HSBC HOLDINGS PLC
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SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

Report of Foreign Private Issuer

Pursuant to Rule 13a - 16 or 15d - 16 of

the Securities Exchange Act of 1934

Commission File Number: 001-14930

For the month of February 2019

HSBC Holdings plc

42nd Floor, 8 Canada Square, London E14 5HQ, England

(Indicate by check mark whether the registrant files or will file annual reports under cover of Form 20-F or Form 40-F).

Form 20-F X Form 40-F .....

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(1): .....

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(Indicate by check mark whether the registrant by furnishing the information contained in this Form is also thereby furnishing the information to the Commission pursuant to Rule 12g3-2(b) under the Securities Exchange Act of 1934).

Yes ..... No X

(If "Yes" is marked, indicate below the file number assigned to the registrant in connection with Rule 12g3-2(b): 82-).

Pillar 3 Disclosures at 31 December 2018

Contents

Certain defined terms

Unless the context requires otherwise, ‘HSBC Holdings’ means HSBC Holdings plc and ‘HSBC’, the ‘Group’, ‘we’, ‘us’ and ‘our’ refer to HSBC Holdings together with its subsidiaries. Within this document the Hong Kong Special Administrative Region of the People’s Republic of China is referred to as ‘Hong Kong’. When used in the terms ‘shareholders’ equity’ and ‘total shareholders’ equity’, ‘shareholders’ means holders of HSBC Holdings ordinary shares and those preference shares and capital securities issued by HSBC Holdings classified as equity. The abbreviations ‘$m’ and ‘$bn’ represent millions and billions (thousands of millions) of US dollars respectively.

Tables

The Group has adopted the EU's regulatory transitional arrangements for International Financial Reporting Standard ('IFRS') 9 Financial instruments. A number of tables in this document report under this arrangement as follows:
a. Some figures for 2018 (indicated with ^) within this table have been prepared on an IFRS 9 transitional basis.
b. All figures within this table have been prepared on an IFRS 9 transitional basis.
All other tables report numbers on the basis of full adoption of IFRS 9.

Pillar 3 Disclosures at 31 December 2018

Introduction

Table 1: Key metrics (KM1/IFRS9-FL)

Ref*		Footnotes	At 31 Dec 2018	30 Sep 2018	30 Jun 2018	31 Mar 2018	1 Jan 2018	31 Dec[1] 2017
	Available capital ($bn)	2						
1	Common equity tier 1 ('CET1') capital	^	121.0	123.1	122.8	129.6	127.3	126.1
2	CET1 capital as if IFRS 9 transitional arrangements had not been applied		120.0	122.1	121.8	128.6	126.3	N/A
3	Tier 1 capital	^	147.1	149.3	147.1	157.1	152.1	151.0
4	Tier 1 capital as if IFRS 9 transitional arrangements had not been applied		146.1	148.3	146.1	156.1	151.1	N/A
5	Total regulatory capital	^	173.2	178.1	176.6	185.2	183.1	182.4
6	Total capital as if IFRS 9 transitional arrangements had not been applied		172.2	177.1	175.6	184.2	182.1	N/A
	Risk-weighted assets ('RWAs') ($bn)							
7	Total RWAs		865.3	862.7	865.5	894.4	872.1	871.3
8	Total RWAs as if IFRS 9 transitional arrangements had not been applied		864.7	862.1	864.9	893.8	871.6	N/A
	Capital ratios (%)	2						
9	CET1	^	14.0	14.3	14.2	14.5	14.6	14.5
10	CET1 as if IFRS 9 transitional arrangements had not been applied		13.9	14.2	14.1	14.4	14.5	N/A
11	Total tier 1	^	17.0	17.3	17.0	17.6	17.4	17.3
12	Tier 1 as if IFRS 9 transitional arrangements had not been applied		16.9	17.2	16.9	17.5	17.3	N/A
13	Total capital	^	20.0	20.7	20.4	20.7	21.0	20.9
14	Total capital as if IFRS 9 transitional arrangements had not been applied		19.9	20.6	20.3	20.6	20.9	N/A
	Additional CET1 buffer requirements as a percentage of RWA (%)							
	Capital conservation buffer requirement		1.88	1.88	1.88	1.88	N/A	1.25
	Countercyclical buffer requirement		0.56	0.45	0.46	0.34	N/A	0.22
	Bank G-SIB and/or D-SIB additional requirements		1.50	1.50	1.50	1.50	N/A	1.25
	Total of bank CET1 specific buffer requirements		3.94	3.83	3.84	3.72	N/A	2.72

	Total capital requirement (%)							
	Total capital requirement	3	10.9	11.5	11.5	11.5	N/A	N/A
	CET1 available after meeting the bank's minimum capital requirements	4	7.9	7.8	7.7	8.0	N/A	8.0
	Leverage ratio	5						
15	Total leverage ratio exposure measure ($bn)	^	2,614.9	2,676.4	2,664.1	2,707.9	2,556.4	2,557.1
16	Leverage ratio (%)	^	5.5	5.4	5.4	5.6	5.6	5.6
17	Leverage ratio as if IFRS 9 transitional arrangements had not been applied (%)		5.5	5.4	5.3	5.5	5.6	N/A
	Liquidity Coverage Ratio ('LCR')	6						
	Total high-quality liquid assets ($bn)		567.2	533.2	540.2	533.1	N/A	512.6
	Total net cash outflow ($bn)		368.7	334.1	341.7	338.5	N/A	359.9
	LCR ratio (%)	7	153.8	159.6	158.1	157.5	N/A	142.2

* The references in this, and subsequent tables, identify the lines prescribed in the relevant European Banking Authority ('EBA') template where applicable and where there is a value.

1 Figures presented as reported under IAS 39 'Financial instruments: recognition & measurement' at 31 December 2017.

2 Capital figures and ratios are reported on the CRD IV transitional basis for additional tier 1 and tier 2 capital in accordance with articles 484-92 of the Capital Requirements Regulation.

3 Total capital requirement is defined as the sum of Pillar 1 and Pillar 2A capital requirements set by the Prudential Regulation Authority ('PRA'). Our Pillar 2A requirement at 31 December 2018, as per the PRA's Individual Capital Guidance based on a point in time assessment, was 2.9% of RWAs, of which 1.6% was met by CET1. On 1 January 2019, our Pillar 2A requirement increased to 3.0% of RWAs, of which 1.7% must be met by CET1.

4 The minimum requirements represent the total capital requirement to be met by CET1.

5 Leverage ratio is calculated using the CRD IV end point basis for additional tier 1 capital.

6 The EU's regulatory transitional arrangements for IFRS 9 'Financial instruments' in article 473a of the Capital Requirements Regulation do not apply to liquidity coverage measures.

7 LCR is calculated as at the end of each period rather than using average values. Refer to page 132 of the Annual Report and Accounts 2018 for further detail.

Table 2: Reconciliation of capital with and without IFRS 9 transitional arrangements applied

	At 31 Dec 2018		
	CET1	Tier 1	Total own funds
	$bn	$bn	$bn
Reported balance using IFRS 9 transitional arrangements	121.0	147.1	173.2
Expected credit losses ('ECL') reversed under transitional arrangements for IFRS 9	(1.2)	(1.2)	(1.2)
– Standardised ('STD') approach	(1.2)	(1.2)	(1.2)
– Internal ratings based ('IRB') approach	—	—	—
Tax impacts	0.3	0.3	0.3
Changes in amounts deducted from CET1 for deferred tax assets and significant investments	(0.1)	(0.1)	(0.1)
– amounts deducted from CET1 for deferred tax assets	—	—	—
– amounts deducted from CET1 for significant investments	(0.1)	(0.1)	(0.1)
Reported balance excluding IFRS 9 transitional arrangements	120.0	146.1	172.2

Regulatory framework for disclosures

HSBC is supervised on a consolidated basis in the United Kingdom ('UK') by the Prudential Regulation Authority ('PRA'), which receives information on the capital adequacy of, and sets capital requirements for, the Group as a whole. Individual banking subsidiaries are directly regulated by their local banking supervisors, who set and monitor their local capital adequacy requirements. In most jurisdictions, non-banking financial subsidiaries are also subject to the supervision and capital requirements of local regulatory authorities.

At a consolidated group level, we calculated capital for prudential regulatory reporting purposes throughout 2018 using the Basel III framework of the Basel Committee ('Basel') as implemented by the European Union ('EU') in the amended Capital Requirements Directive and Regulation ('CRD IV'), and in the PRA's Rulebook for the UK banking industry. The regulators of Group banking entities outside the EU are at varying stages of implementation of the Basel Committee's framework, so local regulation in 2018 may have been on the basis of Basel I, II or III.

The Basel Committee's framework is structured around three 'pillars': the Pillar 1 minimum capital requirements and Pillar 2 supervisory review process are complemented by Pillar 3 market discipline. The aim of Pillar 3 is to produce disclosures that allow market participants to assess the scope of application by banks of the Basel Committee's framework and the rules in their jurisdiction, their capital condition, risk exposures and risk management processes, and hence their capital adequacy.

Pillar 3 requires all material risks to be disclosed to provide a comprehensive view of a bank's risk profile.

The PRA's final rules adopted national discretions in order to accelerate significantly the transition timetable to full 'end point' CRD IV compliance.

Pillar 3 disclosures

HSBC's Pillar 3 Disclosures at 31 December 2018 comprise information required under Pillar 3, both quantitative and qualitative. They are made in accordance with Part 8 of the Capital Requirements Regulation within CRD IV and the European Banking Authority's ('EBA') final standards on revised Pillar 3 disclosures issued in December 2016. These disclosures are supplemented by specific additional requirements of the PRA and discretionary disclosures on our part.

The Pillar 3 disclosures are governed by the Group's disclosure policy framework as approved by the Group Audit Committee ('GAC'). Information relating to the rationale for withholding certain disclosures is provided in Appendix III.

In our disclosures, to give insight into movements during the year, we provide comparative figures for the previous year or period, analytical review of variances and 'flow' tables for capital requirements.

Where disclosures have been enhanced, or are new, we do not generally restate or provide prior year comparatives. Wherever specific rows and columns in the tables prescribed by the EBA or Basel are not applicable or immaterial to HSBC's activities, we omit them and follow the same approach for comparative disclosures.

We publish comprehensive Pillar 3 disclosures annually on the HSBC website www.hsbc.com, concurrently with the release of our Annual Report and Accounts 2018. Similarly, a separate Pillar 3 document is also published at half-year concurrently with the release of our Interim Report disclosure. Quarterly earnings releases also include regulatory information in line with the guidelines on the frequency of regulatory disclosures.

Pillar 3 requirements may be met by inclusion in other disclosure media. Where we adopt this approach, references are provided to the relevant pages of the Annual Report and Accounts 2018 or other locations.

We continue to engage in the work of the UK authorities and industry associations to improve the transparency and comparability of UK banks' Pillar 3 disclosures.

Regulatory developments

The UK's withdrawal from the EU

In August 2018, Her Majesty's Treasury ('HMT') commenced the process of 'onshoring' the current EU legislation to ensure that there is legal continuity in the event of the UK leaving the EU. This involved the publication of draft Statutory Instruments across a wide range of financial services legislation; this included the key prudential legislation for banking groups: the Capital Requirements Regulation and Capital Requirements Directive.

One of the key effects of onshoring will be to treat the EU in the same manner as the EU currently treats non-European Economic Area countries. Under the draft provisions published by HMT, the PRA will be given the

power to grant transitional provisions to delay the implementation of these changes for up to two years, should the UK leave the EU without an agreement on 29 March 2019.

The Bank of England ('BoE') and the PRA published a package of consultations in October and December 2018, setting out the changes required to the PRA's rules and technical standards as a result of the UK's withdrawal. It also included proposals on the exercise of the transitional powers; however the precise scope of these remains uncertain.

There are certain pieces of EU legislation that are in progress, but are not yet live, that will not enter automatically into UK law if it withdraws from the EU without an agreement. The Financial Services (Implementation of Legislation) Bill is currently progressing through the UK Parliament to empower HMT to make regulations in the UK to bring into force certain specified EU legislation that remains in progress on 29 March 2019.

RWAs and leverage ratio

Basel Committee

In December 2017, Basel published revisions to the Basel III framework. The final package includes:

- widespread changes to the risk weights under the standardised approach to credit risk;
- a change in the scope of application of the internal ratings based ('IRB') approach to credit risk, together with changes to the IRB methodology;
- the replacement of the operational risk approaches with a single methodology;
- an amended set of rules for the credit valuation adjustment ('CVA') capital framework;
- an aggregate output capital floor that ensures that banks' total RWAs are no lower than 72.5% of those generated by the standardised approaches; and
- changes to the exposure measure for the leverage ratio, together with the imposition of a leverage ratio buffer for global systemically important banks ('G-SIB'). This will take the form of a tier 1 capital buffer set at 50% of the G-SIB's RWAs capital buffer.

Further refinements to the leverage ratio exposure measure for centrally cleared derivatives and disclosure of daily-average exposure measures are also under consideration.

Following a recalibration, Basel published the final changes to the market risk RWA regime, the Fundamental Review of the Trading book ('FRTB'), in January 2019. The new regime contains a more clearly defined trading book boundary, the introduction of an internal models approach based upon expected shortfall models, capital requirements for non-modellable risk factors, and a more risk-sensitive standardised approach that can serve as a fall-back for the internal models method.

Basel has announced that the package will be implemented on
1 January 2022, with a five-year transitional provision for the output floor, commencing at a rate of 50%. The final standards will need to be transposed into the relevant local law before coming into effect.
HSBC continues to evaluate the final package. Given that the package contains a significant number of national discretions, the possible outcome is uncertain.

European Union

In the EU, Basel's reforms are being implemented through revisions to the Capital Requirements Regulation and the Capital Requirements Directive. The first tranche of Basel's reforms,
collectively referred to as CRR2, is expected to follow a phased implementation commencing in 2019; however, it has yet to enter into law. It includes the changes to the market risk rules under the FRTB, revisions to the counterparty credit risk framework and the new leverage ratio rules.
The CRR2 is included within the scope of the Financial Services (Implementation of Legislation) Bill. If passed by the UK Parliament, this would empower HMT to bring CRR2 into UK law even if it is not in force in the EU on exit day.
In May 2018, the European Commission commenced the process of implementing the second tranche of Basel's reforms, collectively known as CRR3, by requesting that the EBA report on the adoption of the remaining reforms on the EU's banking sector and the wider economy. This tranche will include Basel's reforms in relation to credit risk, operational risk and CVA, together with the output floor. The EBA's final report on the details of the EU's adoption of the reforms is not due to be published until the end of June 2019.
Separately, in January 2019, the EU published final proposals for a prudential backstop for non-performing loans, which will result in a deduction from CET1 capital when a minimum impairment coverage requirement is not met. This regime is expected to be implemented in the first half of 2019.
The EU continues to work on its 'IRB Repair' programme, issuing in November 2018 near final guidance on the specification of economic downturn for the purposes of the loss given default modelling and the final rules on the specification of the definition of default.
In January 2019, the new securitisation framework came into force in the EU for new transactions. Existing transactions will be subject to the framework on 1 January 2020. This regime introduces changes to the methodology for determining RWAs for securitisation positions, with beneficial treatments for simple, transparent and standardised securitisation transactions.

Bank of England

In October 2018, the PRA published a consultation on its supervisory expectations and approach to the financial risks from climate change. This focused on its expectations of firms on the incorporation of the risk from climate change into risk management practices and stress testing, as well as firms' climate change disclosures and internal governance. The PRA has indicated that it expects that the material financial risks from climate change should be included within Pillar 2.

Capital resources, macroprudential, recovery & resolution and total loss absorbing capacity

Financial Stability Board

In June 2018, the Financial Stability Board ('FSB') published a call for feedback on the technical implementation of its standard on total loss absorbing capacity ('TLAC') for G-SIBs in resolution ('the TLAC standard'). This will assess whether the implementation of the TLAC standard is proceeding as envisaged and may be used as a basis to develop further implementation guidance.
Also in June 2018, the FSB published two sets of final guidelines. The first sets out principles to assist authorities as they operationalise resolution strategies and the second covers the development of resolution funding plans for G-SIBs.

Basel Committee

In July 2018, Basel published a revised assessment methodology, updating its 2013 rules, for the G-SIB capital buffer. The revised methodology will take effect in 2021 and the resulting capital buffer will be applied in January 2023.

European Union

In addition to the changes to RWAs, CRR2 will implement the EU's version of the FSB's TLAC standard for G-SIBs, which is in the form of minimum requirements for own funds and eligible liabilities ('MREL'). Several changes are also introduced in the own funds calculation and eligibility criteria. Similar applicability issues will arise in relation to the UK's withdrawal from the EU.

Bank of England

In June 2018, the BoE published its approach to setting MREL within groups, known as internal MREL, and its final policy on selected outstanding MREL policy matters. These requirements came into effect on 1 January 2019. The PRA also published its expectations for MREL reporting, which are also now in force.

In December 2018, the BoE published a consultation on its approach to assessing resolvability. This outlines how it assesses resolvability through its established policies and further proposes new principles on funding and operational continuity in resolution and firms' restructuring capabilities, as well as management, governance and communication capabilities. Simultaneously, the PRA published a consultation on resolution assessments and public disclosure by firms. Together, these publications contain proposals to form a Resolvability Assessment Framework, presented as the final element in the UK's resolution regime.

In addition, a number of changes have come into effect since late 2018:

- The legislative framework for UK ring-fencing took effect on 1 January 2019. HSBC completed the process to set up its ring-fenced bank, HSBC UK Bank plc ('HBUK'), in July 2018, six months ahead of the legal deadline.
- The PRA's final rules on group risk and double leverage came into effect on 1 January 2019. Firms are required to consider both elements as part of the Pillar 2 process. In June 2018, the PRA also published modifications to its intra-group large exposures framework, which came into force with immediate effect.
- In November 2018, the UK Countercyclical Capital Buffer rate increased from 0.5% to 1%. The Hong Kong rate increased from 1.875% to 2.5% with effect from 1 January 2019.

Accounting developments

IFRS 9 Financial instruments

HSBC adopted the requirements of IFRS 9 Financial Instruments on 1 January 2018, with the exception of the provisions relating to the presentation of gains and losses on financial liabilities designated at fair value, which were adopted from 1 January 2017.

The IFRS 9 classification and measurement of financial assets and the recognition and measurement of expected credit losses ('ECL') differ from the previous approach under IAS 39 'Financial Instruments: Recognition and Measurement' and IAS 37 'Provisions, Contingent Liabilities and Contingent Assets'.

As prior periods have not been restated, comparative periods remain in accordance with the legacy accounting standards and are therefore not necessarily comparable to the IFRS 9 amounts recorded for 2018.

The adoption of IFRS 9 has not resulted in any significant change to HSBC's business model or that of our four global businesses. This includes our strategy, country presence, product offerings and target customer segments.

Existing stress testing and regulatory models, skills and expertise were adapted in order to meet IFRS 9 requirements. Data from various client, finance and risk systems have been integrated and

validated. As a result of IFRS 9 adoption, management has additional insight and measures not previously utilised, which over time, may influence our risk appetite and risk management processes.

For regulatory reporting, the Group has adopted the transitional arrangements (including paragraph 4 of CRR article 473a) published by the EU on 27 December 2017 for IFRS 9 Financial Instruments. These permit banks to add back to their capital base a proportion of the impact that IFRS 9 has upon their loan loss allowances during the first five years of use. The proportion that banks may add back starts at 95% in 2018, and reduces to 25% by 2022.

The impact of IFRS 9 on loan loss allowances is defined as:

- the increase in loan loss allowances on day one of IFRS 9 adoption; and
- any subsequent increase in ECL in the non credit-impaired book thereafter.

The impact is calculated separately for portfolios using the STD and IRB approaches. For IRB portfolios, there is no add-back to capital unless loan loss allowances exceed regulatory 12-month expected losses. Any add-back must be tax effected and accompanied by a recalculation of capital deduction thresholds, exposure and risk-weighted assets ('RWAs').

Additional details on IFRS 9 are disclosed on page 224]of the Annual Report and Accounts 2018.

IFRS 16 Leases

From 1 January 2019, IFRS 16 Leases will replace IAS 17 Leases. IFRS 16 requires lessees to capitalise most leases within the scope of the standard, similar to how finance leases were accounted for under IAS 17. Lessees will recognise a right-of-use ('ROU') asset and a corresponding financial liability on the balance sheet. The asset will be amortised over the length of the lease, and the financial liability measured at amortised cost. Lessor accounting remains substantially the same as under IAS 17.

HSBC expects to adopt IFRS 16 using a modified retrospective approach where the cumulative effect of applying the standard is recognised in the opening balance of retained earnings.

For regulatory reporting, the ROU assets will not be deducted from regulatory capital; instead they will be risk-weighted at 100%.

For further information about the Group's implementation of IFRS 16, refer to Note 1 of the Annual Report and Accounts 2018.

Risk management

Our risk management framework

We use an enterprise-wide risk management framework across the organisation and across all risk types. It is underpinned by our risk culture and is reinforced by the HSBC Values and our Global Standards programme.

The framework fosters continuous monitoring of the risk environment, and promotes risk awareness and sound operational and strategic decision making. It also ensures we have a consistent approach to monitoring, managing and mitigating the risks we accept and incur in our activities.

Further information on our risk management framework is set out on page 73 of the Annual Report and Accounts 2018. The management and mitigation of principal risks facing the Group is described in our top and emerging risks on page 69 of the Annual Report and Accounts 2018.

Commentary on hedging strategies and associated processes can be found in the Market risk and Securitisation sections of this document. Additionally, a comprehensive overview of this topic can be found in Note 1.2(h) on page 229 of the Annual Report and Accounts 2018.

Risk culture

HSBC has long recognised the importance of a strong risk culture, the fostering of which is a key responsibility of senior executives. Our risk culture is reinforced by the HSBC Values and our Global Standards programme. It is instrumental in aligning the behaviours of individuals with our attitude to assuming and managing risk,

which helps to ensure that our risk profile remains in line with our risk appetite.

Our risk culture is further reinforced by our approach to remuneration. Individual awards, including those for senior executives, are based on compliance with the HSBC Values and the achievement of financial and non-financial objectives that are aligned to our risk appetite and strategy.

Further information on risk and remuneration is set out on pages 69 and 199 of the Annual Report and Accounts 2018.

Risk governance

The Board has ultimate responsibility for the effective management of risk and approves HSBC's risk appetite. It is advised on risk-related matters by the Group Risk Committee ('GRC') and the Financial System Vulnerabilities Committee ('FSVC').

The activities of the GRC and the FSVC are set out on pages 161 to 163 of the Annual Report and Accounts 2018.

Executive accountability for the ongoing monitoring, assessment and management of the risk environment, and the effectiveness of the risk management framework resides with the Group Chief Risk Officer. He is supported by the Risk Management Meeting ('RMM') of the Group Management Board.

The management of financial crime risk resides with the Group Chief Compliance Officer. He is supported by the Financial Crime Risk Management Meeting.

Further information is available on page 85 of the Annual Report and Accounts 2018.

Day-to-day responsibility for risk management is delegated to senior managers with individual accountability for decision making. These senior managers are supported by global functions. All employees have a role to play in risk management. These roles are defined using the three lines of defence model, which takes into account the Group's business and functional structures.

Our executive risk governance structures ensure appropriate oversight and accountability for risk, which facilitates the reporting and escalation to the RMM.

Further information about the Group's three lines of defence model and executive risk governance structures is available on page 75 of the Annual Report and Accounts 2018.

Risk appetite

Risk appetite is a key component of our management of risk. It describes the type and quantum of risk that the Group is willing to accept in achieving its medium- and long-term strategic goals. In HSBC, risk appetite is managed through a global risk appetite framework and articulated in a risk appetite statement ('RAS'), which is approved biannually by the Board on the advice of the GRC.

The Group's risk appetite informs our strategic and financial planning process, defining the desired forward-looking risk profile of the Group. It is also integrated within other risk management tools, such as the top and emerging risks report and stress testing, to ensure consistency in risk management.

Information about our risk management tools is set out on page 74 of the Annual Report and Accounts 2018. Details of the Group's overarching risk appetite are set out on page 69 of the Annual Report and Accounts 2018.

Stress testing

HSBC operates a wide-ranging stress testing programme that supports our risk management and capital planning. It includes execution of stress tests mandated by our regulators. Our stress testing is supported by dedicated teams and infrastructure.

Our testing programme assesses our capital strength and enhances our resilience to external shocks. It also helps us understand and mitigate risks, and informs our decision about capital levels. As well as taking part in regulatory driven stress tests, we conduct our own internal stress tests.

The Group stress testing programme is overseen by the GRC, and results are reported, where appropriate, to the RMM and GRC.

Further information about stress testing and details of the Group's regulatory stress test results are set out on page 76 of the Annual Report and Accounts 2018.

Global Risk function

We have a dedicated Global Risk function, headed by the Group Chief Risk Officer, which is responsible for the Group's risk management framework. This includes establishing global policy, monitoring risk profiles, and forward-looking risk identification and management. Global Risk is made up of sub-functions covering all risks to our operations. It is independent from the global businesses, including sales and trading functions, helping to ensure balance in risk/return decisions. The Global Risk function operates in line with the three lines of defence model.

For further information see page 74 of the Annual Report and Accounts 2018.

Risk management and internal control systems

The Directors are responsible for maintaining and reviewing the effectiveness of risk management and internal control systems, and for determining the aggregate level and risk types they are willing to accept in achieving the Group's business objectives. On behalf of the Board, the GAC has responsibility for oversight of risk management and internal controls over financial reporting, and the GRC has responsibility for oversight of risk management and internal controls other than for financial reporting.

The Directors, through the GRC and the GAC, conduct an annual review of the effectiveness of our system of risk management and internal control. The GRC and the GAC received confirmation that executive management has taken or is taking the necessary actions to remedy any failings or weaknesses identified through the operation of our framework of controls.

HSBC's key risk management and internal control procedures are described on page 164 of the Annual Report and Accounts 2018, where the Report of the Directors on the effectiveness of internal controls can also be found.

Risk measurement and reporting systems

Our risk measurement and reporting systems are designed to help ensure that risks are comprehensively captured with all the attributes necessary to support well-founded decisions, that those attributes are accurately assessed, and that information is delivered in a timely manner for those risks to be successfully managed and mitigated.

Risk measurement and reporting systems are also subject to a governance framework designed to ensure that their build and implementation are fit for purpose and functioning appropriately. Risk information systems development is a key responsibility of the Global Risk function, while the development and operation of risk rating and management systems and processes are ultimately subject to the oversight of the Board.

We continue to invest significant resources in IT systems and processes in order to maintain and improve our risk management capabilities. A number of key initiatives and projects to enhance consistent data aggregation, reporting and management, and work towards meeting our Basel Committee data obligations are in progress. Group standards govern the procurement and operation of systems used in our subsidiaries to process risk information within business lines and risk functions.

Risk measurement and reporting structures deployed at Group level are applied throughout global businesses and major operating subsidiaries through a common operating model for integrated risk management and control. This model sets out the respective responsibilities of Group, global business, region and country level risk functions in respect of risk governance and oversight, compliance risks, approval authorities and lending guidelines, global and local scorecards, management information and reporting, and relations with third parties such as regulators, rating agencies and auditors.

Risk analytics and model governance

The Global Risk function manages a number of analytics disciplines supporting the development and management of models, including those for risk rating, scoring, economic capital

and stress testing covering different risk types and business segments. The analytics functions formulate technical responses to industry developments and regulatory policy in the field of risk analytics, develops HSBC's global risk models, and oversees local model development and use around the Group toward our implementation targets for IRB approaches.

The Global Model Oversight Committee (‘Global MOC’) is the primary committee responsible for the oversight of Model Risk globally within HSBC. It serves an important role in providing strategic direction on the management of models and their associated risks to HSBC's businesses globally and is an essential element of the governance structure for model risk management. Global MOC is supported by Functional MOCs at the Global and Regional levels which are responsible for model risk management within their functional areas, including wholesale credit risk, market risk, retail risk, and finance.

The Global MOC meets regularly and reports to RMM. It is chaired by the Group CRO and membership includes the CEOs of the Global Businesses, and senior executives from Risk, Finance and global businesses. Through its oversight of the functional MOCs, it identifies emerging risks for all aspects of the risk rating system, ensuring that model risk is managed within our risk appetite statement, and formally advises RMM on any material model-related issues.

Models are also subject to an independent validation process and governance oversight by the Model Risk Management team within Global Risk. The team provides robust challenge to the modelling approaches used across the Group. It also ensures that the performance of those models is transparent and that their limitations are visible to key stakeholders.

The development and use of data and models to meet local requirements are the responsibility of global businesses or functions, as well as regional and/or local entities under the governance of their own management, subject to overall Group policy and oversight.

Linkage to the Annual Report and Accounts 2018

Structure of the regulatory group

Subsidiaries engaged in insurance activities are excluded from the regulatory consolidation by excluding assets, liabilities and post-acquisition reserves. The Group’s investments in these insurance subsidiaries are recorded at cost and deducted from CET1 capital (subject to thresholds).

The regulatory consolidation also excludes special purpose entities (‘SPEs’) where significant risk has been transferred to third parties. Exposures to these SPEs are risk-weighted as securitisation positions for regulatory purposes.

Participating interests in banking associates are proportionally consolidated for regulatory purposes by including our share of assets, liabilities, profit and loss, and risk-weighted assets in accordance with the PRA’s application of EU legislation. Non-participating significant investments, along with non-financial associates, are deducted from capital (subject to thresholds).

