council for Cooperation on Macroprudential Policy (made up by the Riksbank and the Finansinspektionen) is responsible for preventing the generation of risks in the banking system as a whole, and promote financial stability. The Council has issued two memorandums in 2013 focused on the recent growth in mortgages and the inherent risks in household debt.

First macroprudential memorandum: In May 2013 the Finansinspektionen (FI) established a minimum risk weight of 15% for Swedish mortgages in order to preserve Swedish banks' own funds, so that it covers risks in mortgage portfolios. Main reasons behind this measure:

- **Size:** a large portion of Swedish banks' assets is made up by mortgages (SEK 3.5bn, roughly 100% of Sweden's GDP in 2012, 72% of which are Swedish mortgages). It is therefore crucial for the stability of the Swedish financial sector that banks have sufficient capital to cover the credit risks in their Swedish mortgages.
- **Basel II:** when the Basel II agreement entered into force in 2007 most Swedish banks were permitted to use the internal ratings-based approach (IRB) to calculate the risk of their portfolios. As a result, risk weights of domestic mortgages fell sharply, and so did capital requirements. In 2012 several of the largest banks in Sweden published that the risk weight of their domestic mortgages was between 5% and 8% of the total size of the portfolios. This amount of RWAs was much lower than the risk weights calculated with Basel I, roughly 50%, and well below the 35% in the standardized Basel II approach.
- **Structural changes:** according to the FI during the first months of 2013 there were signs in the Swedish mortgage market that indicate that the risk level was even higher than during the crisis of the 1990s, even though it had not materialized in the form of growing credit losses:

- Household indebtedness: mortgage lending grew by an annual average of more than 15% during the first decade of this century; LTV of new mortgages increased constantly for most part of the last ten years, from 60% to over 70% on an aggregated basis; repayment periods were growing.

These factors led to higher household indebtedness in Sweden, not only compared to other European countries, but also compared to past levels. At the end of 2012 household indebtedness in Sweden was 170% of their annual disposable income, higher than before the 1990s crisis (around 130%).

Moreover, debt ratios of the households that were granted a mortgage more recently are significantly higher than the average level of 170%. According to the FI, 21% of the households analyzed and included in the "2013 Swedish Mortgage Market" report had debts that were more than five times their annual disposable income.

- Real house prices in Sweden reached a level of 230, approximately, in 2008 (Q4, 1994 = 100). Since then a maximum of around 240 was reached in 2011. A slight reduction took place in 2012, falling back to the level of 2008.
- The Department of Real Estate and Construction Management at KTH Royal Institute of Technology showed that some vital information needed to assess the risks associated with increasing LTV ratios is missing in several banking institutions in Sweden. However, there is an estimate of the LTV of new Swedish mortgages from data provided by the main banking institutions that operate in Sweden, that places this ratio at 69% in Q3, 2012, with a steady increase between 2002 (59%) and 2011 (71%).

- Interest rate risk: before the 1990s crisis it was common for mortgage rates to be reset every five years. Since then revision periods for interest rates have shortened, and currently mortgages with 3-month interest rate adjustments have become the norm. Since 1999 roughly 50% of the mortgage volume is made up by variable rates loans. Although this helps to stabilize the economy during downturns, it increases households' interest rate risk, chiefly in light of their high indebtedness.

When high indebtedness, high LTV and rising house prices combine, the common choice for households is variable rates on mortgages. This only makes households more vulnerable not only to interest rate risk, but also to income risk. The probability of interest rate hikes is currently very low, but an alternative scenario could be an increase in the banks' funding costs due to investors' deteriorated trust in the solvency of the entities, which may lead to higher rates on loans. This scenario is already taking place in several European countries.

In light of these reasons, the Swedish authorities thought that there was reason to believe that the risk level of banks' domestic mortgage portfolios could be even higher than before the 1990s crisis, and that the volume of own funds maintained to cope with these risks may not be sufficient (in 2012 the major Swedish banks' capital requirements for their domestic mortgage portfolios was between 0.40% and 0.64%, which corresponds to the calculation of RWAs mentioned before).

