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July 15, 2020

## TECHNICAL NOTE

SYSTEMIC RISK OVERSIGHT AND MACROPRUDENTIAL  
POLICY FRAMEWORK

Prepared By  
**Monetary and Capital Markets  
Department**

This Technical Note was prepared by IMF staff in the context of the Financial Sector Assessment Program in Denmark. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at <http://www.imf.org/external/np/fsap/fssa.aspx>

# CONTENTS

Glossary	4
<b>EXECUTIVE SUMMARY</b>	<b>6</b>
<b>INTRODUCTION</b>	<b>9</b>
<b>INSTITUTIONAL FRAMEWORK</b>	<b>9</b>
A. Principle I – Willingness to Act	12
B. Principle II – Ability to Act	14
C. Principle III – Effective Cooperation and Coordination	18
D. Recommendations	19
<b>SYSTEMIC RISK MONITORING</b>	<b>20</b>
<b>SYSTEMIC RISKS AND MACROPRUDENTIAL TOOLS</b>	<b>24</b>
A. Broad-based Vulnerabilities: Assessment, Tools, and Recommendations	24
B. Household Vulnerabilities: Assessment, Tools and Recommendations	26
C. Corporate and CRE Vulnerabilities: Assessment, Tools, and Recommendations	35
D. Funding and Liquidity Vulnerabilities: Assessment, Tools, and Recommendations	40
E. Structural Vulnerabilities: Assessment, Tools, and Recommendations	42
<b>BOX</b>	
1. International Comparison of Debt Limits and the Use of Speed Limits	33
<b>FIGURES</b>	
1. Institutional Arrangement for Macroprudential Policy	11
2. Activation of Countercyclical Capital Buffer	13
3. Inaction Bias: The Case of Housing Sector Tools	16
4. CCyB: Categories and Related Key Indicators	21
5. Heat Map: Systemic Risks in the Housing Market	22
6. Broad Macro-Financial Developments	25
7. Household Sector Vulnerabilities	28
8. Household Indebtedness and Debt-Bias	29
9. Supervisory Diamond for Mortgage Credit Institutions	31
10. Housing Finance-Related Vulnerabilities	32
11. Non-financial Corporations Vulnerabilities	36
12. Commercial Real Estate	38
13. Commercial Real Estate – Adverse Scenario	39
14. Funding and Liquidity Vulnerabilities	41

15. Interconnectedness and Structural Vulnerabilities .....	43
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## **TABLES**

1. Key Recommendations on Macroprudential Policy .....	8
2. Macroprudential Institutional Framework .....	10
3. Framework for Observation, Warning and Recommendation .....	15
4. Observations, Warnings and Recommendations Issued by the SRC .....	17
5. Systemically Important Institutions .....	44

## **APPENDICES**

I. Growth at Risk .....	45
II. House Price at Risk .....	48

## Glossary

ATG	Advisory Technical Group
AWG	Analysis Working Group
BIS	Bank for International Settlements
CCB	Capital Conservation Buffer
CCR	Central Credit Registry
CCyB	Counter Cyclical Capital Buffer
CET1	Common Equity Tier 1 Capital Ratio
CRD IV	Capital Requirement Directive IV
CRE	Commercial Real Estate
CRR	Capital Requirement Regulations
DN	Danmark Nationalbank
DFSA	Danish Financial Stability Authority (Finanstilsynet)
DTI	Debt-to-Income Ratio
DSTI	Debt Service to Income Ratio
EBA	European Bank Authority
ECB	European Central Bank
EEA	European Economic Area
ESRB	European Systemic Risk Board
EU	European Union
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFSR	IMF Global Financial Stability Report
HQLA	High-Quality Liquid Assets
IMF	International Monetary Fund
IRB	Internal Ratings-Based
IWG	Instrument Working Group
LCR	Liquidity Coverage Ratio
LTI	Loan to Income
LTV	Loan-to-Value Ratio
MCI	Mortgage Credit Institution
MoEAI	Ministry of Economic Affairs and the Interior
MoF	Ministry of Finance
MoU	Memorandum of Understanding
MIBFA	Ministry of Business, Industry and Financial Affairs
NBMF	Nordic Baltic Macroprudential Forum
NFC	Non-Financial Corporates
NPL	Non-Performing Loan
NSFR	Net Stable Funding Ratio
O-SII	Other Systematically Important Institutions

PD	Probability of Default
SIFI	Systemically Important Financial Institutions
SRB	Systemic Risk Buffer
SRC	Systemic Risk Council

## EXECUTIVE SUMMARY<sup>1</sup>

**COVID-19 pandemic:** The Financial Sector Assessment Program (FSAP) work was conducted prior to the COVID-19 pandemic, so this Technical Note (TN) does not assess the impact of the crisis or the recent crisis-related policy measures. Nonetheless, given the FSAP's focus on vulnerabilities and policy frameworks, the findings and recommendations of the TN remain pertinent.

**While Denmark's institutional arrangements are uncommon, the authorities have undertaken several macroprudential measures since the last FSAP.** The Minister for Industry, Business and Financial Affairs (MIBFA) has decision-making power over most macroprudential tools in Denmark, which is rare in international practice. However, the Systemic Risk Council (SRC), which includes members from the Danmarks Nationalbank (DN) and Danish Financial Supervisory Authority (DFSA) plays an advisory role and has powers to give recommendations with a comply or explain mechanism. In recent years, the authorities have taken wide-ranging macroprudential policy actions in response to growing systemic vulnerabilities, which have seemed to slow down some of the riskier trends. More recently, in response to the Covid-19 crisis, countercyclical capital buffer (CCyB) has been fully released.

**At the same time, financial sector vulnerabilities remain elevated.** Key financial vulnerabilities include high household leverage amid high real estate valuations following a long period of loose financial conditions. There are also signs of increased risk taking in some sectors, most notably the commercial real estate, which is among the most leveraged corporate sectors. In addition, there are downside risks to bank profitability. Finally, mortgage credit institutions (MCIs) play a central role in the domestic interbank system and can generate significant contagion effects across a financial system which is highly interconnected by covered bond exposures.

**Given these vulnerabilities, the institutional arrangements can be further strengthened by limiting the consensus building phase in decision making.** Some elements of the current institutional arrangements render the system vulnerable to inaction bias. First, the legal framework for the SRC prescribes that it should strive for consensus in decision-making. Procedurally, the secretariat starts working on draft recommendations only after receiving a mandate from the SRC, which often follows a phase of consensus building within SRC meetings. This has led to delayed action in some cases. Second, limited powers of the SRC can also lead to inaction bias in cases where MIBFA does not comply with its recommendations. This has happened, particularly regarding risks related to deferred amortization loans in the household sector. To strengthen the framework, the SRC chair should be given the ability, enshrined in law, to make proposals for a recommendation after due consultation with other SRC members without the need to strive for consensus.

**While recent measures go in the right direction, the authorities should stand ready to take further action if risks related to household vulnerabilities persist.** Recent measures have aided

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<sup>1</sup> Prepared by Umang Rawat (IMF).



in softening of house prices and switching of households to loans with higher amortization and lower interest rate risks. While pockets of vulnerabilities remain, the uncertainty and economic downturn associated with COVID-19 crisis makes further tightening undesirable in the current juncture. However, overtime authorities should consider further action in form of coordinated policies if vulnerabilities persist. These include: (i) introducing national legislation to include borrower-based tools (limits on loan-to-value (LTV), debt-to-income (DTI), and debt service to income (DSTI)) in the policy toolkit; (ii) Introducing a stricter LTV limit (at least 90 percent) to safeguard against large house price shocks if housing related risks continue to grow; (iii) in an economy with elevated house prices, rules targeting LTV become less binding. Hence, if the uptrend in house prices continues, the SRC should introduce binding income-based limits, such as DTI restrictions for all loans, irrespective of their LTV ratios; and (iv) complement macroprudential tools with coordinated policies to reduce debt bias, simplify rental regulations, and relax supply constraints on housing.

**Relatedly, authorities should consider measures in the commercial real estate (CRE) sector if risks intensify.** There are signs of building vulnerabilities in the CRE segment. Firm level analysis reveals that CRE sector is most vulnerable to an increased debt-at-risk in an adverse scenario. While macroprudential tools should not be tightened at the current juncture, overtime authorities should consider introducing measures addressing CRE vulnerabilities, including higher risk weights and sectoral capital tools.

**The strong analytical capacity for systemic risk monitoring can be further enhanced, including by filling data gaps.** The systemic risk monitoring framework is generally good however it can be further enhanced by: (i) more actively covering non-banks (insurers, pension funds, and asset management companies); (ii) developing truly macroprudential stress tests that take into account feedback loops between financial system and the real economy and allow for looking at the impact of macroprudential instruments; and (iii) deeper understanding of the transmission of shocks between financial balance sheets, particularly given the centrality of covered bonds. Data quality and availability is generally good, and further progress was recently made with the establishment of a credit registry. Nonetheless, there are important remaining data gaps, notably in the CRE sector that should be addressed.

**Table 1. Denmark: Key Recommendations on Macroprudential Policy**

<b>Recommendations</b>	<b>Agency</b>	<b>Timing<sup>1/</sup></b>
<b><i>Institutional Arrangements</i></b>		
1. Give the chair of the SRC ability, enshrined in law, to make proposals for a recommendation after due consultation with other SRC members without the need to strive for consensus (Paragraphs 11–13; 21).	MIBFA	MT
2. A comprehensive overview of recommendations made by the SRC should be included in the MIBFA's annual report to Parliament to further increase accountability (Paragraph 22).	MIBFA	ST
<b><i>Systemic Risk Monitoring</i></b>		
3. Develop macroprudential stress tests that take feedback loops between financial system and real economy more fully into account while incorporating contagion effects across financial institutions (Paragraph 30).	DN	MT
4. Extend coverage of systemic risk monitoring to the non-bank financial sector (Paragraph 29)	DN	MT
5. Close data gaps, including by enhancing the coverage and quality of commercial real estate data (Paragraph 31).	DN	MT
<b><i>Toolkit</i></b>		
6. Introduce national legislation to include borrower-based tools (limits on LTVs, DTIs, and DSTIs) in the policy toolkit (Paragraphs 42, 44).	MIBFA	ST
7. Introduce a stricter LTV limits to safeguard against large house price shocks (Paragraphs 40, 43, 45).	MIBFA	MT
8. Introduce a binding income-based macroprudential measure that limits lending to households above a certain DTI threshold calibrated using newly available credit registry data (Paragraphs 40, 43, 45).	MIBFA	MT
9. Issue recommendations to responsible authorities to reduce debt bias, simplify rental regulations, and relax supply constraints on housing (Paragraphs 38, 46).	SRC	MT
10. Continue monitoring CRE vulnerabilities and take actions (higher CRE risk weights, sectoral systemic risk buffer) if risks intensify (Paragraphs 49–50, 52).	MIBFA	MT
<sup>1/</sup> ST: Short term (1–3 years); MT: Medium Term (3–5 years).		

## INTRODUCTION

1. **Denmark's institutional set up for macroprudential policy is uncommon, however authorities have demonstrated willingness to act.** The macroprudential authority in Denmark is the systemic risk council, which is an advisory body. The ultimate decision-making power lies with the minister for industry, business and financial affairs. The authorities have undertaken several measures since the last FSAP. Banks hold large capital buffers that provide valuable resilience against adverse shocks. Further, several demand-side measures have been undertaken to limit risky lending to highly indebted households. The atypical institutional arrangement has nonetheless rendered the system vulnerable to inaction bias in some cases.
2. **At the same time, financial sector vulnerabilities remain elevated.** Key financial vulnerabilities include high household leverage amid high real estate valuations following a long period of loose financial conditions. There are also signs of risk taking in some sectors. In particular, commercial real estate is among the most leveraged corporate sectors and where debt has grown the fastest in recent years. In addition, there are downside risks to bank profitability amid the low-interest-rate environment. Mortgage credit institutions (MCIs) play a central role in the domestic interbank system and can generate significant contagion effects across a financial system which is densely linked by covered bond exposures. Given these vulnerabilities, and the limits on monetary policy implied by the fixed exchange rate regime, macroprudential buffers (which can be relaxed during adverse times) are even more important in Denmark.
3. **This note evaluates the domestic macroprudential framework in Denmark and its ability to address emerging vulnerabilities.** The note is structured as follows: Section II assesses the strengths and weaknesses of the current institutional arrangements for macroprudential policymaking. Section III discusses the existing systemic risk monitoring framework. Section IV maps an assessment of systemic vulnerabilities into recommendations for the macroprudential toolkit. Section V concludes. The assessment is conducted based on the IMF guidance, which is laid out in the Staff Guidance Note ([IMF, 2014a](#)), its background note ([IMF, 2014b](#)), and other IMF's policy papers.

## INSTITUTIONAL FRAMEWORK

4. **Strong institutional arrangements for macroprudential policymaking at national level are essential for effective functioning of macroprudential policy.** A strong institutional framework should generate the willingness to act and thereby overcome the underlying policy inaction bias that results from the cost of policy actions being sooner and more easily observable than their potential benefits. The institutional arrangement also needs to foster the ability to act when systemic risk is building up. Finally, the framework needs to promote effective cooperation and coordination between institutions with a financial stability mandate. This section evaluates the current institutional arrangement against these three key principles, which are set out in [the 2014 IMF Staff Guidance Note on Macroprudential Policy](#).

**5. The atypical institutional arrangement in Denmark has remained unchanged since the last FSAP.** The macroprudential authority in Denmark is the Systemic Risk Council (SRC), which is an advisory body.<sup>2</sup> The SRC has been established with the specific task to monitor systemic financial risks and issue statements as warranted. It is composed of representatives from the Danmarks Nationalbank (Chair), the Danish Financial Supervisory Authority (DFSA), Ministry of Industry, Business and Financial Affairs (MIBFA), Ministry of Finance (MoF), and independent experts (see Table 2). MIBFA is the designated authority for macroprudential policy giving it the ultimate decision-making power.<sup>3</sup> While it is not uncommon to have more than one institution entrusted with the overall mandate for macroprudential policy, it is very rare for a ministry to be the designated authority i.e. have all the hard powers (Figure 1 based on the [IMF Macroprudential Policy Survey](#)).

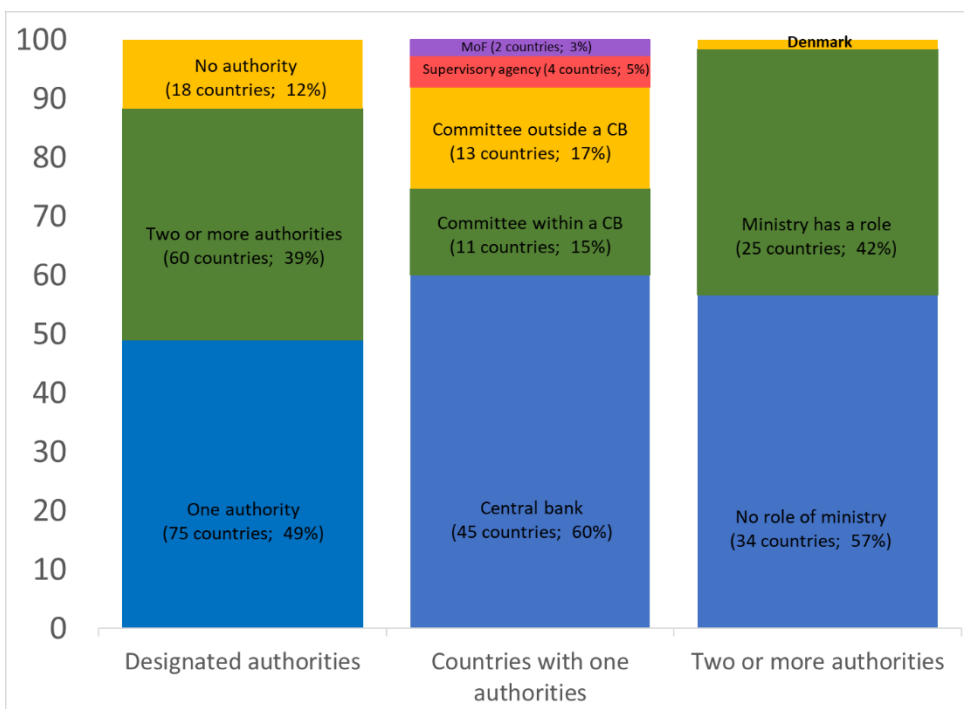
<b>Table 2. Denmark: Macroprudential Institutional Framework</b>	
<b>Macroprudential authority</b>	
Systemic Risk Council (SRC)	Setup by MIBFA in 2013. Consist of 10 members: one representative from the MIBFA, two from the MoF, two from the DFSA, two from DN and three independent experts. At least four meetings a year.
<b>Other institutions with their own mandate</b>	
Danmarks Nationalbank	Central bank with explicit mandate for financial stability. The chairman of the Board of Governors of DN chairs the council and DN also performs secretariat services for the SRC.
Danish Financial Supervisory Authority	DFSA is the integrated financial supervisor in Denmark and the competent authority for CRD IV/CRR instruments.  Conducts cross-sectional analysis on the impact of macroeconomic conditions on the solvency and profitability of institutions (stress tests and quantitative impact studies), and the designation of SIFIs in Denmark.
Ministry of Industry, Business and Financial Affairs	MIBFA is the designated authority for CRD IV/CRR instruments. The minister is typically also the deciding authority on other macroprudential instruments (borrower-based measures etc.) as they are typically implemented through executive order signed by the minister.
Ministry of Finance	
Independent Experts	To provide independent views in the discussion and contribute through their academic/professional experience. At least one of the experts should have knowledge about the insurance and pension area.