Table 3: Reconciliation of balance sheets – financial accounting to regulatory scope of consolidation

	Ref †	Accounting balance sheet $m	Deconsolidation of insurance/ other entities $m	Consolidation of banking associates $m	Regulatory balance sheet $m
Assets					
Cash and balances at central banks		162,843	(39)	191	162,995
Items in the course of collection from other banks		5,787	—	—	5,787
Hong Kong Government certificates of indebtedness		35,859	—	—	35,859
Trading assets		238,130	(1,244)	—	236,886
Financial assets designated and otherwise mandatorily measured at fair value		41,111	(28,166)	502	13,447
– of which: debt securities eligible as Tier 2 issued by Group FSEs that are outside the regulatory scope of consolidation	r	424	(424)	—	—
Derivatives		207,825	(70)	102	207,857
Loans and advances to banks		72,167	(1,264)	1,462	72,365
– of which: lending to FSEs eligible as Tier 2	r	52	—	—	52
Loans and advances to customers		981,696	(1,530)	12,692	992,858
– of which:					
lending eligible as Tier 2 to Group FSEs outside the regulatory scope of consolidation	r	117	(117)	—	—
expected credit losses on IRB portfolios	h	(6,405)	—	—	(6,405)
Reverse repurchase agreements – non-trading		242,804	(3)	542	243,343
Financial investments		407,433	(61,228)	3,578	349,783
Capital invested in insurance and other entities		—	2,306	—	2,306
Prepayments, accrued income and other assets		110,571	(5,968)	247	104,850
– of which: retirement benefit assets	j	7,934	—	—	7,934
Current tax assets		684	(23)	26	687
Interests in associates and joint ventures		22,407	(398)	(4,144)	17,865
– of which: positive goodwill on acquisition	e	492	(13)	—	479
Goodwill and intangible assets	e	24,357	(7,281)	—	17,076
Deferred tax assets	f	4,450	161	1	4,612
Total assets at 31 Dec 2018		2,558,124	(104,747)	15,199	2,468,576
Liabilities and equity					
Liabilities					
Hong Kong currency notes in circulation			35,859	—	—	35,859
Deposits by banks			56,331	1	229	56,561
Customer accounts			1,362,643	2,586	13,790	1,379,019
Repurchase agreements – non-trading			165,884	—	—	165,884
Items in course of transmission to other banks			5,641	—	—	5,641
Trading liabilities			84,431	—	—	84,431
Financial liabilities designated at fair value			148,505	(4,347)	36	144,194
– of which:						
included in tier 1		n	411	—	—	411
included in tier 2		o, q, i	12,499	—	—	12,499
Derivatives			205,835	116	81	206,032
– of which: debit valuation adjustment		i	152	—	—	152
Debt securities in issue			85,342	(1,448)	—	83,894

Accruals, deferred income and other liabilities		97,380	(2,830)	691	95,241
Current tax liabilities		718	(22)	4	700
Liabilities under insurance contracts		87,330	(87,330)	—	—
Provisions		2,920	(9)	44	2,955
– of which: credit-related contingent liabilities and contractual commitments on IRB portfolios	h	395	—	—	395
Deferred tax liabilities		2,619	(1,144)	1	1,476
Subordinated liabilities		22,437	2	323	22,762
– of which:					
included in tier 1	l, n	1,786	—	—	1,786
included in tier 2	o, q	20,584	—	—	20,584
Total liabilities at 31 Dec 2018		2,363,875	(94,425)	15,199	2,284,649
Equity					
Called up share capital	a	10,180	—	—	10,180
Share premium account	a, l	13,609	—	—	13,609
Other equity instruments	k, l	22,367	—	—	22,367
Other reserves	c, g	1,906	1,996	—	3,902
Retained earnings	b, c	138,191	(11,387)	—	126,804
Total shareholders' equity		186,253	(9,391)	—	176,862
Non-controlling interests	d, m, n, p	7,996	(931)	—	7,065
Total equity at 31 Dec 2018		194,249	(10,322)	—	183,927
Total liabilities and equity at 31 Dec 2018		2,558,124	(104,747)	15,199	2,468,576

‡ The references (a) – (r) identify balance sheet components that are used in the calculation of regulatory capital in Table 7: Own funds disclosure on page 14.

Pillar 3 Disclosures at 31 December 2018

Table 3: Reconciliation of balance sheets – financial accounting to regulatory scope of consolidation (continued)

	Ref †	Accounting balance sheet $m	Deconsolidation of insurance/ other entities $m	Consolidation of banking associates $m	Regulatory balance sheet $m
Assets					
Cash and balances at central banks		180,624	(38)	1,174	181,760
Items in the course of collection from other banks		6,628	—	2	6,630
Hong Kong Government certificates of indebtedness		34,186	—	—	34,186
Trading assets		287,995	(359)	1	287,637
Financial assets designated at fair value		29,464	(28,674)	—	790
– of which: debt securities eligible as Tier 2 issued by Group FSEs that are outside the regulatory scope of consolidation	r	324	(324)	—	—
Derivatives		219,818	(128)	57	219,747
Loans and advances to banks		90,393	(2,024)	1,421	89,790
– of which: lending to FSEs eligible as Tier 2	r	74	—	—	74
Loans and advances to customers		962,964	(3,633)	12,835	972,166
– of which:					
lending eligible as Tier 2 to Group FSEs outside the regulatory scope of consolidation	r	117	(117)	—	—
impairment allowances on IRB portfolios	h	(5,004)	—	—	(5,004)
Reverse repurchase agreements – non-trading		201,553	—	1,854	203,407
Financial investments		389,076	(61,480)	3,325	330,921
Capital invested in insurance and other entities		—	2,430	—	2,430
Prepayments, accrued income and other assets		67,191	(4,202)	267	63,256
– of which: retirement benefit assets	j	8,752	—	—	8,752
Current tax assets		1,006	(5)	—	1,001
Interests in associates and joint ventures		22,744	(370)	(4,064)	18,310
– of which: positive goodwill on acquisition	e	521	(14)	(1)	506
Goodwill and intangible assets	e	23,453	(6,937)	—	16,516
Deferred tax assets	f	4,676	170	—	4,846
Total assets at 31 Dec 2017		2,521,771	(105,250)	16,872	2,433,393
Liabilities and equity					
Liabilities					
Hong Kong currency notes in circulation			34,186	—	—	34,186
Deposits by banks			69,922	(86)	695	70,531
Customer accounts			1,364,462	(64)	14,961	1,379,359
Repurchase agreements – non-trading			130,002	—	—	130,002
Items in course of transmission to other banks			6,850	—	—	6,850
Trading liabilities			184,361	867	—	185,228
Financial liabilities designated at fair value			94,429	(5,622)	—	88,807
– of which:						
included in tier 1		n	459	—	—	459
included in tier 2		o, q, i	23,831	—	—	23,831
Derivatives			216,821	69	51	216,941

– of which: debit valuation adjustment	i	59	—	—	59
Debt securities in issue		64,546	(2,974)	320	61,892
Accruals, deferred income and other liabilities		45,907	(211)	622	46,318
Current tax liabilities		928	(81)	—	847
Liabilities under insurance contracts		85,667	(85,667)	—	—
Provisions		4,011	(17)	223	4,217
– of which: credit-related contingent liabilities and contractual commitments on IRB portfolios	h	220	—	—	220
Deferred tax liabilities		1,982	(1,085)	—	897
Subordinated liabilities		19,826	1	—	19,827
– of which:					
included in tier 1	l, n	1,838	—	—	1,838
included in tier 2	o, q	17,561	—	—	17,561
Total liabilities at 31 Dec 2017		2,323,900	(94,870)	16,872	2,245,902
Equity					
Called up share capital	a	10,160	—	—	10,160
Share premium account	a, l	10,177	—	—	10,177
Other equity instruments	k, l	22,250	—	—	22,250
Other reserves	c, g	7,664	1,236	—	8,900
Retained earnings	b, c	139,999	(10,824)	—	129,175
Total shareholders' equity		190,250	(9,588)	—	180,662
Non-controlling interests	d, m, n, p	7,621	(792)	—	6,829
Total equity at 31 Dec 2017		197,871	(10,380)	—	187,491
Total liabilities and equity at 31 Dec 2017		2,521,771	(105,250)	16,872	2,433,393

‡ The references (a) – (r) identify balance sheet components that are used in the calculation of regulatory capital in Table 7: Own funds disclosure on page 14.

Table 4: Principal entities with a different regulatory and accounting scope of consolidation (LI3)

	Principal activities	Method of accounting consolidation	Method of regulatory consolidation	Footnotes	At 31 Dec 2018 Total assets $m	At 31 Dec 2018 Total equity $m	At 31 Dec 2017 Total assets $m	At 31 Dec 2017 Total equity $m
Principal associates								
The Saudi British Bank	Banking services	Equity	Proportional consolidation	1	46,634	8,757	50,417	8,752
Principal insurance entities excluded from the regulatory consolidation								
HSBC Life (International) Ltd	Life insurance manufacturing	Fully consolidated	N/A		48,144	3,321	45,083	3,679
HSBC Assurances Vie (France)	Life insurance manufacturing	Fully consolidated	N/A		26,066	808	27,713	843
Hang Seng Insurance Company Ltd	Life insurance manufacturing	Fully consolidated	N/A		17,356	1,642	16,411	1,403
HSBC Insurance (Singapore) Pte Ltd	Life insurance manufacturing	Fully consolidated	N/A		4,335	493	4,425	706
HSBC Life (UK) Ltd	Life insurance manufacturing	Fully consolidated	N/A		2,026	157	2,115	196
HSBC Life Insurance Company Ltd	Life insurance manufacturing	Fully consolidated	N/A		1,208	70	1,113	87
HSBC Life Assurance (Malta) Ltd	Life insurance manufacturing	Fully consolidated	N/A		976	58	1,681	61
HSBC Seguros S.A. (Mexico)	Life insurance manufacturing	Fully consolidated	N/A		796	121	785	120
Principal SPEs excluded from the regulatory consolidation				2				
Regency Assets Ltd	Securitisation	Fully consolidated	N/A		6,548	—	7,466	—
Mazarin Funding Ltd	Securitisation	Fully consolidated	N/A		476	(21)	852	48
Metrix Portfolio Distribution Plc	Securitisation	Fully consolidated	N/A		296	—	326	—
Barion Funding Ltd	Securitisation	Fully consolidated	N/A		2	—	424	78

1 Total assets and total equity for 2018 are as at 30 September 2018.
2 These SPEs issued no or de minimis share capital.

Group entities that have different regulatory and accounting scope of consolidation are provided in table 4 with their total assets and total equity, on a stand-alone IFRS basis. The figures shown therefore include intra-Group balances. For associates, table 4 shows the total assets and total equity of the entity as a whole rather than HSBC's share in the entities' balance sheets.

For insurance entities, the present value of the in-force long-term insurance business asset of $7.1bn and the related deferred tax liability are only recognised on consolidation in financial reporting, and are therefore not included in the asset or equity positions for the stand-alone entities presented in table 4. In addition, these figures exclude any deferred acquisition cost assets that may be recognised in the entities' stand-alone financial reporting.

Measurement of regulatory exposures

This section sets out the main reasons why the measurement of regulatory exposures is not directly comparable with the financial information presented in the Annual Report and Accounts 2018.

The Pillar 3 Disclosures at 31 December 2018 are prepared in accordance with regulatory capital adequacy concepts and rules, while the Annual Report and Accounts 2018 are prepared in accordance with IFRSs. The purpose of the regulatory balance sheet is to provide a point-in-time ('PIT') value of all on-balance sheet assets.

The regulatory exposure value includes an estimation of risk, and is expressed as the amount expected to be outstanding if and when the counterparty defaults.

Moreover, regulatory exposure classes are based on different criteria from accounting asset types and are therefore not comparable on a line by line basis.

The following tables show in two steps how the accounting values in the regulatory balance sheet link to regulatory exposure at default ('EAD').

In a first step, table 5 shows the difference between the accounting and regulatory scope of consolidation, and a breakdown of the accounting balances into the risk types that form the basis for regulatory capital requirements. Table 6 then shows the main differences between the accounting balances and regulatory exposures by regulatory risk type.

Pillar 3 Disclosures at 31 December 2018

Table 5: Differences between accounting and regulatory scopes of consolidation and mapping of financial statement categories with regulatory risk categories (LI1)

			Carrying value of items				
	Carrying values as reported in published financial statements	Carrying values under scope of regulatory consolidation[1]	Subject to the credit risk framework	Subject to the counter-party credit risk framework[2]	Subject to the securitisation framework[3]	Subject to the market risk framework	Subject to deduction from capital or not subject to regulatory capital requirements
	$bn	$bn	$bn	$bn	$bn	$bn	$bn
Assets							
Cash and balances at central banks	162.8	163.0	163.0	—	—	—	—
Items in the course of collection from other banks	5.8	5.8	5.8	—	—	—	—
Hong Kong Government certificates of indebtedness	35.9	35.9	35.9	—	—	—	—
Trading assets	238.1	236.9	—	18.3	—	236.9	—
Financial assets designated and otherwise mandatorily measured at fair value	41.1	13.4	10.9	1.9	0.6	—	—
Derivatives	207.9	207.9	—	207.1	0.8	207.9	—
Loans and advances to banks	72.2	72.4	71.4	—	1.0	—	—
Loans and advances to customers	981.7	992.9	969.6	5.6	18.5	—	—
Reverse repurchase agreements – non-trading	242.8	243.3	—	243.3	—	—	—
Financial investments	407.4	349.8	347.8	—	2.0	—	—
Capital invested in insurance and other entities	—	2.3	1.5	—	—	—	0.8

Prepayments, accrued income and other assets	110.5	104.7	40.0	39.5	—	47.0	17.7	
Current tax assets	0.7	0.7	0.7	—	—	—	—	
Interests in associates and joint ventures	22.4	17.9	11.4	—	—	—	6.5	
Goodwill and intangible assets	24.4	17.1	—	—	—	—	16.9	
Deferred tax assets	4.5	4.6	6.8	—	—	—	(2.2	)
Total assets at 31 Dec 2018	2,558.2	2,468.6	1,664.8	515.7	22.9	491.8	39.7	
Liabilities								
Hong Kong currency notes in circulation	35.9	35.9	—	—	—	—	35.9	
Deposits by banks	56.4	56.6	—	—	—	—	56.6	
Customer accounts	1,362.6	1,379.0	—	—	—	—	1,379.0	
Repurchase agreements – non-trading	165.9	165.9	—	165.9	—	—	—	
Items in course of transmission to other banks	5.6	5.6	—	—	—	—	5.6	
Trading liabilities	84.4	84.4	—	11.8	—	84.4	—	
Financial liabilities designated at FV	148.6	144.2	—	—	—	58.0	86.2	
Derivatives	205.9	206.0	—	206.0	—	206.0	—	
Debt securities in issue	85.3	83.9	—	—	—	—	83.9	
Accruals, deferred income, and other liabilities	97.4	95.2	—	41.0	—	41.0	54.2	
Current tax liabilities	0.7	0.7	—	—	—	—	0.7	
Liabilities under insurance contract	87.3	—	—	—	—	—	—	
Provisions	2.9	3.0	0.6	—	—	—	2.4	
	2.6	1.5	1.3	—	—	—	2.3	

Deferred tax liabilities							
Subordinated liabilities	22.4	22.8	—	—	—	—	22.8
Total liabilities at 31 Dec 2018	2,363.9	2,284.7	1.9	424.7	—	389.4	1,729.6

Table 5: Differences between accounting and regulatory scopes of consolidation and mapping of financial statement categories with regulatory risk categories (LI1) (continued)

			Carrying value of items				
	Carrying values as reported in published financial statements	Carrying values under scope of regulatory consolidation[1]	Subject to the credit risk framework	Subject to the counter party credit risk framework[2]	Subject to the securitisation framework[3]	Subject to the market risk framework	Subject to deduction from capital or not subject to regulatory capital requirements
	$bn	$bn	$bn	$bn	$bn	$bn	$bn
Assets							
Cash and balances at central banks	180.6	181.8	164.7	—	—	—	—
Items in the course of collection from other banks	6.6	6.6	6.6	—	—	—	—
Hong Kong Government certificates of indebtedness	34.2	34.2	34.2	—	—	—	—
Trading assets	288.0	287.6	2.0	17.1	—	270.4	15.2
Financial assets designated at fair value	29.5	0.8	0.8	—	—	—	—
Derivatives	219.8	219.7	—	218.5	1.2	219.7	—
Loans and advances to banks	90.4	89.8	98.6	6.6	0.6	—	1.1
Loans and advances to customers	963.0	972.2	943.7	10.4	13.1	—	5.0
Reverse repurchase agreements – non-trading	201.6	203.4	—	203.4	—	—	—
Financial investments	389.1	330.9	324.1	—	6.5	—	0.3
Capital invested in insurance and other entities	—	2.4	1.6	—	—	—	0.8
Current tax assets	1.0	1.0	1.0	—	—	—	—
	67.1	63.4	42.0	3.8	0.1	13.3	6.0

Prepayments, accrued income and other assets							
Interests in associates and joint ventures	22.7	18.3	12.9	—	—	—	5.4
Goodwill and intangible assets	23.5	16.5	—	—	—	—	16.4
Deferred tax assets	4.7	4.8	6.3	—	—	—	(1.5)
Total assets at 31 Dec 2017	2,521.8	2,433.4	1,638.5	459.8	21.5	503.4	48.7
Liabilities							
Hong Kong currency notes in circulation	34.2	34.2	—	—	—	—	34.2
Deposits by banks	69.9	70.5	—	—	—	—	70.5
Customer accounts	1,364.5	1,379.4	—	—	—	—	1,379.4
Repurchase agreements – non-trading	130.0	130.0	—	130.0	—	—	—
Items in course of transmission to other banks	6.9	6.9	—	—	—	—	6.9
Trading liabilities	184.4	185.2	—	10.6	—	172.2	13.0
Financial liabilities designated at FV	94.4	88.8	—	—	—	—	88.8
Derivatives	216.8	216.9	—	216.9	—	216.9	—
Debt securities in issue	64.5	61.9	—	—	—	—	61.9
Current tax liabilities	0.9	0.8	—	—	—	—	0.8
Liabilities under insurance contract	85.7	—	—	—	—	—	—
Accruals, deferred income, and other liabilities	45.9	46.3	—	—	—	—	46.3
Provisions	4.0	4.2	0.3	—	—	—	3.9
	2.0	0.9	1.3	—	—	—	1.7

Deferred tax liabilities							
Subordinated liabilities	19.8	19.9	—	—	—	—	19.9
Total liabilities at 31 Dec 2017	2,323.9	2,245.9	1.6	357.5	—	389.1	1,727.3

1 The amounts shown in the column ‘Carrying values under scope of regulatory consolidation’ do not equal the sum of the amounts shown in the remaining columns of this table for line items ‘Derivatives’, ’Trading assets’ and ‘Prepayments, accrued income and other assets’ as some of the assets included in these items are subject to regulatory capital charges for both CCR and market risk.

2 The amounts shown in the column ‘Subject to the counterparty credit risk framework’ include both non-trading book and trading book.

3 The amounts shown in the column ‘Subject to the securitisation framework’ only include non-trading book. Trading book securitisation positions are included in the market risk column.

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Table 6: Main sources of differences between regulatory exposure amounts and carrying values in financial statements (LI2)

			Items subject to:		
	Footnotes	Total $bn	Credit risk framework $bn	CCR framework $bn	Securitisation framework $bn
Carrying value of assets within scope of regulatory consolidation	1	2,428.9	1,664.8	515.7	22.9
Carrying value of liabilities within scope of regulatory consolidation	1	555.1	1.9	424.7	—
Net carrying value within scope of regulatory consolidation		1,873.8	1,662.9	91.0	22.9
Off-balance sheet amounts and potential future exposure for counterparty risk		829.8	277.2	64.0	10.9
Differences in netting rules		10.5	12.5	(2.0)	—
Differences due to financial collateral on standardised approach		(15.6)	(15.6)	—	—
Differences due to expected credit losses on IRB approach		6.2	6.2	—	—
Differences due to EAD modelling and other differences		2.9	4.3	—	(1.4)
Differences due to credit risk mitigation		7.3	—	7.3	—
Exposure values considered for regulatory purposes at 31 Dec 2018		2,714.9	1,947.5	160.3	32.4
Carrying value of assets within scope of regulatory consolidation	1	2,384.7	1,638.5	459.8	21.5
Carrying value of liabilities within scope of regulatory consolidation	1	520.7	1.6	357.5	—
Net carrying value within scope of regulatory consolidation		1,864.0	1,636.9	102.3	21.5
Off-balance sheet amounts and potential future exposure for counterparty risk		801.7	271.0	135.2	15.3
Differences in netting rules		10.4	9.3	1.1	—
Differences due to financial collateral on standardised approach		(14.7)	(14.7)	—	—
Differences due to expected credit losses on IRB approach		4.7	4.7	—	—
Differences due to EAD modelling and other differences		3.3	5.0	—	(1.7)
Differences due to credit risk mitigation		(71.1)	—	(71.1)	—
Exposure values considered for regulatory purposes at 31 Dec 2017		2,598.3	1,912.2	167.5	35.1

1 Excludes amounts subject to deduction from capital or not subject to regulatory capital requirements.

Explanations of differences between accounting and regulatory exposure amounts

Off-balance sheet amounts and potential future exposure for counterparty risk

Off-balance sheet amounts subject to credit risk and securitisation regulatory frameworks include undrawn portions of committed facilities, various trade finance commitments and guarantees. We apply a credit conversion factor ('CCF') to

these items and add potential future exposures (‘PFE’) for counterparty credit risk.

Differences in netting rules

The increase from carrying value due to differences in netting rules is the reversal of amounts deducted from gross loans and advances to customers in the published financial statements in accordance with the offsetting criteria of IAS 32 ‘Financial instruments: presentation’.

Differences due to financial collateral

Exposure value under the standardised approach is calculated after deducting credit risk mitigation whereas accounting value is before such deductions.

Differences due to expected credit losses

The carrying value of assets is net of credit risk adjustments. The regulatory exposure value under IRB approaches is before deducting credit risk adjustments.

Differences due to EAD modelling

The carrying value of assets is usually measured at amortised cost or fair value as at the balance sheet date. For certain IRB models, the exposure value used as EAD is the projected value over the next year.

Differences due to credit risk mitigation

In counterparty credit risk (‘CCR’), differences arise between accounting carrying values and regulatory exposure as a result of the application of credit risk mitigation and the use of modelled exposures.

Explanation of differences between accounting fair value and regulatory prudent valuation

Fair value is defined as the best estimate of the price that would be received to sell an asset or be paid to transfer a liability in an orderly transaction between market participants at the measurement date.

Some fair value adjustments already reflect valuation uncertainty to some degree. These are market data uncertainty, model uncertainty and concentration adjustments.

However, it is recognised that a variety of valuation techniques using stressed assumptions and combined with the range of plausible market parameters at a given point in time may still generate unexpected uncertainty beyond fair value.

A series of additional valuation adjustments (‘AVAs’) are therefore required to reach a specified degree of confidence (the ‘prudent value’) set by regulators that differs both in terms of scope and measurement from HSBC’s own quantification for disclosure purposes.

AVAs should consider at the minimum: market price uncertainty, bid/offer (close out) uncertainty, model risk, concentration, administrative cost, unearned credit spreads and investing and funding costs.

AVAs are not limited to level 3 exposures, for which a 95% uncertainty range is already computed and disclosed, but must also be calculated for any exposure for which the exit price cannot be determined with a high degree of certainty.

Capital and RWAs
Capital management
Approach and policy
Our approach to capital management is driven by our strategic and organisational requirements, taking into account the regulatory, economic and commercial environment. We aim to maintain a strong capital base to support the risks inherent in our business and invest in accordance with our strategy, meeting both consolidated and local regulatory capital requirements at all times.
Our capital management process culminates in the annual Group capital plan, which is approved by the Board. HSBC Holdings is the primary provider of equity capital to its subsidiaries and also provides them with non-equity capital where necessary. These investments are substantially funded by HSBC Holdings' issuance of equity and non-equity capital and by profit retention. As part of its capital management process, HSBC Holdings seeks to maintain a balance between the composition of its capital and its investment in subsidiaries. Subject to the above, there is no current or foreseen impediment to HSBC Holdings' ability to provide such investments.
Each subsidiary manages its own capital to support its planned business growth and meet its local regulatory requirements within the context of the Group capital plan. Capital generated by subsidiaries in excess of planned requirements is returned to HSBC Holdings, normally by way of dividends, in accordance with the Group's capital plan.
During 2018, consistent with the Group's capital plan, the Group's subsidiaries did not experience any significant restrictions on

paying dividends or repaying loans and advances, and none are envisaged with regard to planned dividends or payments. However, the ability of subsidiaries to pay dividends or advance monies to HSBC Holdings depends on, among other things, their respective local regulatory capital and banking requirements, exchange controls, statutory reserves, and financial and operating performance. None of our subsidiaries that are excluded from the regulatory consolidation have capital resources below their minimum regulatory requirement. HSBC Holdings has not entered into any Group Financial Support Agreements pursuant to the application of early intervention measures under the Bank Recovery and Resolution Directive.
All capital securities included in the capital base of HSBC have either been issued as fully compliant CRD IV securities (on an end point basis) or in accordance with the rules and guidance in the PRA's previous General Prudential Sourcebook, which are included in the capital base by virtue of application of the CRD IV grandfathering provisions. The main features of capital securities issued by the Group, categorised as tier 1 ('T1') capital and tier 2 ('T2') capital, are set out on the HSBC website, www.hsbc.com.
The values disclosed are the IFRS balance sheet carrying amounts, not the amounts that these securities contribute to regulatory capital. For example, the IFRS accounting and the regulatory treatments differ in their approaches to issuance costs, regulatory amortisation and regulatory eligibility limits prescribed under CRD IV.
A list of the main features of our capital instruments in accordance with Annex III of Commission Implementing Regulation 1423/2013 is also published on our website with reference to our balance sheet on 31 December 2018. This is in addition to the full terms and conditions of our securities, also available on our website.
For further details of our approach to capital management, please see page 148 of the Annual Report and Accounts 2018.
Own funds
Table 7: Own funds disclosure

Ref*		Ref†	At 31 Dec 2018 $m	CRD IV prescribed residual amount $m	Final CRD IV text $m
	Common equity tier 1 ('CET1') capital: instruments and reserves				
1	Capital instruments and the related share premium accounts		22,384		22,384

	– ordinary shares	a	22,384		22,384
2	Retained earnings	b	121,180		121,180
3	Accumulated other comprehensive income (and other reserves)	c	3,368		3,368
5	Minority interests (amount allowed in consolidated CET1)	d	4,854		4,854
5a	Independently reviewed interim net profits net of any foreseeable charge or dividend	b	3,697		3,697
6	Common equity tier 1 capital before regulatory adjustments		155,483		155,483
	Common equity tier 1 capital: regulatory adjustments				
7	Additional value adjustments[1]		(1,180)		(1,180)
8	Intangible assets (net of related deferred tax liability)	e	(17,323)		(17,323)
10	Deferred tax assets that rely on future profitability excluding those arising from temporary differences (net of related tax liability)	f	(1,042)		(1,042)
11	Fair value reserves related to gains or losses on cash flow hedges	g	135		135
12	Negative amounts resulting from the calculation of expected loss amounts	h	(1,750)		(1,750)
14	Gains or losses on liabilities valued at fair value resulting from changes in own credit standing	i	298		298
15	Defined benefit pension fund assets	j	(6,070)		(6,070)
16	Direct and indirect holdings of own CET1 instruments[2]		(40)		(40)
19	Direct, indirect and synthetic holdings by the institution of the CET1 instruments of financial sector entities where the institution has a significant investment in those entities (amount above 10% threshold and net of eligible short positions)[3]		(7,489)		(7,489)
28	Total regulatory adjustments to common equity tier 1		(34,461)	—	(34,461)
29	Common equity tier 1 capital		121,022	—	121,022
	Additional tier 1 (‘AT1’) capital: instruments				
30	Capital instruments and the related share premium accounts		22,367	—	22,367
31	– classified as equity under IFRSs	k	22,367	—	22,367
33	Amount of qualifying items and the related share premium accounts subject to phase out from AT1	l	2,297	(2,297)	—

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Table 7: Own funds disclosure (continued)

Ref*		Ref†	At 31 Dec 2018 $m	CRD IV prescribed residual amount $m	Final CRD IV text $m
34	Qualifying tier 1 capital included in consolidated AT1 capital (including minority interests not included in CET1) issued by subsidiaries and held by third parties	m, n	1,516	(1,298)	218
35	– of which: instruments issued by subsidiaries subject to phase out	n	1,298	(1,298)	—
36	Additional tier 1 capital before regulatory adjustments		26,180	(3,595)	22,585
	Additional tier 1 capital: regulatory adjustments				
37	Direct and indirect holdings of own AT1 instruments[2]		(60)		(60)
43	Total regulatory adjustments to additional tier 1 capital		(60)	—	(60)
44	Additional tier 1 capital		26,120	(3,595)	22,525
45	Tier 1 capital (T1 = CET1 + AT1)		147,142	(3,595)	143,547
	Tier 2 capital: instruments and provisions				
46	Capital instruments and the related share premium accounts	o	25,056		25,056
48	Qualifying own funds instruments included in consolidated T2 capital (including minority interests and AT1 instruments not included in CET1 or AT1) issued by subsidiaries and held by third parties	p, q	1,673	(1,585)	88
49	– of which: instruments issued by subsidiaries subject to phase out	q	1,585	(1,585)	—
51	Tier 2 capital before regulatory adjustments		26,729	(1,585)	25,144
	Tier 2 capital: regulatory adjustments				
52	Direct and indirect holdings of own T2 instruments[2]		(40)		(40)
55	Direct and indirect holdings by the institution of the T2 instruments and subordinated loans of financial sector entities where the institution has a significant investment in those entities (net of eligible short positions)	r	(593)	—	(593)
57	Total regulatory adjustments to tier 2 capital		(633)	—	(633)
58	Tier 2 capital		26,096	(1,585)	24,511
59	Total capital (TC = T1 + T2)		173,238	(5,180)	168,058
60	Total risk-weighted assets		865,318	—	865,318
	Capital ratios and buffers				
61	Common equity tier 1		14.0%		14.0%
62	Tier 1		17.0%		16.6%
63	Total capital		20.0%		19.4%
64	Institution specific buffer requirement		3.94%		5.19%
65	– capital conservation buffer requirement		1.88%		2.50%
66	– counter-cyclical buffer requirement		0.56%		0.69%
67a	– Global Systemically Important Institution (‘G-SII’) buffer		1.50%		2.00%
68	Common equity tier 1 available to meet buffers		7.9%		7.9%
	Amounts below the threshold for deduction (before risk weighting)				
72	Direct and indirect holdings of the capital of financial sector entities where the institution does not have a significant investment in those entities (amount below 10% threshold and net of eligible short positions)		2,534		
73	Direct and indirect holdings by the institution of the CET1 instruments of financial sector entities where the institution has a significant investment in		12,851		

	those entities (amount below 10% threshold and net of eligible short positions)	
75	Deferred tax assets arising from temporary differences (amount below 10% threshold, net of related tax liability)	4,956
	Applicable caps on the inclusion of provisions in tier 2	
77	Cap on inclusion of credit risk adjustments in T2 under standardised approach	2,200
79	Cap for inclusion of credit risk adjustments in T2 under internal ratings-based approach	3,221
	Capital instruments subject to phase-out arrangements (only applicable between 1 Jan 2013 and 1 Jan 2022)	
82	Current cap on AT1 instruments subject to phase out arrangements	6,921
84	Current cap on T2 instruments subject to phase out arrangements	5,131

* The references identify the lines prescribed in the EBA template. Lines represented in this table are those lines which are applicable and where there is a value.