Therefore, the Riksbank and the FI decided that Swedish mortgage portfolios should have a minimum risk weight of 15% of their total volume. This level places Swedish banks' risk weights for domestic mortgages in line with the average of EU countries' banking systems.

This measure was published in May 2013 and was to be applied by the seven largest Swedish banks and six savings banks (i.e. the entities authorized to use the IRB approach to calculate RWAs). The measure entered into force immediately after its publication and the FI included it as one of the aspects to monitor in its supervisory activities.

Second macroprudential memorandum: in November 2013, the FI issued another memorandum on this very subject. According to the FI, prudence dictated that there was still room to consider the introduction of additional macroprudential measures as long as household debt levels remained high and on an upward trend.

The FI was considering two types of measures to deal with the debt problem: 1) raise the risk-weight floor for domestic mortgages, and 2) implement a countercyclical capital buffer. In this respect, the FI was of the opinion that there were reasons to prioritize the increase in the risk-weight floor in the short-term, in exchange for a lower countercyclical capital buffer.

The purpose of the countercyclical buffer is to force banks to accumulate extra capital during boom periods so that it can be used during recessions. When banks do this they must set aside capital for all types of lending, not only mortgages, so if banks try to compensate for this higher capital requirement by raising lending rates there is a risk that all lending rates will be increased, not just mortgages', especially corporates and SMEs loan rates.

In this vein, if the primary goal is to reduce the risk associated with household indebtedness, it seems more accurate to focus on mortgages. So, with respect to the choice of a countercyclical capital buffer, or raising the risk-weight floor of mortgages, the FI decided to raise the risk-weight floor of domestic mortgages from the current level of 15% to 25%.

The measures adopted by the Swedish authorities in May and November of 2013 to elevate the risk-weight of domestic mortgages are supposed to increase Swedish banks' own funds by an additional SEK52 bn (+110-120pbs of RWAs for the system as a whole).

3. Canada: pioneers in mortgage insurance

Canada provides a different approach to macroprudential policy measures focused on mortgage lending. Financial institutions that operate in Canada are required by law to insure residential mortgage loans when LTV exceeds 80%, i.e. down payment is less than 20%. These mortgages are referred to as “high ratio loans”. This type of insurance is available primarily from CMHC (Canada Mortgage and Housing Corporation) but also from private mortgage loan insurers in Canada, and is backed by the Government of Canada.

CMHC was founded in 1946 to facilitate returning soldiers after World War II the access to housing in favorable conditions (very low-cost mortgages with small down payment and easy terms). CMHC manages the federal Mortgage Insurance Fund (MIF), which was established in 1954 to protect banks reluctant to enter the mortgage lending market. Today its main function is providing insurance for mortgage loans to Canadian home buyers. This insurance protects banks against mortgage defaults on mortgages for which insurance has been purchased (mandatory on loans with LTV higher than 80%).

Since 1954, CMHC’s role in providing insurance to “high ratio loans” has helped shape Canada’s housing finance system. CMHC operates its loan insurance business on a commercial basis. The revenues collected (in the form of premiums, fees and interest earned) cover related claims and other expenses, and therefore contributes a positive return to the public budget (more than CAD15 billion over the last decade from CMHC’s insurance business alone).