<sup>2</sup> Macroprudential authority established in accordance with Recommendation ESRB/2011/3.

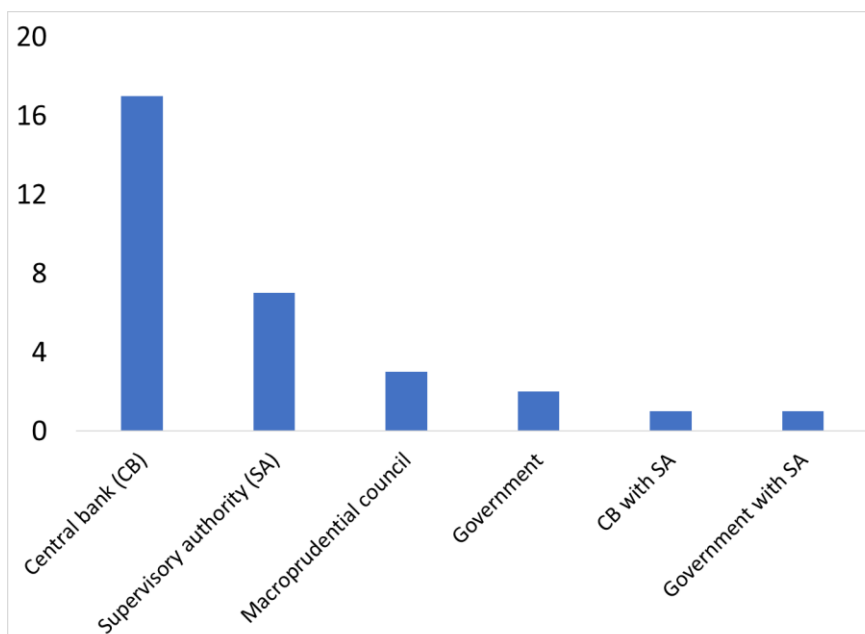
<sup>3</sup> Designated authority established in accordance with Article 136 of Directive 2013/36/EU (CRD IV).

**Figure 1. Denmark: Institutional Arrangement for Macroprudential Policy**

*While a ministry (usually ministry of finance) plays a role in macroprudential policy in several countries, it is rare for it to have all the hard powers*



*Even in EEA countries, it is rare for the government to be the designated authority*



## A. Principle I – Willingness to Act

**6. Based on international experience, certain institutional arrangements are more conducive to fostering stronger willingness to act** ([IMF-Bank for International Settlements \(BIS\)-Financial Stability Board \(FSB\), 2016](#)). These include: a clear mandate forming the basis for assignment of responsibility to take macroprudential policy decisions, well defined policy objectives, a strong role for the central bank, dedicated financial stability units, as well as effective transparency and accountability mechanisms to promote legitimacy and overcome inaction bias. The current framework in Denmark includes several of these features.

**7. The SRC has an explicit mandate to help mitigate and prevent systemic risks.** To achieve this goal, SRC has six intermediate objectives that guide the operational implementation of its macroprudential policy: mitigate and prevent excessive credit growth and leverage, mitigate and prevent excessive maturity mismatch and market illiquidity, limit direct exposure concentrations, limit systemic risks related to indirect exposure concentrations (interconnectedness), limit systemic risks connected with systemically important financial institutions and reduce misaligned incentives, and strengthen the resilience of the financial structures.

**8. The institutional setup of the SRC provides a special role for DN.** The chairman of the Board of Governors of DN chairs the council and DN also performs secretariat services for the SRC. The Secretariat lays out the groundwork for the SRC's discussion. The SRC secretariat is headed by the DN. The DFSA, the MIBFA and the MoF also participate in the secretariat. The agenda for each meeting is set by the secretariat with approval from the chair, but any member can request items to be included in the agenda. However, despite its prominent role in contributing to financial stability, the DN has no decision-making powers on macroprudential instruments.

**9. The decision-making process has in-built mechanism in form of 'abstention rule' to enhance accountability.** Decisions within the SRC are taken on the basis of majority voting by the members. If the SRC has to decide on a recommendation to be made to the government (e.g., on the rate at which the MIBFA has to set the CCyB), the SRC members from the government cannot vote. Since the DFSA directly advises the MIBFA (other than through the SRC), the DFSA members cannot vote either in case of recommendations to the government. The law also states that SRC should strive for consensus in order to strengthen the effect of recommendations. Since nearly all recommendations are made to MIBFA, consensus cannot be achieved in the voting stage due to abstention rule. In practice, consensus building is internalized at the initial phase.

**Figure 2. Denmark: Activation of Countercyclical Capital Buffer**

*The CCyB in other Nordic countries was raised several years before its activation in Denmark*

Country	Actual CCyB (%)	Date of announcement	Effective since
Norway	1	December 2013	June 2015
	1.5	September 2015	May 2016
	2	December 2016	December 2017
	2.5	December 2018	December 2019
Sweden	1	September 2014	September 2015
	1.5	June 2015	June 2016
	2	March 2016	March 2017
	2.5	September 2018	September 2019
Iceland	1	March 2016	March 2017
	1.25	November 2016	November 2017
	1.75	May 2018	May 2019
	2	February 2019	February 2020
Denmark	0.5	December 2017	March 2019
	1	September 2018	September 2019
	1.5	March 2019	June 2020
	2	October 2019	December 2020

Sources: ESRB, IMF Macprudential Survey.

**10. The secretariat is responsible for drafting macroprudential policy proposals that are then discussed in the SRC.** However, procedurally the secretariat starts working on coming up with a draft proposal only after receiving a mandate from the SRC to do so.<sup>4</sup> This often follows a consensus building phase within SRC meetings wherein the DN may have to convince other members about the need for an action. Since all members of the SRC do not have an explicit mandate of financial stability, their other priorities sometimes may be in conflict that could further delay the process. Thus, the need to build consensus before issuing statements may lengthen the time lag between when the risks are identified to when an action is undertaken.

**11. This consensus building phase has likely led to inaction bias in some cases.** From published statements of the SRC meetings, it can be seen that observations mentioning “the risk of systemic financial risks building up” started on September 2014; however, the recommendation to activate the Counter Cyclical Capital Buffer (CCyB) to 0.5 percent was done on December 2017.

<sup>4</sup> The chair of the SRC (DN Governor) can ask the secretariat to draft a proposal without consensus building however there are disadvantages of such discretion as the Governor may not want to exercise such power unless there are exceptional circumstances.

While every risk does not automatically deserve a policy action, the published statements of SRC did recognize the benefits of early build-up of capital to provide resilience in downturn. Thus, it appears that the “consensus building phase” to build up political consensus on the need to increase the CCyB, so the SRC could make a recommendation, took some time. It is also important to note that countries in the region started increasing the CCyB a few years earlier than Denmark (Figure 2). While financial cycles and methodologies to estimate CCyB differ across countries, economies and banking sectors across countries in the region are highly interconnected. Similar delays are seen in activating measures targeting housing sector risks.

## B. Principle II – Ability to Act

**12. In line with its advisory role, the SRC only has limited powers constraining its ability to act.** SRC has soft powers i.e. powers to issue observations and warnings as well as semi-hard powers i.e. power to issue recommendation with a ‘comply-or-explain’ mechanism. The recipients of a recommendation by the SRC may either comply with it or present a report justifying why the recommendation has not been implemented. If the recipient chooses not to follow the recommendation, it must *publicly* explain the reasons for this in accordance with the comply-or-explain principle. The report must be presented to the SRC within three months after the recommendation is notified to the recipient. In special cases, however, the SRC may decide that the report shall be presented earlier. The SRC shall also evaluate whether the actions taken by, for example, by the MIBFA or their inactions and the reasons for this are adequate. If a public recommendation is not followed, the SRC shall publish an assessment of the consequences it may have the systemic risks (Table 3). Relatedly, SRC does not have any hard power over macroprudential tools in Denmark. MIBFA, as the designated authority, has control over most macroprudential tools in Denmark.

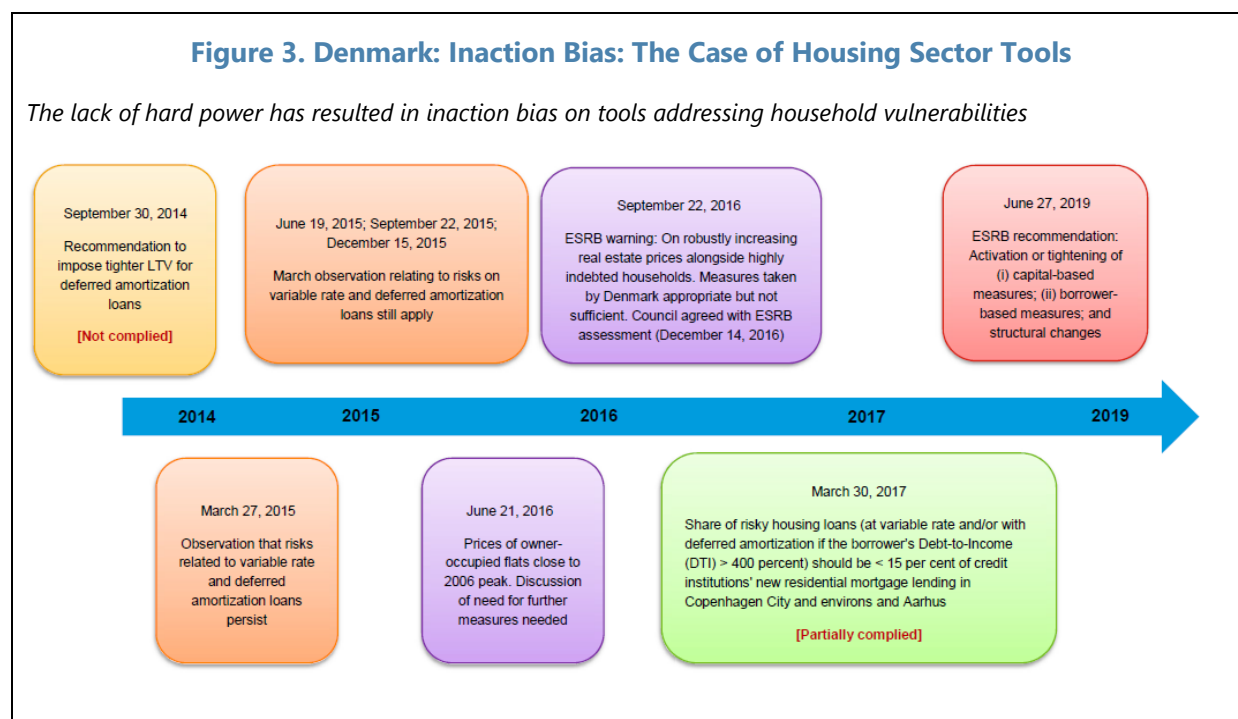


**Table 3. Denmark: Framework for Observation, Warning and Recommendation**

The framework for observations, warnings and recommendations of the Systemic Risk Council				
	Description	Contents of statement	Publication	Follow-up
Observation	<p>A risk that systemic financial risks may build up and, hence, should be closely monitored.</p> <p>Not necessarily directed towards specific authorities. Can be directed towards relevant authorities, the government or the public.</p>	<p>Explanatory description of the systemic risks the observation concerns.</p> <p>Observations directed towards the government must include a statement by the representatives of the ministries.</p>	Will always be made public.	Does not trigger a duty to act for the recipients.
Warning	<p>Clear indications of the building up of systemic financial risks that should be considered mitigated.</p> <p>Not necessarily directed towards specific authorities. Can be directed towards one or more authorities, the government or the public.</p>	<p>Explanatory description of the systemic risks the warning concerns.</p> <p>Warnings directed towards the government must include a statement by the representatives of the ministries.</p>	Will as a general rule be published unless the warning must be confidential for reasons of e.g. financial stability.	<p>The recipients are obliged to present a report within a period of three months addressing the warning, including whether the warning has induced the recipient to make additional assessments, implement initiatives or the like. In special cases, the Council can decide that the report has to be presented earlier.</p> <p>The Council shall evaluate whether the acts or omissions to act and the reasons for this are adequate.</p>
Recommendation	<p>A specific proposal to implement an initiative which, according to the assessment of the Systemic Risk Council, will be appropriate in order to mitigate or counter identified systemic financial risks.</p> <p>Can be directed towards one or more authorities.</p>	<p>Explanatory description of the systemic risks the recommendation concerns. If the recommendation contains specific proposals for changes in legislation etc., it must also be explained why the proposal is considered appropriate and proportional to address the systemic risks the recommendation concerns.</p> <p>As a general rule, an assessment of European Union law should be made prior to all recommendations from the Council.</p> <p>Recommendations directed towards the government must include a statement by the representatives of the ministries.</p>	Will as a general rule be published unless the recommendation must be confidential for reasons of e.g. financial stability.	<p>The recipients are obliged either to act on the recommendation or to present a report within a period of three months explaining and justifying why the recommendation is not being followed. In special cases, the Council can decide that the report has to be presented earlier.</p> <p>The Council shall evaluate whether the acts or omissions to act and the reasons for this are adequate. If a public recommendation is not followed, the Council shall publish an assessment of the consequences it may have for the systemic risks.</p>

Source: Legal basis and Rules of Procedure of the Systemic Risk Council

**13. This has led to inaction bias, particularly on housing-related measures.** MIBFA did not comply with SRC's recommendation regarding risks related to deferred amortization loans in 2014 and only partially complied with the recommendation targeting similar risks in 2017. This is despite SRC's highlighting risks related to high house prices and elevated household debt over the period 2014 – 2016 and ESRB warning in September 2016 on similar risks (Figure 3). Also, currently the SRC does not have borrower-based tools in its macroprudential toolkit. These factors have led to inaction bias wherein (i) macroprudential action is either not taken or delayed, and (ii) when action is taken, second-best policy options are chosen in some cases, which internalize political feasibility.



**14. So far, the SRC has issued 12 statements where transparency and accountability mechanisms have worked well** (Table 4). These included two observations, one warning and nine recommendations. The SRC published assessment of action taken by the government and highlighted risks, as needed.

