

Addendum to provisional findings

The capital requirements regulatory regime

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The Competition and Markets Authority has excluded from this published version of the addendum to provisional findings information which the inquiry group considers should be excluded having regard to the three considerations set out in section 244 of the Enterprise Act 2002 (specified information: considerations relevant to disclosure). The omissions are indicated by [X]. Some numbers have been replaced by a range. These are shown in square brackets.

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Introduction

1. The regulatory capital requirements regime exists to protect customer deposits, banks' trading counterparties and the economy from the effects of banks becoming insolvent. It does this by requiring banks¹ to hold sufficient levels of capital to absorb losses in the event of failure or near failure. It comprises a complex multi-tiered system with the requirements placed on banks reflecting their systemic importance, the nature of the portfolio of products and spread of assets of the bank and their ability and willingness to undertake their own risk weighting. The framework of the system and the core determinants of the capital that a UK bank is required to hold are set internationally by the Basel Committee on Banking Supervision (BCBS) and implemented in the UK through maximum-harmonising EU legislation.² The Prudential Regulatory Authority (PRA) is responsible for ensuring compliance with these regulations in the UK.
2. A key element of the regime requires banks to hold a minimum amount of capital against their assets to protect against credit, market and operational risks. In our provisional findings,³ we found that there are significant disparities in the risk weights for credit risk on residential mortgages applied to different banks depending on the approach they are authorised to adopt to calculate their risk weight. These disparities, we provisionally found, have the potential to distort competition and to act as a barrier to entry and expansion as some banks have to hold significantly more capital on certain loan-to-value (LTV) residential mortgages than other banks. We said that we would undertake further analysis to understand the impact of the regulatory capital requirements regime on competition between banks in the provision of personal current accounts (PCAs), business current accounts (BCAs) and lending to small and medium enterprises (SME lending) and more widely across banks' retail banking businesses.
3. Following the publication of our provisional findings, we have further investigated whether there are features of the UK retail banking markets arising from the regulatory capital requirements regime that are restricting competition in the provision of PCAs, BCAs and SME lending in each of Great Britain (GB) and Northern Ireland (NI) by creating a barrier to entry and expansion in retail banking.
4. This paper is structured as follows:

¹ As previously, in this paper we refer to banks as including banks and building societies.

² The Capital Requirements Directive IV (CRD IV) and the Capital Requirements Regulation (CRR).

³ [Provisional findings](#).

- (a) Background to the capital requirements regulatory regime in the UK.
- (b) Parties' views.
- (c) Framework for our assessment.
- (d) Assessment of the impact of differences in the approach to calculating risk weights on outcomes in the mortgage market, specifically prices, mortgages balances, and mortgage portfolios.
- (e) Provisional conclusions.

Background to the capital requirements regulatory regime in the UK

5. The current regulatory framework for capital is structured as follows:
- (a) **Pillar I: Minimum Capital Requirements** – this is the minimum amount of capital banks must hold to protect against credit, market and operational risk and is specified under the Basel Accords. Under existing minimum capital requirements banks have to maintain a minimum ratio of 8% capital to their risk-weighted assets.⁴
 - (b) **Pillar II: Supervisory Review** – this requires banks to hold an additional amount of capital to cover risks that are either not covered or inadequately covered under Pillar I. The aim is to ensure that banks have adequate capital to support other business risks such as pension, legal, credit concentration and interest rate risks. It also seeks to ensure that banks are able to meet their minimum capital requirements even during periods of severe stress, for example during an economic downturn. Unlike Pillar I, where the capital ratios are agreed internationally by the BCBS and placed into EU legislation through the CRD IV, Pillar II is firm-specific and set by national regulators, in the UK the PRA.
 - (c) **Pillar III: Disclosure** – this aims to complement Pillars I and II by seeking to foster greater market discipline through improved disclosure by all banks of their capital holdings and risk management practices.
 - (d) **Additional buffers** – In addition, all banks are required to hold a number of additional capital buffers, such as the capital conservation buffer and

⁴ The ratio of a banks' capital to their risk-weighted assets is known as the Capital Adequacy Ratio (CAR). Risk-weighted assets are the total assets held by banks, each weighted for their risk. Risk weights can take a value of 0% to more than 100%.

the countercyclical buffer.⁵ For globally systemically important banks,⁶ an additional buffer is applied to reflect the added risks they pose to the financial system and the wider economy. Some of these buffers, such as the capital conservation buffer, are set by Basel and transposed into EU legislation by the CRR and CRD IV⁷ whereas others such as the countercyclical buffer, the globally systemic buffer and national systemic buffers involve a degree of discretion for the national regulator.

6. As a complement to the risk-based capital framework described above, the leverage ratio requires all banks to hold a minimum amount of capital to their total assets (regardless of the riskiness of those assets). The leverage ratio is intended to guard against banks becoming over-leveraged (ie holding too little capital relative to the liabilities they hold) and to protect against under-estimation of risk by banks and regulators. It effectively acts as a floor on the level of capital that banks have to hold and primarily affects banks with a high concentration of assets with low risk weights such as residential mortgages. It is currently set at a minimum of 3%.⁸

Pillar I requirements and risk weights

7. Assets are weighted according to their risk to ensure that banks with riskier lending portfolios hold more capital against their assets compared with banks that hold less risky assets.⁹
8. Banks are able to use one of two approaches when calculating risk weights for credit risk:

⁵ The capital conservation buffer is designed to ensure that banks accumulate sufficient capital in periods of credit growth which can then be drawn down when losses are incurred without requiring banks to draw from their minimum capital requirements. The capital conservation buffer is currently set by Basel at 2.5% of a bank's risk-weighted assets. The countercyclical buffer aims to ensure that levels of capital take account of the stage of the economic cycle. The countercyclical buffer can range from 0% to 2.5% and is set by the Financial Policy Committee (FPC) of the Bank of England (BoE). This is currently set at 0.5%.

⁶ Banks classified as globally systemic are HSBCG, Barclays, RBSG, and Standard Chartered Bank. The globally systemic buffer will be phased in over three years starting in 2016. National systemic buffers for other major systemic banks in the UK will be set by the FPC, following a consultation issued in Q4 2015 and will be implemented in 2019.

⁷ Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 and Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC.

⁸ Cf. PRA Policy Statement PS27/15.

⁹ It is also designed to incentivise banks to hold low-risk assets. If banks were required to hold capital against all of their assets regardless of their risk, there would be incentives on banks just to hold more risky assets in order to maximise their returns. This is the rationale for using a combination of the risk-weighted framework and the leverage ratio.

- (a) **The standardised approach (SA)** – risk weights set internationally by the BCBS, are based on data supplied from credit rating agencies, and are transposed into UK law through the CRD IV.¹⁰ The SA applies one risk weight to each asset class based on the broad type and credit quality of the counterparty (eg sovereign, commercial bank, corporate, retail).
- (b) **The internal ratings-based approach (IRB)**¹¹ – banks calculate their own risk weights based on their own internal risk models and data. The IRB approach is much more granular and is intended to better reflect the actual risks held by the bank. It requires a bank to have sophisticated risk models and good quality data on its own past lending. In the UK, banks wishing to use their own risk models need to seek approval from the PRA, which will assess whether the bank meets the requirements to be IRB approved.¹² Because of the requirements and costs to be IRB approved, it is mostly larger banks that are IRB approved. Smaller banks and new entrants are generally on the SA, which is less tailored.
9. The advantage of becoming IRB approved is that, in better reflecting the actual risks of the assets held by the bank, banks with less risky portfolios have lower risk weights than would be the case under the SA. However, banks approved to use the IRB approach for mortgages are required to use the IRB across all mortgage classes to avoid ‘cherry picking’ by banks using the SA selectively for any loans where the SA gives a lower risk rating.
10. In our provisional findings, we also found that the costs of becoming IRB approved and maintaining IRB approval were significant. Banks wishing to adopt the IRB approach have to make significant upfront investments in developing advanced risk models and infrastructure to support data collection and analyses. Specialist staff to run and maintain the risk models and management time in ensuring compliance with relevant regulations also materially increase the costs for an IRB approved bank relative to an SA bank.
11. Importantly, the largest impediment to banks adopting the IRB approach is data availability. Banks need to hold significant historical data on their lending in the relevant asset classes in order to be able to model credit risk under the IRB approach. Specifically, banks are required to hold a minimum of three to

¹⁰ Risk weights for the SA are agreed internationally by the BCBS and set into legislation in the EU via the CRR. The European Banking Authority (EBA) issues further technical guidance on standardised risk weights.

¹¹ The IRB approach is also sometimes referred to as the model-based approach.

¹² The standards that need to be met by banks to use the IRB approach are agreed internationally by the BCBS and set into legislation in the EU via the CRR. The EBA issues further technical guidance to national regulators to further specify the conditions that need to be met by banks to be authorised to use the IRB approach.

five years' worth of detailed lending data in the relevant asset class. In practice data is required for longer periods and banks must demonstrate that they have been using such data for internal risk management for at least three years. While it is possible to use pooled data sources, such data must be representative of the relevant bank's own asset portfolio and risk.¹³ This can be difficult to achieve.

12. The PRA told us that the introduction of the IRB approach (as part of Basel II) was aimed at ensuring that levels of capital better reflected the inherent risk held by banks and at incentivising better risk management and decision-making within banks.¹⁴ However, as regulators were effectively handing over some of the responsibilities of capital setting to banks, requirements to become IRB approved were set high. Regulators needed confidence that the risk models used to calculate risk weights were sufficiently robust, that there was sound governance in maintaining and using the models, and that banks were using the IRB risk models for their own internal decision-making.
13. The regime described above applies in the EU across all banks, irrespective of their business model and the scale of their activities. In the USA, by contrast, there is a graduated system: the largest internationally active banks are subject to the full Basel regime like EU banks, whereas other banks are subject to a regime under which the level of supervision and the capital requirements vary depending on whether the bank is a national, regional or community bank.
14. Table 1 below lists all the banks that are currently IRB approved in the UK. As can be seen, most large banks are IRB approved for all asset classes including mortgages and SME lending. The only exception is Santander, which is not IRB approved for SME lending as it does not have the requisite data. The table below also shows that there are a number of smaller banks that are IRB approved for mortgages,¹⁵ including Nationwide, TSB, Co-op, Virgin and Principality Building Society and some larger banks, such as Clydesdale and Danske that are not IRB approved for mortgages.

¹³ See [Prudential sourcebook for Banks, Building Societies and Investment Firms: Chapter 4, The IRB approach](#).

¹⁴ For further information please refer to the [PRA hearing summary](#).

¹⁵ Building societies are generally not present in SME lending.

Table 1: UK IRB-approved banks

<i>UK mortgages</i>	<i>UK credit cards</i>	<i>UK retail SMEs</i>	<i>UK corporates</i>	<i>International retail SMEs</i>
Barclays	Barclays	Barclays	Barclays (advanced)	Barclays
Co-op	Co-op	HSBCG	Co-op (foundation)	HSBC
Coventry BS	HSBCG	LBG	HSBCG (advanced)	RBSG
HSBCG	LBG	RBSG	LBG (foundation)	Standard Chartered
LBG	Nationwide		Nationwide (foundation)	
Nationwide	RBSG		RBSG (advanced)	
Principality BS	TSB		Santander (foundation)	
RBSG				
Santander				
TSB				
Virgin Money				

Source: PRA.

Notes:

1. SMEs are either classed as retail or corporate. In order to be classed as retail an exposure to an SME must not exceed €1 million, must be treated consistently in its risk management over time, must not be managed just as individually as those classed as corporates and must represent one of a significant number of similarly managed exposures.
2. Foundation IRB is a version of IRB that was introduced in 2007 for non-retail exposures. In the advanced IRB, the firm estimates probabilities of default, loss-given-default, exposure at default, and the maturity of the loan. In the foundation IRB approach the firm estimates only the probabilities of default.
3. Ulster Bank is IRB approved as part of RBSG. AIB, Bank of Ireland and Danske are on the SA for mortgages.