† The references (a) – (r) identify balance sheet components in Table 3: Reconciliation of balance sheets – financial accounting to regulatory scope of consolidation on page 8 which are used in the calculation of regulatory capital.

1 Additional value adjustments are deducted from CET1. These are calculated on all assets measured at fair value.

2 The deduction for holdings of own CET1, T1 and T2 instruments is set by the PRA.

3 Threshold deduction for significant investments relates to balances recorded on numerous lines on the balance sheet and includes: investments in insurance subsidiaries and non-consolidated associates, other CET1 equity held in financial institutions, and connected funding of a capital nature.

At 31 December 2018, our CET1 ratio decreased to 14.0% from 14.5% at 31 December 2017.

CET1 capital decreased during the year by $5.1bn, mainly as a result of:

- unfavourable foreign currency translation differences of $5.5bn;
- the $2.0bn share buy-back;
- a $1.2bn increase in threshold deductions as a result of an increase in the value of our material holdings; and
- an increase in the deduction for intangible assets of $1.1bn.

These decreases were partly offset by:

- capital generation through profits, net of dividends and scrip of $3.1bn; and
- a $1.2bn day one impact from transition to IFRS 9, mainly due to classification and measurement changes.

RWAs reduced by $6.0bn during the year, primarily due to foreign currency translation differences of $23.4bn. Excluding foreign

currency translation differences, the remaining increase of $17.4bn was primarily driven by lending growth.

Leverage ratio

Our leverage ratio calculated in accordance with CRD IV was 5.5% at 31 December 2018, down from 5.6% at 31 December 2017. The increase in exposure was primarily due to growth in customer lending and financial investments.

The Group's UK leverage ratio at 31 December 2018 was 6.0%. This measure excludes qualifying central bank balances from the
calculation of exposure.

At 31 December 2018, our UK minimum leverage ratio requirement of 3.25% was supplemented by an additional leverage ratio buffer of 0.5% and a countercyclical leverage ratio buffer of 0.2%. These additional buffers translated into capital values of $12.7bn and $4.7bn respectively. We exceeded these leverage requirements.

For further details of the UK leverage ratio, please see page 151 of the Annual Report and Accounts 2018.

The risk of excessive leverage is managed as part of HSBC's global risk appetite framework and monitored using a leverage ratio metric within our risk appetite statement ('RAS'). The RAS articulates the aggregate level and types of risk that HSBC is willing to accept in its business activities in order to achieve its strategic business objectives. The RAS is monitored via the risk appetite profile report, which includes comparisons of actual performance against the risk appetite and tolerance thresholds assigned to each metric, to ensure that any excessive risk is highlighted, assessed and mitigated appropriately. The risk appetite profile report is presented monthly to the RMM and the GRC.

Our approach to risk appetite is described on page 69 of the Annual Report and Accounts 2018.

Table 8: Summary reconciliation of accounting assets and leverage ratio exposures (LRSum)

		At 31 Dec	
		2018	2017
Ref*		$bn	$bn
1	Total assets as per published financial statements	2,558.1	2,521.8
	Adjustments for:		
2	– entities which are consolidated for accounting purposes but are outside the scope of regulatory consolidation	(89.5)	(88.4)
4	– derivative financial instruments	(55.6)	(91.0)
5	– securities financing transactions ('SFT')	(5.1)	12.2
6	– off-balance sheet items (i.e. conversion to credit equivalent amounts of off-balance sheet exposures)	227.4	227.4
7	– other	(20.4)	(24.9)
8	Total leverage ratio exposure	2,614.9	2,557.1

* The references identify the lines prescribed in the EBA template. Lines represented in this table are those lines which are applicable and where there is a value.

Table 9: Leverage ratio common disclosure (LRCom)

		At 31 Dec	
		2018^	2017
Ref*		$bn	$bn
	On-balance sheet exposures (excluding derivatives and SFT)		
1	On-balance sheet items (excluding derivatives, SFTs and fiduciary assets, but including collateral)	2,012.5	1,998.7
2	(Asset amounts deducted in determining tier 1 capital)	(33.8)	(35.3)
3	Total on-balance sheet exposures (excluding derivatives, SFTs and fiduciary assets)	1,978.7	1,963.4
	Derivative exposures		
4	Replacement cost associated with all derivatives transactions (i.e. net of eligible cash variation margin)	44.2	29.0
5	Add-on amounts for potential future exposure ('PFE') associated with all derivatives transactions (mark-to-market method)	154.1	125.5

6	Gross-up for derivatives collateral provided where deducted from the balance sheet assets pursuant to IFRSs	5.9	5.2
7	(Deductions of receivables assets for cash variation margin provided in derivatives transactions)	(21.5)	(23.6)
8	(Exempted central counterparty ('CCP') leg of client-cleared trade exposures)	(38.0)	(14.0)
9	Adjusted effective notional amount of written credit derivatives	160.9	188.2
10	(Adjusted effective notional offsets and add-on deductions for written credit derivatives)	(153.4)	(181.6)
11	Total derivative exposures	152.2	128.7
	Securities financing transaction exposures		
12	Gross SFT assets (with no recognition of netting), after adjusting for sales accounting transactions	248.9	331.2
13	(Netted amounts of cash payables and cash receivables of gross SFT assets)	(3.6)	(105.8)
14	Counterparty credit risk exposure for SFT assets	11.3	12.2
16	Total securities financing transaction exposures	256.6	237.6
	Other off-balance sheet exposures		
17	Off-balance sheet exposures at gross notional amount	829.8	801.7
18	(Adjustments for conversion to credit equivalent amounts)	(602.4)	(574.3)
19	Total off-balance sheet exposures	227.4	227.4
	Capital and total exposures		
20	Tier 1 capital	143.5	142.7
21	Total leverage ratio exposure	2,614.9	2,557.1
22	Leverage ratio (%)	5.5	5.6
EU-23	Choice of transitional arrangements for the definition of the capital measure	Fully phased-in	Fully phased-in

* The references identify the lines prescribed in the EBA template. Lines represented in this table are those lines which are applicable and where there is a value.

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Table 10: Leverage ratio – Split of on-balance sheet exposures (excluding derivatives, SFTs and exempted exposures) (LRSpl)

Ref*		At 31 Dec 2018^ $bn	2017 $bn
EU-1	Total on-balance sheet exposures (excluding derivatives, SFTs and exempted exposures)	1,991.0	1,998.7
EU-2	– trading book exposures	218.5	268.6
EU-3	– banking book exposures	1,772.5	1,730.1
	'banking book exposures' comprises:		
EU-4	covered bonds	1.6	1.3
EU-5	exposures treated as sovereigns	507.3	504.8
EU-6	exposures to regional governments, multilateral development banks ('MDB'), international organisations and public sector entities not treated as sovereigns	9.3	9.8
EU-7	institutions	66.8	77.0
EU-8	secured by mortgage of immovable property	300.0	283.4
EU-9	retail exposures	82.8	89.3
EU-10	corporate	614.3	586.0
EU-11	exposures in default	9.1	9.7
EU-12	other exposures (e.g. equity, securitisations and other non-credit obligation assets)	181.3	168.8

* The references identify the lines prescribed in the EBA template. Lines represented in this table are those lines which are applicable and where there is a value.

Capital buffers

Our geographical breakdown and institution specific CCyB disclosure and our G-SIB Indicator disclosure are published annually on the HSBC website, www.hsbc.com.

Pillar 1 minimum capital requirements and RWA flow

Pillar 1 covers the minimum capital resource requirements for credit risk, counterparty credit risk, equity, securitisation, market risk and operational risk. These requirements are expressed in terms of RWAs.

Risk category	Scope of permissible approaches	Approach adopted by HSBC
Credit risk	The Basel Committee's framework applies three approaches of increasing sophistication to the calculation of Pillar 1 credit risk capital requirements. The most basic level, the standardised approach, requires banks to use external credit ratings to determine the risk weightings applied to rated counterparties. Other counterparties are grouped into broad categories and standardised risk weightings are applied to these categories. The next level, the foundation IRB ('FIRB') approach, allows banks to calculate their credit risk capital requirements on the basis of their internal assessment of a counterparty's probability of default ('PD'), but subjects their quantified estimates of EAD and loss given default ('LGD') to standard supervisory parameters. Finally, the advanced IRB ('AIRB') approach allows banks to use their own internal assessment in determining PD and in quantifying EAD and LGD.	For consolidated Group reporting, we have adopted the advanced IRB approach for the majority of our business. Some portfolios remain on the standardised or foundation IRB

		approaches: • pending the issuance of local regulations or model approval; • following supervisory prescription of a non-advanced approach; or • under exemptions from IRB treatment.
Counterparty credit risk	Four approaches to calculating CCR and determining exposure values are defined by the Basel Committee: mark-to-market, original exposure, standardised and Internal Model Method ('IMM'). These exposure values are used to determine capital requirements under one of the three approaches to credit risk: standardised, foundation IRB or advanced IRB.	We use the mark-to-market and IMM approaches for CCR. Details of the IMM permission we have received from the PRA can be found in the Financial Services Register on the PRA website. Our aim is to increase the proportion of positions on IMM over time.
Equity	For the non-trading book, equity exposures can be assessed under standardised or IRB approaches.	For Group reporting purposes, all non-trading

		book equity exposures are treated under the standardised approach. For the majority of the non-trading book securitisation positions we use the IRB approach and, within this, RBM and IAA with an immaterial amount using the SFM. We also use the standardised approach on the non-trading book positions securitisations. Securitisation positions in the trading book are overseen within Market Risk under the Standardised Approach.
Securitisation	Basel specifies two approaches for calculating credit risk requirements for securitisation positions in non-trading books: the standardised approach and the IRB approach, which incorporates the Ratings Based Method ('RBM'), the Internal Assessment Approach ('IAA') and the Supervisory Formula Method ('SFM'). Securitisation positions in the trading book are treated within the market risk framework per the Capital Requirements Regulation.	
Market risk	Market risk capital requirements can be determined under either the standard rules or the Internal Models Approach ('IMA'). The latter involves the use of internal value at risk ('VaR') models to measure market risks and determine the appropriate capital requirement. In addition to the VaR models, other internal models include stressed VaR ('SVaR'), Incremental Risk Charge ('IRC') and Comprehensive Risk Measure.	The market risk capital requirement is measured using internal market risk models, where approved by the PRA, or under the

		standard rules. Our internal market risk models comprise VaR, stressed VaR and IRC. Non-proprietary details of the scope of our IMA permission are available in the Financial Services Register on the PRA website. We are in compliance with the requirements set out in Articles 104 and 105 of the Capital Requirements Regulation.
Operational risk	The Basel Committee allows firms to calculate their operational risk capital requirement under the basic indicator approach, the standardised approach or the advanced measurement approach.	We currently use the standardised approach in determining our operational risk capital requirement. We have in place an operational risk model that is used for economic capital calculation purposes.

Table 11: Overview of RWAs (OV1)

		At		
		31 Dec 2018	30 Sep 2018	31 Dec 2018
		RWAs	RWAs	Capital[1] required
		$bn	$bn	$bn
1	Credit risk (excluding counterparty credit risk)	638.1	632.6	51.0
2	– standardised approach	128.6	127.4	10.3
3	– foundation IRB approach	30.5	29.9	2.4
4	– advanced IRB approach	479.0	475.3	38.3
6	Counterparty credit risk	47.2	47.6	3.8
7	– mark-to-market	24.7	25.0	2.0
10	– internal model method	16.2	16.2	1.3
11	– risk exposure amount for contributions to the default fund of a central counterparty	0.4	0.6	—
12	– credit valuation adjustment	5.9	5.8	0.5
13	Settlement risk	0.1	0.2	—
14	Securitisation exposures in the non-trading book	8.4	9.0	0.7
15	– IRB ratings based method	4.6	5.1	0.4
16	– IRB supervisory formula method	—	—	—
17	– IRB internal assessment approach	1.7	1.6	0.1
18	– standardised approach	2.1	2.3	0.2
19	Market risk	35.8	34.9	2.8
20	– standardised approach	5.7	5.1	0.4
21	– internal models approach	30.1	29.8	2.4
23	Operational risk	91.1	92.7	7.3
25	– standardised approach	91.1	92.7	7.3
27	Amounts below the thresholds for deduction (subject to 250% risk weight)	44.6	45.7	3.6
29	Total	865.3	862.7	69.2

[1] 'Capital requirement' represents the minimum total capital charge set at 8% of RWAs by article 92 of the Capital Requirements Regulation.

Credit risk (including amounts below the thresholds for deduction)

RWAs increased by $4.4bn in the fourth quarter of the year including a decrease of $4.6bn due to foreign currency translation differences. Excluding foreign currency translation differences, the remaining increase of $9.0bn was primarily driven by lending growth in CMB across Europe and Asia. A further $2.0bn of RWAs arose in RBWM in Asia, largely due to mortgage growth.

Counterparty credit risk (including settlement risk)

Counterparty credit risk RWAs decreased by $0.4bn primarily due to improvements in collateral recognition and customer risk ratings.

Securitisation

The $0.6bn RWA decrease arose predominantly from the sale of legacy positions.

Market risk

RWAs increased by $0.9bn mainly due to an increase in Hong Kong dollar denominated exposure.

Operational risk

RWAs decreased by $1.6bn primarily due to reduced contributions from the retail banking and payment and settlement business lines, partly offset by growth in commercial banking.

Table 12: RWA flow statements of credit risk exposures under the IRB approach[1] (CR8)

	RWAs	Capital

		$bn	required $bn
1	At 1 Oct 2018	505.2	40.4
2	Asset size	8.8	0.6
3	Asset quality	0.7	0.1
4	Model updates	1.5	0.1
5	Methodology and policy	(2.7)	(0.2)
7	Foreign exchange movements	(4.0)	(0.3)
9	At 31 Dec 2018	509.5	40.7

1 Securitisation positions are not included in this table.

RWAs under the IRB approach increased by $4.3bn in the fourth quarter of the year, including a decrease of $4.0bn due to foreign currency translation differences. The remaining increase of $8.3bn (excluding foreign currency translation differences) was principally due to:

- an $8.8bn asset size growth, predominantly in corporate and mortgage portfolios in Europe and Asia;
- $0.7bn movement in asset quality due to changes in portfolio mix, mainly in GB&M; and
- $1.5bn increase under model updates mainly due to a new receivables finance model in Germany.

This was partly offset by $2.7bn changes in methodology and policy, mainly taking the form of CMB management initiatives across Europe and Asia.

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Table 13: RWA flow statements of CCR exposures under IMM (CCR7)

		RWAs	Capital required
		$bn	$bn
1	At 1 Oct 2018	20.5	1.7
2	Asset size	0.8	0.1
3	Asset quality	0.1	—
5	Methodology and policy	(0.3)	—
9	At 31 Dec 2018	21.1	1.8

RWAs under the IMM increased by $0.6bn mainly due to a $0.8bn growth in asset size driven by mark-to-market movements. This was partly offset by a $0.3bn decrease as a result of improvements in collateral recognition in Europe.

Table 14: RWA flow statements of market risk exposures under IMA (MR2-B)

		VaR	Stressed VaR	IRC	Other	Total RWAs	Total capital required
		$bn	$bn	$bn	$bn	$bn	$bn
1	At 1 Oct 2018	6.9	10.7	8.6	3.6	29.8	2.4
2	Movement in risk levels	0.2	1.4	(2.2)	0.9	0.3	—
8	At 31 Dec 2018	7.1	12.1	6.4	4.5	30.1	2.4

RWAs under the IMA increased by $0.3bn mainly due to higher exposures in Europe and Asia that increased VaR, SVaR and other by $2.5bn. This was partly offset by lower sovereign and corporate exposure that reduced IRC by $2.2bn.

Pillar 2 and ICAAP

Pillar 2

We conduct an Internal Capital Adequacy Assessment Process (‘ICAAP’) to determine a forward-looking assessment of our capital requirements given our business strategy, risk profile, risk appetite and capital plan. This process incorporates the Group’s risk management processes and governance framework. Our base capital plan undergoes stress testing. This, coupled with our economic capital framework and other risk management practices, is used to assess our internal capital adequacy requirements and inform our view of our internal capital planning buffer. The ICAAP is formally approved by the Board, which has the ultimate responsibility for the effective management of risk and approval of HSBC’s risk appetite.

The ICAAP is reviewed by the PRA and by a college of European Economic Area (‘EEA’) supervisors, as part of the joint risk assessment and decision process, during the Supervisory Review and Evaluation Process (‘SREP’). This process occurs periodically to enable the regulator to define the individual capital requirement (‘ICR’) (previously known as the individual capital guidance (‘ICG’)) or minimum capital requirements for HSBC and to define the PRA buffer, where required. Under the revised Pillar 2 PRA regime, which came into effect from 1 January 2017, the capital planning buffer has been replaced with a ‘PRA buffer’. This is not intended to duplicate the CRD IV buffers and, where necessary, will be set according to vulnerability in a stress scenario, as identified and assessed through the annual PRA stress testing exercise.

The processes of internal capital adequacy assessment and supervisory review lead to a final determination by the PRA of the ICR and any PRA buffer that may be required.

Within Pillar 2, there are two components namely Pillar 2A and Pillar 2B. Pillar 2A considers, in addition to the minimum capital requirements for Pillar 1 risks described above, any supplementary requirements for those risks and any requirements for other risk categories not captured by Pillar 1. The risk categories to be covered under Pillar 2A depend on the specific circumstances of a firm and the nature and scale of its business.

Pillar 2B consists of guidance from the PRA on the capital buffer a firm would require in order to remain above its ICR in adverse circumstances that may be largely outside the firm’s normal and direct control; for example, during a

period of severe but plausible downturn stress, when asset values and the firm's capital surplus may become strained. This is quantified via any PRA buffer requirement the PRA may consider necessary. The assessment of

this is informed by stress tests and a rounded judgement of a firm's business model, also taking into account the PRA's view of a firm's options and capacity to protect its capital position under stress; for instance, through capital generation. Where the PRA assesses that a firm's risk management and governance are significantly weak, it may also increase the PRA buffer to cover the risks posed by those weaknesses until they are addressed. The PRA buffer is intended to be drawn upon in times of stress, and its use is not of itself a breach of capital requirements that would trigger automatic restrictions on distributions. In specific circumstances, the PRA should agree a plan with a firm for its restoration over an agreed timescale.

Internal capital adequacy assessment

The Board manages the Group ICAAP, and together with RMM and GRC, it examines the Group's risk profile from both a regulatory and economic capital viewpoint. They aim to ensure that capital resources:

- remain sufficient to support our risk profile and outstanding commitments;
- meet current regulatory requirements, and that HSBC is well placed to meet those expected in the future;
- allow the bank to remain adequately capitalised in the event of a severe economic downturn stress scenario; and
- remain consistent with our strategic and operational goals, and our shareholder and investor expectations.

The minimum regulatory capital that we are required to hold is determined by the rules and guidance established by the PRA for the consolidated Group and by local regulators for individual Group companies. These capital requirements are a primary factor in influencing and shaping the business planning process, in which RWA targets are established for our global businesses in accordance with the Group's strategic direction and risk appetite.

Economic capital is the internally calculated capital requirement that we deem necessary to support the risks to which we are exposed. The economic capital assessment is a more risk-sensitive measure than the regulatory minimum, and takes account of the substantial diversification of risk accruing from our operations. Both the regulatory and the economic capital assessments rely upon the use of models that are integrated into our risk management processes. Our economic capital models are calibrated to quantify the level of capital that is sufficient to absorb potential losses over a one-year time horizon to a 99.95% level of confidence for our banking and trading activities, to a 99.5% level of confidence for our insurance activities and pension risks, and to a 99.9% level of confidence for our operational risks.

The ICAAP and its constituent economic capital calculations are examined by the PRA as part of its SREP. This examination informs the regulator's view of our Pillar 2 capital requirements.

Preserving our strong capital position remains a priority, and the level of integration of our risk and capital management helps to optimise our response to business demand for regulatory and economic capital. Risks that are explicitly assessed through economic capital are credit risk (including CCR), market risk, operational risk, interest rate risk in the banking book ('IRRBB'), insurance risk, pension risk and structural foreign exchange risk.

Credit risk

Overview and responsibilities

Credit risk represents our largest regulatory capital requirement.

The principal objectives of our credit risk management function are:

- to maintain across HSBC a strong culture of responsible lending and a robust credit risk policy and control framework;
- to both partner and challenge our businesses in defining, implementing and continually re-evaluating our credit risk appetite under actual and stress scenario conditions; and
- to ensure there is independent, expert scrutiny of credit risks, their costs and their mitigation.

The credit risk functions within Wholesale Credit and Market Risk and RBWM are the constituent parts of Global Risk that support the Group Chief Risk Officer in overseeing credit risks. Their major duties comprise undertaking independent reviews of large and high-risk credit proposals, overseeing large exposure policy and reporting on our wholesale and retail credit risk management disciplines. They also own our credit policy and credit systems programmes, oversee portfolio management and report on risk matters to senior executive management and regulators.

These credit risk functions work closely with other parts of Global Risk; for example, with Operational Risk on the internal control framework and with Risk Strategy on the risk appetite process. In addition, they work jointly with Risk Strategy and Global Finance on stress testing.

The credit responsibilities of Global Risk are described on page 75 of the Annual Report and Accounts 2018.

Group-wide, the credit risk functions comprise a network of credit risk management offices reporting within regional risk functions. They fulfil an essential role as independent risk control units distinct from business line management in providing objective scrutiny of risk rating assessments, credit proposals for approval and other risk matters.

Our credit risk procedures operate through a hierarchy of personal credit limit approval authorities. Operating company chief executives, acting under authorities delegated by their boards and Group standards, are accountable for credit risk and other risks in their business. In turn, chief executives delegate authority to operating company chief risk officers and management teams on an individual basis. Each operating company is responsible for the quality and performance of its credit portfolios in accordance with Group standards. Above these thresholds of delegated personal credit limited approval authorities, approval must be sought from the regional and, as appropriate, global credit risk function.

Credit risk management

Our exposure to credit risk arises from a wide range of customer and products, and the risk rating systems in place to measure and monitor these risks are correspondingly diverse. Senior management receives a variety of reports on our credit risk exposures, including expected credit losses, total exposures and RWAs, as well as updates on specific portfolios that are considered to have heightened credit risk.

Credit risk exposures are generally measured and managed in portfolios of either customer types or product categories. Risk rating systems are designed to assess the default propensity of,

and loss severity associated with, distinct customers who are typically managed as individual relationships or, in the case of retail business exposures, on a product portfolio basis.

Risk rating systems for retail exposures are generally quantitative in nature, applying techniques such as behavioural analysis across product portfolios comprising large numbers of homogeneous transactions. Rating systems for individually managed relationships typically use customer financial statements and market data analysis, but also qualitative elements and a final subjective overlay to better reflect any idiosyncratic elements of the customer's risk

profile.

See ‘Application of the IRB Approach’ on page 38.

A fundamental principle of our policy and approach is that analytical risk rating systems and scorecards are all valuable tools at the disposal of management.

The credit process provides for at least an annual review of facility limits granted. Review may be more frequent, as required by circumstances such as the emergence of adverse risk factors.

We constantly seek to improve the quality of our risk management. Group IT systems that process credit risk data continue to be enhanced in order to deliver both comprehensive management information in support of business strategy and solutions to evolving regulatory reporting requirements.

Group standards govern the process through which risk rating systems are initially developed, judged fit for purpose, approved and implemented. They also govern the conditions under which analytical risk model outcomes can be overridden by decision takers and the process of model performance monitoring and reporting. The emphasis is on an effective dialogue between business line and risk management, suitable independence of decision takers, and a good understanding and robust challenge on the part of senior management.

Like other facets of risk management, analytical risk rating systems are not static. They are subject to review and modification in light of the changing environment, the greater availability and quality of data, and any deficiencies identified through internal and external regulatory review. Structured processes and metrics are in place to capture relevant data and feed this into continuous model improvement.

See also the comments on ‘Model performance’ on page 51.

Credit risk models governance

All new or materially changed IRB capital models require the PRA’s approval, as set out in more detail on page 38. Throughout HSBC, such models fall directly under the remit of the global functional MOCs, operating in line with HSBC’s model risk policy, and under the oversight of the Global MOC.

Both the Wholesale and RBWM MOCs require all credit risk models for which they are responsible to be approved by delegated senior managers with notification to the committees that retain the responsibility for oversight.

Global Risk sets internal standards for the development, validation, independent review, approval, implementation and performance monitoring of credit risk rating models. Independent reviews of our models are performed by our Independent Model Review (‘IMR’) function which is separate from our Risk Analytics functions that are responsible for the development of models.

Compliance with Group standards is subject to examination by Risk oversight and review from within the Risk function itself, and by Internal Audit.

Credit quality of assets

We are a universal bank with a conservative approach to credit risk. This is reflected in our credit risk profile being diversified across a number of asset classes and geographies with a credit quality profile mainly concentrated in the higher quality bands.

Pillar 3 Disclosures at 31 December 2018

Table 15: Credit quality of exposures by exposure classes and instruments[1] (CR1-A)

			Gross carrying values of		Specific credit risk adjustments	Write-offs in the year[2]	Credit risk adjustment charges of the period[2]	Net carrying values
		Footnotes	Defaulted exposures $bn	Non-defaulted exposures $bn	$bn	$bn	$bn	$bn
1	Central governments and central banks		—	331.8	0.1	—	—	331.7
2	Institutions		—	81.1	—	—	—	81.1
3	Corporates		6.9	1,024.0	4.1	0.8	0.5	1,026.8
4	– of which: specialised lending		0.8	49.3	0.4	—	0.1	49.7
6	Retail		3.3	481.8	1.8	0.7	0.9	483.3
7	– Secured by real estate property		2.5	287.3	0.4	—	0.1	289.4
8	SMEs		0.1	3.5	0.1	—	0.1	3.5
9	Non-SMEs		2.4	283.8	0.3	—	—	285.9
10	– Qualifying revolving retail		0.1	132.7	0.7	0.3	0.4	132.1
11	– Other retail		0.7	61.8	0.7	0.4	0.4	61.8
12	SMEs		0.3	7.5	0.3	0.2	0.2	7.5
13	Non-SMEs		0.4	54.3	0.4	0.2	0.2	54.3
15	Total IRB approach		10.2	1,918.7	6.0	1.5	1.4	1,922.9
16	Central governments and central banks	3	—	163.9	—	—	—	163.9
17	Regional governments or local authorities	3	—	7.3	—	—	—	7.3
18	Public sector entities	3	—	12.2	—	—	—	12.2
19	Multilateral development banks		—	0.2	—	—	—	0.2
20	International organisations		—	1.6	—	—	—	1.6
21	Institutions		—	3.4	—	—	—	3.4
22	Corporates		3.3	180.0	2.1	0.3	0.4	181.2
24	Retail		1.1	64.9	1.5	0.7	0.5	64.5
25	– of which: SMEs		—	1.2	—	—	—	1.2
26	Secured by mortgages on immovable property		0.6	32.1	0.2	—	—	32.5
27	– of which: SMEs		—	0.1	—	—	—	0.1
28	Exposures in default	4	5.1	—	2.1	1.0	0.8	3.0

29	Items associated with particularly high risk	0.1	4.7	—	—	—	4.8
32	Collective investment undertakings (‘CIU’)	—	0.6	—	—	—	0.6
33	Equity exposures	—	15.6	—	—	—	15.6
34	Other exposures	—	11.3	—	—	—	11.3
35	Total standardised approach	5.1	497.8	3.8	1.0	0.9	499.1
36	Total at 31 Dec 2018	15.3	2,416.5	9.8	2.5	2.3	2,422.0
	– of which: loans	13.7	1,233.4	9.1	2.5	2.3	1,238.0
	– of which: debt securities	—	348.5	—	—	—	348.5
	– of which: off-balance sheet exposures	1.6	798.7	0.6	—	—	799.7

Table 15: Credit quality of exposures by exposure classes and instruments[1] (CR1-A) (continued)

			Gross carrying values of		Specific credit risk adjustments	Write-offs in the year[2]	Credit risk adjustment charges of the period[2]	Net carrying values
		Footnotes	Defaulted exposures $bn	Non-defaulted exposures $bn	$bn	$bn	$bn	$bn
1	Central governments and central banks		—	308.1	—	—	—	308.1
2	Institutions		—	94.5	—	—	—	94.5
3	Corporates		8.1	987.5	4.2	1.0	0.7	991.4
4	– of which: specialised lending		1.2	47.5	0.3	—	—	48.4
6	Retail		3.6	465.0	1.0	0.7	0.3	467.6
7	– Secured by real estate property		2.5	274.3	0.3	—	—	276.5
8	SMEs		—	1.5	—	—	—	1.5
9	Non-SMEs		2.5	272.8	0.3	—	—	275.0
10	– Qualifying revolving retail		0.1	125.4	0.2	0.3	0.2	125.3
11	– Other retail		1.0	65.3	0.5	0.4	0.1	65.8
12	SMEs		0.6	10.6	0.3	—	—	10.9
13	Non-SMEs		0.4	54.7	0.2	0.4	0.1	54.9
15	Total IRB approach		11.7	1,855.1	5.2	1.7	1.0	1,861.6
16	Central governments and central banks	3	—	198.1	—	—	—	198.1
17	Regional governments or local authorities	3	—	3.8	—	—	—	3.8
18	Public sector entities	3	—	0.4	—	—	—	0.4
19	Multilateral development banks		—	0.3	—	—	—	0.3
20	International organisations		—	2.2	—	—	—	2.2
21	Institutions		—	3.5	—	—	—	3.5
22	Corporates		—	172.8	0.5	—	0.1	172.3
24	Retail		—	71.0	0.4	—	0.2	70.6
25	– of which: SMEs		—	1.7	—	—	—	1.7
26	Secured by mortgages on immovable property		—	29.0	—	—	—	29.0
27	– of which: SMEs		—	0.1	—	—	—	0.1
28	Exposures in default	4	5.4	—	2.0	1.5	0.7	3.4
29	Items associated with particularly		—	3.9	—	—	—	3.9

	high risk					
32	Collective investment undertakings (‘CIU’)	—	0.6	—	—	—	0.6
33	Equity exposures	—	16.0	—	—	—	16.0
34	Other exposures	—	11.9	—	—	—	11.9
35	Total standardised approach	5.4	513.5	2.9	1.5	1.0	516.0
36	Total at 31 Dec 2017	17.1	2,368.6	8.1	3.2	2.0	2,377.6
	– of which: loans	15.1	1,225.2	7.8	3.2	2.0	1,232.5
	– of which: debt securities	—	325.1	—	—	—	325.1
	– of which: off-balance sheet exposures	2.0	782.4	0.2	—	—	784.2

1 Securitisation positions and non-credit obligation assets are not included in this table.

2 Presented on a year-to-date basis.

3 Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments and central banks’.