**Table 4. Denmark: Observations, Warnings and Recommendations Issued by the SRC**

Date	Nature of intervention	Details of intervention	Action taken
06-24-2013	Recommendation	Phasing in of capital requirement legislation (including SIFI buffer; implementing CRR/CRD IV framework; and introducing framework for CCyB)	Done
09-30-2014	Observation	Low interest rate and buildup of systemic risks	
09-30-2014	Recommendation	To restrict deferred amortization on mortgage loans, SRC recommended: (i) imposing restrictions on the mortgage banks' mortgage loans with deferred amortisation at high loan-to-value (LTV), ratios; and (ii) lowering borrowing limits for deferred amortization loans as a ratio of the property value at the time of granting the loan	(i) complied in supervisory diamond for MCI's. Proposed: December 2014; effective Jan 2020. (ii) Not complied
03-27-2015	Observation	Low interest rate and buildup of systemic risks	
09-21-2016	Warning	Buildup of systemic risk in the Faroe Island	
03-30-2017	Recommendation	Activation of systemic risk buffer in Faroe island at 1 percent from January 1 <sup>st</sup> 2018	Complied
03-30-2017	Recommendation	To limit risky loan types at high levels of indebtedness, SRC recommended that the share of risky housing loans (at variable rate and/or with deferred amortization if the borrower's Debt-to-Income (DTI) > 400 percent) should be < 15 per cent of credit institutions' new residential mortgage lending in Copenhagen City and environs and Aarhus	Government proposed good business practices for mortgage lending (proposed march 2017, amended October 2017, effective January 2018) which <i>partially</i> complied with the recommendation
12-20-2017	Recommendation	Activation of CCyB at 0.5 percent from March 2019	Complied
04-09-2018	Recommendation	Increasing systemic risk buffer in Faroe Islands to 2 percent from January 1 <sup>st</sup> 2019, and 3 percent from January 1 <sup>st</sup> 2020	Complied
09-25-2018	Recommendation	Increasing CCyB to 1 percent from September 2019	Complied
03-26-2019	Recommendation	Increasing CCyB to 1.5 percent from June 2020	Complied
10-01-2019	Recommendation	Increasing CCyB to 2 percent from December 2020	Complied

**15. SRC has strong and wide-ranging information powers over the financial system.** The DFSA can require all institutions it supervises to provide any information that it needs to fulfill its mandate. Further, DN has the power to collect information from legal persons and individuals domiciled in Denmark who (i) conduct financial business subject to the Financial Business Act or other financial legislation; (ii) have outstanding debts and/or assets abroad; (iii) who have either issued or own securities, or carry out trading or clearing and settlement of financial products; as well as from branches etc. situated in Denmark that are not legal persons or individuals, but apart from that fall within the definitions in (i – iii). According to the Financial Business Act, §343s, 7 ([Link](#)), the Systemic Risk Council has access to collect all relevant information from the DFSA, relevant ministries and DN to the extent that this information deals with the financial system, information about specific institutions etc. and that this information is necessary for the Council's performance of its tasks. The availability of the new credit-register data has further enhanced information powers.

**16. Although resources for macroprudential policy appear sufficient thanks to inter- and intra-agency collaboration, the DN could expand its human resources for macroprudential policy.** The SRC secretariat, headed by the DN, is responsible for systemic risk monitoring and macroprudential policy formulation, more broadly. The DN has a high capacity for financial stability risk analyses, however it has only few staff fully dedicated to macroprudential policy. Overall, the secretariats' inputs both through the intra-agency cooperation with other units within the DN (Economics, Financial markets, Modeling, and Statistics departments) and through the interagency cooperation, most notably with DFSA, help ensure sufficient quality and quantity of resources available for macroprudential policy at the national level.

### C. Principle III – Effective Cooperation and Coordination

**17. The SRC is a platform for coordination among relevant agencies for macroprudential policy.** SRC facilitates cooperation and exchange of information between the institutions that its members represent, as well as between these institutions and itself. Information exchanges are facilitated by the fact that the DFSA, DN and the relevant ministries have the legal right to provide the SRC with all information they may have, including information protected by professional secrecy. The SRC's coordination role complements pre-existing coordination mechanisms in the Danish institutional set-up.<sup>5</sup>

- The DN is primarily responsible for the macroprudential analysis to support macroprudential decision making. While not enshrined in formal agreement, in practice, the DN (supported by the DFSA) conducts regular macroprudential analysis on systemic risks and vulnerabilities and prepares quarterly Joint Macroprudential Report for the council meetings.
- The ministries are responsible for making proposals for amendments in legislation of the banking sector and the insurance sector, respectively. In addition to the legislator role, the

<sup>5</sup> MOU between DN, MoF and MoBFA and FSA concerning financial supervision (April 8, 2005).

ministries also contribute to staff level discussions on macroprudential analysis and policy recommendations and act as a bridge between the SRC and the government.

**18. At a more informal level, the secretariat facilitates interagency coordination.** The secretariat involves staffs from the DN, the DFSA and the economic ministries. Prior to the SRC meetings, the DN and the DFSA jointly conduct risk assessments. The ministries are consulted in the preparation for the preliminary proposal to the council's decision.

**19. The Danish institutions in charge of financial stability have regular dialogues with European and regional bodies.** DN and the DFSA participate in the work of the ESRB, both through participating in the permanent bodies of the European Systemic Risk Board (ESRB). These include the General Board, the Advisory technical committee (ATC), the instrument working group (IWG), the analysis working group (AWG), as well as through work in several expert groups and task forces. DN and the FSA also participate actively in the Nordic Baltic Macroprudential Forum (NBMF). The Forum comprises of several smaller working groups focusing on sharing information and expertise on macroprudential instruments and analysis of systemic risks. The NBMF workstreams produce biannual reports to cover the risk assessment and macroprudential tools activated by member states. The reports are used for internal discussions in the forum where governors of central banks and directorate generals of FSAs participate.

**20. The authorities should seek to further strengthen the regional cooperation arrangement.** Due to strong interlinkages, it is desirable for macroprudential policy in each country to pay close attention to financial cycles and structural developments in the other countries in the region. The conversion of the legal structure of a systemic Finnish bank in Denmark to a branch have highlighted the importance as well as the need for close cooperation between home and host supervisors to monitor and address vulnerabilities of a systemic institution. Cross-border memorandums of understandings (MoUs) have therefore been agreed to strengthen cooperation, support enforcement, and reduce risks of leakages. A MoU between the Finnish, Norwegian and Swedish MoFs and the Danish Ministry of Business on cooperation regarding significant branches of cross-border banking groups has been signed to arrange for mutual recognition of macroprudential measures—also when this is not compulsory by the European Union (EU)/European Economic Area (EEA) regulation. A MoU between the Nordic supervisory authorities and the European Central Bank (ECB) has also been signed regarding host country regulation. It stresses that the supervisory authorities should strive to ensure that banks follow the rules and regulations in the host country.

## D. Recommendations

**21. The institutional arrangement should foster consensus building without letting it hold up decision-making.** While there are merits to consensus building, in its extreme form it implies that each member has an implicit veto power. SRC chair should be given the ability, enshrined in law, to make proposals for a recommendation—after due consultation with other SRC members—without the need to strive for consensus. This would limit the consensus building phase before the secretariat starts working on draft proposals. Over time, if inaction bias becomes a problem, SRC

could be given hard powers over capital tools under CRD/CRR legislation, that is, it is made the designated authority for macroprudential policy. Borrower-based tools, which have clear distributional implications, can remain with the MIBFA with the SRC having recommendation powers over them with a comply-or-explain mechanism.

**22. A comprehensive overview of recommendations made by the SRC should be included in the MIBFA's annual report to Parliament to further increase accountability.** Since SRC only plays an advisory role, it does not have the power to give instructions to other authorities and accordingly, is not made accountable to the Danish Parliament (the Folketing). The Folketing currently exercises its parliamentary control in relation to financial regulation and supervision through the minister for industry, business and financial affairs. While the SRC normally makes its recommendations publicly available, it has no binding powers. Therefore, it would be useful to, on an annual basis, gather all recommendations from SRC in a table in MIBFA's flagship publication to Parliament, together with explanations about how it has followed, or deviated from, the advice. This would foster transparency on the advice provided and facilitate accountability with regard to policy actions taken (or not taken) by the MIBFA.

## SYSTEMIC RISK MONITORING

**23. Macroprudential policy decisions cannot rely on mechanical rules and should be based on continuous assessment of current and evolving risks.** Since there is no single indicator of systemic risk, the assessment should employ several indicators. Ultimately, a guided discretion approach is advisable wherein key indicators are used for risk identification to assess when policy action might be needed, but the decision is based on judgement that considers all relevant information. Such judgment requires access to data, as well as the analytical capacity to assess systemic risks and effectively map risk assessment into policy recommendations and action.

**24. The SRC's member institutions have strong analytical capacity and framework for monitoring systemic risks.** DN produces, on a semi-annual basis, a financial stability report.<sup>6</sup> DN staff in the SRC secretariat, with input from DFSA staff in the SRC secretariat produces a quarterly report for SRC meetings. These reports usually consist of three parts – a risk picture (regular surveillance of financial stability risks), notes on countercyclical capital buffer and housing market risks, and ad-hoc thematic notes on frontier issues like risks in the commercial real estate sector, interconnectedness etc. Some of this material inspires work that is later published as part of the DN financial stability report however in general, a large part of this useful material is not disseminated to the public.

**25. The SRC uses a broad set of tools and indicators to monitor systemic risk.** The regular surveillance of systemic risk is based on a list of comprehensive and evolving set of indicators for each of the intermediate objectives (see 17). This is useful to strengthen the anchoring of macroprudential policy-making and foster accountability with regards to how SRC conducts policy

<sup>6</sup> Made publicly available online: <http://www.nationalbanken.dk/en/financialstability/Pages/default.aspx>.

against the principles set out in the strategy. Ultimately, a guided discretion approach is used wherein key indicators are used for risk identification to assess when policy action might be needed, but the decision is based on judgement that considers all relevant information. The systemic risk and policy division in the DN relies on several models<sup>7</sup>, micro data sets, and empirical approaches in its impact assessment of risk materialization.

**26. The SRC has developed its approach to guide its CCyB recommendation.**<sup>8</sup> The advice on the buffer rate is based on six key indicator categories (Figure 4). SRC uses a range of indicators to decide on the activation and buffer rate of CCyB. The methodology also includes considerations on the release of the buffer. Indicators such as the financial stress indicator and aggregate earnings, which are more timely are given a higher weight when considering a release of the buffer.

**Figure 4. Denmark: CCyB: Categories and Related Key Indicators**

*The recommendation on CCyB is based on a range of indicators reflecting a broad-based build-up of vulnerabilities*

<b>Risk perception</b> <ul style="list-style-type: none"> <li>• Financial stress indicator</li> <li>• Credit spreads</li> <li>• Equity volatility</li> </ul>	<b>Property prices</b> <ul style="list-style-type: none"> <li>• House prices</li> <li>• Flat prices</li> <li>• Commercial property prices</li> <li>• House price-to-income gap</li> </ul>	<b>Credit standards</b> <ul style="list-style-type: none"> <li>• Lending survey</li> <li>• Interest spread</li> <li>• Housing burden</li> </ul>
<b>Credit developments</b> <ul style="list-style-type: none"> <li>• Total credit-to-GDP</li> <li>• Credit to household and corporates</li> <li>• Credit-to-GDP gap</li> </ul>	<b>Risk build-up in credit institutions</b> <ul style="list-style-type: none"> <li>• Leverage</li> <li>• Earnings</li> <li>• Excess capital adequacy</li> </ul>	<b>Model-based indicators</b> <ul style="list-style-type: none"> <li>• Financial cycle estimates</li> </ul>

Source: SRC.

<sup>7</sup> In particular, [SRISK model](#) is used to measure the level of systemic risk in Danish banks and the financial sector as a whole in terms of the propensity of a bank to be undercapitalized when a crisis occurs. In addition, the impact of contagion risks from covered bonds market is assessed through this [model](#), which accounts for both direct and indirect linkages (through fire-sales) between institutions. The authorities have also developed GDP-at-risk approach for Denmark to link financial conditions to future growth prospects.

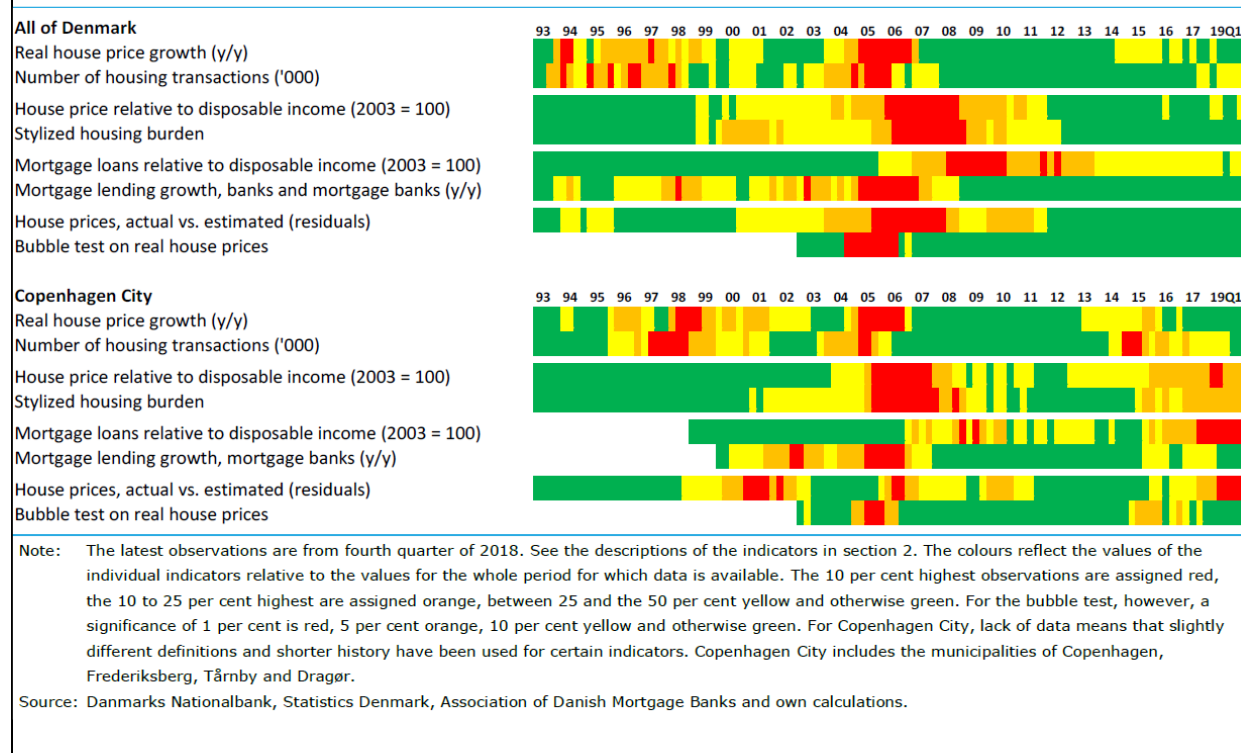
<sup>8</sup> See [SRC's methodology paper on CCyB](#) for more details.



**27. The SRC closely monitors indicators for the development of risk in the Danish housing market.** Risks related to housing market is an area of major importance to the financial system, as mortgages account for a large share of the total balance sheets of credit institutions and households. To obtain a simple, visual overview of various risk factors, the Council has developed a 'heat map' summarizing indicators for all of Denmark and for Copenhagen along four dimensions – activity in the housing market, debt servicing, housing credit, and empirical models.<sup>9</sup>

**Figure 5. Denmark: Heat Map – Systemic Risks in the Housing Market**

*The SRC monitors housing market developments both at the national level and in Copenhagen because developments in the capital city tends to ripple through to the rest of the country with a lag*



**28. Data quality is generally good, and the recent availability of central credit registry (CCR) database will help fill knowledge gaps.** The credit registry data has detailed information on lenders and borrowers by type of exposure, which is useful for studying the interconnectedness within the system. Further, this data can be linked with registry data on individuals within Statistics Denmark. CCR data along with borrower characteristics can be used to perform an analysis of important determinants of financial distress. In particular, DN could establish a model for the probability of default (PDs) based on a number of explanatory variables, including the DTI level of the borrower and their financial margins. Similarly, CCR can be used to understand the links between corporates and the banking system.

<sup>9</sup> See SRC's note on [heat map of the build-up of systemic risks in the housing market](#) for more details.



## Recommendations

**29. Further enhance systemic risk monitoring framework by extending coverage to the non-bank financial sector.** Currently, the analytical framework for systemic risk monitoring is largely oriented towards banks and MCIs. Hence, the monitoring framework can be further enhanced by more actively covering non-banks (insurers, pension funds, and asset management companies) both from the perspective of regular surveillance (including indicators covering non-bank related risks in the risk picture) as well as in-depth analysis of specific risk factors in the non-bank financial sector in Denmark. DN should also build on the interconnectedness work to further understand transmission of shocks between financial balance sheets, particularly given centrality of covered bonds in the system.

**30. While SRC has developed tools for risk identification and assessing the impact if risks materialize, further efforts are needed to develop macroprudential stress test frameworks.** Currently, the impact of adverse scenario on the banking system is largely studied through microprudential stress test and the SRISK model. While these models capture the first-round impact on the banking system, the spillover to the real economy and second round effects are often missed. The DN should devote resources towards developing truly macroprudential stress tests that consider feedback loops between financial system and the real economy and allow for looking at the impact of macroprudential instruments. The primary focus of macroprudential stress tests is not whether banks ‘pass’ the test, that is, they remain sufficiently capitalized, but on how macroprudential policy tools can prevent a deterioration of macroeconomic developments.