Comparison of risk weights under the IRB approach and the SA

15. In our provisional findings, we found that risk weights under the SA are higher than under the IRB approach for residential mortgages and for SME lending.
16. In relation to SME lending, as set out in our provisional findings, the PRA's analysis showed that there was significant variation in the risk weights for SA and IRB banks.¹⁶ However, taking into account the main components of the capital framework and the particular circumstances of individual SA banks,¹⁷ our analysis showed that the capital requirements differential between the SA and IRB approach for an SME loan of £100,000 is broadly eliminated.¹⁸
17. For residential mortgages, Table 2 below sets out analysis undertaken by the PRA on the risk weights under the SA and the IRB approach (the average IRB risk weights and the range of risk weights). It shows that risk weights under the SA are higher than for the IRB approach. For example, the SA risk weights for prime mortgages with an LTV of less than 80% are 35% (regardless of the precise LTV) whereas the weighted average risk weights

¹⁶ See our provisional findings, [Appendix 10.1](#), Table 2.

¹⁷ For example, unlike other banks under the SA for SME lending, Santander is in the unique position of having additional buffers as a systemic bank [38].

¹⁸ See our provisional findings, [Appendix 10.1](#), paragraphs 34–41.

under the IRB approach are between 3.3% and 12.7% depending on the precise LTV.

Table 2: Comparison of mortgage risk weights under the SA and the IRB approach

	SA (%)	IRB (%)		
	Standardised risk weights	Exposure weighted average risk weight	Lower range risk weights	Upper range risk weights
<i>Mortgages (prime)</i>				
0%<=LTV<50%	35	3.3	2.8	3.8
50%<=LTV<60%	35	6.0	5.1	7.0
60%<=LTV<70%	35	8.9	7.5	10.2
70%<=LTV<80%	35	12.7	10.8	14.6
80%<=LTV<90%	36	18.4	15.6	21.1
90%<=LTV<100%	43	31.4	29.9	36.1
>=100%		53.9	45.8	62.0
<i>Mortgages (buy to let)</i>				
0%<=LTV<50%	35	4.1	3.5	4.7
50%<=LTV<60%	35	9.7	8.2	11.1
60%<=LTV<70%	35	12.5	10.6	14.4
70%<=LTV<80%	35	17.5	14.9	20.2
80%<=LTV<90%	36	32.0	27.2	36.8
90%<=LTV<100%	43	43.1	36.7	49.6

Source: PRA.

18. We analysed the differential in capital requirements between SA and IRB banks using PRA data on Pillar I requirements, Pillar II requirements for individual banks, the values of capital buffers for all banks and buffers for globally systemic banks when issuing a £100,000 residential mortgage.^{19,20} Even taking account of Pillar II and the additional buffers, SA banks face significantly higher capital requirements compared with banks on the IRB approach for a £100,000 residential mortgage.
19. We have therefore focused our further analysis on the impact of the residential mortgage differential on competition between banks as any impact on competition is likely to be far greater given the significant differential in residential mortgages than in SME lending. While there is evidence that the risk weights for buy-to-let mortgages are similarly different – see Table 2 above – in order to focus the analysis, we have considered residential mortgage loans. In the remainder of this section, when we refer to mortgages we mean residential mortgages.

¹⁹ As noted in our [provisional findings](#) (see paragraph 10.62) several banks submitted that in carrying out our assessment we should not include additional capital buffers for systemic banks. Santander, in response to our provisional findings, made similar submissions (see Appendix 1). For the reasons set out in paragraph 10.63 of our [provisional findings](#) we remain of the view that in assessing the impact of capital costs arising from regulation we need to examine the differential costs created by the capital regime as a whole. While we have focused on the capital regulatory regime reflecting the concerns raised by parties, we recognise that other aspects of the prudential regime also impose varying costs on different banks.

²⁰ Our provisional findings, [Appendix 10.1](#), paragraphs 34–41 set out in more detail our analysis including the methodology adopted.

20. In our provisional findings we included an analysis of the financial performance of the UK retail banking sector.²¹ Within that analysis we included a review of selected industry publications, reports by equity analysts and consulting firms to understand key profitability drivers of the retail banks in the UK, as well as emerging trends from their recent financial performance. One of the broad conclusions from that review was that the provision of mortgages is the most profitable line of business for many of the UK's banks and that the largest of the UK banks have higher than average mortgage profitability. However, the reports we reviewed mainly covered IRB banks, meaning that our ability to compare profitability between IRB and SA banks is limited. Nevertheless, two of the three SA banks in the review (Clydesdale and Yorkshire Building Society) were shown to have the lowest returns on their mortgage businesses in the year analysed (FY 2013), with a reported return on equity of 11.3% and 12.6% respectively, compared with an average of return on equity of 24%. The other SA bank included in the report, Bank of Ireland, had a reported return on equity of 17.8%.

Future developments

21. There are currently a number of developments being considered by the BCBS that may change the future approach to calculating risk weights:
- (a) **Revisions to the standardised approach for credit risk**^{22,23} – In March and December 2015, the BCBS published consultations on proposed revisions to calculating risk weights for credit risk. The revisions are intended to address existing 'weaknesses' in the standardised approach to credit risk, including the lack of granularity and risk sensitivity, a recognised over-reliance on the information provided by credit rating agencies, out-of-date estimates of risk weights, and lack of comparability and misalignment with the risk weights under the IRB approach. The new proposals will seek to move from the current flat risk weights for mortgages to a more granular approach.
 - (b) **Review of capital risk floors** – The BCBS is also consulting on the design of a standardised floor to be applied to all IRB approved banks. This consultation forms part of broader work to reduce variation in capital ratios across banks.²⁴ The objective in introducing capital floors is to

²¹ Provisional findings, [Appendix 2.2](#).

²² BCBS (March 2015), [Revisions to the Standardised Approach for credit risk](#), consultative document.

²³ BCBS (December 2015), [Revisions to the Standardised Approach for credit risk](#), second consultative document.

²⁴ For further information, please see BCBS (November 2014), [Reducing excessive variability in banks regulatory capital ratios: A report to the G20](#).

ensure that the level of capital across banks does not fall below a certain level. This should further reduce the difference between the SA and the IRB approach. The British Bankers' Association, for example, has indicated that this reform could negate the benefits from investing in IRB models sufficiently that some IRB approved banks revert to using the SA.²⁵

(c) **Review of the structure of the regulatory capital framework** – This is a strategic review considering the costs and benefits of determining regulatory capital that reduces or removes reliance on internal models, while still being adequately risk sensitive.

22. Although many of these are unlikely to be implemented in the near term, they demonstrate that there is a recognition by the BCBS that there are imbalances in the existing framework. However, Secure Trust said that the proposed changes in particular to the SA capital model would dramatically worsen the competitiveness of banks on the SA.
23. In addition, the European Commission is currently consulting on the proportionality of the CRR and CRD IV.²⁶ In its consultation, it states that 'the requirements of the CRR and CRD IV, particularly those relating to credit and other prudential risks, are of general application to all financial institutions, without any distinction being made on the basis of size, business model or business line and are designed to ensure a level playing field.' However, it notes that smaller banks may be less able to spread the fixed overheads of these regulations over their activities. Further it notes that the standards set by the BCBS, on which the CRR was to a large extent based, were originally designed to apply to internationally active institutions only. But a conscious decision was made for the requirements of the CRR and CRD IV to apply more widely. It is now consulting on whether the CRR should allow for more differentiation on how the requirements are applied to banks of different sizes. The BoE is supportive of this development and agrees that a more proportionate approach could be adopted on many aspects of banking regulation.²⁷
24. The UK government in the recent 2016 Spring Budget stated that it will continue to pursue more proportionate capital requirements for small banks (including building societies) in the EU;²⁸ this is part of a wider government

²⁵ See the [British Bankers' Association](#) website.

²⁶ [DG FISMA consultation paper on the possible impact of the CRR and CRD IV on bank financing of the economy](#).

²⁷ For further information on the BoE's response to the consultation, please refer to [EUSurvey, Published Results: long-term-finance-2015](#).

²⁸ [Budget 2016](#) (March 2016), paragraph 1.198.

programme which is aimed at reducing the regulatory burden on banks, in particular smaller banks.

Parties' views²⁹

25. The PRA told us that while smaller and newer banks may face disadvantages on individual assets compared with IRB approved banks, a number of recent measures had been introduced since the financial crisis such as capital buffers for large systemically important banks, total loss absorbing capacity, the leverage ratio and stress testing for large banks. The PRA considered that these measures had largely offset the apparent capital advantages of the IRB approach compared with the SA in most asset classes, although this was not the rationale for the introduction of these measures. However, it recognised that there remained wide gaps in relation to some assets, in particular lower LTV mortgages, and that such gaps were larger than could be considered appropriate or justified on prudential grounds. It was also of the view that such differences may have had unintended consequences by encouraging some banks on the SA to compete on assets where the gap between IRB and SA risk weights was narrower, which were usually riskier assets.

26. The PRA told us that where it had discretion in its implementation of the capital regime, it would wherever possible seek to level the playing field between SA and IRB banks and give appropriate weight to competition. It stated that it had taken a number of steps to level the playing field between SA and IRB banks and that it was undertaking work looking at the impact of the capital requirements regime in particular in the mortgage markets.³⁰ However, on the larger disparities between the risk weights under SA and IRB approaches, the PRA's view was that it was necessary to address these internationally from both sides. On the one hand the modelling under IRB should be improved to make it more robust in the face of uncertainty, particularly for low default assets, and on the other hand the SA should be more reflective of UK risk, in particular for smaller banks. In addition the PRA stated that, in its view, the EU's approach of applying the regime to all banks irrespective of size and business models should be reviewed. It recognised that the costs of the regime bore more heavily on smaller banks and that the benefits of applying the regime in full to smaller banks was proportionally less.

²⁹ Appendix 1 sets out the views of parties in more detail.

³⁰ These include greater flexibility when setting capital expectations for new entrants. Moreover, supervisors may exercise judgement for smaller firms where they identify that the credit concentration risk methodology could overstate risks, or could incentivise risk-taking behaviour.

In its view more proportionate and differentiated rules were more likely to help promote competition and in particular the growth of smaller banks.

27. Several of the larger banks³¹ were generally of the view that regulatory reforms had resulted in a levelling of the playing field between SA banks and IRB banks. They submitted that regulatory advantages from being IRB approved were largely if not completely offset by additional regulatory burdens placed on systemically important banks. RBS in response to our provisional findings also submitted that while the IRB approach may give rise to significantly different risk weightings for similar risk (and not always lower), this did not necessarily result in equally large differentials in capital requirements relating to those credits. HSBC reiterated in response to our provisional findings that in its view the PRA was best placed to deal with issues relating to residential mortgage lending. In particular it highlighted that the PRA had indicated that proposed reforms to the regime would increase capital requirements on larger banks relative to smaller banks and was also exploring the extent to which it could be made more feasible for new entrants to develop IRB models.³²
28. Smaller banks, however, including incumbents as well as recent entrants, told us that capital requirements were a significant barrier to entry and expansion. Such banks stated the following:
- (a) The uniform application under EU legislation of the regime to all banks was not proportionate and put smaller banks at a competitive disadvantage to larger banks.³³ Several banks noted that the USA did not apply a uniform system to all banks and that it had one of the most competitive banking markets.
 - (b) High costs and extensive data requirements meant that it was very difficult for smaller banks and new entrants to be IRB approved.
 - (c) The wide differentials in risk weights between the SA and IRB approach favoured large banks which were invariably IRB banks and was not justified on prudential grounds.
 - (d) The very high capital requirements on mortgages and to a lesser extent SME lending under the SA made it very difficult for smaller banks to generate sufficient return on capital except in riskier assets. To make sufficient returns, smaller banks therefore had to compete in areas where IRB banks did not compete and/or where they may have a competitive

³¹ HSBC, Barclays and LBG (see our [provisional findings](#), paragraphs 10.60–10.61).

³² [HSBC response to our provisional findings](#), footnote 9.

³³ The Challenger Bank Panel of the British Bankers' Association (see our [provisional findings](#), paragraph 10.57).

advantage under the regime (eg lending on riskier assets). This in turn also made it more difficult to become IRB approved as such banks would not acquire the relevant data from lending in the relevant asset classes to become IRB approved.

- (e) Higher risk weights in residential mortgages for SA banks made it difficult for smaller banks to raise capital, as expected returns would be significantly lower than for large banks using an IRB approach.