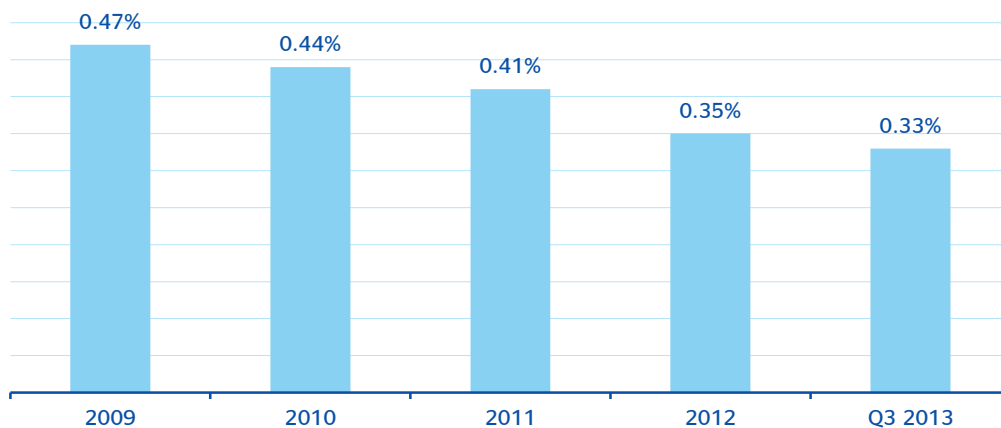
After the outbreak of the financial crisis the government of Canada announced several rounds of changes to CMHC’s mortgage insurance business, which basically tightened the criteria required to qualify for government-backed insurance on new home mortgages. The main changes are summarized below:

- In order to help borrowers prepare for potentially higher interest rates in coming years, the CMHC requires that all borrowers meet the standards for a five-year fixed rate mortgage even if the type of mortgage chosen implies lower interest rates and/or shorter terms.
- The maximum amount that Canadians can borrow when refinancing their loans is lowered from 95% of the value of their homes to 80%.
- Maximum LTV of 80% for government-backed mortgage insurance on non-owner-occupied properties (houses purchased for speculation).
- The maximum amortization period for new government-backed insured mortgages with LTV of more than 80% is reduced to 25 years from 35 years.

These stringent underwriting standards have influenced the functioning of the residential mortgage market in Canada. All applications for insurance are initially reviewed by banks and then sent to CMHC, which then assesses the risk presented by the borrower, the property to be used as collateral, the market in which the property is located, and the application as a whole. Moreover, CMHC conducts stress testing of its mortgage insurance business on an annual basis to assess the effect of several scenarios on its financial performance, its capital levels, and its risk thresholds. Extreme scenarios reflect negative GDP growth, high unemployment and substantial house price reductions lasting for a number of years with the assumption that no corrective actions are taken during the period.

The strength of CMHC’s mortgage loan insurance portfolio and underwriting criteria is demonstrated by its mortgage arrears rate (the ratio of all loans that are more than 90 days past due to the number of outstanding insured loans), which is very low and stable since the beginning of the financial crisis (chart 1).

Chart 1
CMHC's arrears ratio



Source: Canada Mortgage and Housing Corporation

CMHC's mortgage loan insurance in-force is limited by law to a maximum of CAD600 billion. At the end of Q3 2013, CMHC's insurance-in-force was CAD559.8 billion. Annual mortgage repayments are around CAD\$60-65 billion. These repayments offset increases in the Corporation's insurance-in-force that result from providing mortgage loan insurance to qualified homebuyers. As a result, Approximately 40 per cent of CMHC's current insurance-in-force is comprised of low ratio loans. More specifically, the average borrower equity in CMHC's insured portfolio is 45% (i.e. average LTV of 55%).

The Canadian experience shows some of the benefits that a set of long-term macroprudential tools may have on a country's housing market if the implementation of the measures is aligned with the objectives to accomplish.

4. Hong Kong: LTV caps since the 1990s

The case of Hong Kong is basically one of intensive use of limits to affordability ratios with clear differences between types of properties and the value of the properties used as collateral, combined with other macroprudential measures such as mandatory mortgage insurance.

LTV thresholds have been in place for residential mortgages since the 1990s in Hong Kong and have played a vital role in safeguarding banking stability.

The policy was introduced as a result of: 1) the significant weight of residential mortgages in banks' lending portfolios (37% in 2002); 2) the historical link between property prices and the business cycle in Hong Kong; and 3) Hong Kong has no direct control over its monetary policy due to its fixed exchange rate regime, pegged to the US dollar, so alternative policies were necessary for managing the systemic risk of the banking sector.

These features suggested that banking exposure to the property market should be properly managed if financial stability was to be maintained.