**31. The coverage and quality of data in the CRE sector should be enhanced.** First, centralized collection of market data with better coverage is important for regular risk monitoring and assessment of valuation gap and demand-supply imbalances. Second, indicators covering financial system’s CRE credit exposures (stocks and flows of CRE lending, NPLs and loan-loss provisions on CRE lending) should be collected and monitored to assess vulnerabilities in the CRE market. Further, data on credit exposure should cover both the size of exposure and risk characteristics of underlying CRE properties (e.g., by region, segment) to better monitor risk concentrations. Third, DN should collect data on CRE lending standards. While MCI lending in the CRE segment must comply with a 60 percent LTV limit, borrowers can seek top-up loans from banks as long as they have positive cash-flow. The credit registry data should facilitate looking into the overall lending standard for the CRE sector. Finally, regular reporting of CRE companies’ financial conditions is useful for monitoring and assessing repayment risks to banks.

## SYSTEMIC RISKS AND MACROPRUDENTIAL TOOLS

**32. This section provides an assessment of systemic vulnerabilities and their mapping into recommendations for macroprudential toolkit in Denmark.** Systemic vulnerabilities are assessed based on developments in multiple signaling indicators, as well as on the FSAP's financial sector risk analysis (see the Technical note on risk analysis), and following an approach suggested in the Staff Guidance Note on Macroprudential Policy (IMF, 2014). Based on the assessment of each type of vulnerabilities, recommendations are provided for Denmark's macroprudential policy.

### A. Broad-based Vulnerabilities: Assessment, Tools, and Recommendations

**33. The Danish economy has grown steadily in recent years amid accommodative financial conditions** (Figure 6). In an environment characterized by negative policy rates, GDP has exceeded potential for the third consecutive year and the unemployment rate is at a 10-year low. Policy rates, which entered negative territory in mid-2012, are now among the lowest in the world, sovereign yields are negative for maturities up to 10 years, and given the krone's peg to the euro, monetary conditions are expected to remain loose over the medium term. Financial conditions have remained below the historical norm by a greater extent, and for a longer period, relative to regional peers. Credit growth picked up to 4.8 percent in 2019 Q3 from 3.5 percent in 2018, and, notwithstanding a slight downtrend in recent years, the aggregate credit-to-GDP ratio is elevated at 160 percent of GDP and amongst the highest in the OECD. However, more recently economic activity has slowed sharply as a result of the outbreak of coronavirus, the measures to contain the infection and the resulting behavioral changes (see DN scenarios for economic growth in 2020 [here](#)).

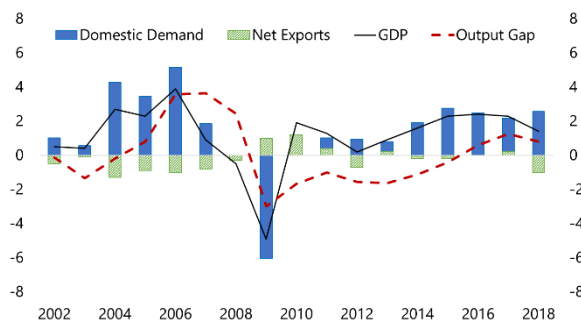
**34. The results from growth-at-risk framework suggest that a prolonged period of loose financial conditions can increase downside risks to growth** (appendix 1). While loose financial conditions improve outlook in the short run, it results in a build-up of vulnerabilities due to higher leverage and risk illusion increasing downside risks to growth in the medium term. Further, a sudden tightening of financial conditions is also associated with adverse growth outcomes.

**35. Relatedly, the authorities had built up CCyB to provide resilience to the financial system in a severe downturn.** The CCyB was increased to 2 percent (effective in December 2020) accompanied by forward guidance of a further increase to 2.5 percent if risks continue to build up. IMF stress test results indicate that in a severe adverse scenario, three SIFIs would have common equity tier 1 (CET1) capital ratio **below** overall requirements when the hurdle rates are assumed to only relax the CCyB by setting it to zero i.e. SIFIs are not allowed to use their capital conservation buffer (CCB) and systemic risk buffer (SRB). However, if they would be assumed to also be allowed to make use of the CCB, all seven SIFIs would meet the regulatory requirements, some by partially depleting their CCB.

**Figure 6. Denmark: Broad Macro-Financial Developments**

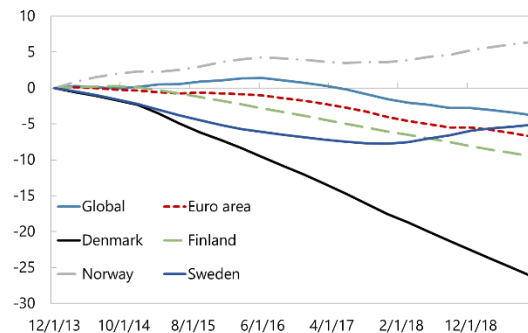
*Growth has exceeded potential in recent years...*

**Output Gap, Real GDP Growth and Demand Components**  
(Percent)



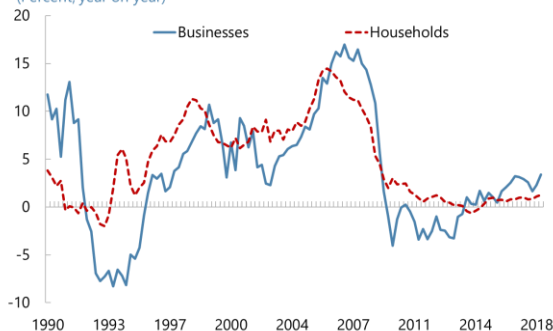
*...with the backdrop of loose financial conditions with cumulative easing in Denmark larger than peers*

**Cumulative Loosening of Financial Conditions**  
(Standard Deviations)



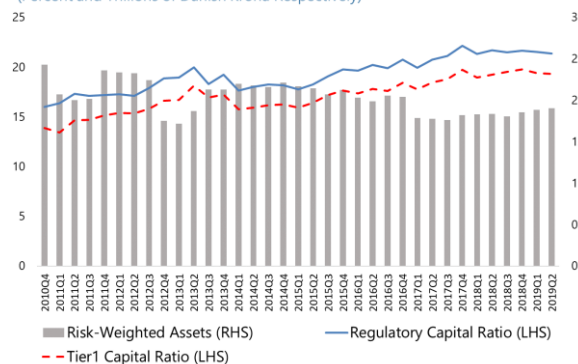
*Credit growth has picked up more recently...*

**Nominal Credit Growth, 1990-2018**  
(Percent, year on year)



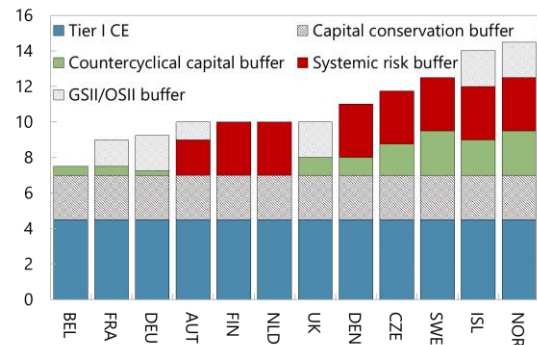
*Bank capital ratios have been rising since the GFC...*

**Bank Capital and Risk-Weighted Assets**  
(Percent and Trillions of Danish Krona Respectively)



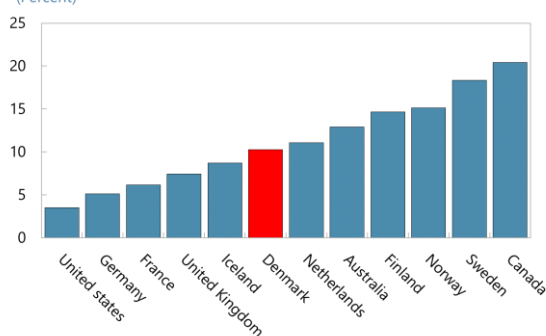
*...which are sizable in international comparison*

**Basel III CET1 Capital Requirements**  
(Systemically important banks, in percent of risk-weighted assets)



*However, banks' profitability is relatively modest*

**Return on Equity**  
(Percent)



**36. In line with its stated objective, CCyB was released (and set to zero) to limit economic impact of Covid-19 outbreak.**<sup>10</sup> Although subject to great uncertainty, the disruption arising from Covid-19 will have a sharp and large adverse economic impact. Stress tests indicated that all systemically important institutions would continue to meet minimum capital requirements in a severe pre-COVID adverse scenario. However, two illustrative COVID scenarios—with deeper and more front-loaded economic contractions—indicate an even larger impact on capital. Importantly, these scenarios and their implications for SIFI solvency are subject to downside risks. (see Technical Note on systemic risk assessment for more details). It's important that the credit institutions use the provided flexibility from CCyB release to extend their lending capacity and not to pay additional dividends or conduct share buybacks.<sup>11</sup> The release of the buffer however implies that unless replenished in due course, the system will have lower buffers to deal with future shocks.

**37. Minimum leverage ratio requirement, once binding, may overrule risk-based capital requirements making part of current buffers unusable.** For institutions with a large share of assets with very low risk weights, the leverage ratio could entail a higher Tier 1 requirement than the risk-based capital requirements. This implies that a part of the capital buffer would go towards fulfilling the leverage requirement for some institutions making it unusable to absorb losses in a downturn.<sup>12</sup> SIFIs, particularly the ones with low risk weight density, hold sufficient excess capital adequacy and hence remain above the leverage requirement in adverse scenario. However, further consideration could be given to introduce a leverage ratio buffer once leverage requirements becoming binding. Other future requirements such as introduction of output floors should also be part of the considerations.

## B. Household Vulnerabilities: Assessment, Tools and Recommendations

**38. Denmark's high level of household debt remains a key source of vulnerability** (Figure 7). Notwithstanding a gradual downtrend, household debt in Denmark is among the highest in advanced economies.<sup>13</sup> Large liabilities are counterbalanced by large assets (housing and pension). However, high gross debt, combined with illiquid assets (concentrated in real estate) expose households to price and interest rate shocks that can impact asymmetrically their consumption and wealth. High household leverage can be a source of systemic risk and they may affect financial stability both directly and indirectly. Direct effects are credit losses on mortgage portfolios due to adverse economic or financial conditions and simultaneous negative developments in the residential real estate market. Indirect effects could be related to adjustments in household consumption,

<sup>10</sup> The authorities have also temporarily relaxed the systemic risk buffer in the Faroe Islands from 3 to 2 percent.

<sup>11</sup> The DFSA has issued a recommendation for banks to use the additional flexibility from the CCyB release to extend their lending capacity.

<sup>12</sup> The capital buffer requirements (CCB and SIFI buffer) are soft requirements whereby non-compliance would result in restrictions on dividend distribution. However, the leverage ratio is a hard requirement and non-compliance will mean that the institution may not continue to operate.

<sup>13</sup> Mortgage loans (including mortgages from MCIs and housing related bank loans) account for about 90 percent of total household debt from banks and MCIs. The share of household loans in total loans from MCI and banks is around 65 percent.

leading to further consequences for the real economy and financial stability. Estimates from IMF growth-at-risk framework suggest that although greater household leverage could stimulate near-term growth, any such increase in indebtedness would raise the chances of a slowdown over the medium term (Appendix 1). High household debt is similarly associated with downside risks to house prices in the medium term (Appendix 2).

**39. High household debt in Denmark and associated vulnerabilities reflects both cyclical and structural factors.**

- Among cyclical factors, the perceived lower risks of, and easier access to, funding may have contributed to an increased demand for real estate, putting upward pressure on property prices. Since the resulting higher collateral values further favor the demand for, and supply of, credit, these self-reinforcing dynamics may result in potential systemic consequences.
- There are also various structural factors contributing to high household debt in Denmark (Figure 8). These include: (i) households' relatively large savings via contributions to mandatory saving schemes which results in the need for large borrowings; (ii) complex rental market regulations with caps on rent in a significant share of apartment buildings in the major cities, which creates a lack of housing supply and exerts upward pressure on house prices and debt for households that buy their own property; and (iii) favorable tax treatment of owner-occupied housing compared to other savings vehicles and most OECD countries and debt bias caused by relatively high mortgage interest deductibility for taxation. Further, since 2001 the system of housing property taxation has been decoupled from market prices, resulting in a decline in the effective tax rate, especially in the major cities. In 2017 the Danish parliament passed into law a bill on a new housing taxation system that re-establishes the link between taxes payable and current residential real estate market prices, which was due to take effect in 2021 but have been postponed to 2024 now.

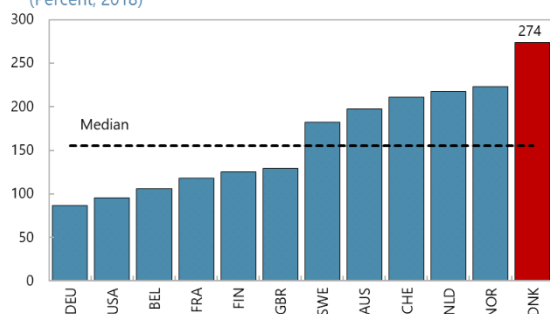
**40. House prices remain elevated, close to pre-GFC levels, most notably in Copenhagen.**

Nationwide house prices appear to be broadly in line with fundamentals. However, they have risen recently after a period of softening in response to prudential measures. By contrast, house prices in urban areas have been on a strong uptrend amid supportive macroeconomic and financial conditions (Figure 7). Specifically, there are concerns that Copenhagen flat prices have been increasing faster than warranted by fundamentals. In fact, downside risks to house prices (based on house prices-at-risk analysis) associated with larger house price misalignments appear to be greater in Copenhagen relative to the national market (Appendix 2).

**Figure 7. Denmark: Household-Sector Vulnerabilities**

Danish households' indebtedness is among the highest in advanced economies.

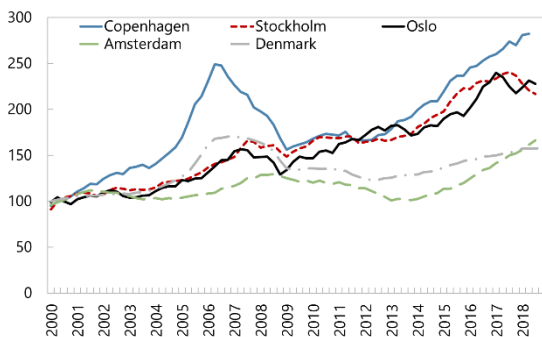
**Household and NPISH Outstanding Debt to Gross Disposable Income**  
(Percent, 2018)



House price in urban areas have been on a stronger uptrend,...

**Real House Price Indices**

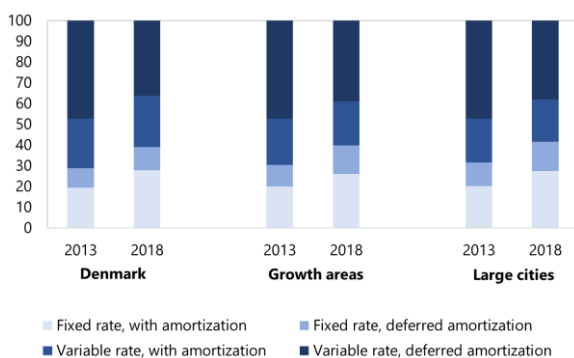
(Index, 2000=100)



Despite improvements, the share of mortgages on variable terms remains high...

**Stock of household mortgages by type**

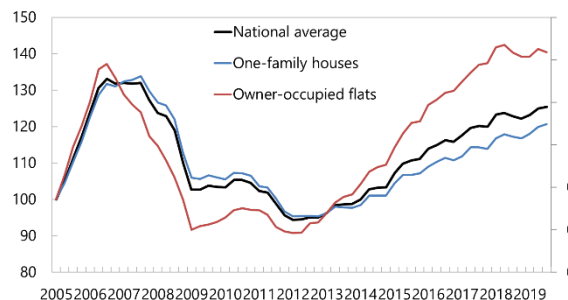
(Percent of total)



House prices remain high, and have risen recently after softening in response to prudential measures.