Framework for our assessment

29. Barriers to entry and expansion give at least some incumbent firms an advantage over efficient potential firms or rival incumbent firms, either by reducing the expected profits, or increasing the expected costs, of entry or expansion.³⁴ In this section we outline the mechanism by which the differential capital requirements regime as applied to SA and IRB banks could lead to a regulatory barrier to entry and/or expansion in retail banking services, through affecting the returns banks receive on retail deposits.
30. Banks accept deposits from customers (in PCA/BCA and savings accounts), which have a short-term maturity, and use these funds (along with other sources of funding) to offer loans with longer-term maturity, including mortgages. This is known as maturity transformation. The ability of banks to effectively compete in lending markets will therefore directly affect the return banks receive on deposits.
31. The capital requirements regime may lead to SA banks having a reduced ability to compete in the provision of mortgages because of the differential risk weights on mortgage loans between SA and IRB banks: higher risk weights mean more capital is allocated to the mortgage, which leads to a higher cost of funds for banks. These higher costs of funds for SA banks may in turn influence SA banks' pricing, reducing their ability to compete with IRB banks.
32. This can be seen in the illustrative example in Table 3 below, in which we calculate the cost of funds for a £100,000 mortgage using risk weights under the SA and average IRB risk weights for different LTV bands. For this illustration, we assume that the required return on equity is 12%³⁵ and the average interest the bank pays on its debt is 2%. In this illustration, in order to

³⁴ [Guidelines for market investigations: Their role, procedure, assessment and remedies](#), paragraph 207.

³⁵ Given the performance of banking shares in recent years – cf. for example [MSCI Europe Financials Index](#) – it is unclear what the best estimate of the required return on equity for banks is. However, based on the data provided by MSCI we consider that 12% is a reasonable estimate of the average total return on equity for banks in recent years.

demonstrate the impact of risk weights on the cost of funds, we allow only risk weights to vary. However, other factors which affect mortgage prices also vary between IRB and SA banks (for example, the cost of equity and cost of debt).³⁶

33. As this table shows, the applicable risk weight determines the share of the £100,000 loan that is financed through debt and the share that is financed through equity. Since debt is cheaper than equity – in this example we have assumed the difference to be 10% – using more debt to finance the loan results in a lower cost of funds. The larger the difference between the cost of equity and the cost of debt, the greater the impact of having a higher risk weight. While the calculation is only illustrative, it shows that a firm that switches from the SA to the IRB approach could reduce its cost of funds by around 10 to 20 basis points. However, we note that comparing the current gap in risk weights between SA and IRB banks may not provide an accurate estimate of the potential reduction in the cost of funds from adopting the IRB approach, as a bank’s credit risk for the same LTV level may lead it to having a lower or higher risk weight than the current average for IRB banks (which has been used in this example).

Table 3: Illustrative example of the calculation of the cost of funds associated with a £100,000 mortgage

	SA (LTV<80%)	IRB (LTV<50%)	IRB (60%≤LTV<70%)	IRB (75%≤LTV<80%)	Calculation
Amount loaned out (£)	100,000	100,000	100,000	100,000	(1)
Risk weight (%)	35	5	11	17	(2)
Risk-weighted assets (£)	35,000	5,000	11,000	17,000	(3) = (1) * (2)
Pillar I capital adequacy ratio (%)	8	8	8	8	(4)
Capital requirement (£)	2,800	400	880	1,360	(5) = (3) * (4)
Debt (£)	97,200	99,600	99,120	98,640	(6) = (1) – (5)
Required return on equity (%)	12	12	12	12	(7)
Interest on debt (%)	2	2	2	2	(8)
Cost of equity (£)	336	48	106	163	(9) = (5) * (7)
Cost of debt (£)	1,944	1,992	1,982	1,973	(10) = (6) * (8)
Cost of funds (£)	2,280	2,040	2,088	2,136	(11) = (9) + (10)
Cost of funds (%)	2.28	2.04	2.09	2.14	(12) = (11) / (1)

Source: CMA calculation.

Note: This calculation is entirely on a nominal, pre-tax basis, and disregards capital requirements other than those under Pillar I of the Basel framework.

34. Where SA banks have a higher cost of funds at lower LTVs compared with IRB banks, this may lead to SA banks having higher mortgage prices. However, the link between risk weights and pricing is not straight forward. Any cost-of-capital advantage gained by IRB banks will only be observed in pricing to the extent that they pass their lower capital costs through to customers in the form of lower prices. Instead, banks on the IRB approach might benefit from lower capital requirements through higher margins. This will depend on

³⁶ IRB banks tend to be larger and more diversified than banks using the SA, which could lead to lower costs of debt and equity.

the intensity of competition in the provision of mortgages. In addition, as we discussed above in paragraph 10, becoming IRB approved requires a considerable upfront and ongoing investment such that IRB banks may seek higher returns than non-IRB approved banks to recoup this investment.

35. If it is the case that SA banks charge higher mortgage prices because of having higher risk weights than IRB banks, then this would lead to SA banks having a reduced ability to win mortgage customers at lower LTVs. The magnitude of the competitive disadvantage for lower LTV mortgages, in the form of lower market shares and/or lower margins, would determine the extent to which SA banks have lower returns on equity and deposits as compared with IRB banks, along with SA banks' ability to offset any disadvantage through alternative investment options. This disadvantage could lead SA banks to have a reduced ability to compete in retail banking more generally, with product offerings that are less competitive and less investment in innovation. This could reduce the attractiveness of investments in SA banks compared with the next best alternative investment. Ultimately this could deter entry into retail banking.
36. We have therefore examined the following indicators of a potential disadvantage from high capital requirements for the same risk in the mortgage market:
 - (a) Mortgage prices: we discuss the preliminary results from the PRA's programme of econometric analysis to assess whether higher risk weights causally lead to higher mortgage prices at lower LTVs.
 - (b) Mortgage balances: we assess the importance of mortgages to banks' business by assessing banks' shares of retail banking assets held in residential mortgages.
 - (c) Mortgage portfolios: we assess whether SA banks' mortgage asset mix is reflective of their higher risk weights at lower LTV. If the risk weights reduce SA banks' ability to compete for lower LTV mortgages, we would expect SA banks to have a higher proportion of their mortgage portfolio in higher LTV mortgages, where the difference in risk weights between SA and IRB banks is smallest.

The impact of risk weights on outcomes in the mortgage market

Mortgage prices

37. In this section we consider whether the differential risk weights adopted by SA and IRB banks for residential mortgages lead to SA banks charging higher

mortgage prices (ie interest rates), therefore putting them at a disadvantage in competing for mortgage customers at lower LTVs.

38. Average interest rates covering the 2005 to 2015 period for mortgages are shown in Figure 1 below for SA and IRB banks respectively. The dual SA-IRB approach to calculating credit risk weights came into effect in January 2008. Prior to this, the capital requirements regime applied risk weights of 50% to all mortgages issued by all banks.³⁷ Figure 1 shows that average interest rates have declined for all banks across all mortgages since 2008, but declined most for IRB banks on lower risk mortgages (that is, LTV less than or equal to 70%). The effect of this is that the average price gap between IRB and SA banks for lower LTV mortgages is now much larger than for higher LTV mortgages.
39. While the change in the capital requirements regime from Basel I to II–III occurred at the start of 2008, it cannot be presumed that this explains the decline in average interest rates. Factors other than risk weights are likely to have had a substantial effect on firms’ pricing of mortgages in this period, and some such factors are likely to have been materially affected by the onset of the financial crisis in 2008, and will have affected banks very differently.³⁸ For example, the financial crisis had a substantial impact on funding costs: funding costs will have been impacted by cuts to the BoE base rate and increased spreads on wholesale funding. Funding costs also vary across banks, and IRB banks tend to be larger and, therefore, as in many sectors, tend to have cheaper access to wholesale funding, reflecting relative differences in terms of perceived riskiness and reliance on this source of funding.
40. The financial crisis also witnessed an industry-wide trend for increases in the relative price of higher LTV mortgages compared with lower LTV mortgages. Before the crisis, average interest rates on lower and higher LTV mortgages were similar, suggesting that risk did not strongly affect pricing. Increases in higher LTV prices will therefore to some extent reflect the more accurate pricing of risk after the financial crisis.
41. To precisely estimate the impact of risk weights on mortgage prices and to better control for other factors that could affect these prices, it is necessary to use econometric techniques.³⁹

³⁷ With the exception of four banks that moved to IRB during 2007.

³⁸ These factors are likely to include: required capital ratios; ‘normal’ return on unit capital; taxation; operational costs; business model/pricing strategy; LTV preferences; market power; interest rate risk; and credit risk.

³⁹ For other factors that could affect prices, all of the models discussed below include controls for borrower type, interest rate type and loan-to-income ratio.

Figure 1: Average mortgage interest rates since 2005 for SA and IRB banks



Source: PRA.

Note: Pre-2008 SA and IRB definition based on subsequent use, since these were not in use prior to 2008.

42. The PRA has started a programme of econometric analysis. Below we discuss this analysis and provide a high-level overview of its provisional results. Detailed results are presented in Appendix 2. In reporting the results of the PRA's analysis we note that these findings are provisional, as this is work in progress which the PRA is seeking to refine to obtain more accurate and robust results.
43. The PRA's analysis is based on an extensive data set of 13 million owner-occupied residential mortgage loans that have been originated in the UK since Q2 2005.⁴⁰ From this data set the PRA dropped observations that could not be used for this study, such as: (a) loans provided by specialist lenders, which are not subject to the same system of prudential regulation; (b) loans where the data is incomplete; and (c) loans that are outliers (such as having an interest rate of more than 10%). As a result, its analyses were run on data sets containing 6.6 million and 7.4 million data points, depending on whether

⁴⁰ Note that the data set excludes data relating to [X], which was not available.

the analysis required data on historical risk weights, which were not available for some of the loans in the original data set.⁴¹

44. For each loan, this data contains information on the mortgage interest rate at origination, the issuing bank and the risk weight on mortgages with the relevant LTV ratio that it held in the year in question.⁴² It also contains data on a number of other factors that could affect mortgage prices, including the date the loan was issued, the LTV ratio, the loan-to-income ratio, the rate type (eg tracker, capped) and the borrower type (eg first-time buyer, re-mortgager). However, the dataset does not include data on fees, which may be an important element of pricing, and it does not capture changes in interest rates after origination (eg at the end of a fixed-rate period).
45. Using this data the PRA has explored three different econometric approaches:
 - (a) The **regime change model** uses the change in the regulatory regime in 2008 as a natural experiment to test how the change in risk weights affected banks' mortgage pricing. It considers the difference in prices between IRB and SA banks, comparing pre- and post-2008, and between high and low LTVs (a 'triple difference' approach).
 - (b) The **IRB switch model** uses a more sophisticated statistical approach to control for other factors that may affect prices (a 'fixed effects' approach). It also reflects the specific date on which relevant individual banks adopted the IRB approach (as this does not necessarily coincide with the regime change at the start of 2008).
 - (c) The **historical risk weights model** also applies a fixed effects approach but rather than simply considering whether each bank used the SA or the IRB approach, instead exploits more granular data on their specific risk weights as the main explanatory variable of interest.
46. We discuss the preliminary results from each model in turn below.

⁴¹ One large lender ([X]) in the pre-2008 period was excluded from the sample due to concerns related to the reported data.