The macroprudential policy in Hong Kong can be divided into four phases:

1. **Before 1997:** until 1991 deposit-taking institutions in Hong Kong were allowed to grant mortgage loans up to 90% of the property's purchase price or market value (whichever was lower). The banking supervisor acknowledged the existence of a potential systemic risk concentrated on the exposure of financial entities to the residential housing sector. Therefore, in 1991 a maximum LTV ratio of 70% was adopted by the banking industry as a prudent measure against overexposure to the real estate sector. Furthermore, in 1995 the government approved at a Legislative Council Meeting that the 70% limit should be adopted by banks as a long-term regulatory policy.

Furthermore, at the beginning of 1994 (a moment when mortgage lending was growing fast) banks whose exposure to mortgages as a percentage of domestic lending was above the average for the industry (around 40%) should seek to reduce that percentage or stabilize it.

2. **1997 to 1999:** against a sharp rise in residential property prices in 1996, signs of speculative activities (particularly for luxury properties) and the rapid increase in residential mortgage lending, the supervisor recommended that a maximum LTV ratio of 60% be adopted for "luxury" properties, i.e. those with a market value of more than HKD12 million (USD1.5 million at that time). During the Asian financial crisis, Hong Kong's housing prices fell by more than 40% between September 1997 and September 1998. However, the banks' mortgage NPL ratio never exceeded 1.43%, low by international standards. This fact alone suggests that the LTV policy is effective in reducing banks' credit risk and their mortgage NPL ratios.

All banks were required in 1997 to have a clearly defined and documented policy to assess the repayment capacity of residential mortgage borrowers, which should include the establishment of a Debt Servicing Ratio (defined as the borrower's monthly repayment obligations as a percentage of disposable income). This ratio was limited to 50% - 60% of monthly income, the upper end of the range being confined to high income clients.

3. **1999 to 2008:** The 60% LTV limit for the purchase of "luxury" houses established in 1997 (with a value of more than \$12 million) is withdrawn in 2001, and the common limit of 70% LTV was restored for such loans.

At the same time, the banking supervisor allowed banks to refinance mortgages loans in negative equity up to 100% of the property's market value, although the 70% LTV policy was reaffirmed as the benchmark long-term prudential measure.

On the other hand, the Asian financial crisis produced a significant drop in household income, which led to calls for the relaxation of the 70% LTV limit. This was accomplished with the introduction of a **Mortgage Insurance Program**, under which mortgages of up to

90% LTV were available to homebuyers that met certain eligibility criteria (these included limits to debt-to-income ratios, maximum loan amount and maximum term to maturity). With this insurance program:

- Banks were protected from losses on loans with LTV higher than 70%.
- A certain number of homeowners were able to purchase a house even if they could not make a 30% down payment at origination. This avoids one of the main drawbacks of the use of LTV thresholds.

Since the introduction of the insurance program the usage of mortgage insurance has grown steadily from roughly 2% of insured loans as a percentage of total mortgage loans in 1999 to close to 20% in 2009. This data shows that the program has been instrumental in helping a large number of homeowners to overcome liquidity constraints without incurring additional risks (or actual losses) in the banking sector. According to data provided by the Hong Kong Monetary Authority (HKMA), the delinquency ratio of the insured portfolio of mortgages reached a historical high of 0.39% in September 2003, which compares with a ratio of 1.05% for the Hong Kong banking system as a whole at the same date.

4. **Since 2008:** due to strong capital inflows and all-time low interest rates worldwide combined with the adoption of unprecedented heterodox monetary policy measures (quantitative easing) by major central banks since 2009, house prices increased sharply in Hong Kong, particularly in the upper end of the housing market. In view of the increasing risk of a property price bubble, the HKMA introduced various rounds of macroprudential countercyclical measures to strengthen risk management of banks in property mortgage lending business.

In this vein, the HKMA issued guidance in October 2009 requiring all banks to reduce the maximum LTV ratio from 70% to 60% for mortgages on properties with a market value of more than HKD20 million.