4 From 1 January 2018, standardised exposures that are in default are reported within individual exposure classes and totalled in ‘Exposures in default’. The reported amounts at 31 December 2017 have not been restated; ‘Exposures in default’ at that date principally comprised defaulted exposure to corporates of $3.3bn, retail clients of $1.1bn and exposure secured on immovable property of $1.0bn.

Pillar 3 Disclosures at 31 December 2018

Table 16: Credit quality of exposures by industry or counterparty types[1] (CR1-B)

			Gross carrying values of					
			Defaulted exposures	Non-defaulted exposures	Specific credit risk adjustments	Write-offs in the year[2]	Credit risk adjustment charges of the period[2]	Net carrying values
		Footnote	$bn	$bn	$bn	$bn	$bn	$bn
1	Agriculture		0.3	8.7	0.1	—	—	8.9
2	Mining & oil extraction		0.5	41.5	0.3	0.1	(0.1)	41.7
3	Manufacturing		2.0	259.5	1.4	0.4	0.3	260.1
4	Utilities		0.1	33.3	0.2	—	—	33.2
5	Water supply		—	2.4	—	—	—	2.4
6	Construction		1.4	41.1	0.6	—	0.2	41.9
7	Wholesale & retail trade		2.2	208.2	1.3	0.3	0.4	209.1
8	Transportation & storage		0.4	54.0	0.2	—	0.1	54.2
9	Accommodation & food services		0.4	28.3	0.2	—	—	28.5
10	Information & communication		—	11.2	0.1	—	0.1	11.1
11	Financial & insurance	3	0.3	540.3	0.2	0.1	(0.1)	540.4
12	Real estate		1.2	235.1	0.7	—	0.2	235.6
13	Professional activities		0.2	19.1	0.1	—	0.1	19.2
14	Administrative service		0.9	87.8	0.8	0.1	0.1	87.9
15	Public admin & defence		0.4	193.4	0.4	—	—	193.4
16	Education		—	3.6	—	—	—	3.6
17	Human health & social work		0.2	7.2	0.1	—	—	7.3
18	Arts & entertainment		—	6.2	—	—	—	6.2
19	Other services		0.2	15.7	0.1	—	—	15.8
20	Personal		4.6	572.9	3.0	1.5	1.0	574.5
21	Extraterritorial bodies		—	47.0	—	—	—	47.0
22	Total at 31 Dec 2018		15.3	2,416.5	9.8	2.5	2.3	2,422.0
1	Agriculture		0.4	9.5	0.1	—	—	9.8
2	Mining & oil extraction		1.4	42.2	0.5	0.2	(0.1)	43.1
3	Manufacturing		2.3	254.2	1.2	0.3	0.2	255.3
4	Utilities		0.3	33.9	0.1	0.1	—	34.1

5	Water supply		—	3.0	—	—	—	3.0
6	Construction		1.0	39.2	0.3	0.1	—	39.9
7	Wholesale & retail trade		2.4	203.5	1.4	0.4	0.5	204.5
8	Transportation & storage		0.5	52.1	0.1	—	—	52.5
9	Accommodation & food services		0.3	24.9	0.1	—	—	25.1
10	Information & communication		0.1	10.0	—	0.1	—	10.1
11	Financial & insurance	3	0.4	576.8	0.8	0.1	0.1	576.4
12	Real estate		1.2	220.9	0.9	0.1	0.2	221.2
13	Professional activities		0.2	19.2	—	—	—	19.4
14	Administrative service		0.9	81.6	0.7	0.1	0.1	81.8
15	Public admin & defence		0.3	172.8	—	—	—	173.1
16	Education		—	3.7	—	—	—	3.7
17	Human health & social work		0.2	7.6	—	—	—	7.8
18	Arts & entertainment		0.1	8.9	—	—	—	9.0
19	Other services		0.1	10.4	—	—	—	10.5
20	Personal		5.0	554.7	1.9	1.7	1.0	557.8
21	Extraterritorial bodies		—	39.5	—	—	—	39.5
22	Total at 31 Dec 2017		17.1	2,368.6	8.1	3.2	2.0	2,377.6

1 Securitisation positions and non-credit obligation assets are not included in this table.

2 Presented on a year-to-date basis.

3 We have restated the comparative period to include within the Financial and Insurance sector $23.8bn exposure in the form of non-customer assets that are neither securitisation nor non-credit obligation assets.

Table 17: Credit quality of exposures by geography[1, 2] (CR1-C)

		Gross carrying values of					
		Defaulted exposures	Non-defaulted exposures	Specific credit risk adjustments	Write-offs in the year[3]	Credit risk adjustment charges of the period[3]	Net carrying values
		$bn	$bn	$bn	$bn	$bn	$bn
1	Europe	6.7	780.1	3.8	0.9	1.0	783.0
2	– United Kingdom	4.1	474.2	2.4	0.8	0.9	475.9
3	– France	1.0	127.2	0.6	0.1	—	127.6
4	– Other countries	1.6	178.7	0.8	—	0.1	179.5
5	Asia	2.8	1,001.7	2.1	0.6	0.8	1,002.4
6	– Hong Kong	0.9	497.5	0.7	0.3	0.1	497.7
7	– China	0.3	157.3	0.3	0.1	0.2	157.3
8	– Singapore	0.2	71.9	0.2	—	0.1	71.9
9	– Other countries	1.4	275.0	0.9	0.2	0.4	275.5
10	MENA	2.9	137.3	2.3	0.3	0.3	137.9
11	North America	2.0	419.4	0.6	0.2	(0.1)	420.8
12	– United States of America	1.3	295.1	0.3	0.1	—	296.1
13	– Canada	0.2	107.5	0.2	0.1	—	107.5
14	– Other countries	0.5	16.8	0.1	—	(0.1)	17.2
15	Latin America	0.9	62.9	1.0	0.5	0.3	62.8
16	Other geographical areas	—	15.1	—	—	—	15.1
17	Total at 31 Dec 2018	15.3	2,416.5	9.8	2.5	2.3	2,422.0
1	Europe	8.1	795.6	3.0	1.2	0.8	800.7
2	– United Kingdom	4.1	465.3	1.8	0.7	0.7	467.6
3	– France	1.2	121.5	0.6	0.1	—	122.1
4	– Other countries	2.8	208.8	0.6	0.4	0.1	211.0
5	Asia	2.5	970.7	1.7	0.6	0.6	971.5
6	– Hong Kong	0.9	465.5	0.5	0.3	0.4	465.9
7	– China	0.3	167.2	0.3	0.1	0.1	167.2
8	– Singapore	0.1	70.2	0.1	—	—	70.2
9	– Other countries	1.2	267.8	0.8	0.2	0.1	268.2
10	MENA	2.9	134.1	1.8	0.4	0.2	135.2
11	North America	2.6	387.6	1.0	0.3	(0.1)	389.2
12	– United States of America	1.5	268.9	0.4	0.1	—	270.0
13	– Canada	0.4	100.9	0.3	0.1	(0.1)	101.0
14	– Other countries	0.7	17.8	0.3	0.1	—	18.2
15	Latin America	1.0	62.3	0.6	0.7	0.5	62.7
16	Other geographical areas	—	18.3	—	—	—	18.3
17	Total at 31 Dec 2017	17.1	2,368.6	8.1	3.2	2.0	2,377.6

1

Amounts shown by geographical region and country/territory in this table are based on the country/territory of residence of the counterparty.

2 Securitisation positions and non-credit obligation assets are not included in this table.

3 Presented on a year-to-date basis.

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Table 18: Ageing of past-due unimpaired and impaired exposures (CR1-D)

	Gross carrying values					
	Less than 30 days	Between 30 and 60 days	Between 60 and 90 days	Between 90 and 180 days	Between 180 days and 1 year	Greater than 1 year
	$bn	$bn	$bn	$bn	$bn	$bn
1 Loans	8.5	1.7	0.8	1.7	1.0	3.4
2 Debt securities	—	—	—	—	—	—
3 Total exposures at 31 Dec 2018	8.5	1.7	0.8	1.7	1.0	3.4
1 Loans	7.6	1.5	0.8	2.0	0.9	4.1
2 Debt securities	—	—	—	—	—	—
3 Total exposures at 31 Dec 2017	7.6	1.5	0.8	2.0	0.9	4.1

Table 19: Non-performing and forborne exposures (CR1-E)

	Gross carrying values of performing and non-performing exposures							Accumulated impairment and provisions and negative fair value adjustments due to credit risk				Collateral and
		of which: performing but past due between 30 and 90 days	of which: performing forborne	of which: non-performing				On performing exposures		On non-performing exposures		On non-performin exposures
					of which: defaulted	of which: impaired	of which: forborne		of which: forborne		of which: forborne	
	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
At 31 Dec 2018												
1 Debt securities	348.5	—	—	—	—	—	—	—	—	—	—	—
2 Loans	1,247.1	2.1	2.0	13.7	13.7	13.7	6.2	(3.6)	(0.1)	(5.5)	(1.8)	4.0
3 Off-balance sheet exposures	800.3	—	0.5	1.6	1.6	1.6	0.1	(0.4)	—	(0.1)	—	0.2
At 31 Dec 2017												
1 Debt securities	325.1	—	—	—	—	—	—	—	—	—	—	—
2 Loans	1,240.3	1.7	2.5	15.8	15.1	15.8	6.7	(2.4)	(0.1)	(5.5)	(1.9)	6.2
3 Off-balance sheet exposures	784.4	—	0.3	2.0	2.0	2.0	—	(0.2)	—	—	—	0.2

Table 19 is presented based on the EBA definitions of ‘non-performing’ and ‘forborne’ exposures. Forborne exposures are referred to as renegotiated loans in the Annual Report and Accounts 2018. In the Annual Report and Accounts 2018, we classify and report loans on which concessions have been granted under conditions of credit distress as ‘renegotiated loans’ when their contractual payment terms have been modified because we have significant concerns about the borrowers’ ability to meet contractual payments when due. This is aligned with the EBA definitions of forborne exposures. The EBA and Annual Report and Accounts 2018 differ in the treatment of cures from the

forborne/renegotiated status. Under the EBA definition, exposures are no longer considered forborne once the exposures have complied with the revised contractual obligations for a period of at least

three years and the exposures are no longer considered impaired or have any elements that are more than 30 days past due. In the Annual Report and Accounts 2018, renegotiated loans retain this classification until maturity or derecognition. The EBA definition of non-performing captures those debtors that have material exposures, which are more than 90 days past due or where the debtor is assessed as unlikely to pay its credit obligations in full without the realisation of collateral, regardless of the existence of any past due amounts. Any debtors that are in default for regulatory purposes or impaired under the applicable accounting framework are considered to be unlikely to pay. The Annual Report and Accounts 2018 does not report non-performing exposure, however, the definition of impaired loans is aligned to the EBA non-performing definitions.

Table 20: Credit risk exposure – summary (CRB-B)

		At 31 Dec 2018				At 31 Dec 2017			
		Net carrying values	Average net carrying values[4]	RWAs^	Capital required^	Net carrying values	Average net carrying values[4]	RWAs	Capital required
	Footnotes	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
IRB advanced approach		1,844.5	1,812.1	468.2	37.4	1,788.2	1,729.1	455.4	36.4
– central governments and central banks		331.7	315.4	36.9	3.0	308.1	320.9	33.9	2.7
– institutions		80.6	88.0	14.2	1.1	94.3	92.1	17.6	1.4
– corporates	1	948.9	932.0	345.1	27.5	918.2	870.6	338.2	27.0
– total retail		483.3	476.7	72.0	5.8	467.6	445.5	65.7	5.3
Secured by mortgages on immovable property SME		3.5	3.2	1.8	0.1	1.5	1.5	0.5	—
Secured by mortgages on immovable property non-SME		285.9	280.9	37.2	3.0	275.0	260.5	33.2	2.7
Qualifying revolving retail		132.1	129.1	17.3	1.4	125.3	120.2	16.0	1.3
Other SME		7.5	8.7	4.8	0.4	10.9	10.2	5.9	0.5
Other non-SME		54.3	54.8	10.9	0.9	54.9	53.1	10.1	0.8
IRB securitisation positions		29.7	31.0	6.3	0.5	32.8	33.9	13.7	1.1
IRB non-credit obligation assets		56.9	59.2	10.8	0.9	56.1	55.2	13.2	1.1
IRB foundation approach		78.4	76.5	30.5	2.4	73.4	71.2	28.4	2.3
– central governments and central banks		—	—	—	—	—	—	—	—
– institutions		0.5	0.3	0.2	—	0.2	0.2	0.1	—
– corporates		77.9	76.2	30.3	2.4	73.2	71.0	28.3	2.3
Standardised approach		501.8	501.9	175.3	14.1	518.0	483.1	174.5	13.9
– central governments and central banks	3	163.9	182.5	12.5	1.0	198.1	173.1	12.7	1.0
– institutions		3.4	3.0	1.2	0.1	3.5	2.9	1.2	0.1
– corporates		179.4	168.4	79.2	6.3	172.3	167.8	78.3	6.3
– retail		63.8	66.2	14.8	1.2	70.6	68.9	16.5	1.3
– secured by mortgages on immovable property		32.0	30.3	11.3	0.9	29.0	27.6	10.4	0.8
– exposures in default		3.0	3.0	3.8	0.3	3.4	3.6	3.9	0.3
– regional governments or local authorities	3	7.3	5.7	1.3	0.1	3.8	3.2	1.0	0.1
– public sector entities	3	12.2	7.6	—	—	0.4	0.2	0.1	—
– equity	2	15.6	13.2	35.0	2.8	16.0	15.9	36.1	2.9
– items associated with particularly high risk		4.8	4.2	6.9	0.6	3.9	3.9	5.7	0.5
– securitisation positions		2.7	2.5	2.1	0.2	2.0	1.3	1.6	0.1
– claims in the form of collective investment undertakings (‘CIU’)		0.6	0.6	0.6	0.1	0.6	0.5	0.6	—
– international organisations		1.6	2.0	—	—	2.2	2.5	—	—
– multilateral development banks		0.2	0.2	—	—	0.3	0.3	—	—
– other items		11.3	12.5	6.6	0.5	11.9	11.4	6.4	0.5
Total		2,511.3	2,480.7	691.1	55.3	2,468.5	2,372.5	685.2	54.8

1

Corporates includes specialised lending exposures which are reported in more detail in Table 60: Specialised lending on slotting approach (CR10).

2 This includes investments that are risk weighted at 250%.

3 Standardised exposures to EEA 'regional governments and local authorities' and 'public sector entities' are reported separately in 2018. In previous years, these exposures were grouped with 'central governments or central banks'.

4 Average net carrying values are calculated by aggregating net carrying values of the last five quarters and dividing by five.

Pillar 3 Disclosures at 31 December 2018

Table 21: Geographical breakdown of exposures (CRB-C)

		Net carrying values[1,2]								
		Europe	Of which: United Kingdom	France	Other countries	Asia	Of which: Hong Kong	China	Singapore	Other countries
		$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes									
1	Central governments and central banks	4.3	0.4	0.1	3.8	172.4	52.9	29.7	15.4	74.4
2	Institutions	23.1	8.7	1.8	12.6	40.8	7.0	13.9	2.6	17.3
3	Corporates	307.9	171.7	47.2	89.0	440.9	207.9	79.8	32.2	121.0
4	Retail	228.1	201.0	25.1	2.0	199.9	161.5	5.4	6.8	26.2
6	Total IRB approach	563.4	381.8	74.2	107.4	854.0	429.3	128.8	57.0	238.9
	Standardised approach exposure classes									
7	Central governments and central banks[3]	158.6	82.7	45.3	30.6	0.8	0.5	—	—	0.3
8	Regional governments or local authorities[3]	2.7	—	—	2.7	—	—	—	—	—
9	Public sector entities[3]	12.1	—	0.2	11.9	—	—	—	—	—
10	Multilateral development banks	—	—	—	—	—	—	—	—	—
11	International organisations	—	—	—	—	—	—	—	—	—
12	Institutions	1.0	—	0.9	0.1	0.2	0.1	—	—	0.1
13	Corporates	27.3	2.9	4.2	20.2	69.3	45.3	5.5	7.8	10.7
14	Retail	3.0	1.2	0.4	1.4	40.2	10.5	3.8	6.6	19.3
15	Secured by mortgages on immovable property	5.5	1.4	0.8	3.3	18.8	6.2	7.5	0.4	4.7
16	Exposures in default	0.6	0.1	—	0.5	0.4	0.1	—	—	0.3
17	Items associated with particularly high risk	2.9	1.3	0.5	1.1	—	—	—	—	—
20	Collective investment undertakings (‘CIU’)	0.6	0.6	—	—	—	—	—	—	—
21	Equity exposures	1.5	0.9	0.5	0.1	12.5	1.5	10.8	0.1	0.1
22	Other exposures	3.8	3.0	0.6	0.2	6.2	4.2	0.9	—	1.1
23	Total standardised approach	219.6	94.1	53.4	72.1	148.4	68.4	28.5	14.9	36.6
24	Total at 31 Dec 2018	783.0	475.9	127.6	179.5	1,002.4	497.7	157.3	71.9	275.5

Table 21: Geographical breakdown of exposures (CRB-C) (continued)

		Net carrying values[1,2]						
		MENA	North America	Of which: United States of America	Canada	Other countries	Latin America	Other	Total
		$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes								
1	Central governments and central banks	17.1	111.9	89.2	22.7	—	12.8	13.2	331.7
2	Institutions	6.3	10.2	1.9	8.0	0.3	0.6	0.1	81.1

3	Corporates	45.8	223.2	162.8	51.8	8.6	9.0	—	1,026.8
4	Retail	2.4	52.6	27.8	22.3	2.5	0.3	—	483.3
6	Total IRB approach	71.6	397.9	281.7	104.8	11.4	22.7	13.3	1,922.9
	Standardised approach exposure classes								
7	Central governments and central banks[3]	1.7	2.2	2.1	0.1	—	0.6	—	163.9
8	Regional governments or local authorities[3]	3.7	—	—	—	—	0.9	—	7.3
9	Public sector entities[3]	—	—	—	—	—	0.1	—	12.2
10	Multilateral development banks	—	—	—	—	—	—	0.2	0.2
11	International organisations	—	—	—	—	—	—	1.6	1.6
12	Institutions	2.1	—	—	—	—	0.1	—	3.4
13	Corporates	44.7	12.3	8.4	0.8	3.1	25.8	—	179.4
14	Retail	8.7	2.9	0.7	1.7	0.5	9.0	—	63.8
15	Secured by mortgages on immovable property	3.4	1.7	0.6	0.1	1.0	2.6	—	32.0
16	Exposures in default	1.1	0.4	0.1	—	0.3	0.5	—	3.0
17	Items associated with particularly high risk	0.2	1.6	0.8	—	0.8	0.1	—	4.8
20	Collective investment undertakings (‘CIU’)	—	—	—	—	—	—	—	0.6
21	Equity exposures	0.2	1.2	1.1	—	0.1	0.2	—	15.6
22	Other exposures	0.5	0.6	0.6	—	—	0.2	—	11.3
23	Total standardised approach	66.3	22.9	14.4	2.7	5.8	40.1	1.8	499.1
24	Total at 31 Dec 2018	137.9	420.8	296.1	107.5	17.2	62.8	15.1	2,422.0

Table 21: Geographical breakdown of exposures (CRB-C) (continued)

		Net carrying values[1,2]								
		Europe	Of which: United Kingdom	France	Other countries	Asia	Of which: Hong Kong	China	Singapore	Other countries
		$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes									
1	Central governments and central banks	6.8	—	—	6.8	171.8	55.9	30.8	13.1	72.0
2	Institutions	23.9	11.1	1.8	11.0	48.0	9.0	18.6	3.7	16.7
3	Corporates	299.5	170.2	47.5	81.8	427.2	194.1	83.2	31.6	118.3
4	Retail	226.5	198.3	26.2	2.0	185.5	148.3	6.0	6.3	24.9
6	Total IRB approach	556.7	379.6	75.5	101.6	832.5	407.3	138.6	54.7	231.9
	Standardised approach exposure classes									
7	Central governments and central banks[3]	193.1	75.8	39.4	77.9	0.9	0.3	0.1	—	0.5
8	Regional governments or local authorities[3]	—	—	—	—	—	—	—	—	—
9	Public sector entities[3]	0.3	—	—	0.3	—	—	—	—	—
10	Multilateral development banks	—	—	—	—	—	—	—	—	—
11	International organisations	—	—	—	—	—	—	—	—	—
12	Institutions	1.1	—	0.8	0.3	0.1	0.1	—	—	—
13	Corporates	30.2	3.0	2.7	24.5	60.0	37.7	5.3	6.7	10.3
14	Retail	4.2	1.2	1.8	1.2	41.7	11.4	3.1	8.2	19.0
15	Secured by mortgages on immovable property	5.6	1.2	0.8	3.6	16.5	3.4	7.8	0.4	4.9
16	Exposures in default	1.0	0.1	0.1	0.8	0.5	0.1	—	—	0.4
17	Items associated with particularly high risk	2.4	1.3	0.4	0.7	—	—	—	—	—
20	Collective investment undertakings (‘CIU’)	0.6	0.6	—	—	—	—	—	—	—
21	Equity exposures	1.2	1.1	0.1	—	13.3	1.6	11.4	0.2	0.1
22	Other exposures	4.3	3.7	0.5	0.1	6.0	4.0	0.9	—	1.1
23	Total standardised approach	244.0	88.0	46.6	109.4	139.0	58.6	28.6	15.5	36.3
24	Total at 31 Dec 2017	800.7	467.6	122.1	211.0	971.5	465.9	167.2	70.2	268.2

Table 21: Geographical breakdown of exposures (CRB-C) (continued)

		Net carrying values[1,2]							
		MENA	North America	Of which: United States of America	Canada	Other countries	Latin America	Other	Total
		$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes								
1	Central governments and central banks	16.8	87.2	69.6	17.5	0.1	10.2	15.3	308.1
2	Institutions	5.5	15.2	7.9	7.3	—	1.4	0.5	94.5
3	Corporates	42.6	210.7	149.4	50.8	10.5	11.4	—	991.4
4	Retail	2.4	53.1	27.1	22.9	3.1	0.1	—	467.6

6	Total IRB approach	67.3	366.2	254.0	98.5	13.7	23.1	15.8	1,861.6
	Standardised approach exposure classes								
7	Central governments and central banks[3]	1.1	2.4	2.3	0.1	—	0.6	—	198.1
8	Regional governments or local authorities[3]	3.1	—	—	—	—	0.7	—	3.8
9	Public sector entities[3]	—	—	—	—	—	0.1	—	0.4
10	Multilateral development banks	—	—	—	—	—	—	0.3	0.3
11	International organisations	—	—	—	—	—	—	2.2	2.2
12	Institutions	2.2	—	—	—	—	0.1	—	3.5
13	Corporates	45.8	11.9	9.7	0.3	1.9	24.4	—	172.3
14	Retail	10.3	3.9	1.8	1.6	0.5	10.5	—	70.6
15	Secured by mortgages on immovable property	3.2	1.5	0.2	0.1	1.2	2.2	—	29.0
16	Exposures in default	1.3	0.2	—	—	0.2	0.4	—	3.4
17	Items associated with particularly high risk	0.2	1.2	0.5	—	0.7	0.1	—	3.9
20	Collective investment undertakings (‘CIU’)	—	—	—	—	—	—	—	0.6
21	Equity exposures	0.2	1.0	1.0	—	—	0.3	—	16.0
22	Other exposures	0.5	0.9	0.5	0.4	—	0.2	—	11.9
23	Total standardised approach	67.9	23.0	16.0	2.5	4.5	39.6	2.5	516.0
24	Total at 31 Dec 2017	135.2	389.2	270.0	101.0	18.2	62.7	18.3	2,377.6

1 Amounts shown by geographical region and country/territory in this table are based on the country/territory of residence of the counterparty.

2 Securitisation positions and non-credit obligation assets are not included in this table.

3 Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments or central banks’.