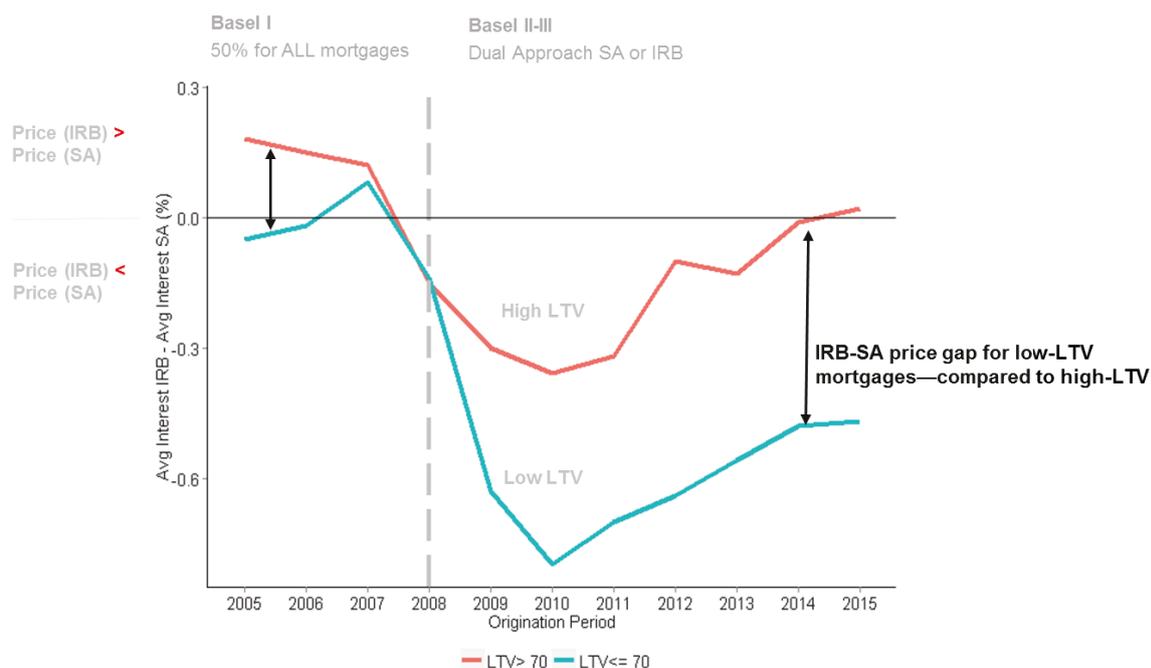
⁴² That is, the PRA assumed that, for a particular LTV band, the new loans the bank originated in a given year were sufficiently similar to the loans it already held – in terms of the other factors that determine an IRB risk weight – that the risk weight on all outstanding balances could be used as a proxy for the risk weight on newly originated loans.

Regime change model

47. The regime change model is a 'triple difference' model, as it proceeds in three steps:
- (1) It examines the current differences in mortgage prices between IRB and SA banks. However, in isolation this analysis would suffer from the limitation that prices are likely to vary across these two types of bank because of factors other than risk weights.⁴³
 - (2) To try to control for these other factors the model compares the price difference between IRB and SA banks to that which existed before the change in regime in 2008. Any pre-2008 difference (when there was no variation in risk weights) would tend to capture the other factors that vary between banks, so that any additional difference in current prices may reflect the impact of the banks varying risk weights post January 2008.
 - (3) It examines how this price difference has evolved over time for high and low LTV mortgages separately. If risk weights do substantially affect pricing, we would not only expect to observe a general increase in the price difference between IRB and SA banks, but would in particular expect this difference to also become larger in the case of low LTV loans, where the reduction in risk weights for IRB banks was greatest.
48. Figure 2 below presents this graphically. The vertical axis is the mortgage pricing gap between IRB and SA banks, and this is shown through time for low and high LTV mortgages. If risk weights do impact mortgage pricing then we would expect the gap between low and high LTV to increase after 2008 (to reflect that the difference in risk weights between IRB and SA banks is largest for low LTV loans).

⁴³ For example, banks using the IRB approach tend to be larger and therefore have cheaper access to wholesale funding, which may result in them offering lower prices unrelated to their approach to calculating risk weights.

Figure 2: Mortgage price gap between IRB and standard approach banks by LTV band



Source: PRA.

49. The results show that differences in the approach to calculating risk weights (IRB vs SA) have an economically and statistically significant effect on mortgage pricing, with an impact on low LTV loans relative to high LTV loans (ie increase in the gap between the red and blue lines) of the order of around 28 to 46 basis points (the ‘relative effect’ on different types of loan). The PRA performed a number of sensitivity checks on the model.⁴⁴ It found a generally consistent picture across most (though not all) of its various sensitivities.
50. While controlling for additional factors that affect banks’ mortgage prices, this model does not control for all factors in particular for credit risk. The model cannot completely separate the effect of risk weights and credit risk, and to this extent will overestimate the effect of risk weights on prices. On the other hand, the use of securitisation by banks might mean that the risk weights for residential mortgages are less relevant to pricing decisions for mortgages that are expected to be securitised, because the mortgage is held on the bank’s balance sheet for a limited period of time.
51. While the intuitive nature of this model is appealing, a weakness of the model is that this ‘triple difference’ approach only controls quite crudely for other explanatory factors that could be driving differences in mortgage prices. We

⁴⁴ These include what LTV threshold is used to define ‘low’ and ‘high’ LTV loans, and the data set that was used. Using the smaller data set described as ‘Sample B’ in Appendix 2, the estimate of the relative effect is 42 to 60 basis points.

cannot rule out other possible explanations besides differences in risk weights for these observed pricing patterns.

IRB switch model

52. The IRB switch model is a refinement of the above model. It uses a ‘fixed effects’ approach to more effectively control for the unrelated variation in prices across banks, time, and LTV band of the loan.⁴⁵ One advantage that the IRB switch model offers over the regime change model is that it uses the specific date at which each individual bank adopted the IRB approach.⁴⁶
53. The ‘fixed effects’ approach serves to control for other factors that can affect pricing, although this has the potential to absorb some of the variation in prices accounted for by the differences in risk weights. As with the model above, however, this model does not fully control for credit risk and does not take into account securitisation.⁴⁷
54. The results of this analysis are broadly consistent across many sensitivity tests, and suggest an economically and statistically significant effect of risk weights on mortgage pricing. These estimates are, however, of substantially smaller magnitude than those found under the regime change model. Specifically, where the regime change model found an impact on low LTV loans relative to high LTV loans (ie increase in the gap between the red and blue lines in Figure 2) of around 28 to 46 basis points, the IRB switch model estimates a relative effect of around 11 to 17 basis points.⁴⁸ Moreover, there are some sensitivities of this analysis that suggest little or no substantial relationship between the approach used to calculating risk weight (IRB vs SA) and mortgage prices.

Historical risk weights model

55. The PRA’s third model goes beyond a focus on whether a bank used the SA or IRB approach to risk weights, and examines the relationship between mortgage prices and the actual risk weights that the issuing bank had at the

⁴⁵ Specifically, these include fixed effects by bank (to control for individual banks’ pricing), time (to control for general price changes over time), LTV band (to control for variation in prices by LTV band), bank time (to control for changes in relative pricing of different banks over time), LTV-time (to control for changes in relative pricing of different LTV bands over time) and bank LTV (to control for variation in banks’ relative prices by LTV band). This model can be seen as a more general version of the regime change model, in that a triple difference model can be obtained by running a restricted version of the fixed-effects model.

⁴⁶ However, in practice we understand that most banks that adopted the IRB approach did so fairly quickly after the change in regulation.

⁴⁷ By banks other than [X], which for the IRB switch model is eliminated from the data set.

⁴⁸ Using the smaller ‘Sample B’ data set, the estimated relative effect is 8 to 19 basis points.

point in time that the loan was issued.⁴⁹ In other respects this model is similar to the IRB switch model, since it also uses a fixed-effects approach to control for other potential explanations for variations in prices. In common with the previous models, however, the model does not fully control for credit risk and does not take into account securitisation.

56. The advantages of this model are that by exploiting the granular data on the actual risk weights of banks it can potentially obtain more refined estimates of their effect. This model does, however, suffer from the limitation that the data on historical risk weights does not appear to be entirely reliable, in contrast to the IRB switch model which uses more robust data on the date of adoption of the IRB approach.⁵⁰
57. The model provides a direct estimate of the impact of the use of risk weights (and therefore the SA) on mortgage prices (the 'absolute effect'). This is in contrast to the previous models, which only provide an estimate of the relative effect of the SA on low LTV mortgages versus high LTV mortgages. The output of this model is a direct estimate of the effect of a one percentage point increase in risk weights on mortgage prices. To illustrate the implied increase in mortgage prices for low LTVs caused by the use of the SA, we therefore multiply this figure by 30 to reflect the fact that there is approximately a 30 percentage point difference in risk weights between the SA and IRB approach for mortgages with LTV below 50% (see Table 2 above. Note that this assumes that the bank switching to IRB has a similar credit risk in this LTV band to the average bank already on IRB). For mortgages with a LTV above 50% the difference in risk weights is (sometimes substantially) smaller, so the implied increase in mortgage prices would be lower.
58. Using data for 2009 to 2015, the model finds that use of the SA results in a bank charging mortgage prices that are 42 basis points higher for low LTV loans than if it used the IRB approach – a difference that is statistically significant and that accounts for approximately one-quarter of the variation in prices in the market.⁵¹ We consider that this estimate of the absolute effect is the most relevant output of the historical risk weights model to focus on, as it represents the full impact on the price of low LTV loans of using the SA rather

⁴⁹ Note that the risk weight data is not available on an individual loan level, rather this is available for each LTV band of 5 or 10 percentage points for each bank in each period.

⁵⁰ The information obtained by the CMA and PRA for this exercise differs from that obtained by the PRA in the past. This model also has other potential limitations, including relating to changes in firms' business models over time in particular since the financial crisis, the impact of differential interest rate risk on banks, the treatment of [§], self-selection of firms adopting the IRB approach, and the impact of other aspects of prudential regulation.

⁵¹ The direct output of the model is that a one percentage point increase in risk weights results in an increase in mortgage prices of 1.386 basis points. As set out above, we estimate the impact of the use of the SA as $30 \times 1.386 = 42$ basis points.

than the IRB approach. However, we also note that if this is converted into a relative effect, so that it is comparable with the output of the previous two models, it implies an impact of 15 to 16 basis points on low LTV loans relative to high LTV loans – ie broadly equivalent to the findings of the IRB switch model.⁵²

59. If the model is run on the longer period of data from 2005 to 2015 then the estimate of the absolute effect shrinks substantially from 42 basis points to only 3 basis points, equivalent to an impact of only 1 basis point on low LTV loans relative to high LTV loans, ie much smaller than the other models.⁵³ We consider that there are good reasons for focusing on the results using the data from 2009 to 2015, as there may have been a structural break in how the industry operated around 2008 to 2009 following the financial crisis and the introduction of the new regulatory regime, for example in terms of how credit risk is priced and the importance of risk weights. This means that data from 2005 to 2008 would not be informative of the current relationship between risk weights and pricing.⁵⁴

Conclusions on the impact of risk weights on mortgage pricing

60. The PRA's analysis is provisional and the PRA intend to undertake further work to refine and test the robustness of its models. Nevertheless, the sensitivity and robustness checks that have been undertaken on the models by the PRA, provide a clear indication of the overall direction of the results if not the precise magnitude of the impact on mortgage prices of the differential in mortgage risks weights. Overall, we observe a fairly consistent picture that higher risk weights result in higher mortgage prices for low LTV mortgages. While some specifications suggest the magnitude of the effect may be substantial, there is some uncertainty surrounding this, as estimates of the magnitude vary between the models and some important factors affecting mortgage pricing are not controlled for in the current models (eg credit risk of the borrower is not fully controlled for because of lack of data, which may result in overestimation of the impact; securitisation which conversely may result in underestimation of the impact; and the fees element of pricing is not

⁵² Note that this is based on running the IRB switch model for the full period of 2005 to 2015 and running the historical risk weights model for 2009 to 2015 only. This is because the IRB switch model – like the regime change model – cannot be run in a meaningful way unless there are enough observations that predate the switch to IRB. Note also that, because of their varying data requirements, the different models use slightly different samples.

⁵³ Note, however, that it is not statistically significant using clustered standard errors. The direct output of the model is that a one percentage point increase in risk weights results in an increase in mortgage prices of 0.116 basis points. As set out above, we estimate the impact of the use of the standard approach as $30 \times 0.116 = 3$ basis points.

⁵⁴ The new regulatory regime could have affected the importance of risk weights for pricing, and in practice the 50% risk weight may not have applied in full to many loans pre-2008 because of securitisation.

included). However, the fact that we find a relationship between risk weights and prices suggests that competition in the provision of mortgages between IRB firms is leading IRB banks to pass at least some of the risk-weight benefits to customers.