In August 2010 several measures were adopted:

- A maximum LTV of 60% is to be applied to properties with a market value in excess of HKD12 million. For properties valued less than HKD12 million, the 70% LTV limit is maintained, but the loan amount is capped at HKD7.2 million. The 60% LTV limit is applied also to properties which are not intended to be occupied by the owners.
- The limit on debt servicing ratio (since 1997 established in a range of 50%-60% of monthly income) is established at 50% to all mortgage applicants regardless of their monthly income levels. In addition, banks are requested to stress-test mortgage borrowers' repayment capacity, assuming an increase in mortgage rates of at least two percentage points.

Finally, in November 2010 the HKMA implemented the following measures to strengthen risk management activities in residential mortgage business:

- The maximum LTV for houses with a market value of more than HKD12 million is reduced from 60% to 50%.
- The maximum LTV for houses with a market value between HKD8 million and HK\$12 million is reduced from 70% to 60%, but the loan amount is capped at HKD6 million.
- The maximum LTV ratio for houses with a market value of less than HKD8 million is maintained at 70%, but the loan amount is capped at HKD4.8 million.
- The maximum LTV ratio for all non-owner-occupied houses, properties owned by enterprises, and industrial and commercial properties, is lowered to 50%, regardless of property values.

In short, Hong Kong's experience shows that the use of LTV caps as a macroprudential tool has been effective to reduce systemic risk in the banking sector stemming from housing booms, especially when it is used together with other instruments such as debt-to-income limits and mandatory mortgage insurance for loans with high LTV.

5. New Zealand: countercyclical capital buffer, core funding ratio and “speed limits” on LTV ratio

As part of its regulation and supervision of registered banks, the Reserve Bank of New Zealand has developed a framework of macro-prudential policy. In this regard, the Bank of New Zealand together with the Ministry of Finance has signed a Memorandum of Understanding (MoU) to set macro-prudential policy objectives. More precisely, they have established the following objectives: i) build additional resilience in the financial system during periods of rapid credit growth, rising leverage and abundant liquidity; and ii) dampen excessive growth in credit and asset prices.

These objectives link with the aim of promoting the maintenance of a sound and efficient financial system in that: i) macro-prudential policy can complement micro-prudential policy in maintaining the soundness of the financial system by creating additional resilience when credit and asset prices become unsustainable, and ii) these latter factors impact adversely on financial system efficiency.

The prudential instruments available in New Zealand legislation, according to the new macro-prudential policy framework released in May 2013, to pursue macro-prudential policy objectives are the following:

- The countercyclical capital buffer (CCB) is an additional capital requirement that may be applied in times when excess private sector credit growth is judged to be leading to a build-up of system-wide risk. The CCB framework applies to banks based in New Zealand. Meanwhile the foreign parent of a bank branch that is operating in New Zealand may choose to hold the CCB against its New Zealand exposure if it follows reciprocity provisions envisaged under Basel III. When risks to the New Zealand financial system are judged to be low, the CCB will be set at zero. However when risks appear banks could be forced to have an extra layer of capital. Typically, this additional layer of capital could range up to 2.5% of Risk Weighted Assets, however, the Reserve Bank may impose a higher CCB if circumstances warrant. This extra layer can be fulfilled by reducing other voluntary capital buffers which may be the preferred option to satisfy this criterion.
- Adjustment to the core funding ratio (CFR). The baseline minimum core funding ratio requires banks to source at least 75% of their funding from retail deposits, long term wholesale funding or capital reducing therefore the vulnerability of the banking sector to disruptions in the funding markets. This tool applies to all locally incorporated banks.
- Sector-specific capital requirements (SCR). Adjustments to sector-specific capital requirements would require banks to hold extra capital against a specific sector or segment in which excessive credit growth is judged to be leading to a build-up of system-wide risk. This applies to all locally incorporated banks.
- Quantitative restrictions on share of high LTV ratio loans to the residential property sector. Quantitative restrictions would typically take the form of “speed limits” which restrict the share of new high LTV lending that banks may undertake. They could also take the form of outright limits on the proportion of the value of the residential property that can be borrowed. LTV restrictions would apply to all banks registered in New Zealand.
 - A speed limit would limit the share of new high-LTV lending to the residential property sector that can be undertaken above a given LTV threshold.
 - An outright limit would mean that banks would not be able to undertake any high-LTV residential property lending above a given threshold.