Pillar 3 Disclosures at 31 December 2018

Table 22: Concentration of exposures by industry or counterparty types (CRB-D)

		Agriculture	Mining & oil extrac -tion	Manufac-turing	Utilities	Water supply	Construction	Wholesale, & retail trade	Transpor-tation & storage	Accom-modation & food services	Inf co
	Net carrying values[1]	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$b
	IRB approach exposure classes										
1	Central governments and central banks	—	—	—	0.4	—	—	—	—	—	—
2	Institutions	—	0.2	—	0.4	—	—	—	—	—	—
3	Corporates	6.9	35.9	231.8	28.4	2.3	33.6	181.8	48.5	24.3	9.2
4	Retail	1.0	—	0.9	—	—	0.2	1.6	0.3	0.4	—
6	Total IRB approach	7.9	36.1	232.7	29.2	2.3	33.8	183.4	48.8	24.7	9.2
	Standardised approach exposure classes										
7	Central governments and central banks[3]	—	—	—	—	—	—	—	—	—	—
8	Regional governments or local authorities[3]	—	—	—	—	—	—	—	—	—	—
9	Public sector entities[3]	—	—	—	0.1	—	—	—	—	—	—
10	Multilateral development banks	—	—	—	—	—	—	—	—	—	—
11	International organisations	—	—	—	—	—	—	—	—	—	—
12	Institutions	—	—	—	—	—	—	—	—	—	—
13	Corporates	0.9	5.6	26.7	3.9	0.1	7.7	25.2	5.2	3.7	1.7
14	Retail	0.1	—	0.2	—	—	—	0.2	0.1	—	—
15	Secured by mortgages on immovable property	—	—	—	—	—	0.1	—	—	—	—
16	Exposures in default	—	—	0.5	—	—	0.2	0.3	0.1	0.1	—

17	Items associated with particularly high risk	—	—	—	—	—	0.1	—	—	—	—
20	Collective investment undertakings (‘CIU’)	—	—	—	—	—	—	—	—	—	—
21	Equity exposures	—	—	—	—	—	—	—	—	—	0.2
22	Other exposures	—	—	—	—	—	—	—	—	—	—
23	Total standardised approach	1.0	5.6	27.4	4.0	0.1	8.1	25.7	5.4	3.8	1.9
24	Total at 31 Dec 2018	8.9	41.7	260.1	33.2	2.4	41.9	209.1	54.2	28.5	11

Table 22: Concentration of exposures by industry or counterparty types (CRB-D) (continued)

		Real estate	Professional activities	Administ-rative service	Public admin & defence	Education	Human health & social work	Arts & entertain-ment	Other services	Personal	Extra-territorial bodies	
	Net carrying values[1]	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	
	IRB approach exposure classes											
1	Central governments and central banks	—	—	—	153.4	—	0.3	—	0.2	—	36.2	
2	Institutions	—	—	—	0.2	0.1	—	—	—	—	0.1	
3	Corporates	196.6	17.4	56.8	2.6	3.0	5.6	5.4	13.9	0.6	—	
4	Retail	1.0	—	0.4	—	0.1	0.2	0.2	0.1	476.7	—	
6	Total IRB approach	197.6	17.4	57.2	156.2	3.2	6.1	5.6	14.2	477.3	36.3	
	Standardised approach exposure classes											
7	Central governments and central banks[3]	—	—	—	25.5	—	—	—	—	—	9.1	
8	Regional governments or local authorities[3]	—	—	—	7.0	—	—	—	—	—	—	
9	Public sector entities[3]	—	—	—	4.3	0.1	—	—	—	—	—	
10	Multilateral development banks	—	—	—	—	—	—	—	—	—	—	
11	International organisations	—	—	—	—	—	—	—	—	—	1.6	
12	Institutions	—	—	—	—	—	—	—	—	—	—	
13	Corporates	37.0	1.8	29.7	0.4	0.3	1.2	0.6	1.4	2.1	—	
14	Retail	0.1	—	0.2	—	—	—	—	0.1	62.6	—	
15	Secured by mortgages on immovable property	0.5	—	—	—	—	—	—	—	31.3	—	
16	Exposures in default	0.1	—	0.3	—	—	—	—	0.1	1.2	—	
17		0.3	—	0.2	—	—	—	—	—	—	—	

19	Items associated with particularly high risk	—	—	—	—	—	—	—	—	—	—	
20	Collective investment undertakings ('CIU')	—	—	—	—	—	—	—	—	—	—	
21	Equity exposures	—	—	—	—	—	—	—	—	—	—	
22	Other exposures	—	—	0.3	—	—	—	—	—	—	—	
23	Total standardised approach	38.0	1.8	30.7	37.2	0.4	1.2	0.6	1.6	97.2	10.7	
24	Total at 31 Dec 2018	235.6	19.2	87.9	193.4	3.6	7.3	6.2	15.8	574.5	47.0	

Pillar 3 Disclosures at 31 December 2018

Table 22: Concentration of exposures by industry or counterparty types (CRB-D) (continued)

		Agriculture	Mining & oil extrac-tion	Manufac-turing	Utilities	Water supply	Construction	Wholesale & retail trade	Transpor-tation & storage	Accom-modation & food services	Inf co
	Net carrying values[1]	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$b
	IRB approach exposure classes										
1	Central governments and central banks	—	—	—	—	—	—	—	—	—	—
2	Institutions	—	0.3	—	—	—	—	—	—	—	—
3	Corporates	7.3	38.9	226.8	29.3	2.8	31.8	174.0	47.9	21.0	7.7
4	Retail	1.0	—	0.7	—	—	0.3	1.7	0.3	0.4	—
6	Total IRB approach	8.3	39.2	227.5	29.3	2.8	32.1	175.7	48.2	21.4	7.7
	Standardised approach exposure classes										
7	Central governments and central banks[3]	—	—	—	—	—	—	—	—	—	—
8	Regional governments or local authorities[3]	—	—	—	—	—	—	—	—	—	—
9	Public sector entities[3]	—	—	—	—	—	—	—	—	—	—
10	Multilateral development banks	—	—	—	—	—	—	—	—	—	—
11	International organisations	—	—	—	—	—	—	—	—	—	—
12	Institutions	—	—	—	—	—	—	—	—	—	—
13	Corporates	1.3	3.8	26.6	4.8	0.2	7.4	28.0	4.3	3.6	1.9
14	Retail	0.1	—	0.2	—	—	—	0.5	—	—	—
15	Secured by mortgages on immovable property	—	—	—	—	—	0.1	—	—	—	—
16	Exposures in default	0.1	0.1	0.7	—	—	0.2	0.3	—	0.1	—
17		—	—	—	—	—	0.1	—	—	—	—

20	Items associated with particularly high risk Collective investment undertakings (‘CIU’)	—	—	—	—	—	—	—	—	—	—
21	Equity exposures	—	—	0.1	—	—	—	—	—	—	0.5
22	Other exposures	—	—	0.2	—	—	—	—	—	—	—
23	Total standardised approach	1.5	3.9	27.8	4.8	0.2	7.8	28.8	4.3	3.7	2.4
24	Total at 31 Dec 2017	9.8	43.1	255.3	34.1	3.0	39.9	204.5	52.5	25.1	10

Table 22: Concentration of exposures by industry or counterparty types (CRB-D) (continued)

		Real estate	Professional activities	Administ-rative service	Public admin & defence	Education	Human health & social work	Arts & entertain-ment	Other services	Personal	Extra-territorial, bodies
	Net carrying values[1]	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes										
1	Central governments and central banks	—	—	—	139.6	—	0.1	0.1	—	—	27.3
2	Institutions	—	—	—	0.1	—	—	—	—	—	—
3	Corporates	180.0	18.0	53.0	0.8	3.2	6.1	8.3	8.5	—	—
4	Retail	0.7	—	0.7	—	0.1	0.3	0.1	0.4	460.8	—
6	Total IRB approach	180.7	18.0	53.7	140.5	3.3	6.5	8.5	8.9	460.8	27.3
	Standardised approach exposure classes										
7	Central governments and central banks[3]	—	—	—	29.2	—	—	—	—	—	10.3
8	Regional governments or local authorities[3]	—	—	—	2.3	—	—	—	—	—	—
9	Public sector entities[3]	—	—	—	0.4	—	—	—	—	—	—
10	Multilateral development banks	—	—	—	—	—	—	—	—	—	—
11	International organisations	—	—	—	0.3	—	—	—	—	—	1.9
12	Institutions	—	—	—	—	—	—	—	—	—	—
13	Corporates	38.7	1.3	27.0	0.4	0.4	1.3	0.5	1.4	0.6	—
14	Retail	0.6	0.1	0.4	—	—	—	—	0.1	67.0	—
15	Secured by mortgages on immovable property	0.8	—	—	—	—	—	—	—	28.1	—
16	Exposures in default	0.2	—	0.3	—	—	—	—	—	1.3	—
17	Items associated	0.2	—	0.2	—	—	—	—	—	—	—

	with particularly high risk										
20	Collective investment undertakings (‘CIU’)	—	—	—	—	—	—	—	—	—	—
21	Equity exposures	—	—	0.1	—	—	—	—	0.1	—	—
22	Other exposures	—	—	0.1	—	—	—	—	—	—	—
23	Total standardised approach	40.5	1.4	28.1	32.6	0.4	1.3	0.5	1.6	97.0	12.2
24	Total at 31 Dec 2017	221.2	19.4	81.8	173.1	3.7	7.8	9.0	10.5	557.8	39.5

1 Securitisation positions and non-credit obligation assets are not included in this table.

2 We have restated the comparative period to include within the Financial and Insurance sector $23.8bn exposure in the form of non-customer assets that are neither securitisation nor non-credit obligation assets.

3 Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments and central banks’.

Pillar 3 Disclosures at 31 December 2018

Table 23: Maturity of on-balance sheet exposures (CRB-E)

		Net carrying values[1]					
		On demand	Less than 1 year	Between 1 and 5 years	More than 5 years	Undated	Total
		$bn	$bn	$bn	$bn	$bn	$bn
	IRB approach exposure classes						
1	Central governments and central banks	38.0	149.5	93.8	47.3	—	328.6
2	Institutions	10.1	35.1	23.4	0.9	—	69.5
3	Corporates	59.1	183.7	221.0	62.5	—	526.3
4	Retail	21.5	7.3	38.0	267.3	—	334.1
6	Total IRB approach	128.7	375.6	376.2	378.0	—	1,258.5
	Standardised approach exposure classes						
7	Central governments and central banks[2]	75.5	50.5	22.9	8.8	5.2	162.9
8	Regional governments or local authorities[2]	0.8	0.9	3.9	1.4	—	7.0
9	Public sector entities[2]	—	2.6	7.3	2.2	—	12.1
10	Multilateral development banks	—	—	0.2	—	—	0.2
11	International organisations	—	0.8	0.3	0.5	—	1.6
12	Institutions	0.1	0.3	2.9	—	—	3.3
13	Corporates	3.9	44.0	36.5	6.6	—	91.0
14	Retail	6.8	2.0	7.0	4.5	—	20.3
15	Secured by mortgages on immovable property	—	1.9	5.0	23.7	—	30.6
16	Exposures in default	0.3	0.9	1.1	0.5	—	2.8
17	Items associated with particularly high risk	—	0.1	0.7	0.1	1.6	2.5
20	Collective investment undertakings (‘CIU’)	—	—	—	—	0.6	0.6
21	Equity exposures	—	—	—	—	15.6	15.6
22	Other exposures	—	2.7	—	0.2	7.6	10.5
23	Total standardised approach	87.4	106.7	87.8	48.5	30.6	361.0
24	Total at 31 Dec 2018	216.1	482.3	464.0	426.5	30.6	1,619.5
	IRB approach exposure classes						
1	Central governments and central banks	38.8	139.9	82.2	44.9	—	305.8
2	Institutions	6.5	51.5	22.1	0.8	—	80.9
3	Corporates	60.6	163.7	214.3	62.6	—	501.2
4	Retail	21.1	10.0	38.8	254.1	—	324.0
6	Total IRB approach	127.0	365.1	357.4	362.4	—	1,211.9
	Standardised approach exposure classes						
7	Central governments and central banks[2]	41.7	99.2	40.1	10.9	5.0	196.9
8	Regional governments or local authorities[2]	0.8	0.4	0.2	1.9	—	3.3
9	Public sector entities[2]	—	0.1	—	0.1	—	0.2
10	Multilateral development banks	—	0.1	—	0.2	—	0.3
11	International organisations	—	0.4	1.3	0.5	—	2.2
12	Institutions	0.1	1.5	1.5	0.3	—	3.4
13	Corporates	3.8	53.3	23.6	7.9	—	88.6
14	Retail	7.7	3.5	9.5	3.1	—	23.8
15	Secured by mortgages on immovable property	—	2.0	4.9	20.9	—	27.8
16	Exposures in default	0.3	1.1	1.0	0.7	—	3.1

17 Items associated with particularly high risk	—	0.1	0.7	0.4	0.9	2.1
20 Collective investment undertakings (‘CIU’)	—	—	—	0.1	0.5	0.6
21 Equity exposures	—	—	—	—	16.0	16.0
22 Other exposures	—	0.1	—	0.2	10.8	11.1
23 Total standardised approach	54.4	161.8	82.8	47.2	33.2	379.4
24 Total at 31 Dec 2017	181.4	526.9	440.2	409.6	33.2	1,591.3

1 Securitisation positions and non-credit obligation assets are not included in this table.

2 Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments and central banks’.

Past due unimpaired and credit-impaired exposures

Table 24 analyses past due unimpaired and credit-impaired exposures on a regulatory consolidation basis using accounting values. There are no material differences between the regulatory and accounting scope of consolidation. Credit-impaired (stage 3) exposures are disclosed on page 101 of the Annual Report and Accounts 2018.

The Group’s definitions for accounting purposes of ‘past due’ and ‘credit impaired’ are set out on pages 90, 103 and in Note 1.2(i) of the Annual Report and Accounts 2018.

All amounts past due more than 90 days are considered credit impaired even where regulatory rules deem default as 180 days past due.

Table 24: Amount of past due unimpaired and credit-impaired exposures by geographical region

	Europe	Asia	MENA	North America	Latin America	Total
At 31 Dec 2018	$bn	$bn	$bn	$bn	$bn	$bn
Past due	5.0	5.2	3.3	2.3	1.3	17.1
– personal	2.1	2.6	0.8	1.5	0.6	7.6
– corporate and commercial	2.9	2.4	2.3	0.8	0.7	9.1
– financial	—	0.2	0.2	—	—	0.4

Risk mitigation

Our approach when granting credit facilities is to do so on the basis of capacity to repay, rather than placing primary reliance on credit risk mitigants. Depending on a customer's standing and the type of product, facilities may be provided unsecured.

Mitigation of credit risk is a key aspect of effective risk management and takes many forms. Our general policy is to promote the use of credit risk mitigation, justified by commercial prudence and capital efficiency. Detailed policies cover the acceptability, structuring and terms with regard to the availability of credit risk mitigation such as in the form of collateral security. These policies, together with the setting of suitable valuation parameters, are subject to regular review to ensure that they are supported by empirical evidence and continue to fulfil their intended purpose.

Collateral

The most common method of mitigating credit risk is to take collateral. In our retail residential and commercial real estate ('CRE') businesses, a mortgage over the property is usually taken to help secure claims. Physical collateral is also taken in various forms of specialised lending and leasing transactions where income from the physical assets that are financed is also the principal source of facility repayment. In the commercial and industrial sectors, charges are created over business assets such as premises, stock and debtors. Loans to private banking clients may be made against a pledge of eligible marketable securities, cash or real estate. Facilities to small- and medium-sized enterprises ('SMEs') are commonly granted against guarantees given by their owners and/or directors.

For credit risk mitigants comprising immovable property, the key determinant of concentration at Group level is geographic. Use of immovable property mitigants for risk management purposes is predominantly in Asia and Europe. Further information regarding collateral held over CRE and residential property is provided on pages 109 and 117, respectively, of the Annual Report and Accounts 2018.

Financial collateral

In the institutional sector, trading facilities are supported by charges over financial instruments, such as cash, debt securities and equities. Financial collateral in the form of marketable securities is used in much of the Group's derivatives activities and in securities financing transactions, such as repos, reverse repos, securities lending and borrowing. Netting is used extensively and is a prominent feature of market standard documentation.

Further information regarding collateral held for trading exposures is on page 81.

In the non-trading book, we provide customers with working capital management products. Some of these products have loans and advances to customers, and customer accounts where we have rights of offset and comply with the regulatory requirements for on-balance sheet netting. Under on-balance sheet netting, the customer accounts are treated as cash collateral and the effects of this collateral are incorporated in our LGD estimates. For risk management purposes, the net amounts of such exposures are subject to limits and the relevant customer agreements are subject to review to ensure the legal right of offset remains appropriate. At 31 December 2018, $35bn of customer accounts were treated as cash collateral, mainly in the UK.

Other forms of credit risk mitigation

Our Global Banking and Markets ('GB&M') business utilises credit risk mitigation to manage the credit risk of its portfolios, with the goal of reducing concentrations in individual names, sectors or portfolios. The techniques in use include credit default swap ('CDS') purchases, structured credit notes and securitisation structures. Buying credit protection creates credit exposure against the protection provider, which is monitored as part of the overall credit exposure to them. Where applicable, the transaction is entered into directly with a central clearing house counterparty;

otherwise our exposure to CDS protection providers is diversified among mainly banking counterparties with strong credit ratings. In our corporate lending, we also take guarantees from corporates and export credit agencies ('ECA'). Corporates would normally provide guarantees as part of a parent/subsidiary or common parent relationship and would span a number of credit grades. The ECAs will normally be investment grade.

Policy and procedures

Policies and procedures govern the protection of our position from the outset of a customer relationship; for instance, in requiring standard terms and conditions or specifically agreed documentation permitting the offset of credit balances against debt obligations, and through controls over the integrity, current valuation and, if necessary, realisation of collateral security.

Valuing collateral

Valuation strategies are established to monitor collateral mitigants to ensure that they will continue to provide the anticipated secure secondary repayment source. Where collateral is subject to high volatility, valuation is frequent; where stable, less so. For market trading activities such as collateralised over-the-counter ('OTC') derivatives and securities financing transactions ('SFTs'), we typically carry out daily valuations. In the residential mortgage business, Group policy prescribes revaluation at intervals of up to three years, or more frequently as the need arises; for example, where market conditions are subject to significant change. Residential property collateral values are determined through a combination of professional appraisals, house price indices or statistical analysis.

Local market conditions determine the frequency of valuation for CRE. Revaluations are sought where, for example, material concerns arise in relation to the performance of the collateral. CRE revaluation also occurs commonly in circumstances where an obligor's credit quality has declined sufficiently to cause concern that the principal payment source may not fully meet the obligation.

Recognition of risk mitigation under the IRB approach

Within an IRB approach, risk mitigants are considered in two broad categories:

- those which reduce the intrinsic PD of an obligor and therefore operate as determinants of PD; and
- those which affect the estimated recoverability of obligations and require adjustment of LGD or, in certain limited circumstances, EAD.

The first category typically includes full parental guarantees – where one obligor within a group guarantees another. It is assumed that the guarantor's performance materially informs the PD of the guaranteed entity. PD estimates are also subject to a 'sovereign ceiling', constraining the risk ratings assigned to

obligors in countries of higher risk, and where only partial parental support exists. In certain jurisdictions, certain types of third-party guarantee are recognised by substituting the obligor's PD with that of the guarantor.

In the second category, LGD estimates are affected by a wider range of collateral, including cash, charges over real estate property, fixed assets, trade goods, receivables and floating charges such as mortgage debentures. Unfunded mitigants, such as third-party guarantees, are also considered in LGD estimates where there is evidence that they reduce loss expectation.

The main types of provider of guarantees are banks, other financial institutions and corporates. The creditworthiness of providers of unfunded credit risk mitigation is taken into consideration as part of the guarantor's risk profile. Internal limits for such contingent exposure are approved in the same way as direct exposures.

EAD and LGD values, in the case of individually assessed exposures, are determined by reference to regionally approved internal risk parameters based on the nature of the exposure. For retail portfolios, credit risk mitigation data is incorporated into the internal risk parameters for exposures and feeds into the calculation of the expected loss ('EL') band value summarising both customer delinquency and product or facility risk. Credit and credit risk mitigation data form inputs submitted by all Group offices to centralised databases. A range of collateral recognition approaches are applied to IRB capital treatments:

- Unfunded protection, which includes credit derivatives and guarantees, is reflected through adjustment or determination of PD or LGD. Under the IRB advanced approach, recognition may be through PD or LGD.
- Eligible financial collateral under the IRB advanced approach is recognised in LGD models. Under the IRB foundation approach, regulatory LGD values are adjusted. The adjustment to LGD is based on the degree to which the exposure value would be

adjusted notionally if the financial collateral comprehensive method were applied.

- For all other types of collateral, including real estate, the LGD for exposures under the IRB advanced approach is calculated by models. For IRB foundation, base regulatory LGDs are adjusted depending on the value and type of the asset taken as collateral relative to the exposure. The types of eligible mitigant recognised under the IRB foundation approach are more limited.

Table 54 in Appendix I sets out, for IRB exposures, the exposure value and the effective value of credit risk mitigation expressed as the exposure value covered by the credit risk mitigant. IRB credit risk mitigation reductions of EAD were immaterial at 31 December 2018.

Recognition of risk mitigation under the standardised approach

Where credit risk mitigation is available in the form of an eligible guarantee, non-financial collateral or a credit derivative, the exposure is divided into covered and uncovered portions. The covered portion is determined after applying an appropriate 'haircut' for currency and maturity mismatches (and for omission of restructuring clauses in credit derivatives, where appropriate) to the amount of the protection provided and attracts the risk weight of the protection provider. The uncovered portion attracts the risk weight of the obligor.

The value of exposure fully or partially covered by eligible financial collateral is adjusted under the financial collateral comprehensive method using supervisory volatility adjustments (including those for currency mismatch) which are determined by the specific type of collateral (and its credit quality, in the case of eligible debt securities) and its liquidation period. The adjusted exposure value is subject to the risk weight of the obligor.

Table 25: Credit risk mitigation techniques – overview (CR3)

		Exposures unsecured: carrying amount	Exposures secured: carrying amount	Exposures secured by collateral	Exposures secured by financial guarantees	Exposures secured by credit derivatives
		$bn	$bn	$bn	$bn	$bn
1	Loans	641.2	596.8	494.0	102.1	0.7
2	Debt securities	316.1	32.4	27.2	5.2	—
3		957.3	629.2	521.2	107.3	0.7

	Total at 31 Dec 2018					
4	Of which: defaulted	6.3	4.6	4.1	0.4	—
1	Loans	657.7	574.8	478.9	93.8	2.1
2	Debt securities	301.0	24.1	18.7	5.4	—
3	Total at 31 Dec 2017	958.7	598.9	497.6	99.2	2.1
4	Of which: defaulted	6.5	5.1	4.8	0.3	—

Table 26: Standardised approach – credit conversion factor ('CCF') and credit risk mitigation ('CRM') effects (CR4)

		Exposures before CCF and CRM		Exposures post-CCF and CRM		RWAs and RWA density	
		On-balance sheet amount	Off-balance sheet amount	On-balance sheet amount	Off-balance sheet amount	RWAs	RWA density
		$bn	$bn	$bn	$bn	$bn	%
	Asset classes[1]						
1	Central governments or central banks[2]	162.7	1.0	170.8	1.1	12.5	7
2	Regional governments or local authorities[2]	7.0	0.3	7.0	0.1	1.3	19
3	Public sector entities[2]	12.1	0.1	12.0	—	—	—
4	Multilateral development banks	0.2	—	0.2	—	—	2
5	International organisations	1.6	—	1.6	—	—	—
6	Institutions	3.3	0.1	2.3	—	1.2	52
7	Corporates	91.2	88.3	72.0	12.2	79.2	94
8	Retail	20.5	43.5	19.7	0.2	14.8	74
9	Secured by mortgage on immovable property	30.6	1.4	30.6	0.3	11.3	37
10	Exposures in default	3.3	0.2	3.3	—	3.8	117
11	Higher-risk categories	2.5	2.3	2.4	2.2	6.9	150
14	Collective investment undertakings	0.6	—	0.6	—	0.6	100
15	Equity	15.7	—	15.7	—	35.0	223
16	Other items	10.5	0.8	10.5	0.8	6.6	58
17	Total at 31 Dec 2018	361.8	138.0	348.7	16.9	173.2	47
1	Central governments or central banks[2]	196.9	1.2	203.4	0.8	12.7	6
2	Regional governments or local authorities[2]	3.3	0.5	3.3	0.2	1.0	29
3	Public sector entities[2]	0.2	0.2	0.1	—	0.1	79
4	Multilateral development banks	0.3	—	0.3	—	—	5
5	International organisations	2.2	—	2.2	—	—	—
6	Institutions	3.4	0.1	2.5	—	1.2	50
7	Corporates	88.6	83.7	71.8	11.8	78.3	94
8	Retail	23.8	46.8	21.9	0.3	16.5	74
9	Secured by mortgage on immovable property	27.8	1.2	27.9	0.2	10.4	37
10	Exposures in default	3.1	0.3	3.0	0.1	3.9	127
11	Higher-risk categories	2.1	1.8	2.0	1.8	5.7	150
14	Collective investment undertakings	0.6	—	0.5	—	0.6	100
15	Equity	16.0	—	16.0	—	36.1	225
16	Other items	11.1	0.8	11.2	0.8	6.4	54
17	Total at 31 Dec 2017	379.4	136.6	366.1	16.0	172.9	45

1 Securitisation positions are not included in this table.

2

Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments or central banks’.

Pillar 3 Disclosures at 31 December 2018

Table 27: Standardised approach – exposures by asset class and risk weight (CR5)

	Risk weight ('RW%')	0%	2%	20%	35%	50%	70%	75%	100%	150%	250%	Deducted	Total credit exposure amount (post-CCF and CRM)	Of which unrated
		$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn	$bn
	Asset classes[1]													
1	Central governments or central banks[2]	166.5	—	0.2	—	0.1	—	—	0.1	—	5.0	—	171.9	5.0
2	Regional governments or local authorities[2]	2.8	—	3.5	—	0.5	—	—	0.3	—	—	—	7.1	0.5
3	Public sector entities[2]	12.0	—	—	—	—	—	—	—	—	—	—	12.0	—
4	Multilateral development banks	0.2	—	—	—	—	—	—	—	—	—	—	0.2	—
5	International organisations	1.6	—	—	—	—	—	—	—	—	—	—	1.6	—
6	Institutions	—	0.1	0.4	—	1.4	—	—	0.4	—	—	—	2.3	0.2
7	Corporates	—	—	3.6	0.3	3.4	0.5	—	75.6	0.8	—	—	84.2	59.1
8	Retail	—	—	—	—	—	—	19.9	—	—	—	—	19.9	19.9
9	Secured by mortgage on immovable property	—	—	—	30.2	—	—	—	0.7	—	—	—	30.9	30.9
10	Exposures in default	—	—	—	—	—	—	—	2.2	1.1	—	—	3.3	3.3
11	Higher-risk categories	—	—	—	—	—	—	—	—	4.6	—	—	4.6	4.6
14	Collective investment undertakings	—	—	—	—	—	—	—	0.6	—	—	—	0.6	0.6
15	Equity	—	—	—	—	—	—	—	2.8	—	12.9	—	15.7	15.7
16	Other items	—	—	5.9	—	—	—	—	5.4	—	—	—	11.3	11.3
17	Total at 31 Dec 2018	183.1	0.1	13.6	30.5	5.4	0.5	19.9	88.1	6.5	17.9	—	365.6	151.1
1	Central governments or central banks[2]	198.9	—	0.1	—	0.2	—	—	—	—	5.0	—	204.2	5.0
2	Regional governments or local authorities[2]	—	—	2.6	—	0.7	—	—	0.2	—	—	—	3.5	0.6
3	Public sector entities[2]	—	—	—	—	—	—	—	0.1	—	—	—	0.1	0.1
4	Multilateral development banks	0.2	—	0.1	—	—	—	—	—	—	—	—	0.3	0.3
5	International organisations	2.2	—	—	—	—	—	—	—	—	—	—	2.2	—
6	Institutions	—	0.1	0.4	—	1.7	—	—	0.3	—	—	—	2.5	0.3
7	Corporates	—	—	3.8	0.2	3.9	0.5	—	74.5	0.7	—	—	83.6	72.4
8	Retail	—	—	—	—	—	—	22.2	—	—	—	—	22.2	22.2
9	Secured by mortgage on immovable property	—	—	—	27.3	—	—	—	0.8	—	—	—	28.1	28.1
10	Exposures in default	—	—	—	—	—	—	—	1.5	1.6	—	—	3.1	3.1
11	Higher-risk categories	—	—	—	—	—	—	—	—	3.8	—	—	3.8	3.8
14	Collective investment undertakings	—	—	—	—	—	—	—	0.5	—	—	—	0.5	0.5

15 Equity	—	—	—	—	—	—	—	2.6	—	13.4	—	16.0	16.0
16 Other items	0.2	—	6.7	—	—	—	—	5.1	—	—	—	12.0	12.0
17 Total at 31 Dec 2017	201.5	0.1	13.7	27.5	6.5	0.5	22.2	85.6	6.1	18.4	—	382.1	164.4

1 Securitisation positions are not included in this table.

2 Standardised exposures to EEA ‘regional governments and local authorities’ and ‘public sector entities’ are reported separately in 2018. In previous years, these exposures were grouped with ‘central governments or central banks’.

Table 28: IRB – Effect on RWA of credit derivatives used as CRM techniques (CR7)

		At 31 Dec[1]			
		2018		2017	
		Pre-credit derivatives RWAs	Actual RWAs	Pre-credit derivatives RWAs	Actual RWAs
	Footnotes	$bn	$bn	$bn	$bn
1 Exposures under FIRB		30.5	30.5	28.4	28.4
3 Institutions		0.2	0.2	0.1	0.1
6 Corporates – other		30.3	30.3	28.3	28.3
7 Exposures under AIRB	2	480.0	479.0	469.8	468.6
8 Central governments and central banks		36.9	36.9	33.9	33.9
9 Institutions		14.2	14.2	17.6	17.6
11 Corporates – specialised lending		27.0	27.0	28.7	28.7
12 Corporates – other		319.1	318.1	310.7	309.5
13 Retail – Secured by real estate SMEs		1.8	1.8	0.5	0.5
14 Retail – Secured by real estate non-SMEs		37.2	37.2	33.2	33.2
15 Retail – Qualifying revolving		17.3	17.3	16.0	16.0
16 Retail – Other SMEs		4.8	4.8	5.9	5.9
17 Retail – Other non-SMEs		10.9	10.9	10.1	10.1
19 Other non-credit obligation assets		10.8	10.8	13.2	13.2
20 Total		510.5	509.5	498.2	497.0

1 From 31 Dec 2018, we report all IRB exposures in the above table, instead of only those entities that have credit derivatives. Prior year has been restated for comparability.

2 Securitisation positions are not included in this table.

Table 29: Credit derivatives exposures (CCR6)

		At 31 Dec 2018		2017	
	Footnote	Protection bought $bn	Protection sold $bn	Protection bought $bn	Protection sold $bn
Notionals					
Credit derivative products used for own credit portfolio					
– Index credit default swaps		2.3	—	6.3	3.7
Total notionals used for own credit portfolio		2.3	—	6.3	3.7
Credit derivative products used for intermediation	1				
– Index credit default swaps		168.6	154.0	195.5	176.0
– Total return swaps		14.6	6.9	7.8	12.2
Total notionals used for intermediation		183.2	160.9	203.3	188.2
Total credit derivative notionals		185.5	160.9	209.6	191.9
Fair values					
– Positive fair value (asset)		2.6	1.2	0.8	4.3
– Negative fair value (liability)		(1.4)	(2.4)	(4.4)	(1.0)

1 This is where we act as an intermediary for our clients, enabling them to take a position in the underlying securities. This does not increase risk for HSBC.

Table 29 shows the credit derivative exposures that HSBC holds, split between those amounts due to client intermediation and those amounts booked as part of HSBC's own credit portfolio. Where the credit derivative is used to hedge our own portfolio, no counterparty credit risk capital requirement arises.

For a discussion on hedging risk and monitoring the continuing effectiveness of hedges, refer to Note 1.2(h) of the Annual Report and Accounts 2018.

Global risk

Application of the IRB approach

Our Group IRB credit risk rating framework incorporates obligor propensity to default expressed in PD, and loss severity in the event of default expressed in EAD and LGD. These measures are used to calculate regulatory EL and capital requirements. They are also used with other inputs to inform rating assessments for the purposes of credit approval and many other purposes, for example:

- credit approval and monitoring: IRB models are used in the assessment of customer and portfolio risk in lending decisions;
- risk appetite: IRB measures are an important element in identifying risk exposure at customer, sector and portfolio level;
- pricing: IRB parameters are used in pricing tools for new transactions and reviews; and
- economic capital and portfolio management: IRB parameters are used in the economic capital model that has been implemented across HSBC.

Roll-out of the IRB approach

With the PRA's permission, we have adopted the advanced IRB approach for the majority of our business. At the end of 2018, portfolios in much of Europe, Asia and North America were on advanced IRB approaches. Others remain on the standardised or foundation approaches pending the development of models for the PRA's approval in line with our IRB roll-out plans where the primary focus is on corporate and retail exposures.

At 31 December 2018, 77% of the exposures were treated under AIRB, 3% under FIRB and 20% under the standardised approach.

EL and credit risk adjustments

We analyse credit loss experience in order to assess the performance of our risk measurement and control processes, and to inform our understanding of the implications for risk and capital

management of dynamic changes occurring in the risk profile of our exposures.
When comparing regulatory EL with measures of ECL under IFRS 9, differences in the definition and scope of each should be considered. These differences can give rise to material differences in the way economic, business and methodological drivers are reflected quantitatively in the accounting and regulatory measures of loss.
In general, HSBC calculates ECL using three main components namely a probability of default, a loss given default, and the exposure at default.
ECLs include impairment allowances (or provisions, in the case of commitments and guarantees) for the 12-month period ('12-month ECL'), for the lifetime ('lifetime ECL') and on financial assets that are considered to be in default or otherwise credit impaired.
ECLs resulting from default events that are possible:
- within the next 12 months are recognised for financial instruments in stage 1; and
- beyond 12 months ('lifetime ECL') are recognised for financial instruments in stages 2 & 3.