Mortgage balances

61. The proportion of assets invested in mortgages is informative of the importance of mortgages as an investment option to a bank's business.
62. We based our assessment on data we received from banks on their mortgage portfolios and total UK retail banking assets for each year between 2011 and 2014. Where possible this was requested on an average and period-end basis.⁵⁵ The submissions included nine IRB banks and six SA banks, with a further four banks⁵⁶ reporting no mortgage balances being held. While the approach used to allocate assets to retail banking will differ between banks and is a snapshot of a limited number of banks, we nevertheless consider that this assessment allows for a broad indication of the importance of mortgages to a bank's business.
63. In 2014 total mortgage balances for the nine IRB banks exceeded £800 billion, compared with £[X] billion for the six SA banks, almost £[X] billion of which relates to one SA bank. As noted above, several SA banks reported no mortgage balances.
64. For eight IRB banks, the mortgage share of total retail assets in 2014 was between approximately [60 and 100]%. The other IRB bank did not report retail assets to us.
65. Among the six SA mortgage banks, two banks had approximately [40–60]% of their UK retail banking assets held as mortgage assets; the other four SA banks had between [10 and 40]%.
66. Four further banks reported holding no mortgage balances. In addition, one additional bank told us that it intended to enter the retail banking market without investing in mortgages (Starling), and another bank intended to enter the retail banking market offering just current accounts and overdrafts (Mondo).⁵⁷

⁵⁵ We requested data for period end and average assets and average risk-weighted assets. Where average assets were not available, we have used period-end assets as an estimate.

⁵⁶ [X]

⁵⁷ See [Mondo](#) website and article in *The Telegraph* (26 March 2016): 'Banking industry primed for a pocket-sized revolution'.

Table 4: Residential mortgages as a proportion of UK retail assets 2014

	<i>Mortgages as % UK retail assets</i>
<i>IRB banks</i>	
Barclays	[X]
Co-op	[X]
HSBC	[X]
LBG	[X]
Nationwide	[X]
RBS	[X]
Santander	[X]
TSB	[X]
Virgin	[X]
<i>SA banks</i>	
Aldermore	[X]
Clydesdale	[X]
Danske	[X]
First Trust	[X]
Handelsbanken	[X]
Tesco	[X]

Source: CMA based on banks' data.

Definitions:

1. Residential mortgages: Comprising UK owner-occupied mortgages, ie residential mortgages secured on owner-occupied properties in the UK. This includes mortgages to first-time buyers, home movers and remortgages but excludes buy-to-let, second-charge and business mortgages and mortgages secured on properties outside the UK.

2. Retail banking includes personal lending and SME lending (turnover below £25 million) including mortgages and overdrafts, credit and debit cards and other payment facilities.

Conclusions on mortgage balances

67. The evidence shows that the majority of SA banks hold a considerably lower proportion of their total retail assets in mortgages as compared with IRB banks, although we note that the data is limited and data definitions used by banks may not have been wholly consistent. Several banks report no mortgage balances including a number of new entrant banks. Conversely, IRB banks hold a high percentage (approximately [60 and 100]%) of their retail assets in mortgages. This evidence is therefore consistent with the hypothesis that SA banks have a reduced ability to compete in the provision of mortgages.
68. If SA banks have a reduced ability to compete in the provision of mortgages, this will impact upon the returns on equity and deposits received by SA banks if alternative investment options do not mitigate the disadvantage. We have not sought to try to quantify the size of the SA banks' disadvantage, but the high proportion of mortgage assets held by IRB banks in an area that is profitable to them is suggestive that mortgages are an important investment option, and that alternative investments are unlikely to provide commensurate returns to SA banks.
69. Some banks have entered retail banking with business models that do not include mortgages, some SA banks have a strong retail banking presence in their respective geographical areas and one SA bank is expanding in retail banking with a relatively small mortgage balance. This may suggest that

alternative business models are available to banks to compete in retail banking and/or that factors other than risk weights may explain why SA banks generally hold a materially lower proportion of their retail assets in mortgages compared with IRB banks. A fuller picture would require an assessment of the proportion of mortgage assets held by a greater number of banks through time and a comparison of this to their ability to compete in retail banking markets, and would need to consider other factors that influence a bank's choices of investment, including its individual business model and risk appetite.

Mortgage portfolios

70. We found above that SA banks have higher mortgage prices as compared with IRB banks because of the higher risk weights under SA. Since the difference in risk weighting between SA and IRB banks is most pronounced for lower LTV mortgages, SA banks are likely to be at a particular pricing disadvantage compared with IRB banks in the provision of lower LTV mortgages. The proportion of mortgage assets SA banks hold in lower LTV mortgages as compared with IRB banks may provide some indication of the materiality of this disadvantage in winning business.
71. The data received from banks suggests that the mix of mortgage assets between LTV bands varied substantially between IRB banks, between SA banks and across the two types (see Table 5 below). For example, in 2014, for the 80% and above LTV bands, IRB banks have shares of mortgage assets between [0 and 30]%, compared with SA banks with a range of [0–60]%

Table 5: Mortgage asset mix across LTV bands – 2014

	LTV range			Balances* £bn
	0–50%	50–80%	80% +	
<i>IRB banks</i>				
Barclays	[X]	[X]	[X]	[X]
Coop†	[X]	[X]	[X]	[X]
HSBC†	[X]	[X]	[X]	[X]
LBG‡	[X]	[X]	[X]	[X]
Nationwide	[X]	[X]	[X]	[X]
RBS	[X]	[X]	[X]	[X]
Santander	[X]	[X]	[X]	[X]
TSB	[X]	[X]	[X]	[X]
Virgin	[X]	[X]	[X]	[X]
<i>Standardised banks</i>				
Aldermore	[X]	[X]	[X]	[X]
Clydesdale	[X]	[X]	[X]	[X]
Danske†	[X]	[X]	[X]	[X]
First Trust	[X]	[X]	[X]	[X]
Handelsbanken	[X]	[X]	[X]	[X]
Tesco	[X]	[X]	[X]	[X]

Source: CMA calculations.

* We requested data for period-end and average assets. Where average assets were not available, we have used period-end assets as an estimate.

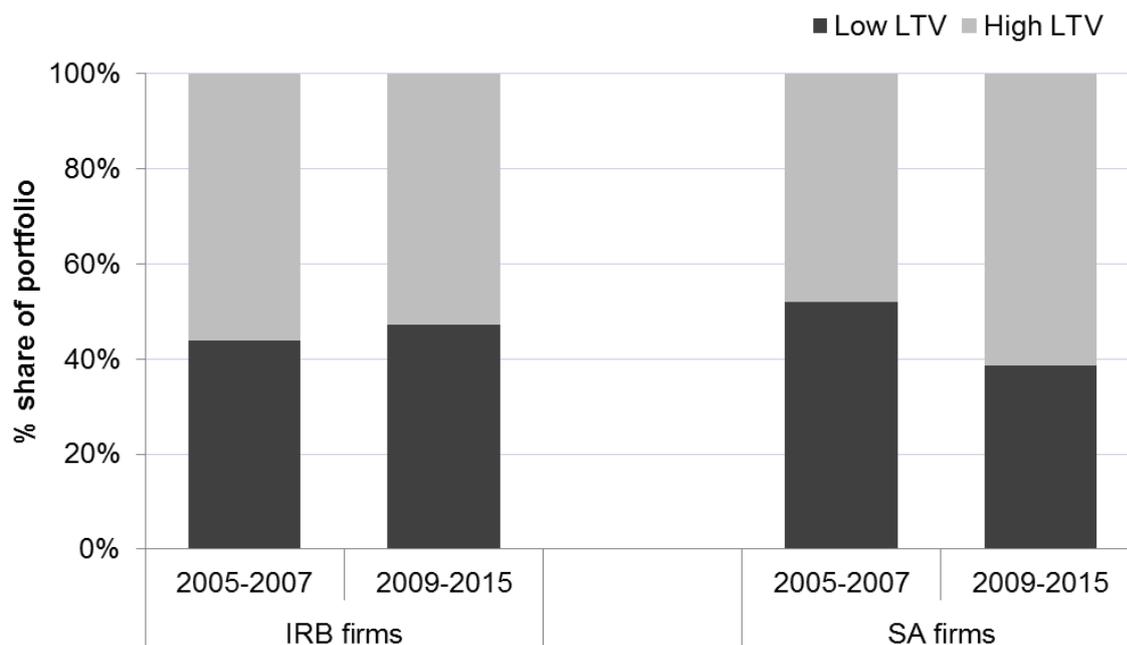
† [X]

‡ [X]

72. We have also considered whether there has been a change in banks' mortgage portfolios stock since the introduction of the new capital requirements regime in 2008. The data we have suggests that over 2011 to 2014 IRB banks⁵⁸ increased the percentage of their mortgage assets within the 0–50% LTV band by between 1% and 20%. Among SA banks that operated in 2011, [X] showed an increased proportion of assets within 0–50% LTV over the period 2011 to 2014, [X].
73. Analysis undertaken by the PRA on mortgage origination (rather than mortgage stock as above), shows that SA banks have increased the proportion of high LTV loans (defined as loans with LTV above 70%) in their portfolio since 2007 by around 10% (see Figure 3 below).

⁵⁸ Considering those IRB banks which were operating since 2011.

Figure 3: Comparison of mortgage origination for IRB and SA firms for low (below 70%) and high (above 70%) LTVs since 2005



Source: PRA calculations using loan-level data from the FCA Product Sales Database.

Notes:

1. Analysis contains IRB and SA firms only, which account for around 94% of new origination value in the market currently. Buyer types include first-time buyers, home movers, and re-mortgagors, which together make up 96% of originations over the whole period.
2. The qualitative results are robust to thresholds between 50% and 90%.
3. This chart aggregates 'split loans', that is, multiple loans against the same property on the same date, into a single combined loan. 1.4% of the loans (after combination) had been split.

Conclusions on mortgage portfolios

74. The evidence on mortgage assets held in 2014 suggests that some, but not all, SA banks have a higher proportion than IRB banks of their assets in the highest LTV bands. The pattern is less clear in the lower LTV bands. The evidence available on mortgage asset mix for SA banks is, however, limited to a small number of SA banks.
75. The evidence on loan origination suggests that since 2007 SA banks have a greater overall propensity to originate high LTV mortgages. While there are other factors, such as differences in business models or risk appetite, that could at least contribute to an explanation for this, this provides some support for the hypothesis that SA banks overall are shifting their mortgage portfolios to high LTV mortgages which is where they are at less of a risk weight and, therefore, price disadvantage.

Provisional findings on capital requirements

76. We have provisionally found that:

- (a) Under the risk weighted assets based capital framework, banks under the IRB approach are required to hold significantly less capital than banks on the SA approach for similar risk for certain types of assets, unless the leverage ratio is the binding capital constraint. The difference is particularly marked in relation to residential mortgages. The widest differential in residential mortgages is for low LTV mortgages, and the PRA has confirmed that this differential in low LTV mortgages is larger than can be justified or considered appropriate on prudential grounds.
 - (b) It is difficult for new entrants and smaller banks to become IRB approved because of the data requirements and the significant costs of obtaining and maintaining IRB approval. Nevertheless, several smaller banks and building societies are IRB approved for residential mortgages and, conversely, some larger established banks are not IRB approved for residential mortgages.
- 77. If it is the case that SA banks charge higher mortgage prices because of having higher risk weights than IRB banks, then this would lead to SA banks having a reduced ability to win mortgage customers at lower LTVs. The magnitude of the competitive disadvantage for lower LTV mortgages, in the form of lower market shares and/or lower margins, would determine the extent to which SA banks have lower returns on equity and deposits as compared with IRB banks, along with SA banks' ability to offset any disadvantage through alternative investment options. This disadvantage could lead SA banks to have a reduced ability to compete in retail banking more generally, with product offerings that are less competitive and with lower investment in innovation. This could reduce the attractiveness of investments in SA banks compared with the next best alternative investment. Ultimately this could deter entry into retail banking.
- 78. On the impact of the capital requirements regime on the supply of mortgages, we have provisionally found that:
 - (a) while the PRA analysis is preliminary and needs further refinement and testing, the initial results are sufficiently robust to show that SA banks have higher mortgage prices in lower LTV mortgages compared with IRB banks because of SA banks' higher risk weights;
 - (b) SA banks from which we were able to obtain data generally have a lower proportion of their assets in mortgages than IRB banks (and several have no mortgage lending at all). Conversely IRB banks hold a high percentage (approximately [60 and 100]%) of their retail assets in mortgages confirming that for such banks at least mortgage lending is an important aspect of their retail banking business;