**Real Property Prices**

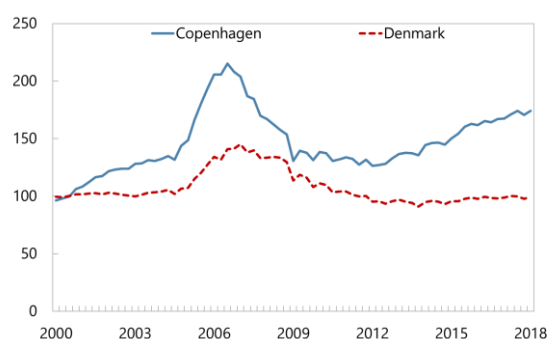
(Index, 2005Q1 = 100)



...and have been increasing faster than warranted by fundamentals.

**House Price-to-Disposable Income**

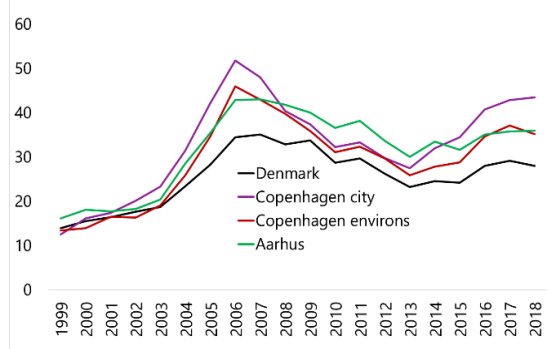
(Index, 2000=100)



...which coupled with rising DTIs may compound risks.

**Share of Households with DTI > 4**

(Percent of total new mortgage lending)



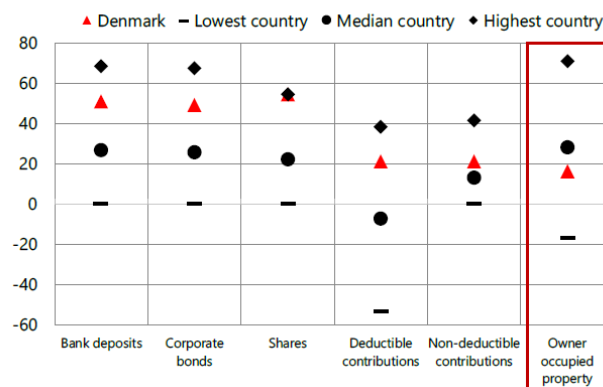
Source: Danmarks Nationalbank, Association of Danish Mortgage Banks, Statistics Denmark, Eurostat, IMF staff calculations.

Notes: Real property prices are calculated using CPI as the deflator. National averages is the weighted average of owner-occupied flats and one-family houses nationally.

**Figure 8. Denmark: Household Indebtedness and Debt Bias**

*Tax treatment of owner-occupied households is more favorable compared to other savings vehicles*

**Marginal Effective Tax Rates Across Asset Types, 2016**  
(Percent)



Source: OECD.

*Mortgage interest deductibility from personal income taxes is generous compared to several other countries*

	Denmark	Finland	Ireland	Netherlands
General rule	32.7 percent	45 percent capital income deduction in 2017; 35 percent in 2018; 25 percent in 2019 and thereafter	Sliding scale until end-2020. Up to 30 percent for first-time homebuyers; half for others. 1/4 nominal reduction each year	100 percent for pre-2013 loans; 100 percent for post-2013 fully amortizing loans (within 30 years)
Caps/notes	Reduced to 26 percent in 2018 for annual mortgage interest expense over DKK 50,000; 25 percent in 2019 and thereafter	30 percent deduction of the excess interest expense over capital income against income tax, up to EUR 1,400 per year (32 percent for first-time homebuyers)	Deductibility varies by origination date (only 2004-12), and borrower's marital status. All deductibility ends as of Jan 1, 2021.	The maximum tax rate that mortgage interest can be deducted decreases by 3 points annually from 2019, to 36.9 percent in 2025 (around 50 percent in 2018)
	Norway	Spain	Sweden	United Kingdom
General rule	100 percent (full deduction)	0 percent for properties purchased after Jan 1, 2013	30 percent	0 percent
Caps/notes		15 percent deduction up to EUR 9,040 per year, for properties purchased before Dec 31, 2012	Reduced to 21 percent for annual mortgage interest expense over SEK 100,000	Mortgage interest relief at source abolished in 2000

Sources: National tax and other authorities; IMF staff calculations.



**41. Households exposed to house price over-valuation, over-indebtedness or risky mortgage products are most vulnerable to shocks** (Figure 7).<sup>14</sup> The household vulnerabilities in Denmark can be broadly categorized into three buckets. The risk factors further increase when households fulfill more than one of these criteria.

- Households who have purchased in highly appreciating and potentially overvalued urban areas such as Copenhagen, where loan-to-income (LTI) ratios and credit growth are noticeably higher than in the rest of the country. An interest rate, house price or income shock would significantly affect the balance sheets of these households
- Households with a high level of indebtedness, that is, high debt to income (DTI) ratios. Low-income households that spend a significant proportion of their income in servicing debt are especially vulnerable.
- Households with variable rate and/or deferred amortization mortgage products. Despite improvements, the still high share of variable-rate mortgages (60 percent of the stock, of which 36 percent are non-amortizing) leave households sensitive to interest rate hikes.

**42. Danish authorities have undertaken several measures to address household vulnerabilities since the last FSAP.** Demand-side measures targeting borrowers loan origination and amortization requirements include:

- **Supervisory diamond for MCIs.** A regulatory framework consisting of 5 benchmarks for mortgage credit institutions was announced in 2014 and amended in 2016 (Figure 9).
- **Mandatory Downpayment.** A consumer protection clause mandates at least 5 percent downpayment for residential real estate purchases, translating into an effective 95 percent LTV limit. However, tighter single-loan restrictions apply, with 80 percent LTV per loan for loans financed by mortgage credit institutions. The remaining 15 percent of the value of the property is financed with an additional loan having a secondary lien status.
- **Guidelines on Good Mortgage Lending in Growth Areas (Seven Best Practices).** The authorities introduced a rule in 2016 to address risks related to mortgage lending for the most vulnerable households with high DTI and LTV ratios. The rule stipulates that new borrowers in “growth areas” (effectively, Copenhagen and Aarhus) with a DTI ratio above 4 or 5 should have sufficient wealth so that their net wealth remains positive if house prices drop by 10% or 25%, respectively.
- **Good Business Practice for Mortgage Lending.** The authorities introduced additional requirements in 2018 as part of consumer protection legislation to ensure that vulnerable households choose a less risky financing profile. These rules require new borrowers with a DTI

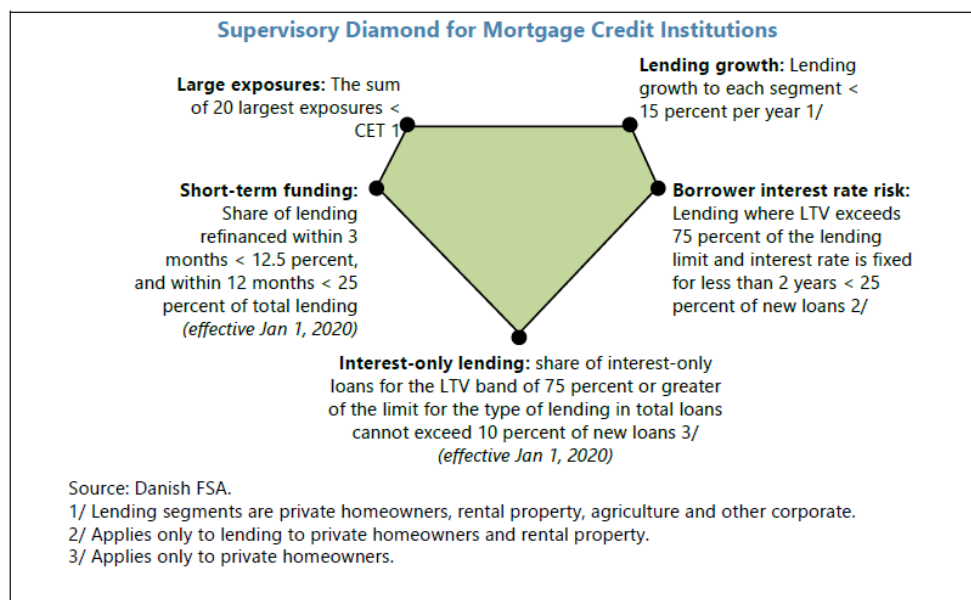
<sup>14</sup> See Denmark 2018 Article IV, [Selected Issues](#) for more details.



ratio above 4 and a LTV ratio above 60% to have an interest rate fixation period of at least five years and to obtain deferred amortisation only if the interest rate fixation period is 30 years.

**Figure 9. Denmark: Supervisory Diamond for Mortgage Credit Institutions**

*Supervisory diamond for MCIs aims to promote sound lending practices by the MCIs*



**43. The macroprudential toolkit is however incomplete as it does not include binding borrower-based tools.** Currently, there is no legal basis to use limits on LTV or DTIs as a macroprudential tool in Denmark. Therefore, several demand-side measures (anchored on LTV and DTIs) have been introduced under the consumer protection legislation rather than binding macroprudential measures. This affects the legitimacy and transparency of the use of these measures for macroprudential purposes.

**44. While the current macroprudential measures go in the right direction, authorities should stand ready to take further action if risks persist (Figure 10).**

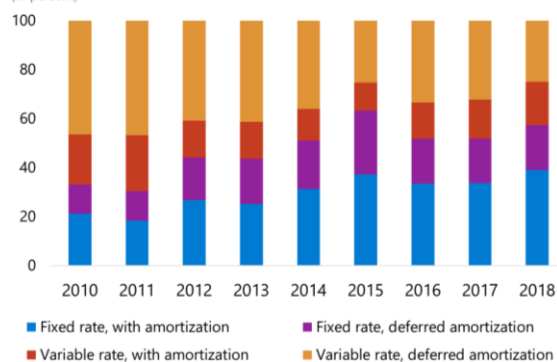
- The mandatory down-payment requirement of 5 percent (an effective LTV limit of 95 percent) in Denmark is loose when compared to other countries. Based on sensitivity analysis (a 20 percent reduction in house prices), the share of residential real estate loans with current LTV greater than 100 would increase from 2 to 12 percent of MCI's mortgage portfolio under an adverse house price shock. The overall impact would be even greater when bank loans (guaranteed by real estate) are also accounted for.
- Further, in some cases, most notably the mandatory down payment and seven best practices, the guidelines reflected existing best practices. The objective was to reduce financial

**Figure 10. Denmark: Housing Finance-Related Vulnerabilities**

Recent measures have reduced the share of interest-only, variable rate loans in new lending.

#### New Mortgage Lending by Type

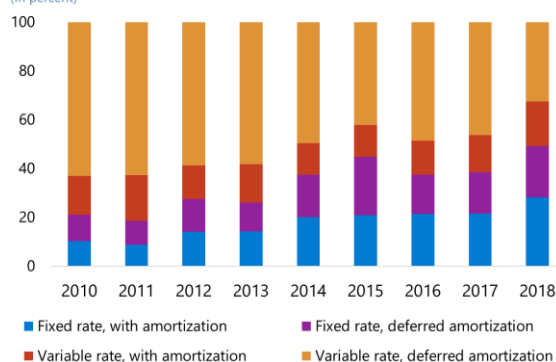
(In percent)



However, a large share of highly indebted households still borrow on variable and/or deferred amortization terms.

#### New Mortgage Lending by Type; LTI > 4

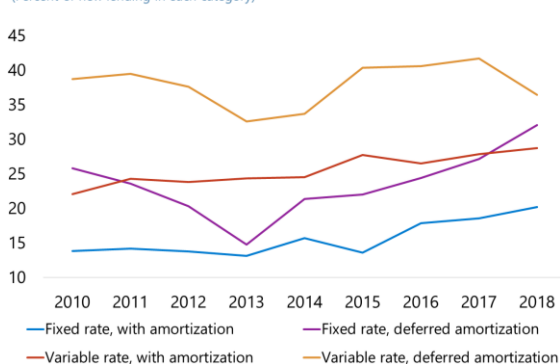
(In percent)



Indebted households continue to get deferred amortization loans, but have shifted from variable to fixed rates.

#### New Mortgage Lending by Type; LTI > 4

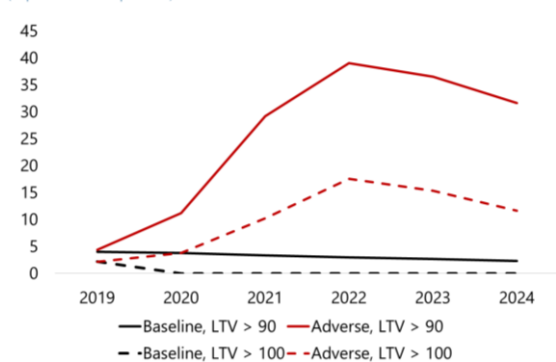
(Percent of new lending in each category)



A 20 percent house price shock would shift a large part of the mortgage portfolio over LTV greater than 100 percent.

#### House Price Shock: MCIs Loan Portfolio by LTV

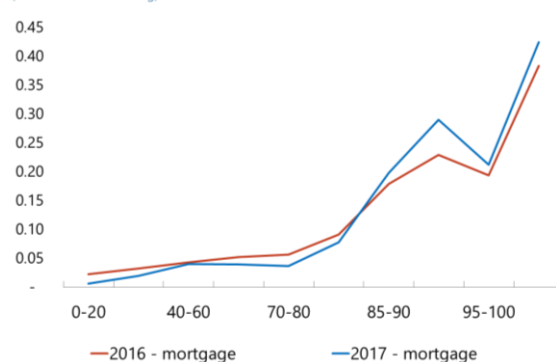
(In percent of total portfolio)



Households NPLs increase non-linearly with LTVs, with a break after an LTV of 85 percent...

#### NPLs by LTV Brackets

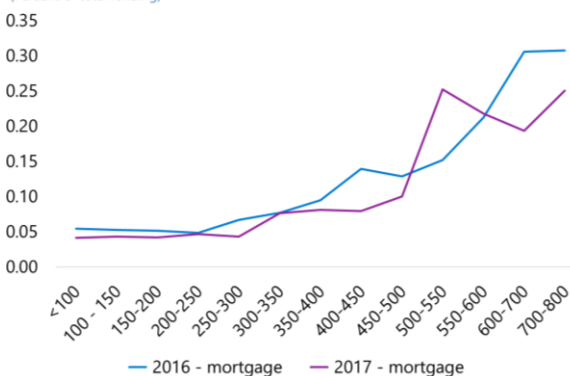
(Percent of total lending)



...and a break of an LTI of 500.

#### NPLs by LTI Brackets

(Percent of total lending)



Sources: Danmarks Nationalbank.

- vulnerabilities by promoting best practices rather than by tightening of lending standards. Hence, these measures had limited impact.
- The 2018 measure has been most successful and has resulted in softening of the overall house prices and households are switching to loans with higher amortization and lower interest rate risk. However, the share of new loans going to highly indebted household (LTI > 4) continues to be large and a large share of household still opt for deferred amortization loans – even though 2018 measures has shifted households from variable to fixed rate loans.

## Recommendations

**45. Introduce national legislation to include borrower-based tools in the real estate sector in the policy toolkit.** These borrower-based tools include limits on LTV ratio, DTI/LTI ratio and the debt service-to-income ratio (DSTI). These tools are available in most European countries and have been used widely both in Europe and elsewhere. These tools should be part of SRC's toolkit to enhance the legitimacy of their use for macroprudential purposes. Further, this would also allow for their use as binding measures rather than guidelines.

### Box 1. International Comparison of Debt Limits and the Use of Speed Limits

As of now, there are five high-income countries that have introduced DTI/LTI caps as a complement to their LTV caps (UK in 2014, Ireland in 2015, Norway in 2017, and Czech Republic and Slovakia in 2018).

Table. Use of DTI/LTI Caps and Speed Limits					
	Norway	UK	Czech Republic	Slovakia	Ireland
<i>Measures</i>	DTI	LTI	LTI	DTI	LTI
<i>Numerator</i>	All debt	Mortgage loan	Mortgage loan	All debt	Mortgage loan
<i>Denominator</i>	Gross annual income	Gross annual income	Net annual disposable income	Net annual disposable income	Gross annual income
<i>Limit</i>	5	4.5	9	8	3.5
<i>Exemptions</i>	10 percent of new loans per quarter	Up to GBP 100 million per annum or extending fewer than 300 mortgages	5 percent	10 percent	20 percent

Source: IMF Macroprudential Policy Survey.