An assessment of whether credit risk has increased significantly since initial recognition is performed at each reporting period by considering the change in the risk of default occurring over the remaining life of the financial instrument.
Unless identified at an earlier stage, all financial assets are deemed to have suffered a significant increase in credit risk when 30 days past due.
Change in ECL and other credit impairment charges represents the movement in the ECL during the year including write-offs, recoveries and foreign exchange. EL represents the one-year regulatory expected loss accumulated in the book at the balance sheet date.
Credit risk adjustments ('CRAs') encompass the impairment allowances or provisions balances, and changes in ECL and other credit impairment charges.
Table 52 in Appendix I sets out for IRB credit exposures the EL, CRA balances and actual loss experience reflected in the charges for CRAs.
HSBC leverages the Basel IRB framework where possible, with recalibration to meet the differing IFRS 9 requirements as follows:

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	Regulatory capital	IFRS 9
PD	• Through the cycle (represents long-run average PD throughout a full economic cycle) • The definition of default includes a backstop of 90+ days past due, although this has been modified to 180+ days past due for some portfolios, particularly UK and US mortgages	• Point in time (based on current conditions, adjusted to take into account estimates of future conditions that will impact PD) • Default backstop of 90+ days past due for all portfolios
EAD	• Cannot be lower than current balance	• Amortisation captured for term products
LGD	• Downturn LGD (consistent losses expected to be suffered during a severe but plausible economic downturn) • Regulatory floors may apply to mitigate risk of underestimating downturn LGD due to lack of historical data	• Expected LGD (based on estimate of loss given default including the expected impact of future economic conditions such as changes in value of collateral) • No floors
Other	• Discounted using cost of capital • All collection costs included	• Discounted using the original effective interest rate of the loan • Only costs associated with obtaining/selling collateral included • Discounted back from point of default to balance sheet date

Qualitative disclosures on banks' use of external credit ratings under the standardised approach for credit risk

The standardised approach is applied where exposures do not qualify for use of an IRB approach and/or where an exemption from IRB has been granted. The standardised approach requires banks to use risk assessments prepared by external credit assessment institutions ('ECAIs') or ECAs to determine the risk weightings applied to rated counterparties.

ECAI risk assessments are used within the Group as part of the determination of risk weightings for the following classes of exposure:

- central governments and central banks;
- regional governments and local authorities;
- institutions;
- corporates;
- securitisation positions; and
- short-term claims on institutions and corporates.

We have nominated three ECAIs for this purpose – Moody's Investor Service ('Moody's'), Standard and Poor's rating agency ('S&P') and Fitch Ratings ('Fitch'). In addition to this, we use DBRS ratings specifically for securitisation positions. We have not nominated any ECAs.

Data files of external ratings from the nominated ECAIs are matched with customer records in our centralised credit database.

When calculating the risk-weighted value of an exposure using ECAI risk assessments, risk systems identify the customer in question and look up the available ratings in the central database according to the rating selection rules. The systems then apply the prescribed credit quality step mapping to derive from the rating the relevant risk weight. All other exposure classes are assigned risk weightings as prescribed in the PRA's Rulebook.

Credit quality step	Moody's assessment	S&P's assessment	Fitch's assessment	DBRS assessment
1	Aaa to Aa3	AAA to AA–	AAA to AA–	AAA to AAL
2	A1 to A3	A+ to A–	A+ to A–	AH to AL
3	Baa1 to Baa3	BBB+ to BBB–	BBB+ to BBB–	BBBH to BBBL
4	Ba1 to Ba3	BB+ to BB–	BB+ to BB–	BBH to BBL
5	B1 to B3	B+ to B–	B+ to B–	BH to BL
6	Caa1 and below	CCC+ and below	CCC+ and below	CCCH and below

Exposures to, or guaranteed by, central governments and central banks of European Economic Area ('EEA') states and denominated in local currency are risk-weighted at 0% using the standardised approach, provided they would be eligible under that approach for a 0% risk weighting.

Wholesale risk

The wholesale risk rating system

This section describes how we operate our credit risk analytical models and use IRB metrics in the wholesale customer business.

PDs for wholesale customer segments (that is central governments and central banks, financial institutions and corporate customers) and for certain individually assessed personal customers are derived from a customer risk rating ('CRR') master scale of 23 grades. Of these, 21 are non-default grades representing varying degrees of strength of financial condition, and two are default grades. Each CRR has a PD range associated with it as well as a mid-point PD.

The score generated by a credit risk rating model for the obligor is mapped to a corresponding PD and master-scale CRR. The CRR is then reviewed by a credit approver who, taking into account information such as the most recent events and market data, makes the final decision on the rating. The rating assigned reflects the approver's overall view of the obligor's credit standing.

The mid-point PD associated with the finally assigned CRR is then used in the regulatory capital calculation.

Relationship managers may propose a different CRR from that indicated through an override process which must be approved by the Credit function. Overrides for each model are recorded and monitored as part of the model management process.

The CRR is assigned at an obligor level, which means that separate exposures to the same obligor are generally subject to a single, consistent rating. Unfunded credit risk mitigants, such as guarantees, may also influence the final assignment of a CRR to an obligor. The effect of unfunded risk mitigants is considered for IRB approaches in table 54 and for the standardised approach in table 55.

If an obligor is in default on any material credit obligation to the Group, all of the obligor's facilities from the Group are considered to be in default.

Under the IRB approach, obligors are grouped into grades that have similar PD or anticipated default frequency. The anticipated default frequency may be estimated using all relevant information at the relevant date (PIT rating system) or be free of the effects of the credit cycle (TTC rating system).

We generally utilise a hybrid approach of PIT and through the cycle ('TTC'). That is, while models are calibrated to long-run default rates, obligor ratings are reviewed annually, or more frequently if necessary, to reflect changes in their circumstances and/or their economic operating environment.

Our policy requires approvers to downgrade ratings on expectations, but to upgrade them only on performance. This leads to expected defaults typically exceeding actual defaults.

For EAD and LGD estimation, operating entities are permitted, subject to overview by Group Risk, to use their own modelling approaches to suit conditions in their jurisdictions. Group Risk provides co-ordination, benchmarks, and promotion of best practice on EAD and LGD estimation.

EAD is estimated to a 12-month forward time horizon and represents the current exposure, plus an estimate for future increases in exposure and the realisation of contingent exposures post-default.

LGD is based on the effects of facility and collateral structure on outcomes post-default. This includes such factors as the type of client, the facility seniority, the type and value of collateral, past recovery experience and priority under law. It is expressed as a percentage of EAD.

Wholesale models

To determine credit ratings for the different types of wholesale obligor, multiple models and scorecards are used for PD, LGD, and

EAD. These models may be differentiated by region, customer segment and/or customer size. For example, PD models are differentiated for all of our key customer segments, including sovereigns, financial institutions, and large-, medium- and small-sized corporates.

Global PD models have been developed for asset classes or clearly identifiable segments of asset classes where the customer relationship is managed globally; for example, sovereigns, financial institutions and the largest corporate clients that typically operate internationally.

Local PD models, specific to a particular country, region, or sector, are developed for other obligors. These include corporate clients when they show distinct characteristics in common in a particular geography.

The two major drivers of model methodology are the nature of the portfolio and the availability of internal or external data on historical defaults and risk factors. For some historically low-default portfolios, e.g. sovereign and financial institutions, a model will rely more heavily on external data and/or the input of an expert panel. Where sufficient data is available, models are built on a statistical basis, although the input of expert judgement may still form an important part of the overall model development methodology.

Most LGD and EAD models are developed according to local circumstances, considering legal and procedural differences in the recovery and workout processes. Our approach to EAD and LGD also encompasses global models for central governments and central banks, and for institutions, as exposures to these customer types are managed centrally by Global Risk. The PRA requires all firms to apply an LGD floor of 45% for senior unsecured exposure to sovereign entities. This floor was applied to reflect the relatively few loss observations across all firms in relation to these obligors. This floor is applied for the purposes of regulatory capital reporting.

The PRA has published guidance on the appropriateness of LGD models for low default portfolios. It states there should be at least 20 defaults per country per collateral type for LGD models to be approved. Where there are insufficient defaults, an LGD floor will be applied. As a result, in 2018, we continued to apply LGD floors for our banks portfolio and some Asian corporate portfolios where there were insufficient loss observations.

In the same guidance, the PRA also indicated that it considered income-producing real estate to be an asset class that would be difficult to model. As a result, RWAs for our UK CRE portfolio and US income-producing CRE portfolio are calculated using the supervisory slotting approach. Under the supervisory slotting approach the bank allocates exposures to one of five categories. Each category then fixed pre-determined RWA and EL percentages.

Local models for the corporate exposure class are developed using various data inputs, including collateral information and geography (for LGD) and product type (for EAD). The most material corporate models are the UK and Asia models, all of which are developed using more than 10-years' worth of data. The LGD models are calibrated to a period of credit stress or downturn in economic conditions.

None of the EAD models is calibrated for a downturn, as analysis shows that utilisation decreases during a downturn because credit stress is accompanied by more intensive limit monitoring and facility reduction.

Table 30 sets out the key characteristics of the significant wholesale credit risk models that drive the capital calculation split by regulatory wholesale asset class, with their associated RWAs, including the number of models for each component, the model method or approach and the number of years of loss data used.

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Table 30: Wholesale IRB credit risk models

Regulatory asset classes measured	RWAs for associated asset class $bn	Component	Number of significant models	Model description and methodology	Number of years loss data	Regulatory Floors
Central governments and central banks	36.9	PD	1	A shadow rating approach that includes macroeconomic and political factors, constrained with expert judgement.	>10	No
		LGD	1	An unsecured model built on assessment of structural factors that influence the country's long-term economic performance. For unsecured LGD, a floor of 45% is applied.	8	45%
		EAD	1	A cross-classification model that uses both internal data and expert judgement, as well as information on similar exposure types from other asset classes.	8	EAD must be at least equal to the current utilisation of the balance at account level
Institutions	14.4	PD	1	A statistical model that combines quantitative analysis on financial information with expert inputs and macroeconomic factors.	10	PD >0.03%
		LGD	1	A quantitative model that produces both downturn and expected LGD. Several securities types are included in the model to recognise collateral in the LGD calculation. For unsecured LGD, a floor of 45% is applied.	10	45%
		EAD	1	A quantitative model that assigns credit conversion factors ('CCF') taking into account product types and committed/uncommitted indicator to calculate EAD using current utilisation and available headroom.	10	EAD must be at least equal to the current utilisation of the balance at account level
Corporates[1]	353.3					
Global large corporates		PD	1	A statistical model built on 15 years of data. The model uses financial information, macroeconomic information and market-driven data, and is complemented by a qualitative assessment.	15	PD >0.03%
Other regional / local corporates		PD	11	Corporates that fall below the global large corporate threshold are rated through regional/local PD models, which reflect regional/local circumstances. These models use financial information, behavioural data and qualitative information to derive a statistically built PD.	>10	
		PD	10		10	PD >0.03%

Non-bank financial institutions			Predominantly statistical models that combines quantitative analysis on financial information with expert inputs.		
All corporates	LGD	7	Regional/local statistical models covering all corporates, including global large corporates, developed using historical loss/recovery data and various data inputs, including collateral information, customer type and geography.	>7	UK 45%
	EAD	5	Regional/local statistical models covering all corporates, including global large corporates, developed using historical utilisation information and various data inputs, including product type and geography.	>7	EAD must be at least equal to the current utilisation of the balance at account level

1 Excludes specialised lending exposures subject to supervisory slotting approach (see table 60).

Table 31: IRB models – estimated and actual values (wholesale)[1]

		PD[2]		LGD[3]		EAD[4]	
		Estimated	Actuals	Estimated[5]	Actuals[5]	Estimated	Actuals
	Footnotes	%	%	%	%	%	%
2018							
– Sovereigns model	6	2.37	—	—	—	—	—
– Banks model		1.31	—	—	—	—	—
– Corporates models	7	1.61	0.87	30.47	21.69	0.38	0.33
2017							
– Sovereigns model	6	2.24	—	—	—	—	—
– Banks model		1.72	—	—	—	—	—
– Corporates models	7	1.72	0.96	27.75	25.45	0.39	0.36
2016							
– Sovereigns model	6	3.43	—	—	—	—	—
– Banks model		1.63	—	—	—	—	—
– Corporates models	7	1.79	1.23	37.71	29.43	0.91	0.76
2015							
– Sovereigns model	6	1.72	1.12	45.00	—	0.07	—
– Banks model		2.22	—	—	—	—	—
– Corporates models	7	1.89	1.26	37.74	21.52	0.60	0.55
2014							
– Sovereigns model	6	2.27	—	—	—	—	—
– Banks model		3.28	—	—	—	—	—
– Corporates models	7	1.88	1.16	36.83	16.06	0.47	0.34
2013							
– Sovereigns model	6	4.14	—	—	—	—	—
– Banks model		3.18	0.20	40.01	—	0.06	0.04
– Corporates models	7	2.63	1.20	33.09	18.69	0.54	0.48

1 Data represents an annual view, analysed at 30 September.

2 Estimated PD for all models is average PD calculated on the number of obligors covered by the model(s).

3 Estimated and actual LGD represent defaulted populations. Average LGD values are EAD-weighted.

4 Expressed as a percentage of total EAD, which includes all defaulted and non-defaulted exposures for the relevant population.

5 For sovereigns and banks models, estimated and actual LGD represents the average LGD for customers that defaulted in the year. For corporates models, they represent the average LGD for customers that have defaulted and been resolved in the period.

6 The estimated PD excludes inactive sovereign obligors.

7 Covers the combined populations of the global large corporates model, all regional IRB models for large, medium and small corporates, and non-bank financial institutions. The estimated and observed PDs were calculated only for unique obligors.

Table 32: IRB models – corporate PD models – performance by CRR grade

		Corporates[1]					
		Facility[2]	Defaulted[3]	Estimated PD[4]	Actual PD[5]	Diff. in PD	Actual PD[5]
	Footnotes	%	%	%	%	%	

2018						
CRR 0.1	6	—	—	0.01	—	0.00
CRR 1.1		2.32	—	0.02	—	0.02
CRR 1.2		6.60	—	0.04	—	0.04
CRR 2.1		16.09	0.04	0.07	0.10	(0.03)
CRR 2.2		15.67	—	0.13	0.04	0.09
CRR 3.1		12.26	0.11	0.22	0.03	0.19
CRR 3.2		11.07	0.01	0.37	0.07	0.30
CRR 3.3		9.39	0.31	0.63	0.23	0.40
CRR 4.1		8.01	0.36	0.87	0.47	0.40
CRR 4.2		4.96	0.29	1.20	0.59	0.61
CRR 4.3		4.58	0.54	1.65	0.73	0.92
CRR 5.1		3.40	0.68	2.25	0.98	1.27
CRR 5.2		2.11	1.06	3.05	1.17	1.88
CRR 5.3		1.50	0.97	4.20	1.73	2.47
CRR 6.1		1.08	3.31	5.75	3.31	2.44
CRR 6.2		0.35	5.33	7.85	9.11	(1.26)
CRR 7.1		0.19	15.57	10.00	9.10	0.90
CRR 7.2		0.11	2.99	13.00	15.34	(2.34)
CRR 8.1		0.21	2.48	19.00	9.32	9.68
CRR 8.2		0.09	23.20	36.00	27.97	8.03
CRR 8.3		0.01	17.11	75.00	21.98	53.02
Total		100.00				

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Table 32: IRB models – corporate PD models – performance by CRR grade (continued)

		Corporates[1]				
		Facility[2]	Defaulted[3]	Estimated PD[4]	Actual PD[5]	Diff. in PD
Actual PD[5]	Footnotes	%	%	%	%	%
2017						
CRR 0.1	6	—	—	0.01	—	0.00
CRR 1.1		2.84	—	0.02	—	0.02
CRR 1.2		5.98	—	0.04	—	0.04
CRR 2.1		17.92	—	0.07	—	0.07
CRR 2.2		13.84	0.02	0.13	0.03	0.10
CRR 3.1		11.53	0.01	0.22	0.07	0.15
CRR 3.2		10.51	0.02	0.37	0.14	0.23
CRR 3.3		10.78	0.12	0.63	0.25	0.38
CRR 4.1		7.05	0.15	0.87	0.36	0.51
CRR 4.2		5.35	0.27	1.20	0.40	0.80
CRR 4.3		4.89	0.14	1.65	0.58	1.07
CRR 5.1		3.58	0.77	2.25	1.39	0.86
CRR 5.2		1.93	1.25	3.05	1.61	1.44
CRR 5.3		1.58	2.56	4.20	2.28	1.92
CRR 6.1		1.21	4.95	5.75	4.47	1.28
CRR 6.2		0.36	4.43	7.85	7.88	(0.03)
CRR 7.1		0.27	8.32	10.00	10.47	(0.47)
CRR 7.2		0.09	11.95	13.00	10.10	2.90
CRR 8.1		0.22	14.07	19.00	10.88	8.12
CRR 8.2		0.04	32.01	36.00	15.88	20.12
CRR 8.3		0.03	33.10	75.00	17.89	57.11
Total		100.00				
2016						
CRR 0.1	6	—	—	0.01	—	0.01
CRR 1.1		3.88	—	0.02	—	0.02
CRR 1.2		6.05	—	0.04	—	0.04
CRR 2.1		17.51	—	0.07	—	0.07
CRR 2.2		15.05	0.01	0.13	0.03	0.10
CRR 3.1		11.22	1.03	0.22	0.25	(0.03)
CRR 3.2		10.67	0.26	0.37	0.36	0.01
CRR 3.3		9.21	0.26	0.63	0.49	0.14
CRR 4.1		6.46	0.78	0.87	0.79	0.08
CRR 4.2		5.49	0.47	1.20	0.64	0.56
CRR 4.3		4.59	1.18	1.65	1.46	0.19
CRR 5.1		4.08	1.31	2.25	1.41	0.84
CRR 5.2		2.11	1.40	3.05	1.89	1.16
CRR 5.3		1.76	1.96	4.20	2.27	1.93
CRR 6.1		0.98	10.15	5.75	5.57	0.18
CRR 6.2		0.38	15.38	7.85	4.68	3.17
CRR 7.1		0.27	14.29	10.00	9.46	0.54
CRR 7.2		0.09	12.38	13.00	6.63	6.37

CRR 8.1	0.10	48.22	19.00	13.11	5.89
CRR 8.2	0.07	47.10	36.00	20.29	15.71
CRR 8.3	0.03	36.10	75.00	17.83	57.17
Total	100.00				

For footnotes, see page 48.

Table 32: IRB models – corporate PD models – performance by CRR grade (continued)

		Corporates[1]				
		Facility[2]	Defaulted[3]	Estimated PD[4]	Actual PD[5]	Diff. in PD
Actual PD[5]	Footnote	%	%	%	%	%
2015						
CRR 0.1	6	—	—	0.01	—	0.01
CRR 1.1		5.72	—	0.02	—	0.02
CRR 1.2		5.25	—	0.04	—	0.04
CRR 2.1		16.48	—	0.07	—	0.07
CRR 2.2		14.17	—	0.13	0.01	0.12
CRR 3.1		11.92	0.17	0.22	0.15	0.07
CRR 3.2		11.00	0.10	0.37	0.30	0.07
CRR 3.3		9.35	0.14	0.63	0.47	0.16
CRR 4.1		6.52	0.64	0.87	0.97	(0.10)
CRR 4.2		5.07	0.45	1.20	1.06	0.14
CRR 4.3		4.38	0.62	1.65	1.55	0.10
CRR 5.1		3.52	0.99	2.25	1.24	1.01
CRR 5.2		2.19	0.61	3.05	1.44	1.61
CRR 5.3		2.24	1.74	4.20	1.89	2.31
CRR 6.1		0.89	4.66	5.75	5.05	0.70
CRR 6.2		0.66	3.58	7.85	6.46	1.39
CRR 7.1		0.31	10.79	10.00	7.13	2.87
CRR 7.2		0.09	7.27	13.00	9.48	3.52
CRR 8.1		0.14	11.33	19.00	11.11	7.89
CRR 8.2		0.07	16.97	36.00	23.61	12.39
CRR 8.3		0.03	16.66	75.00	17.10	57.90
Total		100.00				
2014						
CRR 0.1	6	0.01	—	0.01	—	0.01
CRR 1.1		6.32	—	0.02	—	0.02
CRR 1.2		6.68	—	0.04	—	0.04
CRR 2.1		16.71	0.01	0.07	0.04	0.03
CRR 2.2		13.07	—	0.13	—	0.13
CRR 3.1		10.38	0.06	0.22	0.10	0.12
CRR 3.2		12.50	0.11	0.37	0.23	0.14
CRR 3.3		6.62	0.25	0.63	0.54	0.09
CRR 4.1		10.41	0.28	0.87	0.54	0.33
CRR 4.2		4.12	0.79	1.20	0.81	0.39
CRR 4.3		3.49	0.83	1.65	0.91	0.74
CRR 5.1		2.50	0.53	2.25	0.97	1.28
CRR 5.2		2.09	0.54	3.05	1.24	1.81
CRR 5.3		1.47	1.74	4.20	2.70	1.50
CRR 6.1		0.59	3.02	5.75	4.11	1.64
CRR 6.2		0.30	1.12	7.85	4.27	3.58
CRR 7.1		0.29	14.59	10.00	11.35	(1.35)
CRR 7.2		0.08	2.78	13.00	10.11	2.89
CRR 8.1		2.31	1.17	19.00	13.77	5.23
CRR 8.2		0.04	32.32	36.00	22.33	13.67

CRR 8.3	0.02	4.85	75.00	14.89	60.11
Total	100.00				

Table 32: IRB models – corporate PD models – performance by CRR grade (continued)

	Corporates[1]				
	Facility[2]	Defaulted[3]	Estimated PD[4]	Actual PD[5]	Diff. in PD
Actual PD[5]	%	%	%	%	%
2013					
CRR 0.1	6—	—	0.01	—	0.01
CRR 1.1	4.83	—	0.02	—	0.02
CRR 1.2	7.47	—	0.04	—	0.04
CRR 2.1	20.85	—	0.07	—	0.07
CRR 2.2	10.38	0.01	0.13	0.03	0.10
CRR 3.1	10.79	0.07	0.22	0.16	0.06
CRR 3.2	9.49	0.13	0.37	0.22	0.15
CRR 3.3	8.33	0.15	0.63	0.27	0.36
CRR 4.1	6.40	0.35	0.87	0.48	0.39
CRR 4.2	5.84	0.93	1.20	0.80	0.40
CRR 4.3	4.22	0.47	1.65	0.67	0.98
CRR 5.1	4.18	0.72	2.25	0.76	1.49
CRR 5.2	3.07	0.97	3.05	1.03	2.02
CRR 5.3	1.85	2.77	4.20	1.89	2.31
CRR 6.1	0.98	4.37	5.75	3.28	2.47
CRR 6.2	0.46	5.74	7.85	3.77	4.08
CRR 7.1	0.44	12.69	10.00	7.95	2.05
CRR 7.2	0.15	7.84	13.00	8.68	4.32
CRR 8.1	0.15	9.48	19.00	11.44	7.56
CRR 8.2	0.07	14.94	36.00	13.70	22.30
CRR 8.3	0.05	13.12	75.00	13.64	61.36
Total	100.00				

1 Covers the combined populations of the global large corporates model and all regional IRB models for large, medium and small corporates and non-bank financial institutions.

2 Total facility limits for each CRR grade, expressed as a percentage of total limits granted.

3 Defaulted facilities as a percentage of total facility limits at that grade.

4 The estimated PD is before application of the 0.03% regulatory floor.

5 Actual PD is based on the number of defaulted obligors covered by the model(s), without taking into account the size of the facility granted or the exposures to the obligor.

6 The top band of the wholesale CRR master scale is not available to entities in the corporates exposure class. It is restricted to the strongest central governments, central banks and institutions.

Retail risk

Retail risk rating systems

Due to the different country-level portfolio performance characteristics and loss history, there are no global models for our retail portfolios. Across the Group, over 100 models are used with the PRA's approval under our IRB permission. The 10 most material risk rating systems for which we disclose details of modelling methodology and performance data represent RWAs of $41bn or 58% of the total retail IRB RWA.

PD models are developed using statistical estimation based on a minimum of five years of historical data. The modelling approach is typically inherently TTC. Where models are developed based on a PIT approach (as in the UK), the model outputs become

effectively TTC through the application of buffer or model adjustments as agreed with the PRA.

EAD models are also developed using at least five years of historical observations and typically adopt one of two approaches:

- For closed-end products without the facility for additional drawdowns, EAD is estimated as the outstanding balance of accounts at the time of observation.
- For products with the facility for additional drawdowns, EAD is estimated as the outstanding balance of accounts at the time of observation plus a credit conversion factor applied to the undrawn portion of the facility.

LGD estimates have more variation, particularly in respect of the time period that is used to quantify economic downturn assumptions.

Table 33: Material retail IRB risk rating systems

Portfolio	CRD IV asset class	RWA $bn	Component model	Number of material component models	Model description and methodology	Number of years loss data[1]	Applicable Pillar 1 regulatory thresholds and overlays
UK HSBC residential mortgages	Retail – secured by mortgages on immovable property non-SME	4.74	PD	1	Statistical model built on internal behavioural data and bureau information. Underlying PIT model is calibrated to the latest observed PD. An adjustment is then applied to generate the long-run PD based on a combination of historical misalignment of the underlying model and expert judgement.	7–10	PD floor of 0.03%
			LGD	1	Component based model incorporating, 'possession given default', 'predicted shortfall' and 'time to possession'. A downturn adjustment is applied to each component including a 30% reduction from peak house valuation and a 10% adjustment to forced sale haircut.	>10	LGD floor of 10% at portfolio level
			EAD	1	Logical model that uses the sum of balance at observation plus further unpaid interest that could accrue before default.	7–10	EAD must at least be equal to current balance
UK First Direct residential	Retail – secured by mortgages on	0.85	PD	1	Underlying PIT PD model is a segmented scorecard. An adjustment is then applied based on	7–10	PD floor of 0.03%

mortgages	immovable property non-SME				observed misalignment in the underlying model (with some additional conservatism applied).		
			LGD	1	Component based model incorporating, 'possession given default', 'predicted shortfall' and 'time to possession'. A downturn adjustment is applied to each component including a 30% reduction from peak house valuation and a 10% adjustment to forced sale haircut.	>10	LGD floor of 10% at portfolio level
			EAD	2	There are two separate EAD models – one for standard capital repayment mortgages and one for offset mortgages which offer a revolving loan facility.	7–10	EAD must at least be equal to current balance
			PD	1	Statistical model built on internal behavioural data and bureau information. Underlying PIT model is calibrated to the latest observed PD. An adjustment is then applied to generate the long-run PD based on historical observed misalignment of the underlying model.	7–10	PD floor of 0.03%
UK HSBC credit cards	Retail – qualifying revolving	2.09					
			LGD	1	Statistical model based on forecasting the amount of expected future recoveries, segmented by default status.	7–10	
			EAD	1	Statistical model that directly estimates EAD for different segments of the portfolio using either balance or limit as the key input.	7–10	EAD must at least be equal to current balance
			PD	1	Statistical model built on internal behavioural data and bureau information. Underlying PIT model is calibrated to the latest observed PD. An adjustment is then applied to generate the long-run PD based on historical observed misalignment of the underlying model.	7–10	PD floor of 0.03%
UK HSBC personal loans	Retail – other non-SME	3.96					
			LGD	1	Statistical model based on forecasting the amount of expected future recoveries, segmented by default status.	7–10	
			EAD	1	EAD is equal to current balance as this provides a conservative estimate.	7–10	EAD must at least be equal to current balance

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Table 33: Material retail IRB risk rating systems (continued)

Portfolio	CRD IV asset class	RWA $bn	Component model	Number of material component models	Model description and methodology	Number of years loss data[1]	Applicable Pillar 1 regulatory thresholds and overlays
			PD	1	Statistical model built on internal behavioural data and bureau information. Underlying PIT model is calibrated to the latest observed PD. An adjustment is then applied to generate the long run PD based on historical observed misalignment of the underlying model.	7–10	PD floor of 0.03%
UK business banking	Retail – other SME	2.62			Two sets of models – one for secured exposures and another for unsecured exposures. The secured model uses the value to loan as a key component for estimation and the unsecured model estimates the amount of future recoveries and undrawn portion.		
			LGD	2		7–10	
			EAD	1	Statistical model using segmentation according to limit and utilisation and estimation of the undrawn exposure.	7–10	EAD must at least be equal to current balance
			PD	2	Statistical model built on internal behavioural data and bureau information, and calibrated to a long-run default rate.	>10	PD floor of 0.03%
Hong Kong HSBC personal residential mortgages[2]	Retail – secured by mortgages on immovable property non-SME	10.05	LGD	2	Statistical model based on estimate of loss incurred over a recovery period derived from historical data with downturn LGD based on the worst observed default rate.	>10	LGD floor of 10% at portfolio level
			EAD	2	Rule-based calculation based on current balance, which provides a conservative estimate of EAD.	>10	EAD must at least be equal to current balance
Hong Kong Hang Seng personal residential	Retail – secured by mortgages on immovable	6.25	PD	2	Statistical model built on internal behavioural data, and calibrated to a long-run default rate.	>10	PD floor of 0.03%

mortgages	property non-SME		LGD	2	Two statistical models and one historical average model based on estimates of loss incurred over a recovery period derived from historical data with a downturn adjustment.	>10	LGD floor of 10% at portfolio level
			EAD	2	Rule-based calculation based on current balance, which provides a conservative estimate of EAD.	>10	EAD must at least be equal to current balance
			PD	1	Statistical model built on internal behavioural data and bureau information, and calibrated to a long-run default rate.	>10	PD floor of 0.03%
Hong Kong HSBC credit cards	Retail – qualifying revolving	3.77	LGD	1	Statistical model based on forecasting the amount of expected losses. Downturn LGD derived using data from the period with the highest default rate.	>10	
			EAD	1	Statistical model that derives a credit utilisation which is used to estimate EAD.	>10	EAD must at least be equal to current balance
			PD	1	Statistical model built on internal behavioural data and bureau information, and calibrated to a long-run default rate.	>10	PD floor of 0.03%
Hong Kong HSBC personal instalment loans	Retail – other non-SME	1.70	LGD	1	Statistical model based on forecasting the amount of expected future losses. Downturn LGD derived using data from the period with the highest default rate.	>10	
			EAD	1	Statistical model that derives a credit conversion factor to determine the proportion of undrawn limit to be added to the balance at observation.	>10	EAD must at least be equal to current balance
			PD	1	Statistical model built on internal behavioural data and bureau information, and calibrated to a long-run default rate.	>10	PD floor of 0.03%
US HSBC personal first lien residential mortgages[3]	Retail – secured by mortgages on immovable property non-SME	5.38	LGD	1	Statistical model based on identifying the main risk drivers of loss and recovery and grouping them into homogeneous pools. Downturn	>10	LGD floor of 10% at portfolio level

		LGD is derived based on the peak default rate observed. Additional assumptions and estimations are made on incomplete workouts.		
EAD	1	Rule-based calculation based on current balance which provides a conservative estimate of EAD.	>10	EAD must at least be equal to current balance

1 Defined as the number of years of historical data used in model development and estimation.

2 The Hong Kong Monetary Authority ('HKMA') applies a risk weight floor of 25% to all residential mortgages booked after 19 May 2017 (previously 15%).