- (c) our review of industry reports suggests that mortgages are the most profitable lending products for banks and an important source of profits for banks; and
- (d) there is some evidence that those SA banks which engage in mortgage lending have a higher proportion of high LTV mortgages in their portfolio than IRB banks but this evidence is mixed. The evidence on loan origination suggests that after 2008 SA banks have a greater overall propensity to originate high LTV mortgages, which supports the proposition that SA banks overall are shifting their mortgage portfolios to where the risk weight differential and price disadvantage between SA and IRB banks is lower.
79. The Group is unanimous in its provisional view that the capital requirements regime places SA banks at a competitive disadvantage in lower LTV mortgages because they have higher risk weights than IRB banks. Two members of the Group⁵⁹ are of the view that the evidence is sufficient to support a provisional finding that the capital requirements regime for mortgages has sufficiently large effects on the costs and returns of SA banks to be a barrier to entry and/or expansion in retail banking more generally including the supply of PCAs and of SME banking services. The majority of the Group, however, consider that further evidence is needed in order to be sufficiently confident about the scale of the impact that is attributable to the capital regime. In their view, further evidence on the materiality of the competitive disadvantage and the impact on competition and outcomes would be required in order to support a finding that the differential in mortgage risk weights is a barrier to entry and/or expansion in PCAs, and/or SME banking (or indeed in other retail banking markets).
80. The Group has considered whether it would be appropriate to undertake further analysis in the course of this investigation in order to determine the matter. We do not have powers to change the capital requirements regime set under European law, specifically, CRD IV and CRR. The regime as a whole is the subject of a number of current developments for reform at international level. The PRA, BoE and HM Treasury have confirmed to us that they are considering these issues as a matter of priority including the proportionality of banking regulation and the regulatory burden on smaller banks. We therefore do not intend to undertake further analysis to determine whether SA banks' disadvantage in lower LTV mortgages gives rise to a barrier to entry and/or expansion in retail banking.

⁵⁹ Professor Alasdair Smith and Professor Tom Hoehn.

81. It is clear that the capital regulatory regime, and indeed the prudential regulation of banks more widely, has the potential to impact on competition in retail banking in a range of areas. We believe therefore that the CMA should continue to liaise in particular with the PRA, the BoE and HM Treasury in this area beyond the limited timescale of this investigation. We believe that it is essential that the impact on competition is given due weight by the relevant authorities, including the European Commission and the EBA as well as UK authorities, in the reform of the capital regime and in its ongoing implementation.

Views of parties

Prudential Regulation Authority¹

1. The PRA stated that it was very difficult to design a regulatory system that optimally aligned capital requirements with the underlying credit risks held by banks. Inherent uncertainty meant that any assessment of risk was an estimate: for example, structural changes in the economy could not be predicted. Asymmetric information between the regulator and banks naturally meant that there would be some divergence between the regulatory capital set by regulators and banks' own estimates of the risks on their balance sheet. Ultimately, this meant that there would be differing impacts on banks under any regime. The introduction of the IRB approach (as part of Basel II) was aimed at ensuring that levels of capital better reflected the inherent risk held by banks and at incentivising better risk management and decision-making within banks. However, as regulators were effectively handing over some of the responsibilities of capital setting to banks, requirements to become IRB-approved were set high. Regulators needed sufficient confidence that the risk models used to calculate risk weights were sufficiently robust, there was sound governance in maintaining and using the models, and that banks were using the models for their own internal decision-making. In addition, some gaps between banks on the SA and the IRB approach were intended as they were thought to incentivise banks to invest in better risk management under the IRB approach.
2. However, the PRA also explained that while the IRB approach had its advantages in being more risk reflective, it also had limitations to the extent that not all banks were capable of developing risk models and it could lead to risk gaming. For those banks (without IRB approval) the SA was the fall-back option.
3. The PRA also told us that while smaller and newer banks might face disadvantages on individual assets compared with IRB approved banks, a number of recent measures had been introduced since the financial crisis such as capital buffers for large systemically important banks, total loss absorbing capacity, the leverage ratio and stress testing for large banks. The PRA considered that these measures had largely offset the apparent capital advantages of the IRB approach compared to the SA in most asset classes, although this was not the rationale for the introduction of these measures.

¹ For further information please refer to the [PRA hearing summary](#).

However, it recognised that there remained wide gaps in relation to some assets, in particular lower LTV mortgages, and that such gaps were larger than could be considered appropriate or justified on prudential grounds. It was also of the view that such differences might have had unintended consequences by encouraging some banks on the SA to compete instead on assets where the gap between IRB and SA risk weights was narrower, which were usually riskier assets.

4. The PRA told us that where it had discretion in its implementation of the capital regime, it would wherever possible seek to level the playing field between SA and IRB banks and give appropriate weight to competition. It stated that it had taken a number of steps to level the playing field between SA and IRB banks and that it was undertaking work looking at the impact of the capital requirements regime, in particular in the mortgage markets.² However, to address the larger disparities between the risk weights under the SA and IRB approach, the PRA's view was that it was necessary to address it at international level from both sides. On the one hand the modelling under IRB should be improved to make it more robust in the face of uncertainty, particularly for low default assets, and on the other hand the SA should be more reflective of UK risk, in particular for smaller banks. In addition the PRA stated that, in its view, the EU's approach of applying the regime to all banks irrespective of size and business models should be reviewed. It recognised that the costs of the regime bore more heavily on smaller banks and that the benefits of applying the regime in full to smaller banks is proportionally less. In its view more proportionate and differentiated rules were more likely to help promote competition and, in particular, the growth of smaller banks.

Banks

5. In response to our provisional findings, HSBC stated that the PRA was best placed to deal with any residual issues under the capital requirements regime relating to residential mortgage lending, given that: (a) several smaller banks were IRB-approved for mortgages by the PRA; (b) the PRA had indicated that reforms on the regulatory agenda would increase capital requirements on larger banks relative to smaller banks; and (c) the PRA was already exploring the extent to which it could be made more feasible for new entrants to develop IRB models (see the provisional findings, paragraphs 10.85 and 10.86).³

² These included greater flexibility when setting capital expectations for new entrants. Moreover, supervisors may exercise judgement for smaller firms where they identify that the credit concentration risk methodology could overstate risks, or could incentivise risk-taking behaviour.

³ [HSBC response to the provisional findings](#), footnote 9.

6. RBS submitted⁴ that the PRA had been active in ensuring a level playing field for new and more established banks, in particular, relating to different methods of calculating relevant credit risk (ie whether the SA or the IRB approach). While the SA and IRB approaches may give rise to significantly different risk weightings for similar credits (and not always lower for IRB), RBS argued that that did not necessarily result in equally large differentials in capital requirements relating to those credits. This was because effective capital requirements were determined not only by reference to the risk-weighted capital framework but also by, *inter alia*, the leverage ratio and the BoE stress testing framework. As regards the latter, RBS noted that the 2014 stress test was applied only to the eight largest banks and building societies, and not to newer or smaller banks. In addition, RBS risk weights under the IRB approach were subject to a number of floors. The PRA had, for example, applied a 'slotting' regime to commercial real estate credits, while the Basel Committee was consulting on a capital floor framework based on standardised, non-internal modelled approaches. Finally, RBS stated that the IRB approach entailed added costs, such as the development and maintenance of the model, and reflected capital buffers which larger banks were required to maintain, but which did not apply to new entrants.
7. LBG emphasised that the output from the CMA's analysis of mortgage data needed to be interpreted with care and that any conclusions should reflect the full capital requirements (and not only the risk weighted assets requirements). It emphasised the complexity of assessing mortgage risk and the impact of additional capital requirements from Pillar II and stress analyses of the portfolio. In comparing data between banks, LBG pointed out that each bank's asset portfolio mix would differ for a number of reasons including differences in risk appetite. Pricing analysis was complex, driven by legacy pricing considerations, portfolio term, age of book and other factors. Also, mortgages would move between LTV bands as a loan was repaid and house prices changed, which would complicate comparison of price and risk weightings over time.
8. Santander stated that the CMA should look at the regulatory regime as a whole and assess the cumulative effects of each set of regulations and how they affected competition between banks and not individually as was the approach in the provisional findings. In assessing regulations, the CMA should look at whether the relevant regulation was proportionate to its aims. It submitted that the regulatory regime as a whole had disproportionate effects on smaller banks including Santander. It was much harder for smaller banks to accommodate regulatory costs. In relation to capital requirements,

⁴ [RBS response to the provisional findings](#), paragraph 7, p9.

Santander submitted that there were clear capital benefits in using IRB but that this was inherent in the design of the system in order to reward banks for better risk management.

9. The main reason Santander could not be IRB approved across all its portfolio of assets was the lack of data history. In its view the data requirements were too onerous. While it was easier to collect data on mortgages, it was far more difficult on SME assets as the number of customers and loans for which a smaller bank could obtain data in the UK was very small. It said that, when it started its SME operations in 2008, in the absence of legacy books which it could rely on and as it did not have good data for the prior seven years, it could have bought data to underpin an IRB model. However, this would have distorted its numbers significantly as it would not have been indicative of its underwriting standards and did not reflect its lower risk. Therefore the IRB requirements and the term required for statistical accuracy did not assist new entrants. Instead they created an advantage for established market participants. An example of the impact of the differential in capital financing regulation was that, had Santander bought Williams & Glyn, it would immediately have had to put approximately 30% more capital behind the same assets as RBSG did.
10. Moreover, Santander disagreed with the CMA's analysis that the differential in risk weights in SME lending was not significant. Santander stated that (as a new entrant in SME lending) it was required to hold more capital in relation to SME lending than, for example, RBSG would for the same unit of lending. In its view Pillar II and other capital buffers should not be looked at as they were not intended to 'offset' the differential between the SA risk weights and IRB. In its view the differential between IRB and SA for mortgages and SME were broadly similar.
11. [redacted] suggested that it was important that the effect of mortgages with a LTV>100% and investment home loans were considered as part of an analysis of banks' mortgage portfolios, particularly when the financial climate could lead to some banks having a higher proportion of loans with negative equity than was usual.
12. Aldermore considered that capital requirements, together with the capital tax surcharge and the cost of funding, were the biggest challenge for small banks. It submitted that regulation fell disproportionately on smaller banks and that the greatest differential in risk weights arose in the vital mortgage market and in particular the lower LTV mortgages. Such mortgages represented 60% of the market but Aldermore was unable to compete against IRB banks in the mainstream mortgage market due to its having to hold much higher levels of capital for such lending. [redacted]

13. TSB (which uses IRB for mortgage lending) cited capital requirements as an obstacle for a new bank. It said that banks which used the IRB approach had significant capital advantages over those banks that the used the SA, most significantly on residential mortgages. On unsecured lending, it was broadly neutral, although in some instances, the IRB approach gave a higher capital requirement than the SA. TSB said that a new bank with a small number of customers and a small infrastructure did not have the data to do the analysis and so would use the SA. TSB said that much of this was caused by a 'scale mismatch' rather than a problem with the IRB system itself. The IRB processes and systems were expensive and there were high maintenance costs as well.⁵
14. Clydesdale (which uses the SA) said that it had an average risk weighting [REDACTED] that was [REDACTED]. A solution suggested by Clydesdale was for regulators to make accrediting standardised banks with IRB status easier and more proportionate in terms of the cost and the process involved. [REDACTED]⁶
15. Clydesdale gave an example of a differential for a [REDACTED] between an SA and an IRB-approved bank. It said that [REDACTED].
16. Metro told us that there should be tighter bands for capital requirements for standard product sets, rather than allowing for the current wide differentiation in the market. In particular, the advanced modelling approaches used by many existing banks allowed for too much variability in capital. In order to promote a truly fair and competitive market, capital requirements for all product sets should be brought more closely in line with each other using industry-wide indicators set by the regulator. This would make the market more transparent. Metro also told us that it was required to hold around six to ten times more capital than the big banks and building societies when securing a mortgage for a customer, even if it was the same customer, with the same deposit, on the same property. In its view, the UK should adopt the same approach as the USA in imposing lower capital requirements on smaller banks that posed less risk.
17. Secure Trust said that recent UK banking consolidation was driven partly by the introduction of the Basel II⁷ capital methodology. In practice, only the largest firms could commit the resources necessary to meet the criteria required to qualify to use the IRB approach, which gave them an immediate and substantial capital advantage. Secure Trust referred to an ICB report which noted that Nationwide was able to risk-weight its mortgage assets at

⁵ [TSB hearing summary](#).