**46. Further tightening of borrower-based measures would help addressing residual risks related to the housing market.** While pockets of vulnerabilities remain, the uncertainty and economic downturn caused by the COVID-19 crisis makes it undesirable to undertake further tightening measures at the current juncture. The authorities should continue monitoring

developments in the housing market and stand ready to act in case of an abrupt correction in house prices. Overtime, if vulnerabilities associated with housing finance persists, further tightening for borrower-based measures could be considered. In particular:

- *If house price valuation remains elevated, introduce a stricter LTV limit to safeguard the financial system from large house price shocks.* Micro data suggests that households' NPLs respond non-linearly with LTVs (Figure 10) with an observed jump after the LTV level of 85 percent. Earlier IMF work (Denmark 2016 Article IV, [Selected Issues](#)) also note that the LTV limit should be lowered from 95 to 90 percent to better protect households from house price declines.<sup>15</sup>
- *Introduce strict DTI limits for all borrowers irrespective of LTV considerations if the uptrend in house price continues.* In an economy with elevated house prices, rules targeting LTVs become less binding. Thus, increased focus on income-based measures, including DTI, LTI and DSTI might prove more effective in addressing high leverage and encourage faster amortization. Therefore, authorities should introduce a binding DTI limit (prudently calibrated using, for example, the credit registry database) such that households above this limit are not granted loans. Speed limits can be considered to minimize the negative impact of the measure on real economy.
- *Highly-leveraged households—with debt-to-income above 400 percent—should be subject to mandatory amortization, irrespective of amortization periods.*

**47. Structural policies should complement macroprudential measures in addressing factors contributing to the build-up of systemic risk in residential real estate market.** These policies include:

- *Limiting debt-bias in mortgage finance* by (i) further reducing mortgage interest deductibility, taking advantage of the current low rate environment; (ii) balancing tax-incentives on savings products that incentivizes large mortgage borrowing; and (iii) fastening the process of re-establishing the link between taxes payable and current residential real estate market prices (currently postponed to 2024).
- *Reduce rent control in Denmark*, which among the highest in advanced economies, to stimulate the rental market.
- *Relax supply constraints*, for example by relaxing restrictions on the size of new apartments in urban areas to improve demand-supply mismatches; and streamlining zoning and planning procedures across municipalities.

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<sup>15</sup> The selected issues paper finds that reducing LTVs from 95 to 90 percent would lower aggregate consumption by about 1.5 percentage points one year after introduction but increase it by 0.2 percentage points in a new steady-state because of lower debt-servicing costs.

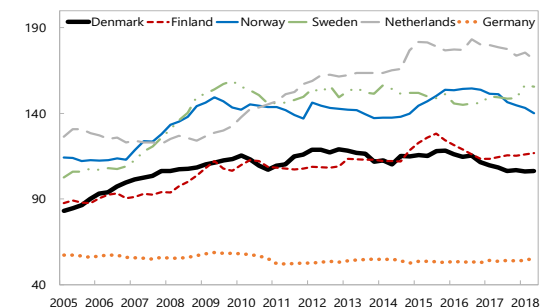
## C. Corporate and CRE Vulnerabilities: Assessment, Tools, and Recommendations

**48. Corporate debt remains stable at an aggregate level; however, its riskiness has increased** (Figure 11). On aggregate, corporate debt-to-GDP at around 90 percent is both stable and benign in comparison to peer countries. However, the riskiness of credit allocation (captured by leverage-based indicator; GFSR (April 2018)) has increased since 2013. This is also reflected in an easing in corporate lending standards. Nominal credit growth in the corporate sector, which had plummeted after the GFC, has picked up in recent periods.

**Figure 11. Denmark: Non-financial Corporations Vulnerabilities**

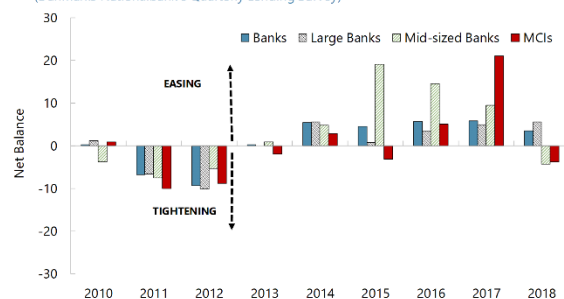
*Corporate debt on aggregate remains stable...*

#### Debt-to-GDP Ratio in Selected Countries (Percent)

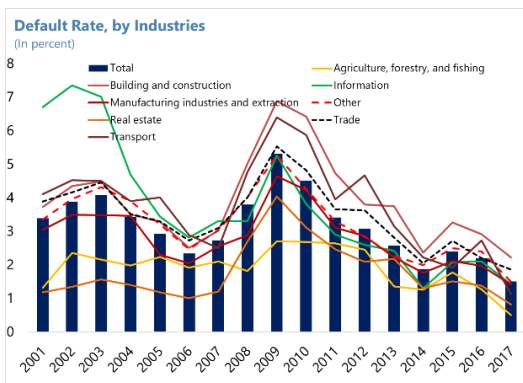


*... as some mid-sized banks and MCIs have increasingly relaxed lending standards in recent years.*

#### Credit Standards for Corporate Lending in Denmark (Danmarks Nationalbank's Quarterly Lending Survey)

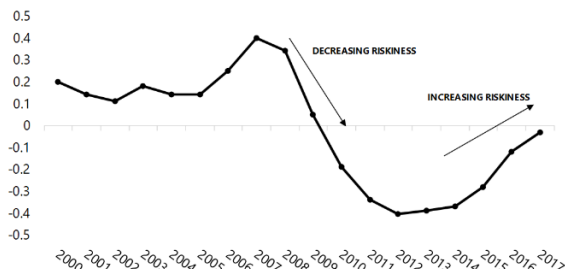


*...alongside a decline in the default rates.*



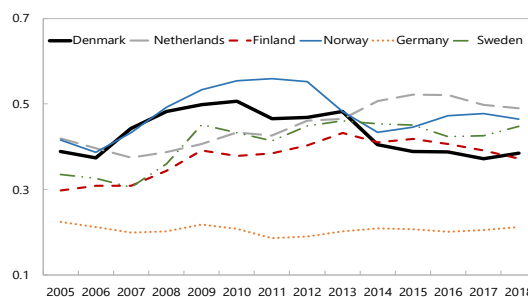
*However, its allocation has become riskier...*

#### Riskiness of Credit Allocation (Danish NFCs excl. Finance and Insurance)



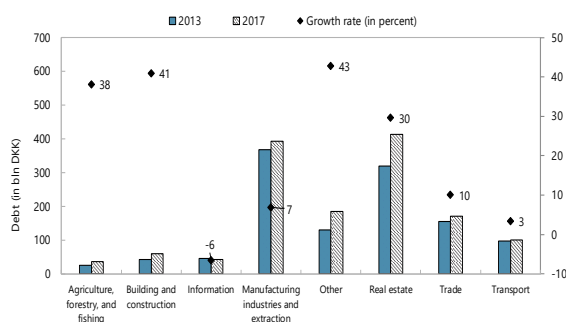
*The debt service ratio of Danish NFCs has improved, returning to the level of the pre-crisis period...*

#### Debt Service-to-Income Ratio in Selected Countries



*Debt has increased most significantly in cyclical industries including real estate.*

#### Debt Growth by Sector (2013-2017) (Billions DKK)



Sources: Bank for International Settlements, Danmarks Nationalbank, IMF staff calculations.

Notes: In panel 2, the two-year moving average of the GFSR (2018) leverage-based indicator is shown: a positive (negative) value indicates that the riskiness of credit allocation is higher (lower) than its historical average. In panel 3, net balance is calculated using the corporate lending survey: a positive (negative) net balance indicates easing (tightening) standards relative to the preceding quarter. In panel 4, the debt service ratio is calculated as the ratio of interest payments and loan amortizations, as a proportion of total income.

**49. Corporates appear to be in sound financial condition, with debt service costs and default rates back to pre-crisis levels.** Overall debt service to income for corporates has come down from a peak of 50 percent during GFC to 35 percent in 2019, which is significantly lower than in peer countries. Similarly, overall NFC default rate has gone down from 5.3 percent in 2009 to 1.5 percent in 2017. While there is substantial heterogeneity across the sectors, default rates have trended down in all sectors.

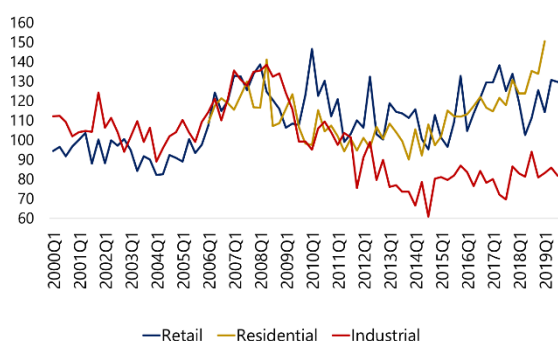
**50. However, pockets of vulnerabilities exist particularly in the CRE segment** (Figure 12). CRE is the most leveraged sector in Denmark and one of the sectors where debt has grown fastest. Prices in the CRE segment have continued to increase alongside a trend decline in the yield making the sector vulnerable to repricing of risks. The transaction volumes are large and there are potential concerns regarding the income generating capacity of CRE (for example, due to high vacancy rates) even though property companies are better capitalized than in the pre-crisis years. Foreign investors account for a considerable share of transactions, particularly in Copenhagen. Although there are diversification benefits of CRE foreign financing through increased risk sharing, the presence of foreign investors can amplify boom-bust cycles through higher synchronicity with global CRE markets.

**Figure 12. Denmark: Commercial Real Estate**

*Prices in the commercial real estate market continue to grow....*

#### Commercial Real Estate Prices

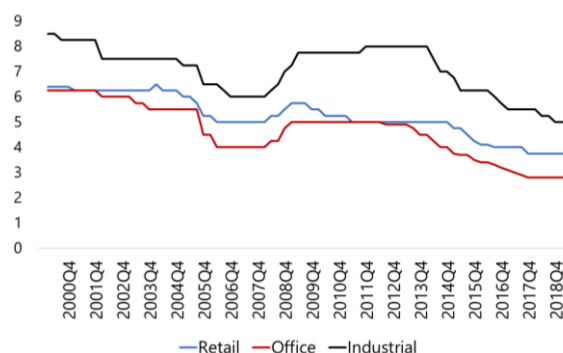
(Index: 2006=100)



*.... alongside a decline in the required yield in various segments*

#### CRE Yields

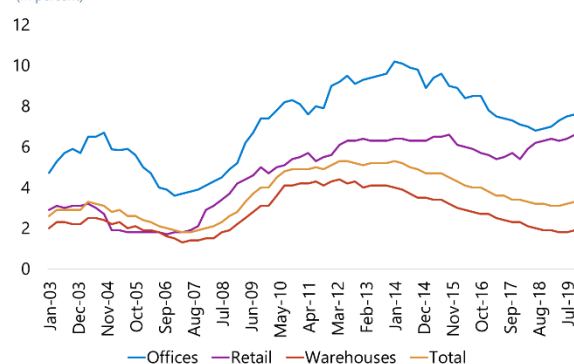
(Percent)



*Vacancy rates have increase in some segments, which may affect their income generation capacity...*

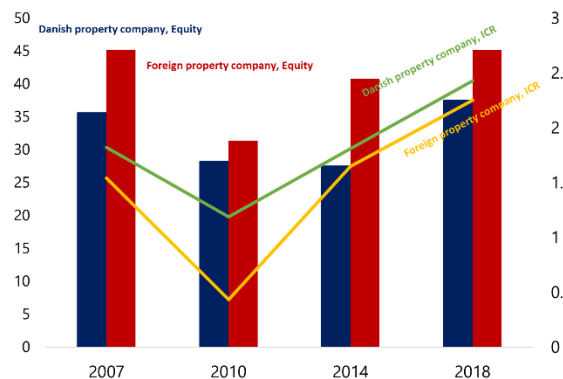
#### CRE Market: Vacancy Rates

(In percent)



*However, property companies' financial position has improved since the past crisis.*

#### Property Companies: Financial Position



Sources: Danmarks Nationalbank.

**51. Debt-at-risk in the CRE sector increases significantly under adverse scenario.<sup>16</sup>** Firm-level analysis indicates that the CRE sector, accounting for about 30 percent of the total corporate debt, is especially vulnerable. In particular, the analysis reveals a six-fold jump in debt-at-risk for the CRE sector in an adverse scenario—far greater than other sectors (Figure 13). These risks are concerning given the large exposure of banks and significant interconnectedness of the CRE market with the financial system. Hence, there is a need for specialized monitoring of the CRE market from a financial stability perspective.

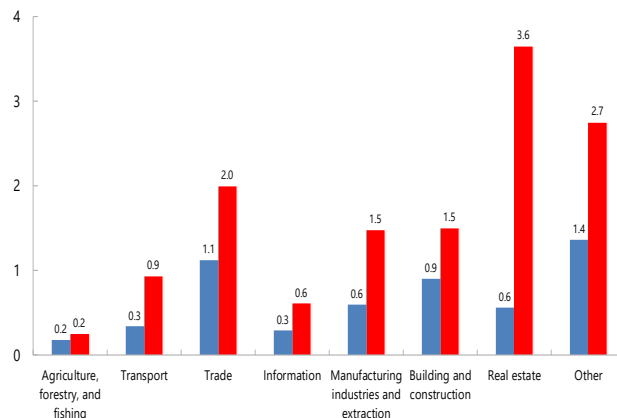
<sup>16</sup> See the Technical note on Systemic Risk Assessment and Stress Testing for more details.



**Figure 13. Denmark: Commercial Real Estate – Adverse Scenario**

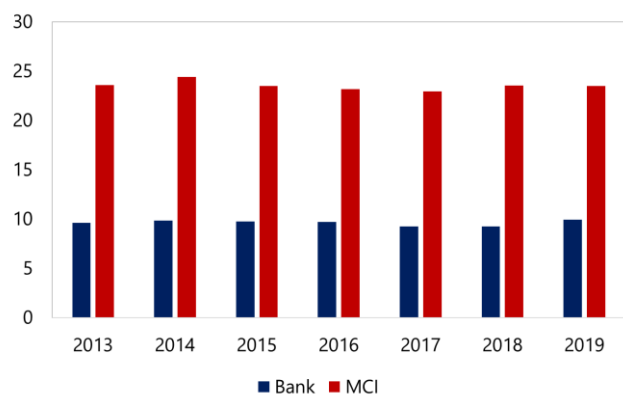
*Debt-at-risk in the CRE sector is expected to increase six-fold in an adverse scenario...*

**Debt-at-Risk by Sector in 2021**  
(Percent of total debt)



*...which alongside large bank exposure may have systemic implications*

**Exposure to the CRE sector**  
(In percent of total loans)



Sources: Danmarks Nationalbank, IMF staff calculations.

Note: Estimated firm-level PDs are based on sector-specific default probability models. Debt-at-risk is calculated by aggregating debt of firms with projected PDs above 1.5 percent.

**52. Considering the importance of the sector, Danish authorities have undertaken measures to address CRE risks.** These include (i) Supervisory Diamond for banks, which limits the sum of commercial property lending to no more than 25 percent of total bank lending and a lending growth cap of 20 percent; (ii) Supervisory diamond for MCIs, which caps lending growth at 15 percent in different segments; and (iii) a 100 percent limit on debt-service-to-income ratio for lending by banks.

## Recommendations

### 53. The authorities should take macroprudential action if risks intensify in the CRE sector.

The SRC has discussed CRE related risks in its recent meeting, in particular, developments in mortgage credit institutions' risk weights, which have fallen substantially as the commercial property market has picked up. If risks continue to build, banks should consider sectoral capital measures that target banks with higher exposures to riskier sectors. These include:

- **Risk weights.** Consider introducing temporary risk weight floors or adding temporary risk weight add-on on CRE exposures for IRB banks and MCIs using Art. 458 CRR.<sup>17</sup> Belgium has used Art. 458 to increase risk weights on residential real estate exposures. More recently, Sweden and Norway are proposing to impose the risk weights on CRE exposures for IRB banks. Hong Kong SAR also has differential risk weights for IRB banks depending on the property characteristics. UK has a slotting system with risk weights ranging from 50 to 250 percent based on the risk level for the IRB banks.
- **Capital buffers.** Some countries have added capital buffers to add resilience against risks in the CRE sector. For example, activations of the systemic risk buffer (SRB) (Croatia and Hungary), and the CCyB (Norway, the Netherlands, Australia, and Ireland) was justified partly on grounds of addressing CRE-related vulnerabilities. CRE prices is also one of the indicators used in Denmark for deciding on the buffer rate on CCyB. However, unlike broad-based tools discussed above, a sectoral SRB/CCyB would be preferable as it could be better targeted and calibrated to identified risks. Sectoral SRB would be available within the European framework once CRDV/CRR II comes into effect. An important advantage of capital buffers (SRB/CCyB) is that they are adjustable over the cycle—in particular that they can be relaxed—allowing losses to be absorbed and credit to flow when it is most needed.