The Reserve Bank favours a discretionary and relatively simple approach to implementation. Macro-prudential instruments will be applied in a forward-looking manner. In this regard, the Reserve Bank has released indicative notice periods for imposition of macro-prudential requirement. As such, countercyclical capital buffers would have a notice period of up to twelve months, sector-specific capital requirements of up to three months, adjustments to core funding ratio of up to six months and restrictions on high-LTV house lending of at least two weeks.

In addition, the MoU has established some sort of governance in a way that the Reserve Bank would consult with the Minister of Finance ahead of making macro-prudential policy decisions and keep the Minister regularly informed of any condition that might warrant a future macro-prudential policy response. However, final policy decisions would rest with the Governor of the Reserve Bank.

To offset recent escalation of house prices and a rise in residential mortgage lending with high LTV, some macro-prudential tools have been activated, namely the introduction of speed limit LTVs. House prices are currently growing at a rate of around 9% per annum from an historically high base with the household debt-to-disposable income ratio at 145% and rising. These factors could increase both the probability and potential impact of significant downward house price adjustment which could result from a future economic or financial shock.

As a result, the Reserve Bank recently reviewed the scale of housing risk weights in relation to residential LTVs. The outcome of this review is an increase in the required levels of regulatory capital for high-LTV lending by banks that use internal models to calculate RWAs, and amount to an average increase in capital for residential mortgage loans for these banks of about 12%. These requirements came into effect on September 30, 2013. The Reserve Bank is also reviewing the overall calibration of banks' capital for residential mortgage lending and the relation between the capital requirements for standardised and internal models banks.

Apart from this measure, the Reserve Bank is considering an LTV threshold for lending, typically somewhere in the range of 80%-90% with all new loans/refinancing above this threshold temporarily prohibited. However, the Reserve Banks preferred a "speed limit" restricting the proportion of new lending above an LTV of 80% to no more than 10% of a banks' new residential mortgage lending, with some exemptions to this general rule: i) loans made under Housing New Zealand's Welcome Home Loans scheme; ii) bridging loans; iii) the refinancing of existing high LTV residential mortgage lending, and iv) the transfer of an existing high LTV residential mortgage loan to another residential property.

Restrictions on high-LTV lending will impose costs in the short run, which include implementation costs and on-going compliance costs on banks, wider economic costs from reduced credit growth and potential welfare costs for those who are temporarily prevented from borrowing for a house purchase. However, these costs cannot be accurately quantified.

6. South Korea: time-varying affordability ratios

In Korea house price increases over the past decade were small compared to other countries. Indeed, the ratio of house prices to income rose only 7% between 2000 and 2007, versus more than 30% in average in ten OECD countries. House price increases were concentrated in the capital region while prices in the rest of the country were mainly stable. The Korean government is particularly sensitive to prices in the capital region, given the distributional implications as well as the risk that they will spread to other parts of the country.

The residential real estate market in Korea has gone through significant changes in the past two decades. A government-led drive to build two million new dwellings between 1988 and 1992 helped alleviate the housing shortage and make homes affordable. Beginning in 1995 price controls on new houses and regulations on the conversion of agricultural land were gradually reduced, propelling urbanization. Homeownership surpassed the 50% ratio since 2005. Affordability, measured by price-to-income ratio, improved comparing the 90s vis-à-vis the 80s.

The housing finance system in Korea was deregulated in the second half of the 90s. Particularly, commercial banks entered the mortgage business in 1996 followed by the privatization of the Korean Housing Banks, the monopolistic provider of low-interest long term rate of housing loans in 1997. Before the deregulation of the housing finance system, more than 80% of mortgage loans were held by the publicly-owned National Housing Fund.