⁶ [Clydesdale hearing summary](#).

⁷ Basel II introduced the dual system of IRB and SAs for calculating risk weights.

5%, while Barclays and LBG had risk weights of 16%. This meant that banks on the standardised risk weight of 35% had between a 218% and 700% capital disadvantage relative to banks on the IRB approach. Secure Trust said that new entrants focused their approaches in particular market segments more through necessity than choice – they must concentrate in areas where they had some ability to compete. This in turn meant that it would be very difficult to become IRB approved, for example in relation to mortgages, as they would not be able to collect the necessary data. Secure Trust said that this could imply that the market was not functioning effectively. It said that the creation of more new banks could be suboptimal and counterproductive unless it was also aligned to a broader strategy to address the capital disadvantages of new banks.

18. Virgin Money noted that Andy Haldane, Chief Economist at the BoE, had observed a striking fall in the average risk weights of large banks using the IRB approach since the 1990s. It also noted previous comments by the BoE about changes in measurement methodology that had led to reductions in reported risk-weighted assets, but which may not have been associated with improvements in underlying resilience. It considered that there needed to be a more level playing field between larger incumbent banks, smaller banks and new entrants (with some of the very low risk-weight outcomes of the larger banks being challenged). It submitted that higher risk weights in residential mortgages for SA banks was a barrier to entry and expansion; these made it more difficult for SA banks to raise capital as the expected returns on their larger amounts of capital would be significantly lower than for large banks using the IRB approach. It said that this might explain that while there had been new entrants in retail banking, no new banks were focusing exclusively, or largely, on residential mortgages. It also noted that the suggested 'overheating' of the buy-to-let market, to the extent that it was true, might be in part a consequence of firms using the SA driving up their buy-to-let business in order to achieve the higher yields that had been available in this market relative to other assets. Virgin Money noted the FCA's observation that competition in mortgages was largely price-driven. While it suggested that SA banks could choose to match IRB banks' pricing, it did not think this approach would be sustainable given the ongoing pressure there would be to pass on to consumers at least part of the higher costs associated with higher capital requirements.

Other parties

19. The Challenger Bank Panel of the British Bankers' Association told us that smaller banks in the UK were at a disadvantage in relation to larger banks due to the uniform application of the Basel rules to all banks, and the difficulty

involved in moving from the SA on to the IRB approach. Banks using internal ratings were able to apply lower risk weightings to many asset classes, enabling them to make more productive use of their capital. It said that the issue was also faced in other European jurisdictions, and the European Commission had just launched a public consultation on the impact of capital regulation, more specifically CRR and CRD IV,⁸ which considered the question of the proportionality of regulation for different types of bank.

20. In a multi-party submission in response to provisional findings, a group of smaller banks⁹ stated that the CMA should work with the PRA to facilitate SA banks transitioning to the IRB approach, increase access to BoE aggregate data for use in risk modelling by smaller banks and reduce the differential in risk weights between the IRB approach and the SA. They also argued that regulation in general should make greater use of *de minimis* thresholds and that banks should have greater discretion in how to achieve the objectives of regulation rather than imposing detailed requirements out of proportion to the risk posed by smaller banks. They also submitted that the regulatory problems faced by smaller banks were compounded by the corporation tax surcharge and the higher cost of funds of smaller banks.
21. Sir John Vickers raised competition concerns in relation to the FPC's proposals on which the BoE was consulting for the implementation of the systemic risk buffer for large ring-fenced banks. Sir John submitted that the current proposed framework for the systemic risk buffer could blunt the incentives on ring-fenced retail banks to compete for new business and could incentivise such banks to shrink their business thereby weakening and/or distorting competition between retail banks. In particular, Sir John argued that the proposed stepped thresholds for the rates of the systemic risk buffer, and the 'empty bucket' policy towards the top rate, might deter growth as banks approached each threshold, in particular as the higher rate was applied to all assets and not only to the value of assets which exceeded the threshold (unlike income tax).
22. The Building Societies Association (BSA) told us that there were potential competition concerns in relation to the proposals for bail-in requirements as part of bank resolution.¹⁰ As it set out in its response to the BoE consultation on this topic, the BSA argued that the compliance costs of the proposed

⁸ [European Commission public consultation](#) on the possible impact of the CRR and CRD IV on bank financing of the economy.

⁹ [Challenger banks response to the provisional findings](#). (Aldermore Bank, Charter Savings Bank, Close Brothers, Hampden and Co, Metro Bank, OneSavings Bank, Paragon Bank, Secure Trust Bank, Shawbrook Bank Limited, Tesco Bank.)

¹⁰ [Bank of England consultation](#) on the Bank's approach to setting a minimum requirement for own funds and eligible liabilities (MREL).

regime would add to existing barriers to entry and expansion. The BoE's proposals include an exemption only for banks with fewer than 40,000 transactional accounts.¹¹ The BSA was concerned that the requirements were structured in a way that discouraged PCA growth for banks that were either currently just below the threshold, or contemplating entering the PCA market. The BSA argued that a higher threshold and a more gradual transition would strike a more appropriate balance between competition and prudential concerns.

23. We have not considered in detail the submissions by Sir John Vickers and the BSA, given that the proposals are still being consulted upon and therefore the BoE are best placed to consider the arguments put forward. As set out in our conclusions, we agree with Sir John and the BSA that the BoE should give due weight to competition as well as financial stability in its implementation of the systemic risk buffer and its design of the new regime for bank resolution.

¹¹ The PRA proposes to base its definition of transactional banking services on 'an appropriate definition of "current accounts"'. However, the exact definition is one of the questions for consultation. See [Bank of England consultation](#) (paragraphs 3.7–3.12).

Summary of Bank of England research on the impact of risk weights on pricing in the UK owner-occupied residential mortgage market

Summary

Background—The BoE/PRA is conducting research on the impact of risk weights on mortgage pricing. The research is still in progress, but the BoE has agreed to share with the CMA some of the preliminary results. The BoE expects to further refine the model and further check data quality—both could affect the results.

The research focuses on evidence that firms who calculate mortgage risk weights using the IRB approach tend to have lower risk weights than firms who use the SA, and more so for lower-LTV mortgages. This gap between risk weights for firms using IRB models and those using the SA was highlighted in the CMA’s preliminary findings report.¹ (In the following, the labels ‘IRB firms’ and ‘SA firms’ are used to identify the two groups of firms).

Data—The research is based on a dataset derived from the FCA’s Product Sales Database (PSD)², that contains all mortgages originated by banks and building societies³, and secured on UK owner-occupied residential property, between 2005Q2 and 2015Q2. The loan data is matched with two other datasets. First, data on whether the originating firm was on IRB or not on the date that the loan was originated. This gives a sample with approximately 7.4 million loans (sample A). Second, information on the historical risk weights used by IRB firms over the period 2008-15, which was collected with the help of the CMA. This gives a smaller sample with approximately 6.6 million loans (sample B) because historical weight data is available for only a subset of firm-years.

Methodology—To test the impact of risk weights on pricing, the research uses three different model specifications. These can be ordered in terms of increasing tightness of identification, or extent of controls for factors other than risk weights that might be driving variation in prices (initial interest rates at the point of origination):⁴

¹ CMA (2015), ‘Retail banking market investigation: Provisional findings report’.

² The FCA Product Sales Data include regulated mortgage contracts only, and therefore exclude other regulated home finance products such as home purchase plans and home reversions, and unregulated products such as second charge lending and buy-to-let mortgages.

³ Non-deposit taking (“specialist”) lenders are not included, except in a small number of cases where the lender is a subsidiary of a deposit taker and is not just a specialist lender. We also excluded one large lender [X] in the pre-2008 period due to concerns related to the reported data.

⁴ PSD does not include information on fees and changes in interest rates after origination (e.g. at the end of a fixed-rate period).

- 1) The *regime change model* is perhaps the most intuitive. However, it implicitly assumes that all firms switch to IRB at the same time, and the controls are relatively coarse.
- 2) The *IRB switch model* uses information on individual firms' switch dates, and adds more granular controls.⁵
- 3) The *historical risk weights model* has the same controls as the IRB switch model, but captures the risk weight variation directly. However, we only have the risk weight data for a subset of firms and years, as mentioned above.

Preliminary results—The preliminary results so far all point to a positive sign (lower risk weights lead to lower prices). The effects appear to be material for low-LTV mortgages, in particular in the regime change and IRB switch models. However, the results of the historical risk weights model, which allows for the tightest identification, are not robust to changes in the sample period: they are economically significant for 2009Q1-2015Q2, but not for the full 2005Q2-2015Q2 sample. Further work is required to understand how material the effects are.

Limitations—The research approach captures only imperfectly credit risk, which is correlated with risk weights, and is likely to bias (upwards) the estimated impact of risk weights on prices. Moreover, comparisons of average risk weights between IRB and SA firms could be biased by self-selection if the firms that have stayed on SA are those with riskier portfolios and hence with less to gain from IRB models in terms of risk weights. At the moment, the research does not take into account the effect of securitisations and other aspects of the regulatory framework for capital (e.g. capital ratio, leverage ratio), and it does not include specialised lenders (non-deposit takers). The quality of the information provided by firms on historical risk weights has not been audited.⁶ Finally, the magnitudes of the results are sensitive to which firms and years are included in the sample.

The regime change model

The regime change model simply tests whether any gap in average prices – that emerged between IRB and SA firms after the regulatory regime for risk weights changed in 2008 – was larger at lower LTV.⁷ Under Basel, the risk weight was 50% for all mortgages. From 2008, banks and building societies have had to choose between the IRB and standardised approach. Under both approaches, average risk weights fell—but they fell more for IRB firms, in particular at low LTVs (*Figure 1*).

⁵ Both the regime change and the IRB switch model capture the variation in risk weights indirectly, using a dummy variable for the switch to IRB as a proxy for the decline in risk weights that we know is typically associated with such a switch. We observe this proxy for all firms and time periods in our samples (see below).

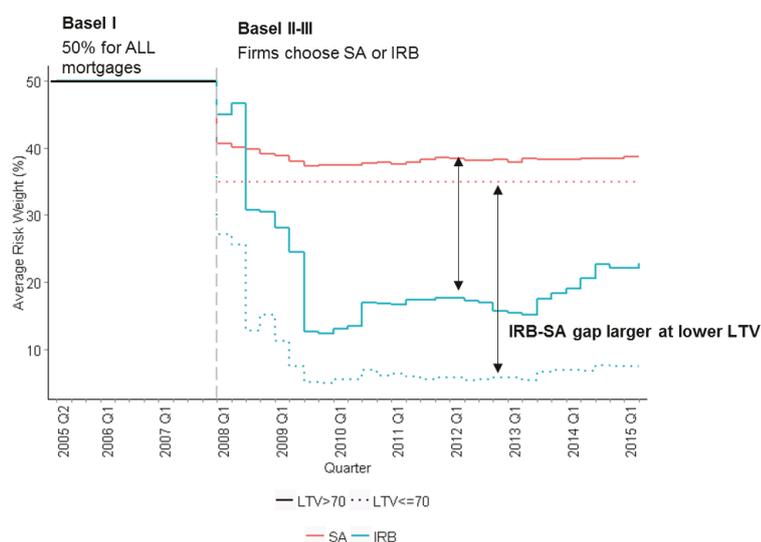
⁶ The information obtained by the CMA and PRA for this exercise differs from other risk-weight data obtained by the PRA in the past.

⁷ Some firms switching to foundation (as opposed to advanced) IRB were allowed to do so in 2007. All the IRB firms in our sample use advanced IRB.

After 2008, mortgage prices also fell, mainly driven by macroeconomic factors. But the fall was larger for IRB firms, and more so at low LTVs (*Figure 2*). This can be seen more clearly by comparing the IRB-SA price difference at low vs high LTVs. The change in the IRB-SA price difference is larger for low LTV mortgages—consistent with the hypothesis that it was caused by the introduction of the new regime for risk weights (*Figure 3*). For example, if we put the threshold between high- and low-LTV at 70% LTV, then the relative price difference is approximately 60bp on the same sample used in the historical risk weights model below (results are qualitatively similar for other choices of sample and threshold, see *Table 1*).