## D. Funding and Liquidity Vulnerabilities: Assessment, Tools, and Recommendations

**54. Market-based funding in Denmark is focused on the domestic issuance of covered bonds by MCIs.**<sup>18</sup> Danish commercial banks mainly rely on deposits to finance retail lending and mortgages, whereas MCIs issue covered bonds to finance their mortgage portfolios (Figure 14). Some large Danish banks resort to some extent to unsecured funding abroad, for example through the issuance of CPs or longer term senior unsecured bank bonds in the euro area or other Nordic countries. Covered bonds are largely issued domestically and are denominated in DKK. The amount of covered bonds issues in FX is at a historic minimum of currently 4.2 percent.

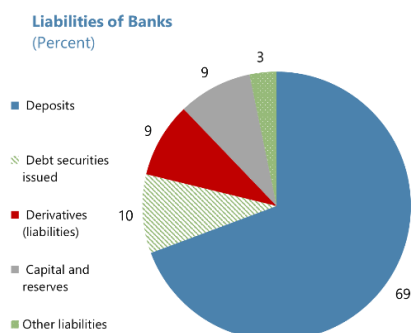
<sup>17</sup> The future introduction of the Basel risk-weight floors for the IRB-model banks should be a part of this consideration. However, the timeline for that is uncertain and not immediate and hence the temporary risk-weight add-on using Art. 458 CRR might be easier in the short run.

<sup>18</sup> Systemic liquidity considerations are covered in the Technical Note on Systemic Liquidity.

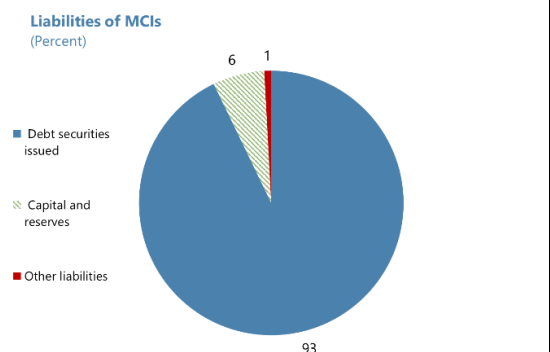
**55. The banks comply with the short-term Liquidity Coverage Ratio, LCR, with a certain margin.** Banks and MCIs must maintain a minimum LCR of 100 percent for all currencies in total and for each significant currency.<sup>19</sup> In the current climate of favorable market liquidity, both systemic and non-systemic banks hold enough excess liquidity above the regulatory minimum. Banks also fulfill the net stable funding ratio (NSFR), although that is still only monitored and is expected to be introduced as a requirement in 2021.

**Figure 14. Denmark: Funding and Liquidity Vulnerabilities**

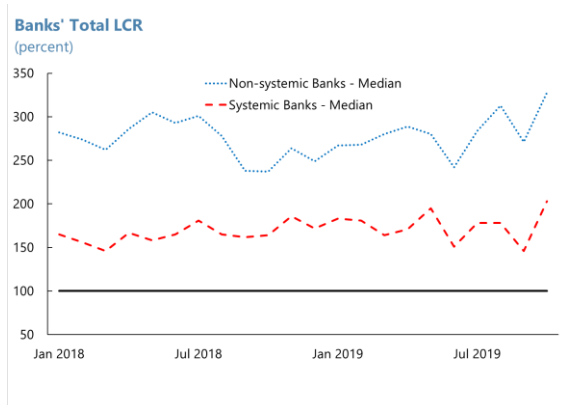
*Commercial banks mostly use deposit funding to finance retail lending and mortgages.*



*MCIs issue covered bonds to finance the mortgage portfolios originated by banks.*

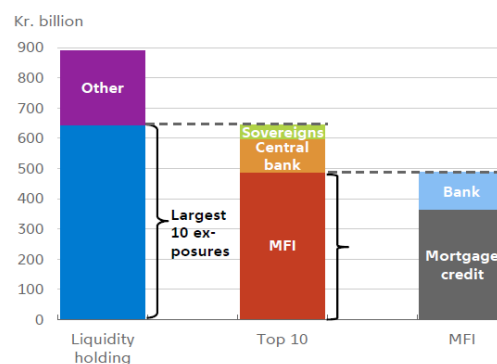


*Banks comply with the LCR requirements, with a comfortable margin...*



*...however, HQLA portfolios are concentrated both in terms of asset class and counterparty.*

**Systemic Banks Liquidity Stock, Aug 2019**



Sources: Danmarks Nationalbank.

**56. However, banks' HQLA portfolios are concentrated in terms of both asset classes and counterparty exposure.** When calculating HQLA, at least 30 percent must be government-guaranteed assets or central bank deposits and mortgage bonds must not exceed 70 percent.

<sup>19</sup> Currencies (other than Swedish kronor and Norwegian kroner) that make up more than 5 percent of their liabilities are considered significant currencies for the bank/MCI.

Covered bonds play a dominant role in banks' HQLA portfolios, which are complemented by government bonds and central bank deposits. The portfolio composition reflects the limited availability of high-quality liquid assets in Danish kroner outside the covered bond segment. In addition, the concentrated covered bond primary market may lead to concentration issues also at issuer level. For this reason, the DFSA is closely monitoring the use of covered bonds and concentration issues in HQLA portfolios, both at asset class level and at issuer level.<sup>20</sup>

**57. The LCR in significant currencies provides an important buffer against foreign currency liquidity risks.** Experience from the GFC demonstrated that foreign currency liquidity can dry up in periods of market turmoil, leaving central banks with limited capacity to provide foreign currency funding in a challenging situation. This is one of the reasons behind the LCR in significant currencies being enforced in Denmark, not just monitored. Hence, the LCR provides an important buffer that can be used in periods of stress.

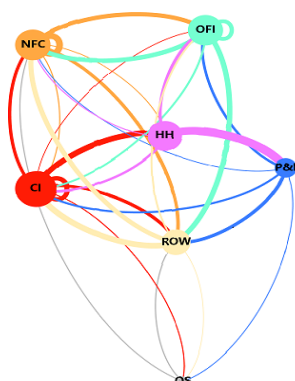
## **E. Structural Vulnerabilities: Assessment, Tools, and Recommendations**

**58. The housing market plays a vital role in Denmark, leading to interconnectedness reinforcing macro-financial linkages.** High mandatory pension contributions and household savings have created a pension system that has facilitated the development of the world's largest covered bond market in percent of GDP. Banks, Insurance companies, pension funds, and foreign investors are among the largest holders of covered bonds, which are issued by MCI to fund household mortgages (Figure 15). Thus, housing asset exposures interlink MCIs, banks, pension funds, insurance, foreign investors, and the household sector. Real estate developments not only affect household consumption via the usual wealth effects and collateral (financial accelerator) effects via housing, but also via potentially mutually reinforcing financial wealth effects through households' large pension savings invested in financial assets. Hence, shocks to real estate may impact negatively households' financial and non-financial assets, hindering consumption; thus, reinforcing macro-financial linkages (Denmark 2018 Article IV, [Selected Issues](#)).

<sup>20</sup> Under current market conditions, price differentiation across covered bond issuers is marginal, given the high credit quality of both the underlying mortgages and the issuing MCIs. However, price differentiation is expected to increase and be more sensitive to dedicated features of the mortgage pool, such as regional distribution, in case market conditions and the credit quality of mortgage borrowers and covered bond issuers decrease. See the technical note on Systemic Liquidity for the role of covered bonds in the resilience of the financial system.

**Figure 15. Denmark: Interconnectedness and Structural Vulnerabilities**

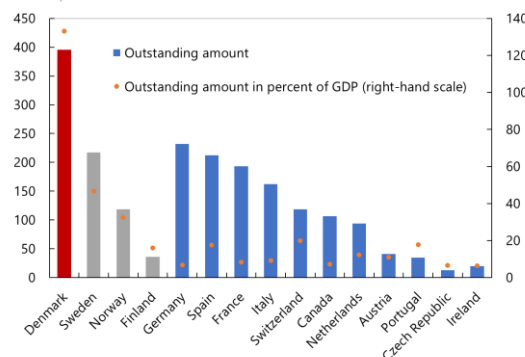
Housing asset exposures interlink credit institutions with institutional investors and the household sector...

**Cross sectoral Network Map**

...resulting in a covered bonds market that is largest in the World.

**Mortgage Covered Bonds Outstanding, 2018**

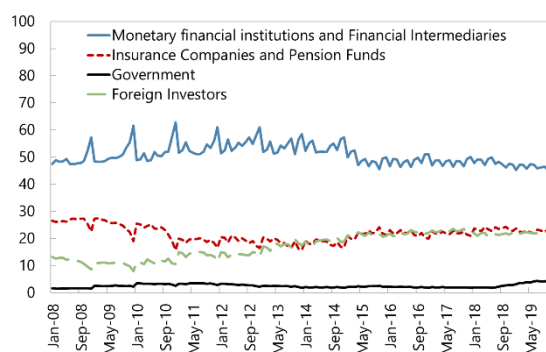
(Billions of euros)



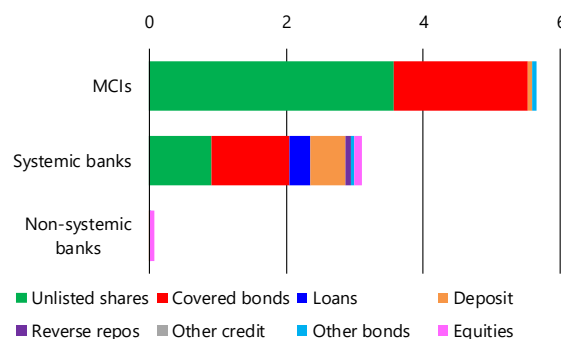
The large share of bank covered bond holdings suggests a high level of interconnectedness.

**Ownership Share of Mortgage Bonds**

(Percent)



MCIs are a key source of outward spillovers....

**Contagion Index by Layers**

Sources: Danmarks Nationalbank, and IMF Staff Calculations.

Notes: Contagion index (CI) is the average losses to the core network comprising 21 credit institutions normalized by their capital. NFC: nonfinancial corporates, HH: households, P&I: pension and insurance, CI: credit institutions, OFI: other financial institutions, and ROW: rest of the world.

**59. The contagion and interconnectedness analysis reveal that Danish credit institutions are mostly exposed to shocks from within the banking system.**<sup>21</sup> MCIs play a central role in the domestic interbank system linking systemic and non-systemic banks through a dense network of covered bond exposures. The full network highlights the strong connections between the Danish banking system and the domestic corporate (in particular, CRE) and household sectors (via loans) and domestic institutional investors, which include insurers and pension and investment funds, (via securities). MCIs are a key source of outward spillovers and induce the highest levels of contagion

<sup>21</sup> See the Technical Note on Interconnectedness and Contagion Analysis for more details.

losses through unlisted shares (reflecting complex group structures) and covered bond exposures. Systemic banks, on average, are more vulnerable to inward spillovers losses owing to their covered bond holdings. Given the high degree of interconnectedness via covered bonds, ensuring the health of this market under stressed conditions is crucial for financial stability.

**60. Seven institutions are assessed by the DFSA to be systemically important and therefore subject to systemic risk buffer (SRB).** The criteria for identification and designation of O-SIIs in Denmark were determined in a political agreement in 2013 voted through the Danish Parliament. The OSII buffer is not applied in Denmark. The Minister of Industry, Business and Financial Affairs sets the SRB.<sup>22</sup> The identification of O-SIIs in Denmark is based on the following criteria, where only one needs to be met in order to be identified: (i) total assets in per cent of domestic GDP > 6.5 per cent, (ii) loans in per cent of the total lending by the domestic sector > 5 per cent, and (iii) deposits in per cent of the total deposits of the domestic sector > 3 per cent. Based on this criteria, seven institutions are designated as systemically important (Table 5).

**Table 5. Denmark: Systemically Important Institutions**

Danish O-SIIs are allocated into five different subcategories based on the level of systemic importance of the institutions. The systemic importance is calculated as an average of the total assets in per cent of the total assets of the sector, loans in per cent of the total lending by the sector and deposits in per cent of the total deposits of the sector. The allocation is shown below

Subcategory	Score	Buffer Rate	O-SII Institutions
Subcategory 1	<=5	1 percent	Sydbank DLR Kredit Spar Nord Bank A/S
Subcategory 2	[5-15[	1.5 percent	Jyske Bank Nordea Kredit Realkreditaktieselskab
Subcategory 3	[15-25[	2 percent	Nykredit Realkredit
Subcategory 4	[25-35[	2.5 percent	-
Subcategory 5	>=35	3 percent	Danske Bank

Sources: DFSA.

Notes: For Spar Nord Bank A/S the systemic risk buffer is set to 0.5 per cent at the end of 2019 and 1 per cent at the end of 2020 according to the Danish Financial Business Act.

<sup>22</sup> Under CRD V, SRB can no longer be used as a substitute for systemically important institutions buffer. Hence, Denmark will have to shift its SRB to the O-SII buffer and SRB can be used to build buffers for other risks in the economy.

## Appendix I. Growth at Risk<sup>1</sup>

*This annex is based on the Growth-at-Risk (GaR) approach developed in October 2017 [GFSR](#). The GaR links current financial conditions to the distribution of future growth outcomes. An important advantage of this approach is that it allows us to assess whether a tightening or an easing of financial conditions is on net macro-critical and may therefore put financial stability and future growth at risk. The SRC is already monitoring GaR as part of its macrofinancial surveillance framework.*

**The GaR framework uses financial and economic indicators to identify macrofinancial linkages and gauge financial vulnerabilities.** We use three groups of variables in our estimations. These capture (i) financial conditions or price of risk (real short term interest rate, interbank spread, sovereign local debt spread, corporate local debt spread, equity prices, and real house prices); (ii) leverage (household debt-to-GDP gap, credit growth (y-o-y change)); and (iii) external factors (quarterly euro area GDP growth, US 10yr yield, VIX, global liquidity indicator and oil prices).

**Current loose financial conditions stimulate growth in the near term, however, increase risks of a medium-term downturn<sup>2</sup>.** Conditional on current financial conditions, the forecast range of severely adverse outcomes (the 5<sup>th</sup> percentile of conditional GDP distribution) gives us a metric for assessing growth-at-risk and hence the degree of concern about the current level of financial vulnerabilities. In the severely adverse scenario, one-year ahead GDP growth in Denmark will be about 1 percent or less (potentially not a bad outcome), however it could turn negative in a three year ahead period (Appendix Figure 1).

**A sudden tightening of financial conditions is associated with increased downside risks to growth.** A prolonged period of loose financial conditions often leads to build-up of risks due to stretched asset valuations, risk illusion and increased risk taking. An abrupt tightening of financial conditions will therefore lead to a sudden repricing of risks and fall in asset prices. Estimates suggest that a tightening of both domestic and global financial conditions will increase growth-at-risk.

**Higher leverage increases growth outlook in the short run however, by increasing financial vulnerabilities, increases downside risks in medium term.** We also look at the impact of household leverage on future conditional GDP distribution. Higher household leverage increases household consumption and thereby output in the short run (one-year ahead). However, increased household leverage also makes household's balance sheet susceptible to shocks, increasing downside risks to growth in the three-year horizon.

**The results call for caution in a period of continued loose financial conditions; macroprudential buffers would assist in building resilience in an adverse scenario.** The markedly loose financial conditions in Denmark, associated with protracted low interest rate

<sup>1</sup> Prepared by Umang Rawat and Elizabeth Mahoney (both IMF).

<sup>2</sup> Financial conditions are tight (seen from a historical perspective) when above zero and loose otherwise.