As a consequence of the deregulation, outstanding mortgage debt grew considerably from roughly 12% in 1996 to more than 30% of GDP at present. The prevalent loan type carries an adjustable rate and 56% LTV at origination. While maturities up to 20 years are common, the majority of mortgages are “bullet loans”, which require full payment or refinancing after a 3-year period. Banks dominate the mortgage market.

As a result of the 90s financial crisis, the Korean Financial Supervisory Service (FSS) use macro-prudential tools to tackle the crisis starting in late 2002. LTV limits were introduced first followed by DTI limits in 2005. In addition, in an effort to improve macro-prudential supervision, the FSS created the Macro-prudential Supervision Department with the mandate to assess systemic risk factors using early warning systems and stress tests to guide prudential rules.

There have been several changes in both tools as can be observed in the following table:

Table 3
Timeline of LTV regulations

Date	Specification	Range of application
Sept 2002	Introduction of LTV ceiling at 60%	Banks and insurance companies
June 2003	Reduced the LTV from 60% to 50% for loans of 3 years and less maturity to buy houses in speculative zones	Banks and insurance companies
October 2003	Reduced the LTV from 50% to 40% for loans of 10 years and less maturity to buy houses in the speculative zones	Banks and insurance companies
March 2004	Raised the LTV from 60% to 70% for loans of 10 years or more maturity and less than one year of interest-only payments	All financial institutions
June 2005	Reduced the LTV from 60% to 40% for loans of 10 years and less maturity to buy houses worth 600 million won and more in the speculative zones	Banks and insurance companies
Nov 2006	Set the LTV ceiling at 50% percent for loans of 10 years and less maturity to buy houses worth 600 million won	Banks and insurance companies
July 2009	Reduced the LTV from 60% to 50% for loans to buy houses worth 600 million won and more in the metropolitan area	Banks
October 2009	Expand the LTV regulations to all financial institutions for the metropolitan area	Non Bank Financial Institutions

Source: BBVA Research

Table 4

Timeline of DTI regulations

Date	Specification	Range of application
August 2005	Introduced the DTI ceiling at 40% for loans used to buy houses in the speculative zones only if the borrower is single and under the age of 30 or if the borrower is married and the spouse has debt	All Financial Institutions
March 2006	Set the DTI ceiling at 40% for loans to buy houses worth 600 million won and more in speculative zones	All Financial Institutions
Nov 2006	Extended the range of application of DTI regulation to the overheated speculation zones in the metropolitan area	All Financial Institutions
Feb 2007	Set the DTI ceiling at 40-60% for loans to buy houses worth 600 million won and less	Banks
August 2007	Set the DTI ceiling at 40-70% for loans originated by non-bank financial institutions such as insurance companies, mutual savings banks, and credit specialized financial institutions	Extended to Nonbanking institutions
Sept 2009	Extended the range of application of DTI regulation to non-speculative zones in Seoul and metropolitan area	Banks
August 2010	Exempted the loans to buy houses in the non-speculative zones of the metropolitan area if the	All Financial Institutions

Source: BBVA Research

The set of policy tools to accomplish the objective of stable house prices included adjustments in LTV and DTI limits as well as moral suasion on lenders, subsidies to housing finance, changes in taxes, direct support for the private construction sector and government supply of new housing units or purchase of existing units.

Korea is one of the few examples where some sort of validation of macroprudential policy tools can be pursued and, in fact, there are some pieces of research that have tried to do so. Between 2001 and 2010, Korea experienced two major housing cycles split by the trough of May 2005. Since the launch of LTV and DTI ratios, limits have been changed several times not only in terms of the levels themselves but also in terms of the areas and of the financial institutions to which they are applicable.

- First period: introduction of the 60% LTV limit provoking a deceleration of house prices appreciation from 20% on year-on-year basis to 9% in six months, but accelerated again eliciting tightening of LTV limits twice. The second tightening was accompanied by tax measures, which included changing the basis for capital gains tax calculation to real transaction price and increasing the capital gains taxes for owners of multiple properties marking the beginning of the downturn phase.
- Second cycle: policy responses came quickly in 2007 and 2009

All in all, macroprudential measures had effects on volume and on prices.

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