The triple difference (IRB vs SA, before vs after the-switch to IRB/SA, and high- vs low-LTV) helps capture the effect of risk weights on prices while controlling for drivers of prices other than risk weights. For example, changes in funding costs will have the same effect on high- and low-LTVs for the same lender, and as a result the impact of funding costs will cancel out in the triple difference.⁸

Figure 1: Average risk weights for IRB and SA firms on low- and high-LTV mortgages (2005Q2-2015Q2)



⁸ Assuming that the lender does not account differently for funding costs for low- and high-LTV mortgages, e.g. through its transfer pricing.

Figure 2: Average prices for IRB and SA firms for low- and high-LTV mortgages (2005Q2-2015Q2)

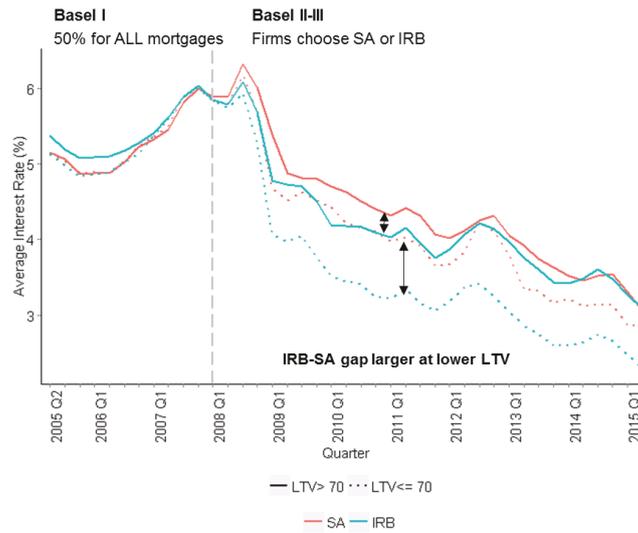
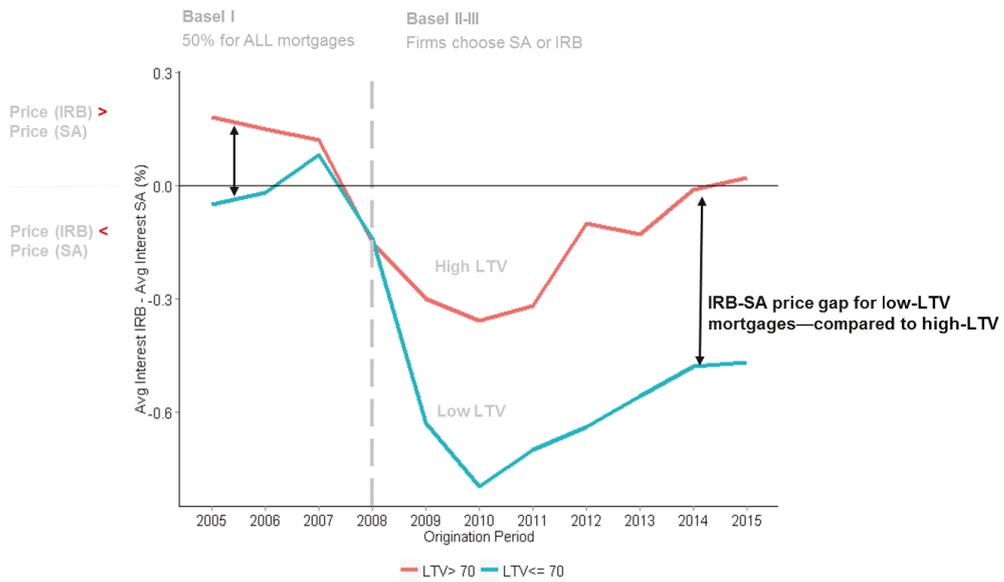


Figure 3: Price gap between IRB and SA firms for low- and high-LTV mortgages (2005Q2-2015Q2)



Box 1: Specification of the regime change model

The regime change model is specified as a difference-in-difference-in-difference model. The impact of IRB models after 2008 on low-LTV loans is captured by a triple interaction factor.

$$Rate_{ibst} = \beta_0 + \beta_1 IRB_b + \beta_2 LowLTV_s + \beta_3 Post2008_t + \beta_{12} IRB_b \times LowLTV_s + \beta_{13} IRB_b \times Post2008_t + \beta_{23} LowLTV_s \times Post2008_t + \beta_{123} IRB_b \times LowLTV_s \times Post2008_t + \theta X_{ibst} + \varepsilon_{ibst}$$

Where i indicates the individual loan, b the lender (bank), s the LTV band, t time, and:

$Rate_{ibst}$ is the initial interest rate on the mortgage loan

IRB_b is a dummy equal to 1 if the bank b is on IRB at any point in time

$LowLTV_s$ is a dummy equal to 1 if the loan-to-value is below a certain threshold (e.g. $LTV \leq 70\%$)

$Post2008_t$ is a dummy equal to 1 after January 2008

X_{ibst} are additional individual controls (borrower type, interest rate type, LTI)

$\beta_{123} IRB_b \times LowLTV_s \times Post2008_t$ is the triple interaction factor that we expect to capture the impact of IRB models from 2008 (cf. before) on low-LTV (cf. high-LTV) loans.

Table 1: Regime change model, 2005Q2-2015Q2: price advantage (in bps) for IRB firms at low LTVs (compared to high LTVs)

Sample	Definition of 'low' LTV		
	LTV ≤ 70	LTV ≤ 75	LTV ≤ 80
Sample A	-46.3*** (0.005)	-34.7*** (0.005)	-28.4*** (0.005)
Sample B	Classical errors -60.0*** (0.005)	-48.4*** (0.005)	-41.8*** (0.005)
	Clustered errors -60.0*** (19.258)	-48.4*** (16.578)	-41.8*** (12.491)

Notes: Standard errors in parentheses. ***, **, * denote significance at the 99%, 95%, and 90% levels respectively. Clustered errors use two-way clustering by bank and time.

The individual IRB switch model

The IRB switch model is very similar to the regime change model, but uses i) the specific quarter in which firms switched to IRB, and ii) more detailed fixed effects to control for other factors. Fixed effects control for all variation along particular dimensions or combinations thereof—rather than explicitly for specific explanatory factors. Our models include fixed effects for pairwise interactions between time, bank and LTV, capturing the variation along these dimensions—which encompass many factors that may drive price variation.

For example, volatility in funding costs is captured by interacting bank and time fixed effects. Changes in central bank rates would be captured by simple time fixed-effects. However, the impact on pricing of spreads on wholesale funding diverged across banks during the crisis, reflecting relative differences in terms of riskiness and reliance on wholesale funding. This latter variation is captured by interacted bank-time fixed effects.

Table 2 below summarises the main results. The size of the relative price advantage for IRB firms at low LTVs (compared to the price advantage at high LTVs) is estimated around 19bp, using 70% as a threshold for high vs low LTV, and considering the same sample we used to estimate the historical risk weights model below (sample B). The results remain statistically significant (at the 90% level), for results with 70% and 75% LTV thresholds, when we allow for correlation of the error term (ε_{ibst}) within clusters of loans made by the same bank and/or in the same period, which could cause classical errors to exaggerate the statistical significance of the coefficients. The results are qualitatively similar for other choices of sample and threshold.

Box 2: Specification of the individual IRB switch model

The ‘individual IRB switch’ model uses the date at which firms switched to IRB; pairwise interacted fixed effects that capture bank-time, bank-LTV and time-LTV variation; and loan-level controls for borrower and rate type and loan-to-income (LTI) ratio.

$$Rate_{ibst} = \gamma_{bs} + \gamma_{st} + \gamma_{bt} + \delta IRB_{bt} \times LowLTV_s + \theta X_{ibst} + \varepsilon_{ibst}$$

Where i indicates the individual loan, b the lender (bank), s the LTV band, t time, and:

$Rate_{ibst}$ is the initial interest rate on the mortgage loan

$\gamma_{bs}, \gamma_{bt}, \gamma_{st}$ are bank-LTV, bank-time and LTV-time dummies (fixed effects)

IRB_{bt} is a dummy equal to 1 in the period t when the bank b is on IRB (note that this is different from the definition of the IRB dummy in the regime-change model)

$LowLTV_s$ is a dummy equal to 1 if the loan-to-value is below a certain threshold (e.g. $LTV \leq 70\%$)

X_{ibst} are additional individual controls (borrower type, interest rate type, LTI)

The effect of IRB models is captured by the coefficient δ that reflects the price gap between firms on IRB vs SA, on high- vs low-LTV mortgages, after vs before the adoption of IRB.

Table 2: Individual IRB switch model, 2005Q2-2015Q2: price advantage (in bps) for IRB firms at low LTVs (compared to high LTVs)

Sample	Definition of ‘low’ LTV		
	LTV ≤ 70	LTV ≤ 75	LTV ≤ 80
Sample A	-17.0*** (0.003)	-15.5*** (0.003)	-10.7*** (0.003)
Sample B	Classical errors -18.8*** (0.003)	-15.0*** (0.003)	-7.6*** (0.004)
	Clustered errors -18.8* (9.939)	-15.0* (8.496)	-7.6 (7.643)

Notes: Standard errors in parentheses. ***, **, * denote significance at the 99%, 95%, and 90% levels respectively. Clustered errors, in *italics*, use two-way clustering by bank and time.

The historical risk weights model

The last model is a fixed effects model that uses information about historical risk weights (by LTV band). Otherwise, the model is similar to the individual IRB switch model.

The size of effect depends on the sample period. We focus on two subsamples of sample B (we do not have the data to estimate this model on sample A):

- 2009Q1-2015Q2: the period during which the IRB-SA regime is in place (excluding 2008 because of limited data, transitional effects of the new regime, and the impact of the financial crisis).
- 2005Q2-2015Q2: this is the full period for which we have data available. Within the period 2005-2007 however there is no variability in risk weights (50% for all firms/mortgages).

The results for 2009Q1-2015Q2 indicate a 1.4bp reduction in price per 1pp reduction in risk weights (here the relevant change in risk weights can be both within the same LTV and between LTVs). The impact in terms of price difference between IRB and SA firms can be calculated by multiplying this coefficient by the risk weight gap between IRB and SA firms. As a result the impact is larger for low LTV mortgages, where the IRB-SA risk weight gap is largest. This results in a 42bp reduction in price for a 30pp difference between SA and IRB that is typical for $LTV \leq 50\%$.

The results for 2005Q2-2015Q2 indicate a much weaker effect (about 1/10th the size of the estimate for 2009Q1-2015Q2) and the effect on pricing for the same 30pp difference in risk weights is around only 3bp.

Box 3: Specification of the historical risk weights model

The historical risk weights model captures variation over time in bank- and LTV-specific risk weights. The specification is otherwise identical to the individual IRB switch model, with pairwise interacted fixed effects that capture, bank-LTV, LTV-time, and bank-time variation, and loan-level controls for borrower and rate type and LTI.

$$Rate_{ibst} = \gamma_{bs} + \gamma_{st} + \gamma_{bt} + \beta RW_{bst} + \theta X_{ibst} + \varepsilon_{ibst}$$

Where i indicates the individual loan, b the lender (bank), s the LTV band, t time, and:
 $Rate_{ibst}$ is the initial interest rate on the mortgage loan
 $\gamma_{bs}, \gamma_{bt}, \gamma_{st}$ are bank-LTV, bank-time and LTV-time dummies
 X_{ibst} are additional individual controls (borrower type, interest rate type, LTI)
 RW_{bst} captures the variation over time in bank- and LTV-band-specific risk weights.

Table 3: Historical risk weights model (2009Q1-2015Q2 and 2005Q2-2015Q2)

Period	Effect of a 1pp change in RW on price (bp)	
	Classical errors	Clustered errors
Full period (2005Q2-2015Q2)	0.116*** (0.011)	0.116 (0.271)
Only 2009Q1-2015Q2	1.386*** (0.029)	1.386* (0.678)

Notes: Standard errors in parentheses. ***, **, * denote significance at the 99%, 95%, and 90% levels respectively. Clustered errors use two-way clustering by bank and time.