3 In US mortgage business, first lien is a primary claim on a property that takes precedence over all subsequent claims and will be paid first from the proceeds in case of the property's foreclosure sale.

Retail credit models

Given the large number of retail IRB models globally, we disclose information on our most material local models. The actual and estimated values are derived from the model monitoring and calibration processes performed at a local level. Within the discipline of our global modelling policies, our analytics teams adopt back-testing criteria specific to local conditions in order to assess the accuracy of their models.

Table 34 contains the estimated and actual values from the back-testing of our material IRB models covering portfolios in the UK, Hong Kong and the residential mortgage portfolio in the US. The most recent five years have been included for comparative purposes.

Within table 36, for back-testing purposes, a customer's PD is observed at a PIT and their default or non-default status in the following one-year period is recorded against that PD grade. The PD presented here is expressed on an obligor count basis consisting of non-defaulted obligors at the time of observation. The LGD and EAD refer to observations for the defaulted population, being the appropriate focus of an assessment of these models' performance. The LGD values represent the amount of loss as a percentage of EAD, and are calculated based on defaulted accounts that were fully resolved or have completed the modelled recovery outcome period at the reporting date. The EAD values of the defaulted exposures are presented as a percentage of the total EAD, which includes all defaulted and non-defaulted exposures for the relevant population. The regulatory PD and LGD floors of 0.03% and 10%, respectively, are applied during final capital calculation and are not reflected in the estimates below.

For our UK residential mortgage portfolios, the estimates include required regulatory downturn adjustments. In conducting the back-testing, our UK residential mortgage LGD models consider repossession rates over a 36 month period starting at the date of default. For both our HSBC and First Direct branded residential mortgages, LGD estimates and LGD actual values remained low and stable in 2018.

The Hong Kong estimated LGD values in table 34 include required stressed factors to reflect downturn conditions. The LGD models for our Hong Kong HSBC and Hang Seng residential mortgage portfolios use a recovery outcome period of 24 months starting at the date of default. For both portfolios, LGD estimates remain higher than the calculated actual values but below the 10% regulatory floor. The Hong Kong credit card EAD model currently underestimates exposure values at the point of default; however, this is mitigated by a temporary adjustment to RWAs. An updated model has been submitted to the PRA for approval following approval from the local regulator and is expected to be implemented during 2019.

The US estimates in table 34 include downturn adjustments and model overlays agreed with the PRA. The LGD models use a recovery outcome period of 36 months, reflecting the recovery process due to foreclosure moratoria. The LGD estimates and LGD actual values remained stable in 2018.

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Table 34: IRB models – estimated and actual values (retail)[1]

	PD		LGD		EAD	
	Estimated	Actuals	Estimated	Actuals	Estimated	Actuals
	%	%	%	%	%	%
2018						
UK						
– HSBC residential mortgage	0.40	0.27	9.60	0.38	0.27	0.25
– FD residential mortgages	0.45	0.38	8.19	2.07	1.05	0.86
– HSBC credit card	1.01	0.97	88.75	85.15	1.42	1.40
– HSBC personal loans	2.13	1.88	84.84	87.97	1.83	1.75
– Business Banking (Retail SME)	2.83	2.86	78.56	71.56	2.30	2.09
Hong Kong						
– HSBC personal residential mortgage	0.70	0.02	2.87	1.70	0.02	0.02
– Hang Seng personal residential mortgage	0.39	0.09	5.99	0.84	0.08	0.08
– HSBC credit card	0.57	0.24	87.92	75.98	0.40	0.42
– HSBC personal instalment loans	2.27	1.47	89.01	83.73	1.24	1.10
US						
– US HSBC personal first lien residential mortgage	1.71	0.69	52.06	21.69	0.43	0.42
2017						
UK						
– HSBC residential mortgage	0.44	0.28	9.74	0.88	0.26	0.24
– FD residential mortgages	0.48	0.41	2.11	0.45	1.09	0.91
– HSBC credit card	0.92	0.77	90.86	85.68	1.10	1.07
– HSBC personal loans	1.94	1.62	87.77	79.90	1.58	1.50
– Business Banking (Retail SME)	2.57	2.64	73.87	70.25	1.90	1.51
Hong Kong						
– HSBC personal residential mortgage	0.72	0.04	1.43	0.14	0.05	0.05
– Hang Seng personal residential mortgage	0.42	0.14	5.18	0.59	0.14	0.14
– HSBC credit card	0.65	0.28	89.33	76.11	0.47	0.50
– HSBC personal instalment loans	2.34	1.51	89.07	80.05	1.25	1.14
US						
– US HSBC personal first lien residential mortgage	1.91	0.80	53.27	22.22	0.37	0.36
2016						
UK						
– HSBC residential mortgage	0.50	0.35	10.53	1.09	0.34	0.31
– FD residential mortgages	0.49	0.43	3.06	0.55	0.95	0.80
– HSBC credit card	0.89	0.75	91.72	89.92	1.03	1.00
– HSBC personal loans	1.84	1.52	88.26	79.08	1.36	1.29
– Business Banking (Retail SME)	2.40	2.47	93.56	82.63	1.80	1.64
Hong Kong						
– HSBC personal residential mortgage	0.79	0.04	4.52	0.97	0.04	0.03
– Hang Seng personal residential mortgage	0.49	0.16	4.48	0.62	0.12	0.12
– HSBC credit card	0.69	0.30	88.97	82.48	0.52	0.56
– HSBC personal instalment loans	2.46	1.78	89.28	69.62	1.44	1.33
US						
– Consumer Lending real estate first lien	5.30	4.29	74.22	51.89	3.53	3.49

– Mortgage Services real estate first lien	6.16	3.77	68.26	51.79	3.37	3.34
– US HSBC personal first lien residential mortgage	2.20	1.27	41.18	29.25	0.50	0.50

Table 34: IRB models – estimated and actual values (retail)[1] (continued)

	PD		LGD		EAD	
	Estimated	Actuals	Estimated	Actuals	Estimated	Actuals
	%	%	%	%	%	%
2015						
UK						
– HSBC residential mortgage	0.45	0.22	16.43	3.54	0.17	0.17
– FD residential mortgages	0.40	0.11	12.13	10.89	0.22	0.20
– HSBC credit card	1.06	0.86	91.54	88.42	1.23	1.19
– HSBC personal loans	1.93	1.23	82.10	78.46	1.18	1.13
– Business Banking (Retail SME)	2.26	2.21	76.06	71.78	1.57	1.47
Hong Kong						
– HSBC personal residential mortgage	0.79	0.03	1.90	0.03	0.04	0.03
– Hang Seng personal residential mortgage	0.46	0.14	4.12	0.57	0.11	0.11
– HSBC credit card	0.67	0.32	90.40	81.75	0.52	0.58
– HSBC personal instalment loans	2.40	2.02	89.43	69.59	1.69	1.51
US						
– Consumer Lending real estate first lien	5.92	5.47	75.98	51.60	5.37	5.31
– Mortgage Services real estate first lien	6.96	5.96	69.59	54.09	7.97	7.88
– US HSBC personal first lien residential mortgage	4.66	2.08	29.63	37.19	0.70	0.69
2014						
UK						
– HSBC residential mortgage	0.50	0.31	15.82	4.68	0.24	0.23
– HSBC credit card	1.37	1.07	91.11	86.30	1.83	1.78
– HSBC personal loans	2.28	1.57	81.56	80.45	1.52	1.46
– Business Banking (Retail SME)	2.83	2.57	73.04	68.17	2.00	1.88
Hong Kong						
– HSBC personal residential mortgage	0.72	0.04	1.26	0.35	0.03	0.03
– HSBC credit card	0.62	0.32	92.91	88.13	0.55	0.59
– HSBC personal instalment loans	2.37	2.04	89.69	87.66	1.77	1.63
US						
– Consumer Lending real estate first lien	7.31	7.72	77.16	60.29	7.83	7.72
– Mortgage Services real estate first lien	9.43	8.12	71.40	60.17	7.51	7.43
– US HSBC personal first lien residential mortgage	5.24	2.28	29.63	39.36	1.00	1.00
2013						
UK						
– HSBC residential mortgage	0.55	0.38	17.30	6.40	0.32	0.31
– HSBC credit card	1.54	1.27	88.10	84.10	1.70	1.67
– HSBC personal loans	3.57	2.35	85.40	73.00	2.19	2.11
– Business Banking (Retail SME)	2.39	2.61	78.00	70.00	2.03	1.99
Hong Kong						
– HSBC personal residential mortgage	0.71	0.03	1.84	0.43	0.03	0.03
– HSBC credit card	0.63	0.33	91.41	84.58	0.56	0.59
– HSBC personal instalment loans	2.20	1.99	90.07	96.16	1.69	1.55
US						
– Consumer Lending real estate first lien	7.74	8.22	67.13	64.93	7.08	6.72
– Mortgage Services real estate first lien	10.15	9.68	60.04	62.92	6.12	5.88
– US HSBC personal first lien residential mortgage	4.64	4.43	49.85	37.17	2.40	2.40

1 Data represents an annual view, analysed at 30 September.

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Model performance

Model validation is subject to global internal standards designed to support a comprehensive quantitative and qualitative process within a cycle of model monitoring and validation that includes:

- investigation of model stability;
- model performance measured through testing the model's outputs against actual outcomes; and
- model use within the business, e.g. user input data quality, override activity and the assessment of results from key controls around the usage of the rating system as a whole within the overall credit process.

Models are validated against a series of metrics and triggers approved by the appropriate governance committee. Model

performance metrics, and any remedial actions in the event of a trigger breach, are reported at the Wholesale and RBWM MOCs. We also disclose model performance reports for our IRB models to our lead regulator, the PRA, quarterly.

A large number of models are used within the Group, and data at individual model level is, in most cases, immaterial in the context of the overall Group. We therefore disclose data covering most wholesale models, including corporate models on an aggregated basis, and on the most material retail models.

Tables 35 and 36 below validate the reliability of PD calculations by comparing the PD used in IRB calculations with actual default experience.

Table 35: Wholesale IRB exposure – back-testing of probability of default (PD) per portfolio[1] (CR9)

PD range	External rating equivalent (S&P)	External rating equivalent (Moody's)	External rating equivalent (Fitch)	Weighted average PD %	Arithmetic average PD by obligors %	Number of obligors End of previous year[3]	End of the year	Defaulted obligors in the year	of which: new defaulted obligors in the year	Average historical annual default rate %
2018										
Sovereigns[2]										
0.00 to <0.15	AAA to BBB	Aaa to Baa2	AAA to BBB	0.02	0.04	53	53	—	—	—
0.15 to <0.25	BBB-	Baa3	BBB-	0.22	0.22	7	6	—	—	—
0.25 to <0.50	BBB-	Baa3	BBB-	0.37	0.37	5	8	—	—	—
0.50 to <0.75	BB+ to BB	Ba1 to Ba2	BB+ to BB	0.63	0.63	7	7	—	—	—
0.75 to <2.50	BB- to B-	Ba3 to B2	BB- to B-	1.44	1.32	23	21	—	—	—
2.5 to <10.00	B to B-	B2 to Caa1	CCC+ to CCC	3.65	4.92	21	21	—	—	—
10.00 to <100.00	B- to C	Caa1 to C	CCC to C	10.00	18.75	8	6	—	—	1.79
Banks										
0.00 to <0.15	AAA to A-	Aaa to Baa1	AAA to BBB+	0.05	0.08	258	268	—	—	—
0.15 to <0.25	BBB+	Baa2	BBB	0.22	0.22	62	62	—	—	—
0.25 to <0.50	BBB	Baa3	BBB-	0.37	0.37	48	61	—	—	—
	BBB-	Baa3	BBB-	0.63	0.63	58	47	—	—	—

0.50 to <0.75										
0.75 to <2.50	BB+ to BB-	Ba1 to B1	BB+ to B+	1.15	1.36	119	102	—	—	—
2.5 to <10.00	B+ to B-	B2 to Caa1	B to CCC+	4.10	4.54	75	54	—	—	0.17
10.00 to <100.00	CCC+ to C	Caa1 to C	CCC to C	15.62	13.61	18	17	—	—	1.55
Corporates										
0.00 to <0.15	AAA to A-	Aaa to Baa1	AAA to BBB+	0.09	0.10	12,935	13,750	6	—	0.02
0.15 to <0.25	BBB+	Baa2	BBB	0.22	0.22	12,344	12,741	4	—	0.11
0.25 to <0.50	BBB	Baa3	BBB-	0.37	0.37	12,779	12,794	9	—	0.22
0.50 to <0.75	BBB-	Baa3	BBB-	0.63	0.63	11,153	11,616	27	1	0.40
0.75 to <2.50	BB+ to BB-	Ba1 to B1	BB+ to B+	1.35	1.44	36,542	35,581	275	27	0.88
2.5 to <10.00	B+ to B-	B2 to Caa1	B to CCC+	4.23	4.32	13,712	14,023	379	42	2.93
10.00 to <100.00	CCC+ to C	Caa1 to C	CCC to C	18.81	19.65	1,814	1,762	269	21	12.93

Table 35: Wholesale IRB exposure – back-testing of probability of default (PD) per portfolio[1] (CR9) (continued)

PD range	External rating equivalent (S&P)	External rating equivalent (Moody's)	External rating equivalent (Fitch)	Weighted average PD %	Arithmetic average PD by obligors %	Number of obligors End of previous year[3]	Number of obligors End of the year	Defaulted obligors in the year	of which: new defaulted obligors in the year	Average historical annual default rate %
2017										
Sovereigns										
0.00 to <0.15	AAA to BBB	Aaa to Baa2	AAA to BBB	0.02	0.05	43	53	—	—	—
0.15 to <0.25	BBB-	Baa3	BBB-	0.22	0.22	7	7	—	—	—
0.25 to <0.50	BBB-	Baa3	BBB-	0.37	0.37	7	5	—	—	—
0.50 to <0.75	BB+ to BB	Ba1 to Ba2	BB+ to BB	0.63	0.63	6	7	—	—	—
0.75 to <2.50	BB- to B-	Ba3 to B2	BB- to B-	2.02	1.65	17	23	—	—	—
2.5 to <10.00	B to B-	B2 to Caa1	CCC+ to CCC	3.90	6.09	18	21	—	—	—
10.00 to <100.00	B- to C	Caa1 to C	CCC to C	12.89	12.57	7	8	—	—	2.67
Banks										
0.00 to <0.15	AAA to A-	Aaa to Baa1	AAA to BBB+	0.05	0.08	250	258	—	—	—
0.15 to <0.25	BBB+	Baa2	BBB	0.22	0.22	72	62	—	—	—
0.25 to <0.50	BBB	Baa3	BBB-	0.37	0.37	59	48	—	—	—
0.50 to <0.75	BBB-	Baa3	BBB-	0.63	0.63	68	58	—	—	—
0.75 to <2.50	BB+ to BB-	Ba1 to B1	BB+ to B+	1.20	1.40	122	119	—	—	—
2.5 to <10.00	B+ to B-	B2 to Caa1	B to CCC+	4.63	4.71	100	75	—	—	0.20
10.00 to <100.00	CCC+ to C	Caa1 to C	CCC to C	17.91	14.66	32	18	—	—	4.68
Corporates										
0.00 to <0.15	AAA to A-	Aaa to Baa1	AAA to BBB+	0.09	0.10	11,220	11,401	2	—	0.01
0.15 to <0.25	BBB+	Baa2	BBB	0.22	0.22	10,899	11,453	10	2	0.12
0.25 to <0.50	BBB	Baa3	BBB-	0.37	0.37	12,161	11,675	20	3	0.25
0.50 to <0.75	BBB-	Baa3	BBB-	0.63	0.63	10,920	10,508	29	2	0.46
0.75 to <2.50	BB+ to BB-	Ba1 to B1	BB+ to B+	1.37	1.45	35,150	34,911	244	12	0.91

2.5 to <10.00	B+ to B-	B2 to Caa1	B to CCC+	4.34	4.38	12,978	13,183	418	30	2.87
10.00 to <100.00	CCC+ to C	Caa1 to C	CCC to C	18.42	19.33	2,119	1,785	266	20	12.54

1 Data represents an annual view, analysed at 30 September.

2 The CRR to external ratings mapping has been updated for Sovereign portfolios to reflect the current CRR master scale.

3 Back-testing is conducted on the basis of the opening count of obligors not in default in each year. Obligors who default during the year are excluded from the opening count for the following year.

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Table 36: Retail IRB exposure – back-testing of probability of default (PD) per portfolio[1] (CR9)

PD range	Weighted average PD	Arithmetic average PD by obligors	Number of obligors		Defaulted obligors in the year	of which: new defaulted obligors in the year	Average historical annual default rate
			End of previous year[2]	End of the year			
2018							
Retail – Secured by real estate non-SME							
0.00 to <0.15	0.06	0.06	696,972	738,577	259	3	0.03
0.15 to <0.25	0.19	0.19	60,467	60,748	59	—	0.08
0.25 to <0.50	0.35	0.34	65,972	64,896	98	2	0.13
0.50 to <0.75	0.60	0.60	26,090	24,446	59	—	0.20
0.75 to <2.50	1.33	1.35	58,184	53,707	237	1	0.41
2.50 to <10.00	4.33	4.32	18,547	15,669	332	1	1.97
10.00 to <100.00	26.08	23.26	7,612	4,883	1,254	9	18.79
Retail – qualifying revolving							
0.00 to <0.15	0.06	0.06	3,142,314	3,246,838	1,492	72	0.05
0.15 to <0.25	0.19	0.19	727,005	756,129	747	18	0.10
0.25 to <0.50	0.36	0.36	660,076	690,157	1,277	38	0.20
0.50 to <0.75	0.61	0.62	310,930	334,756	1,120	23	0.35
0.75 to <2.50	1.35	1.32	661,414	723,761	5,871	97	0.81
2.50 to <10.00	4.60	4.41	205,789	224,910	7,319	78	3.11
10.00 to <100.00	29.12	28.71	68,365	48,267	16,375	11	21.00
Retail – other non-SME							
0.00 to <0.15	0.09	0.08	124,924	146,849	267	7	0.15
0.15 to <0.25	0.19	0.19	79,492	89,056	145	5	0.14
0.25 to <0.50	0.36	0.36	114,634	127,085	395	23	0.27
0.50 to <0.75	0.61	0.62	39,397	40,862	213	13	0.52
0.75 to <2.50	1.35	1.40	97,623	96,793	1,345	45	1.23
2.50 to <10.00	4.52	4.82	53,464	47,449	2,108	48	3.51
10.00 to <100.00	41.84	40.92	15,141	7,090	5,535	6	35.84
Retail – other SME							
0.00 to <0.15	0.10	0.10	61,271	59,701	18	—	0.06
0.15 to <0.25	0.20	0.19	51,337	50,498	78	1	0.18
0.25 to <0.50	0.38	0.36	114,069	113,307	382	3	0.38
0.50 to <0.75	0.61	0.61	120,311	121,038	687	4	0.69
0.75 to <2.50	1.54	1.37	292,313	289,602	4,083	86	1.55
2.50 to <10.00	4.86	4.80	155,113	145,309	7,558	117	4.21
10.00 to <100.00	19.62	22.47	49,944	42,946	11,563	29	17.07

Table 36: Retail IRB exposure – back-testing of probability of default (PD) per portfolio[1] (CR9) (continued)

PD range	Weighted average PD	Arithmetic average PD by obligors	Number of obligors		Defaulted obligors in the year	of which: new defaulted obligors in the year	Average historical annual default rate
			End of previous year[2]	End of the year			
2017							
Retail – Secured by real estate non-SME							
0.00 to <0.15	0.06	0.06	662,941	700,284	238	4	0.03
0.15 to <0.25	0.19	0.19	62,640	59,539	69	—	0.08
0.25 to <0.50	0.36	0.35	63,554	64,051	97	—	0.13
0.50 to <0.75	0.60	0.60	26,579	27,095	63	—	0.21
0.75 to <2.50	1.33	1.34	61,808	59,299	277	1	0.43
2.50 to <10.00	4.63	4.56	18,796	17,156	379	1	1.94
10.00 to <100.00	27.70	24.33	8,090	5,358	1,308	15	19.49
Retail – qualifying revolving							
0.00 to <0.15	0.07	0.07	2,903,455	3,128,491	1,403	100	0.05
0.15 to <0.25	0.19	0.19	702,956	715,693	643	25	0.10
0.25 to <0.50	0.36	0.36	641,717	666,802	1,229	44	0.21
0.50 to <0.75	0.61	0.62	316,331	317,666	1,075	36	0.36
0.75 to <2.50	1.35	1.33	717,012	677,685	5,202	131	0.85
2.50 to <10.00	4.39	4.30	214,063	217,996	6,465	79	3.06
10.00 to <100.00	26.42	26.77	66,144	52,014	14,140	10	19.19
Retail – other non-SME							
0.00 to <0.15	0.08	0.08	123,797	143,758	216	5	0.15
0.15 to <0.25	0.19	0.19	75,671	84,219	112	6	0.13
0.25 to <0.50	0.36	0.36	109,873	118,254	327	18	0.25
0.50 to <0.75	0.61	0.62	37,381	39,622	208	8	0.48
0.75 to <2.50	1.36	1.41	94,398	93,147	1,261	61	1.05
2.50 to <10.00	4.63	4.88	49,426	39,977	1,811	55	3.03
10.00 to <100.00	42.70	42.41	12,114	5,550	4,380	9	34.31
Retail – other SME							
0.00 to <0.15	0.11	0.11	66,454	65,482	45	—	0.09
0.15 to <0.25	0.20	0.20	42,675	43,437	66	—	0.29
0.25 to <0.50	0.38	0.37	126,549	132,200	451	11	0.51
0.50 to <0.75	0.63	0.63	124,441	128,686	739	11	0.83
0.75 to <2.50	1.55	1.38	316,020	305,501	4,562	82	1.77
2.50 to <10.00	4.77	4.68	167,107	148,916	7,730	111	4.48
10.00 to <100.00	17.47	19.38	48,949	39,032	10,329	48	17.57

1 Data represents an annual view, analysed at 30 September.

2 Back-testing is conducted on the basis of the opening count of obligors not in default in each year. Obligors who default during the year are excluded from the opening count for the following year.

Counterparty credit risk

Counterparty credit risk management

Counterparty credit risk ('CCR') arises for derivatives and SFTs. It is calculated in both the trading and non-trading books, and is the risk that a counterparty may default before settlement of the transaction. CCR is generated primarily in our wholesale global businesses.

Four approaches may be used under CRD IV to calculate exposure values for CCR: mark-to-market, original exposure, standardised and IMM. Exposure values calculated under these approaches are used to determine RWAs. Across the Group, we use the mark-to-market and IMM approaches.

Under the mark-to-market approach, the EAD is calculated as current exposure plus regulatory add-ons. We use this approach for all products not covered by our IMM permission. Under the IMM approach, EAD is calculated by multiplying the effective expected positive exposure with a multiplier called 'alpha'.

Alpha (set to a default value of 1.4) accounts for several portfolio features that increase EL above that indicated by effective expected positive exposure in the event of default, such as:

- co-variance of exposures;
- correlation between exposures and default;
- level of volatility/correlation that might coincide with a downturn;
- concentration risk; and
- model risk.

The effective expected positive exposure is derived from simulation, pricing and aggregation internal models approved by regulators. The IMM model is subject to ongoing model validation including monthly model performance monitoring.

From a risk management perspective, including daily monitoring of credit limit utilisation, products not covered by IMM are subject to conservative asset class add-ons.

The potential future exposure ('PFE') measures used for CCR management are calibrated to the 95th percentile. The measures consider volatility, trade maturity and the counterparty legal documentation covering netting and collateral.

Limits for CCR exposures are assigned within the overall credit process. The credit risk function assigns a limit against each counterparty to cover exposure which may arise as a result of a counterparty default. The magnitude of this limit will depend on the overall risk appetite and type of derivatives and SFT trading undertaken with the counterparty.

The models and methodologies used in the calculation of CCR are overseen and monitored by the Global Markets Risk Model Oversight Committee. Models are subject to ongoing monitoring and validation. Additionally, they are subject to independent review at inception and annually thereafter.

Credit valuation adjustment

Credit valuation adjustment ('CVA') risk is the risk of adverse moves in the CVAs taken for expected credit losses on derivative transactions. Where we have both specific risk VaR approval and IMM approval for a product, the CVA VaR approach has been used to calculate the CVA capital charge. Where we do not hold both approvals, the standardised approach has been applied. Certain counterparty exposures are exempt from CVA, such as non-financial counterparties and sovereigns.

Collateral arrangements

Our policy is to revalue all traded transactions and associated collateral positions on a daily basis. An independent collateral management function manages the collateral process, including pledging and receiving collateral and investigating disputes and non-receipts.

Eligible collateral types are controlled under a policy to ensure price transparency, price stability, liquidity, enforceability, independence, reusability and eligibility for regulatory purposes. A valuation 'haircut' policy reflects the fact that collateral may fall in value between the date the collateral was called and the date of liquidation or enforcement. Approximately 98% of collateral held as variation margin under CSAs is either cash or liquid government securities.

Further information on gross fair value exposure and the offset due to legally enforceable netting and collateral is set out on page 284 of the Annual Report and Accounts 2018.

Credit rating downgrade

A credit rating downgrade clause in a Master Agreement or a credit rating downgrade threshold clause in a credit support annex ('CSA') is designed to trigger an action if the credit rating of the affected party falls below a specified level. These actions may include the requirement to pay or increase collateral, the termination of transactions by the non-affected party or the assignment of transactions by the affected party.

At 31 December 2018, the potential value of the additional collateral pertaining to International Swaps and Derivatives Association CSA downgrade thresholds that we would need to post with counterparties in the event of a one-notch downgrade of our rating was $0.2bn (2017: $0.3bn) and for a two-notch downgrade was $0.4bn (2017: $0.5bn).

Table 37: Counterparty credit risk exposure – by exposure class, product and geographical region

		Exposure value					
		Europe	Asia	MENA	North America	Latin America	Total
	Footnotes	$bn	$bn	$bn	$bn	$bn	$bn
By exposure class							
IRB advanced approach		64.7	25.3	0.7	19.0	0.8	110.5
– central governments and central banks		3.2	5.6	0.3	2.1	0.4	11.6
– institutions		32.5	10.7	0.1	3.7	0.3	47.3
– corporates		29.0	9.0	0.3	13.2	0.1	51.6
IRB foundation approach		3.8	—	0.3	—	—	4.1
– corporates		3.8	—	0.3	—	—	4.1
Standardised approach		8.2	0.5	0.9	—	0.9	10.5
– central governments and central banks		7.8	—	0.6	—	—	8.4
– institutions		—	—	—	—	0.1	0.1
– corporates		0.4	0.5	0.3	—	0.8	2.0
CVA advanced	2	—	—	—	—	—	—
CVA standardised	2	—	—	—	—	—	—
CCP standardised		21.2	5.8	—	7.8	0.4	35.2
At 31 Dec 2018		97.9	31.6	1.9	26.8	2.1	160.3
By product							
Derivatives (OTC and exchange traded derivatives)		55.0	20.5	1.1	19.5	1.7	97.8
SFTs		40.2	6.2	0.8	7.2	0.4	54.8
Other	1	2.7	4.9	—	0.1	—	7.7
CVA advanced	2	—	—	—	—	—	—
CVA standardised	2	—	—	—	—	—	—
CCP default funds	3	—	—	—	—	—	—
At 31 Dec 2018		97.9	31.6	1.9	26.8	2.1	160.3
By exposure class							
IRB advanced approach		63.0	33.0	0.7	20.4	1.2	118.3
– central governments and central banks		4.6	4.8	0.3	2.2	0.6	12.5
– institutions		26.8	18.6	0.2	8.6	0.2	54.4
– corporates		31.6	9.6	0.2	9.6	0.4	51.4
IRB foundation approach		3.4	—	0.3	—	—	3.7
– corporates		3.4	—	0.3	—	—	3.7
Standardised approach		6.2	0.4	2.2	—	0.7	9.5
– central governments and central banks		5.6	—	1.9	—	—	7.5
– institutions		0.1	—	—	—	—	0.1
– corporates		0.5	0.4	0.3	—	0.7	1.9
CVA advanced	2	—	—	—	—	—	—
CVA standardised	2	—	—	—	—	—	—
CCP standardised		16.5	8.0	—	11.1	0.4	36.0
At 31 Dec 2017		89.1	41.4	3.2	31.5	2.3	167.5
By product							
Derivatives (OTC and exchange traded derivatives)		52.3	31.8	1.0	24.3	1.6	111.0
SFTs		34.1	5.8	2.2	7.2	0.7	50.0
Other	1	2.7	3.8	—	—	—	6.5
CVA advanced	2	—	—	—	—	—	—
CVA standardised	2	—	—	—	—	—	—

CCP default funds	3	—	—	—	—	—	—
At 31 Dec 2017		89.1	41.4	3.2	31.5	2.3	167.5

1 Includes free deliveries not deducted from regulatory capital.

2 The RWA impact due to the CVA capital charge is calculated based on the same exposures as the IRB and standardised approaches. The table above does not present any exposures for CVA to avoid double counting.