## Appendix Figure 1. Denmark: Growth-at-Risk

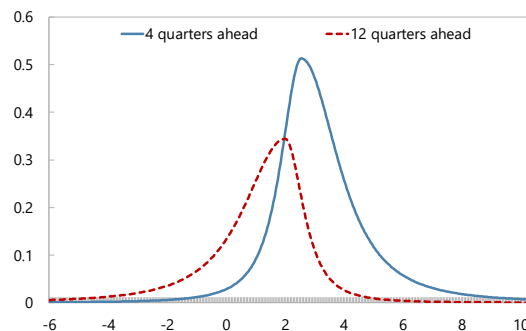
*Financial conditions remain accommodative...*

**Financial Conditions Partition**  
(Standard deviation)



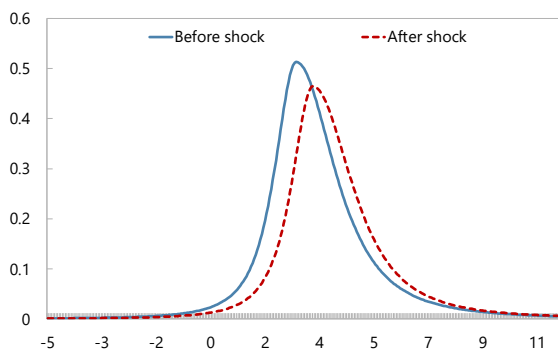
*...stimulating growth in the near term, but with a greater risk of a medium-term downturn.*

**Conditional Distribution of Future Real GDP Growth**  
(Probability density)



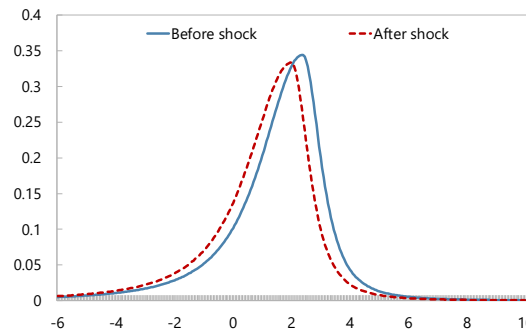
*Greater household debt is associated with more favorable short-term prospects...*

**Conditional Distribution (GDP growth), Short-term Leverage Shock**  
(Probability density)



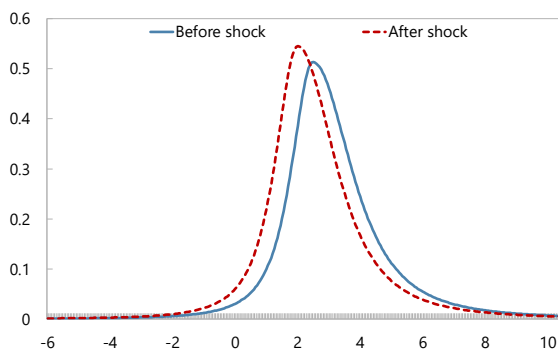
*...but, by exacerbating vulnerabilities, increases the chances of a slowdown over the medium term.*

**Conditional Distribution (GDP growth), Long-term Leverage Shock**  
(Probability density)



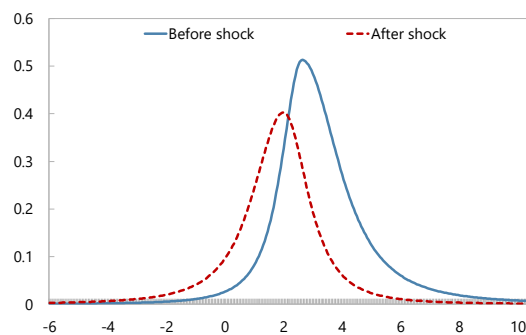
*An abrupt tightening of global or regional financial conditions could dampen the short-term outlook...*

**Conditional Distribution (GDP growth), Global Financial Conditions Shock**  
(Probability density)



*...as could a possibly synchronous tightening of domestic financial conditions.*

**Conditional Distribution (GDP growth), Domestic Financial Conditions Shock**  
(Probability density)



Sources: IMF staff calculations.

Notes: Short- and long-term refer to 4 and 12 quarters ahead, respectively; one standard deviation shocks are simulated. The x-axis (except for FCIs) is measured annualized average real GDP growth.



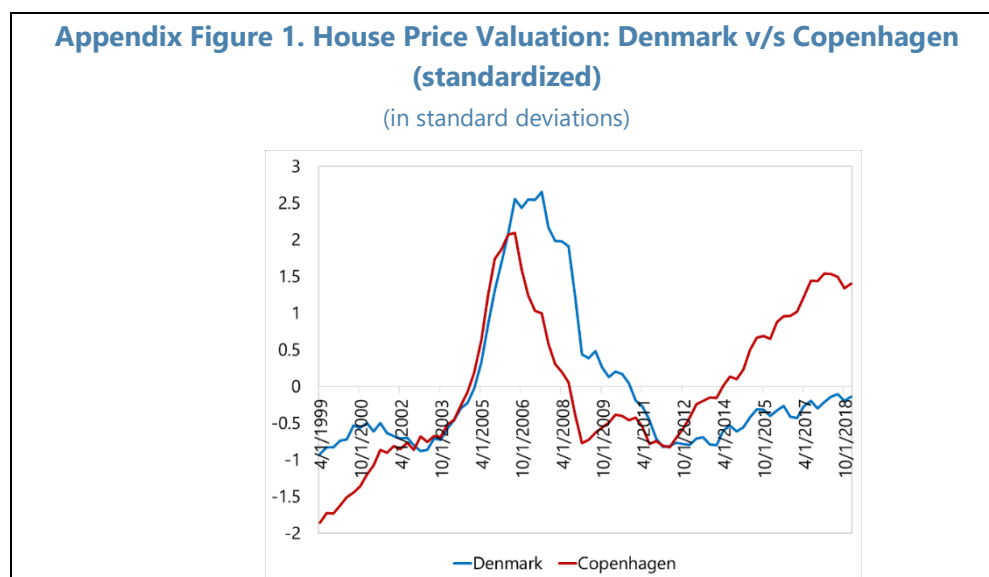
environment, is expected to continue. This creates the perfect environment for build-up of risks. The systemic risk council has been closely monitoring risks associated with prolonged periods of loose financial conditions and had increased the CCyB to build resilience in periods of stress. The release of the buffer with the Covid-19 pandemic should add much needed resilience to the banking system and the real economy.

## Appendix II. Denmark: House Price at Risk<sup>1</sup>

*This annex is based on the House price-at-Risk (HaR) approach developed in April 2019 [GFSR](#). The HaR links current financial conditions and other macroeconomic variables to the distribution of future house price growth. House prices play a major role in assessing financial stability and monitoring systemic risk. A sharp deterioration of housing markets can have severe adverse effects on household balance sheets, business confidence, banks' ability to lend, and on future GDP growth. In this annex we explore the drivers of future downside risks to house prices in Denmark and in Copenhagen region and reflect on possible policy implications.*

**Based on the existing literature, five groups of variables are used to estimate conditional distribution of house prices.<sup>2</sup>** These include: (i) financial conditions or the price of risk (real short term interest rate, interbank spread, sovereign local debt spread, corporate local debt spread, and equity prices); (ii) leverage (household debt-to-GDP gap, credit growth (y-o-y change)); (iii) house price valuation (house price-to-income (deviation from long-term average)); (iv) macro factors (quarterly GDP growth rate); and (v) housing supply (construction starts, construction cost index).

**House prices appear to be over-valued in Copenhagen however are broadly in line with fundamentals at the national level.** House price levels are generally elevated both at the national level and in Copenhagen (real house prices are at or above levels prior to the GFC). Nationally house prices appear to be in line with fundamentals reflecting growth in income in recent years. However, house prices are overvalued in Copenhagen although there are some signs of slowing down in recent quarters (house prices are overvalued when the standardized indicator is greater than zero). Studies suggest that house prices in capital cities are an early indication of



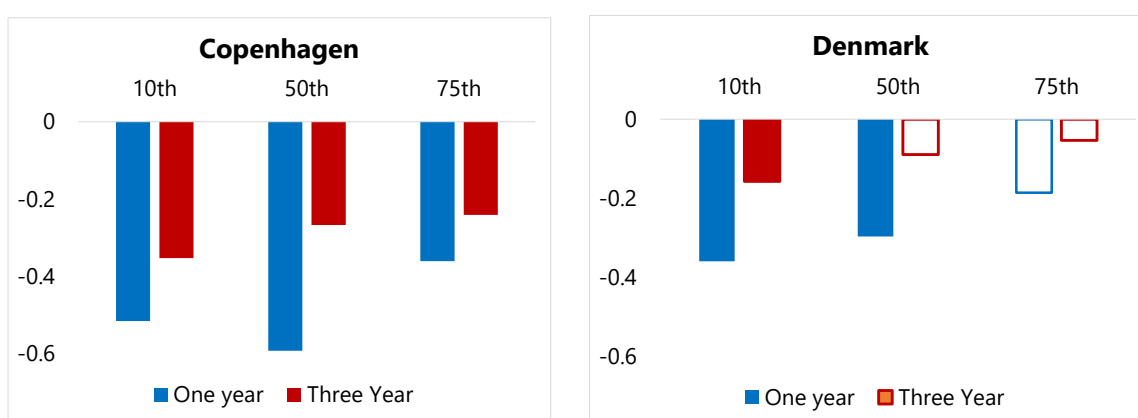
<sup>1</sup> Prepared by Umang Rawat and Elizabeth Mahoney (both IMF).

<sup>2</sup> Some relevant literature includes Campbell and Cocco, 2005; Mian and Sufi, 2016; Agnello and Schuknecht, 2011; Grimes, Aitken, 2010; Capozza et al., 2002; and Duca, Muellbauer and Murphy, 2011.

house prices at national level. We indeed find that owner occupied flat prices in Copenhagen granger cause one-family house prices at national level. Hence, overvaluation in Copenhagen warrants enhanced monitoring and policy actions.

**In the short-term, tighter financial conditions are detrimental to house price risks, while the effect is dampened in the long-term.** A sudden tightening of the financial conditions is found to increase downside-risks to house prices for both Copenhagen and at national level. The impact is found to be strongest in the short term (one-year ahead) and overall the coefficients are much larger in Copenhagen than at the national level.

**Appendix Figure 2. Denmark: Impact of Financial Conditions on Future Real House Prices**



Source: IMF Staff Calculations

Notes: The figure shows coefficients from quantile regressions estimated at the 5<sup>th</sup> and 50<sup>th</sup> (median) and 75<sup>th</sup> quantiles for one- and three-year real house price growth and lagged house prices, financial conditions, house price misalignment, real GDP growth, household leverage and housing supply. Colored bars indicate that the coefficients are statistically significant at the 10 percent level or higher. Outlined bars indicate insignificant coefficients.

**Household leverage is associated with ameliorating house price risks in the short run, while exacerbating them in the long-term.** Leverage is found to be positively related with house prices one-year ahead however the relationship turns insignificant or negative in a three-year period.

**Housing market in Copenhagen is found to be especially vulnerable to shocks.** Overall, the impact of shocks on downside risks to growth is larger for Copenhagen than at the national average. This is true both for a sudden tightening of financial conditions as well as a valuation shock (Appendix Figure 3).

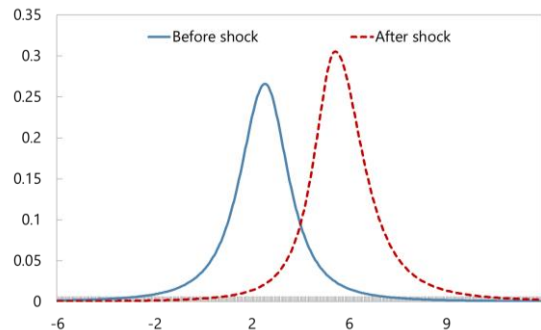
**Estimates of house prices at risk can be used to complement other surveillance indicators of housing market vulnerabilities and guide macroprudential policy.** HaR is an estimate of the tail risk in house prices over a specific horizon. Careful analysis of these tail risks can reveal nonlinear relationships that may not affect (and may be concealed by) the rest of the distribution. Hence, HaR provides a useful indicator that should be monitored together with other measures of house price vulnerability that take into account the entire distribution of house prices.

### Appendix Figure 3. Denmark: Conditional Distribution of Future House Prices

*Greater household debt is associated with more favorable prospects for house prices in the short term....*

#### Short-Term Leverage Shock

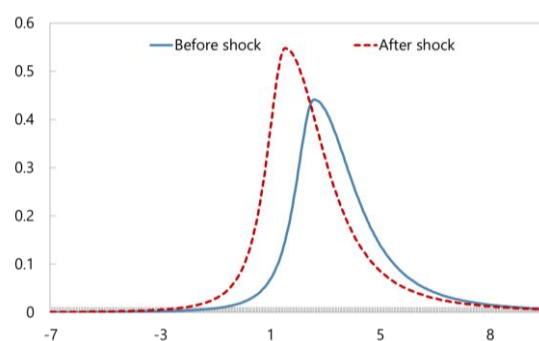
(Probability density, Denmark)



*....but increases the risk of a sharp decline over the medium term.*

#### Long-Term Leverage Shock

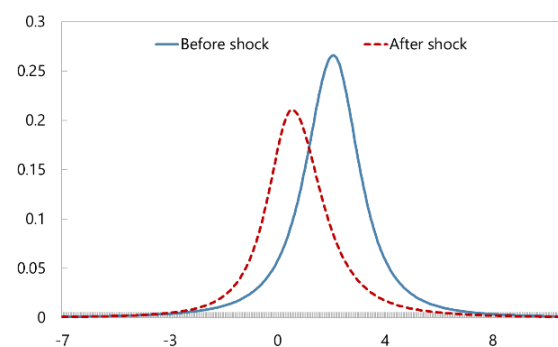
(Probability density, Denmark)



*A sudden tightening of financial conditions would increase downside risks to house prices....*

#### Short-Term Financial Conditions Shock

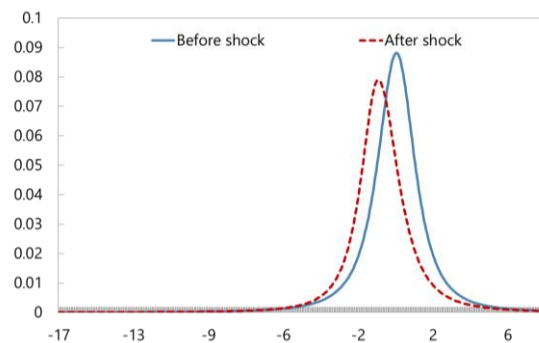
(Probability density, Denmark)



*.... with the impact being larger for Copenhagen than the national average.*

#### Short-Term Financial Conditions Shock

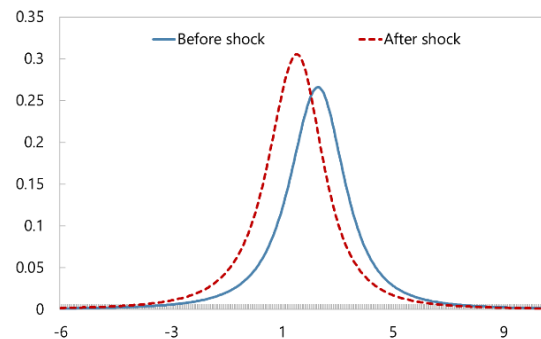
(Probability density, Copenhagen)



*Similarly, a valuation shock also increases downside risks to house prices...*

#### Short-Term Valuation Shock

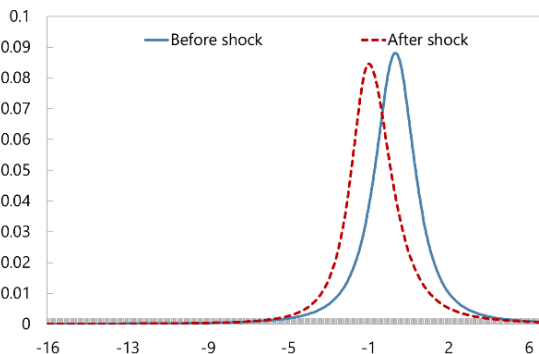
(Probability density, Denmark)



*....with a stronger impact in Copenhagen.*

#### Short-Term Valuation Shock

(Probability density, Copenhagen)



Sources: IMF Staff calculations.

Notes: Short- and long-term refer to 4 and 12 quarters ahead, respectively. The x-axis is annualized average real house price growth, percent.