3 Default fund contributions are cash balances posted to CCPs by all members. These cash balances have nil impact on reported exposure.

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Table 38: Counterparty credit risk – RWAs by exposure class, product and geographical region

		RWAs						
		Europe	Asia	MENA	North America	Latin America	Total	Capital required
	Footnotes	$bn	$bn	$bn	$bn	$bn	$bn	$bn
By exposure class								
IRB advanced approach		21.7	7.2	0.4	6.7	0.4	36.4	3.0
– central governments and central banks		0.5	0.1	0.3	0.8	0.2	1.9	0.2
– institutions		8.3	2.8	—	0.9	0.2	12.2	1.0
– corporates		12.9	4.3	0.1	5.0	—	22.3	1.8
IRB foundation approach		1.7	—	0.2	—	—	1.9	0.1
– corporates		1.7	—	0.2	—	—	1.9	0.1
Standardised approach		0.4	0.5	0.3	—	0.8	2.0	0.1
– central governments and central banks		—	—	—	—	—	—	—
– institutions		—	—	—	—	0.1	0.1	—
– corporates		0.4	0.5	0.3	—	0.7	1.9	0.1
CVA advanced	2	2.8	1.1	—	1.0	—	4.9	0.4
CVA standardised	2	0.1	0.3	0.1	0.3	0.2	1.0	0.1
CCP standardised		0.6	0.2	—	0.3	—	1.1	0.1
At 31 Dec 2018		27.3	9.3	1.0	8.3	1.4	47.3	3.8
By product								
Derivatives (OTC and exchange traded derivatives)		16.5	5.9	0.6	4.5	1.0	28.5	2.3
SFTs		6.8	0.6	0.3	2.4	0.2	10.3	0.8
Other	1	0.9	1.3	—	—	—	2.2	0.2
CVA advanced	2	2.8	1.1	—	1.0	—	4.9	0.4
CVA standardised	2	0.1	0.3	0.1	0.3	0.2	1.0	0.1
CCP default funds	3	0.2	0.1	—	0.1	—	0.4	—
At 31 Dec 2018		27.3	9.3	1.0	8.3	1.4	47.3	3.8
By exposure class								
IRB advanced approach		21.2	9.9	0.6	7.3	0.9	39.9	3.2
– central governments and central banks		0.7	0.1	0.4	0.8	0.4	2.4	0.2
– institutions		7.1	5.0	0.1	2.1	0.2	14.5	1.2
– corporates		13.4	4.8	0.1	4.4	0.3	23.0	1.8
IRB foundation approach		1.7	—	0.1	—	—	1.8	0.1
– corporates		1.7	—	0.1	—	—	1.8	0.1
Standardised approach		0.6	0.4	0.3	—	0.6	1.9	0.2
– central governments and central banks		—	—	—	—	—	—	—
– institutions		—	—	—	—	—	—	—
– corporates		0.6	0.4	0.3	—	0.6	1.9	0.2
CVA advanced	2	2.8	—	—	—	—	2.8	0.2
CVA standardised	2	0.8	2.4	0.1	3.2	0.2	6.7	0.6
CCP standardised		0.7	0.3	—	0.4	—	1.4	0.1
At 31 Dec 2017		27.8	13.0	1.1	10.9	1.7	54.5	4.4
By product								—
Derivatives (OTC and exchange traded derivatives)		17.3	8.6	0.6	5.4	0.9	32.8	2.6

SFTs		5.0	0.6	0.4	2.1	0.6	8.7	0.7
Other	1	1.5	1.3	—	—	—	2.8	0.2
CVA advanced	2	2.8	—	—	—	—	2.8	0.2
CVA standardised	2	0.8	2.4	0.1	3.2	0.2	6.7	0.6
CCP default funds	3	0.4	0.1	—	0.2	—	0.7	0.1
At 31 Dec 2017		27.8	13.0	1.1	10.9	1.7	54.5	4.4

1 Includes free deliveries not deducted from regulatory capital.

2 The RWA impact due to the CVA capital charge is calculated based on the exposures under the IRB and standardised approaches. No additional exposures are taken into account.

3 Default fund contributions are cash balances posted to CCPs by all members. These cash balances are not included in the total reported exposure.

Wrong-way risk

Wrong-way risk occurs when a counterparty's exposures are adversely correlated with its credit quality.

There are two types of wrong-way risk:

- General wrong-way risk occurs when the probability of counterparty default is positively correlated with general risk factors, for example, where a counterparty is resident and/or incorporated in a higher-risk country and seeks to sell a non-domestic currency in exchange for its home currency.
- Specific wrong-way risk occurs in self-referencing transactions. These are transactions in which exposure is driven by capital or financing instruments issued by the counterparty and occurs where exposure from HSBC's perspective materially increases as the value of the counterparty's capital or financing instruments referenced in the contract decreases. It is HSBC policy that specific wrong-way transactions are approved on a case-by-case basis.

We use a range of tools to monitor and control wrong-way risk, including requiring the business to obtain prior approval before undertaking wrong-way risk transactions outside pre-agreed guidelines. The regional Traded Risk functions are responsible for the control and monitoring process within an overarching Group framework and limit framework.

Central counterparties

While exchange traded derivatives have been cleared through central counterparties ('CCPs') for many years, recent regulatory initiatives designed to reduce systemic risk in the banking system are directing increasing volumes of OTC derivatives to be cleared through CCPs.

A dedicated CCP risk team has been established to manage the interface with CCPs and undertake in-depth due diligence of the unique risks associated with these organisations. This is to address an implication of the regulations that the Group's risk will be transferred from being distributed among individual, bilateral counterparties to a significant level of risk concentration on CCPs. We have developed a risk appetite framework to manage risk accordingly, on an individual CCP and global basis.

Securitisation

HSBC securitisation strategy

HSBC acts as originator, sponsor, liquidity provider and derivative counterparty to our own originated and sponsored securitisations, as well as those of third parties. Our strategy is to use

securitisation to meet our needs for aggregate funding or capital management, to the extent that market, regulatory treatments and other conditions are suitable, and for customer facilitation. We do not provide support to any of our originated or sponsored securitisations, and it is not our policy to do so.

We have senior and junior exposures to Mazarin Funding Limited, which is a securities investment conduit ('SIC'). We also hold all of the commercial paper issued by Solitaire Funding Limited. These are considered legacy businesses, and exposures are being repaid as the securities they hold amortise or are sold.

HSBC securitisation activity

Our roles in the securitisation process are as follows:

- originator: where we originate the assets being securitised, either directly or indirectly;
- sponsor: where we establish and manage a securitisation programme that purchases exposures from third parties; and
- investor: where we invest in a securitisation transaction directly or provide derivatives or liquidity facilities to a securitisation.

HSBC as originator

We use special purpose entities ('SPEs') to securitise customer loans and advances and other debt that we have originated in order to diversify our sources of funding for asset origination and for capital efficiency purposes. In such cases, we transfer the loans and advances to the SPEs for cash, and the SPEs issue debt securities to investors to fund the cash purchases.

In addition, we use SPEs to mitigate the capital absorbed by some of the customer loans and advances we have originated. Credit derivatives are used to transfer the credit risk associated with such customer loans and advances to an SPE, using an approach commonly known as synthetic securitisation by which the SPE writes CDS protection for HSBC.

HSBC as sponsor

We are sponsor to a number of types of securitisation entities, details of which can be found in the table below.
During 2018, two securities investment conduits ('SICs') sponsored by HSBC, Barion Funding Limited and Malachite Funding Limited, redeemed all outstanding securitisation obligations. The Group's exposure to these entities at 31 December 2018 is not significant and limited to balances associated with the winding-up of these entities.
Further details are available in Note 20 of the Financial Statements in the Annual Report and Accounts 2018.

Securitisation entity	Description and nature of exposure	Accounting consolidation	Regulatory consolidation	Regulatory treatment
Solitaire	Asset-backed commercial paper ('ABCP') conduit to which a first-loss letter of credit and transaction-specific liquidity facilities are provided	P	P	Look through to risk weights of underlying assets
Mazarin	Vehicle to which senior term funding is provided	P	O	Exposures (including derivatives and liquidity facilities) are risk-weighted as securitisation positions
Regency	Multi-seller conduit to which senior liquidity facilities and programme-wide credit enhancement are provided	P	O	

HSBC as investor
We have exposure to third-party securitisations across a wide range of sectors in the form of investments, liquidity facilities and as a derivative counterparty. These are primarily legacy exposures.
Monitoring of securitisation positions
Securitisation positions are managed by a dedicated team that uses a combination of market standard systems and third-party data providers to monitor performance data and manage market and credit risks.
In the case of re-securitisation positions, similar processes are conducted in respect of the underlying securitisations.

Liquidity risk of securitised assets is consistently managed as part of the Group's liquidity and funding risk management framework.
Further details are provided on page 80 of the Annual Report and Accounts 2018.
Valuation of securitisation positions
The process of valuing our investments in securitisation exposures primarily focuses on quotations from third parties, observed trade levels and calibrated valuations from market standard models.
Our hedging and credit risk mitigation strategy, with regards to retained securitisation and re-securitisation exposures, is to continually review our positions.

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Securitisation accounting treatment

For accounting purposes, we consolidate structured entities (including SPEs) when the substance of the relationship indicates that we control them; that is, we are exposed, or have rights, to variable returns from our involvement with the structured entity and have the ability to affect those returns through our power over the entity.

Full details of these assessments and our accounting policy on structured entities may be found in Note 1.2(a) and Note 20 on the Financial Statements respectively of the Annual Report and Accounts 2018.

We reassess the need to consolidate whenever there is a change in the substance of the relationship between HSBC and a structured entity.

HSBC enters into transactions in the normal course of business by which it transfers financial assets to structured entities. Depending on the circumstances, these transfers may either result in these financial assets being fully or partly derecognised, or continuing to be recognised in their entirety.

Full derecognition occurs when we transfer our contractual right to receive cash flows from the financial assets, or assume an obligation to pass on the cash flows from the assets, and transfer substantially all the risks and rewards of ownership. Only in the event that derecognition is achieved are sales and any resultant gains recognised in the financial statements.

Partial derecognition occurs when we sell or otherwise transfer financial assets in such a way that some but not substantially all of the risks and rewards of ownership are transferred and control is retained. These financial assets are recognised on the balance sheet to the extent of our continuing involvement and an associated liability is also recognised. The net carrying amount of the financial asset and associated liability will be based on either the amortised cost or the fair value of the rights and obligations retained by the entity, depending upon the measurement basis of the financial asset.

Further disclosure of such transfers may be found in Note 17 on the Financial Statements of the Annual Report and Accounts 2018.

Securitisation regulatory treatment

For regulatory purposes, any reduction in RWAs that would be achieved by our own originated securitisations must receive the PRA's permission and be justified by a commensurate transfer of credit risk to third parties. If achieved, the associated SPEs and underlying assets are not consolidated but exposures to them, including derivatives or liquidity facilities, are risk-weighted as securitisation positions.

For the majority of the non-trading book securitisation positions we use the IRB approach and, within this, Ratings Based Method ('RBM') and Internal Assessment Approach ('IAA') with lesser amounts on the Supervisory Formula Method ('SFM'). We also use the standardised approach on the non-trading book positions. Securitisation positions in the trading book are overseen within Market Risk under the standardised Approach.

Use of the IAA is limited to exposures arising from Regency Assets Limited related to liquidity facilities. Eligible ECAI rating methodology, which includes stress factors, is applied to each asset class in order to derive the equivalent rating level for each transaction. This methodology is verified by the internal credit function as part of the approval process for each new transaction. The performance of each underlying asset portfolio, including residential and commercial mortgages and re-securitisations, is monitored to confirm that the applicable equivalent rating level still applies and is independently verified. Our IAA approach is audited periodically by Internal Audit and reviewed by the PRA.

At 31 December 2018, unrealised losses on asset-backed securities ('ABS') in the year amounted to $0.2bn (2017: $0.5bn), which relates to assets within SPEs that are consolidated for regulatory purposes.

Also disclosed on page 121 of the Annual Report and Accounts 2018.

Analysis of securitisation exposures

HSBC's involvement in securitisation activities reflects the following:

- securitisation positions are not backed by revolving exposures other than trade receivables in Regency Assets Limited, which is unchanged from 2017;
- facilities are not subject to early amortisation provisions;

- $3.2bn positions held as synthetic transactions (2017: $4.7bn);
- no assets awaiting securitisation and no material realised losses on securitisation asset disposals during the year; and
- total exposures include off-balance sheet exposure of $10.9bn (2017: $15.3bn), mainly relating to contingent liquidity lines provided to securitisation vehicles where we act as sponsor, with a small amount from derivative exposures where we are an investor. The off-balance sheet exposures are held in the non-trading book and the exposure types are residential mortgages, commercial mortgages, trade receivables and re-securitisations.

Further details of our securitisation exposures may be found on page 121 of the Annual Report and Accounts 2018.

Table 39: Securitisation exposure – movement in the year

	Footnotes	Total at 1 Jan $bn	Movement in year As originator $bn	As sponsor $bn	As investor $bn	Total at 31 Dec $bn
Aggregate amount of securitisation exposures						
Residential mortgages		3.8	—	4.0	1.4	9.2
Commercial mortgages		2.7	—	(0.1)	(0.3)	2.3
Credit Cards		1.2	—	0.6	(0.4)	1.4
Leasing		1.2	—	4.8	—	6.0
Loans to corporates or SMEs		5.1	(1.5)	(0.3)	—	3.3
Consumer loans		4.6	—	2.0	0.2	6.8
Trade receivables	1	16.2	0.4	(11.2)	—	5.4
Other assets		1.0	—	(0.2)	(0.3)	0.5
Re-securitisations		1.8	(0.8)	(0.6)	—	0.4
2018		37.6	(1.9)	(1.0)	0.6	35.3

1 Exposures previously presented as 'trade receivables' have been represented in ‘consumer loans’, ‘leasing’ and ‘residential mortgage’ exposures at 31 December 2018 to provide more information on the composition of the Group’s securitisation exposures.

Table 40: Securitisation – asset values and impairments

		2018			2017		
		Underlying assets[1]		Securitisation exposures impairment	Underlying assets[1]		Securitisation exposures impairment
	Footnotes	Total[4] $bn	Impaired and past due $bn	$bn	Total[4] $bn	Impaired and past due $bn	$bn
As originator		5.4	—	—	5.8	0.5	0.2
– loans to corporates and SMEs		5.0	—	—	5.0	—	—
– trade receivables		0.4	—	—	—	—	—
– re-securitisations	2	—	—	—	0.8	0.5	0.2
As sponsor		19.9	—	—	21.1	0.4	0.1
– residential mortgages		4.3	—	—	0.3	—	—
– commercial mortgages		0.1	—	—	0.1	0.1	0.1
– credit cards		0.7	—	—	—	—	—
– leasing		5.6	—	—	0.8	—	—
– loans to corporates and SMEs		—	—	—	0.3	0.3	—
– consumer loans		3.6	—	—	1.9	—	—
– trade receivables	3	5.0	—	—	16.2	—	—
– re-securitisations	2	0.4	—	—	1.0	—	—
– other assets		0.2	—	—	0.5	—	—
At 31 Dec		25.3	—	—	26.9	0.9	0.3

1 Securitisation exposures may exceed the underlying asset values when HSBC provides liquidity facilities while also acting as derivative counterparty and a note holder in the SPE.

2 The amount of underlying assets reported for re-securitisations denotes the value of collateral within the re-securitisation vehicles.

3 Exposures previously presented as 'trade receivables' have been represented in ‘consumer loans’, ‘leasing’ and ‘residential mortgage’ exposures at 31 December 2018 to provide more information on the composition of the Group’s securitisation exposures.

4 As originator and sponsor, all associated underlying assets are held in the non-trading book. These assets are all underlying to traditional securitisations with the exception of ‘loans to corporates and SMEs’, which is underlying to a

synthetic securitisation.

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Market risk

Overview of market risk in global businesses

Market risk is the risk that movements in market factors, such as foreign exchange rates, interest rates, credit spreads, equity prices and commodity prices, will reduce our income or the value of our portfolios.

Exposure to market risk

Exposure to market risk is separated into two portfolios:

- Trading portfolios: these comprise positions arising from market-making.
- Non-trading portfolios: these comprise positions that primarily arise from the interest rate management of our retail and commercial banking assets and liabilities, financial investments measured at fair value through other comprehensive income, debt instruments measured at amortised cost, and exposures arising from our insurance operations.

Where appropriate, we apply similar risk management policies and measurement techniques to both trading and non-trading portfolios. Our objective is to manage and control market risk exposures in order to optimise return on risk while maintaining a market profile consistent within our established risk appetite.

The nature of the hedging and risk mitigation strategies performed across the Group corresponds to the market risk management instruments available within each operating jurisdiction. These strategies range from the use of traditional market instruments, such as interest rate swaps, to more sophisticated hedging strategies to address a combination of risk factors arising at portfolio level.

For a discussion on hedging risk and monitoring the continuing effectiveness of hedges, refer to page 229 of the Annual Report and Accounts 2018.

The tables below reflect the components of capital requirement under the standardised approach, table 41 and the internal model approach, table 42 for market risk.

Table 41: Market risk under standardised approach (MR1)

	At 31 Dec		
	2018	2017	2018
	RWAs	RWAs	Capital requirements
	$bn	$bn	$bn
Outright products			
1 Interest rate risk (general and specific)	2.5	2.2	0.2
2 Equity risk (general and specific)	0.1	0.1	—
3 Foreign exchange risk	1.4	0.2	0.1
4 Commodity risk	—	0.1	—
Options			
6 Delta-plus method	0.1	—	—
7 Scenario approach	—	—	—
8 Securitisation	1.6	1.8	0.1
9 Total	5.7	4.4	0.4

Table 42: Market risk under IMA (MR2-A)

	2018		2017	
	RWAs	Capital required	RWAs	Capital required
	$bn	$bn	$bn	$bn
1 VaR (higher of values a and b)	7.1	0.6	8.3	0.7
(a) Previous day's VaR		0.1		—
(b) Average daily VaR		0.6		0.7
2 Stressed VaR (higher of values a and b)	12.1	1.0	14.3	1.1
(a) Latest SVaR		0.2		—

(b) Average SVaR		1.0		1.1
3 Incremental risk charge (higher of values a and b)	6.4	0.5	10.0	0.8
(a) Most recent IRC value		0.4		0.1
(b) Average IRC value		0.5		0.8
5 Other	4.5	0.3	1.9	0.2
6 Total at 31 Dec	30.1	2.4	34.5	2.8

Market risk RWAs under the standardised approach increased in the current year mainly due to an increase in Hong Kong dollar denominated exposure. Under the IMA approach, the decrease in IRC is mainly due to lower sovereign and corporate exposure.

Market risk governance

The majority of the total VaR, stressed VaR ('SVaR') and incremental risk charge ('IRC') of HSBC (excluding insurance) and almost all trading VaR resides in GB&M. GB&M manages the Group's market risk, using risk limits approved by the GMB.

For a discussion on market risk governance refer to page 81 of the Annual Report and Accounts 2018.

Market risk measures

Monitoring and limiting market risk exposures

Our objective is to manage and control market risk exposures while maintaining a market profile consistent with our risk appetite.

We use a range of tools to monitor and limit market risk exposures including sensitivity analysis, VaR and stress testing.

Sensitivity analysis

We use sensitivity measures to monitor the market risk positions within each risk type. Sensitivity limits are set for portfolios, products and risk types, with the depth of the market being one of the principal factors in determining the level of limits set.

Value at risk

Value at risk ('VaR') is a technique that estimates the potential losses on risk positions in the trading portfolio as a result of movements in market rates and prices over a specified time horizon and to a given level of confidence. The use of VaR is integrated into market risk management and is calculated for all trading positions regardless of how we capitalise those exposures.

Where there is not an approved internal model, we use the appropriate local rules to capitalise exposures locally.

In addition, we calculate VaR for non-trading portfolios to have a complete picture of risk. Our models are predominantly based on historical simulation. VaR is calculated at a 99% confidence level for a one-day holding period. Where we do not calculate VaR explicitly, we use alternative tools as described in the stress testing section below.

Our VaR models derive plausible future scenarios from past series of recorded market rates and prices, taking into account inter-relationships between different markets and rates such as interest rates and foreign exchange rates. Our models use a mixed approach when applying changes in market rates and prices:

- For equity, credit and foreign exchange risk factors, the potential movements are typically represented on a relative return basis.
- For interest rates, a mixed approach is used. Curve movements are typically absolute, whereas volatilities are on a relative return basis.

We use the past two years as the data set in our VaR models, which is updated on a fortnightly basis, and these scenarios are then applied to the market baselines and trading positions on a daily basis. The models also incorporate the effect of option features on the underlying exposures.

The valuation approach used in our models values:

- non-linear instruments using a full revaluation approach; and
- linear instruments, such as bonds and swaps, using a sensitivity-based approach.

The nature of the VaR models means that an increase in observed market volatility will lead to an increase in VaR even without any changes in the underlying positions.

VaR model limitations

Although a valuable guide to risk, VaR should always be viewed in the context of its limitations, for example:

- The use of historical data as a proxy for estimating future events may not encompass all potential events, particularly those which are extreme in nature.
- The use of a holding period assumes that all positions can be liquidated or the risks offset during that period. This may not fully reflect the market risk arising at times of severe illiquidity, when the holding period may be insufficient to liquidate or hedge all positions fully.
- The use of a 99% confidence level by definition does not take into account losses that might occur beyond this level of confidence.

- VaR is calculated on the basis of exposures outstanding at close of business and therefore does not necessarily reflect intra-day exposures.

Risk not in VaR framework

The risks not in VaR ('RNIV') framework captures risks from exposures in the HSBC trading book that are not captured well by the VaR model. Our VaR model is designed to capture significant basis risk such as CDS versus bond, asset swap spreads and cross-currency basis. Other basis risks that are not completely covered in VaR, such as CCP swap basis risks, are complemented by our RNIV calculations and are integrated into our capital framework. Risk factors are reviewed on a regular basis and are either incorporated directly in the VaR models, where possible, or quantified through the VaR-based RNIV approach or a stress test approach within the RNIV framework. The severity of the scenarios is calibrated to be in line with the capital adequacy requirements. The outcome of the VaR-based RNIV approach is included in the overall VaR calculation but excluded from the VaR measures used for regulatory back-testing. In addition, a stressed VaR RNIV is also computed for the risk factors considered in the VaR-based RNIV approach.

Stress-type RNIVs include a gap risk exposure measure to capture risk on non-recourse margin loans and a de-peg risk measure to capture risk to pegged and heavily managed currencies.

Back-testing

We routinely validate the accuracy of our VaR models by back-testing them against both actual and hypothetical profit and loss. Hypothetical profit and loss excludes non-modelled items such as fees, commissions and revenues of intra-day transactions.

The actual number of profits or losses in excess of VaR over this period can therefore be used to gauge how well the models are performing.

We back-test our VaR at various levels of our Group entity hierarchy. Back-testing using the regulatory hierarchy includes entities which have approval to use VaR in the calculation of market risk regulatory capital requirement. HSBC submits separate back-testing results to regulators, including the PRA and the European Central Bank, based on applicable frequencies ranging from two business days after an exception occurs, to quarterly submissions.

In terms of the CRD IV rules, VaR back-testing loss, and not profit, exceptions count towards the multiplier determined by the PRA for the purposes of the capital requirement calculation for market risk. The multiplier does not get increased if there are less than five loss exceptions.

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The following graphs show a one-year history for VaR back-testing exceptions against both actual and hypothetical profit and loss.
In 2018, the Group experienced three back-testing exceptions against actual profit and loss: a profit exception in February, driven by gains on short positions on falling index and stock exposures; a profit exception in August, driven by volatility in Turkish lira spot; and a loss exception in December, driven by month end adjustments that are not in scope of the market risk model.

The Group also experienced one back-testing profit exception against hypothetical profit and loss in August based on the same driver described above in exceptions against actual profit and loss.
There was no evidence of model errors or control failures.
The back-testing result excludes exceptions due from changes in fair value adjustments.
Comparison of VaR estimates with gains/losses
VaR back-testing exceptions against actual profit and loss ($m)

Actual profit and loss VaR w Back-testing profit exception

VaR back-testing exceptions against hypothetical profit and loss ($m)

Hypothetical profit and loss VaR w Back-testing profit exception

Stress testing

Stress testing is an important procedure that is integrated into our market risk management framework to evaluate the potential impact on portfolio values of more extreme, although plausible, events or movements in a set of financial variables. In such scenarios, losses can be greater than those predicted by VaR modelling.

Stress testing is implemented at legal entity, regional and overall Group levels. A set of scenarios is used consistently across all regions within the Group. Scenarios are tailored to capture the relevant events or market movements at each level. The risk appetite around potential stress losses for the Group is set and monitored against referral limits.

Market risk reverse stress tests are designed to identify vulnerabilities in our portfolios by looking for scenarios that lead to loss levels considered severe for the relevant portfolio. These scenarios may be quite local or idiosyncratic in nature, and complement the systematic top-down stress testing.

Stressed VaR and stress testing, together with reverse stress testing and the management of gap risk, provide management with insights regarding the 'tail risk' beyond VaR, for which HSBC's appetite is limited.

The market risk stress testing incorporates the historical and hypothetical events. During 2018 we ran stress hypothetical scenarios for specific geopolitical and economic events including several Brexit scenarios, Emerging Markets decoupling, Global Trade war, Italian Elections and NAFTA renegotiation. These new

scenarios were run in addition to existing scenarios that capture potential events of concern.

Market risk capital models

There are a number of measures that HSBC has permission to use in calculating regulatory capital which are listed in the table below. For regulatory purposes, the trading book comprises all positions in CRD financial instruments and commodities held with trading intent, and taken with the intention of benefiting from short-term gains or positions where it can be demonstrated that they hedge positions in the trading book. Trading book positions must either be free of any restrictive covenants on their tradability or be capable of being hedged.

A CRD financial instrument is defined as any contract that gives rise to both a financial asset to one party and a financial liability or equity instrument to another party.

HSBC maintains a trading book policy, which defines the minimum requirements for trading book positions and the process for classifying positions as trading or non-trading book. Positions in the trading book are subject to market risk-based rules, i.e. market risk capital, computed using regulatory approved models. Otherwise, the market risk capital is calculated using the standardised approach.

If any of the policy criteria are not met, then the position is categorised as a non-trading book exposure.

Model component	Confidence level	Liquidity horizon	Model description and methodology
VaR	99%	10 day	Uses most recent two years' history of daily returns to determine a loss distribution. The result is scaled, using the square root of 10, to provide an equivalent 10-day loss.
Stressed VaR	99%	10 day	Stressed VaR is calibrated to a one-year period of stress observed in history.
IRC	99.9%	1 year	Uses a multi-factor Gaussian Monte-Carlo simulation, which includes product basis, concentration, hedge mismatch, recovery rate and liquidity as part of the simulation process. A minimum liquidity horizon of three months is applied and is based on a combination of factors, including issuer type, currency and size of exposure.
Options	n/a	n/a	Uses a standard charge scenario approach based on a spot volatility grid where, for each point on the grid, there is a full revaluation of the portfolio. The regulators prescribe the ranges, therefore there is no equivalence with confidence level and liquidity horizon.

Non-proprietary details of these models are available in the Financial Services Register on the PRA website.

Table 43: IMA values for trading portfolios (MR3)

	At 31 Dec

		2018 $m	2017 $m
VaR (10 day 99%)			
1	Maximum value	249.0	319.1
2	Average value	178.5	197.0
3	Minimum value	160.8	163.7
4	Period end	193.5	228.2
Stressed VaR (10 day 99%)			
5	Maximum value	408.3	439.7
6	Average value	304.6	284.7
7	Minimum value	191.2	193.3
8	Period end	408.3	251.3
Incremental risk charge (99.9%)			
9	Maximum value	945.5	1,042.7
10	Average value	516.5	828.5
11	Minimum value	424.3	673.4
12	Period end	491.9	803.4

VaR

VaR used for regulatory purposes differs from VaR used for management purposes with key differences listed below.

VaR	Regulatory	Management
Scope	Regulatory approval (PRA)	Broader population of trading and non-trading book positions
Confidence interval	99%	99%
Liquidity horizon	10 day	1 day
Data set	Past 2 years	Past 2 years

The trading books that received approval from the regulator to be covered via an internal model are used to calculate VaR for regulatory purposes. Regulatory VaR levels contribute to the calculation of market risk RWAs.

The regulatory VaR table is based on the regulatory permissions received, plus aggregated sites. This differs from the daily VaR reported in the Annual Report and Accounts 2018, which shows a fully diversified view used for internal risk management.

There were no material changes in the VaR used for regulatory purposes; this is in line with expectation.

Stressed VaR

Stressed VaR is primarily used for regulatory capital purposes and is integrated into the risk management process to ensure prudent capital management. Stressed VaR complements other risk measures by providing the potential losses under stressed market conditions.

Stressed VaR modelling follows the same approach as our VaR risk measure except that:

- potential market movements employed for stressed VaR calculations are based on a continuous one-year period of stress for the trading portfolio;
- the choice of period is based on the assessment at the Group level of the most volatile period in recent history. This is assessed quarterly and changed during 2018 as follows:
  - to (November 2007 to November 2008) in March 2018; and
  - to (January 2010 to December 2010) in September 2018.
- it is calculated to a 99% confidence using a 10-day holding period; and
- it is based on an actual 10-day holding period, whereas regulatory VaR is based on a one-day holding period scaled to 10 days.

The increase in stressed VaR was primarily due to the change of scenario window, recalibrated quarterly, under the new January 2010 to December 2010 window.

Incremental risk charge

The incremental risk charge ('IRC') measures the default and migration risk of issuers of traded instruments.

IRC risk factors include credit migration, default, product basis, concentration, hedge mismatch, recovery rate and liquidity. The PDs are floored to reflect the lack of historical data on defaults and a period of stress is used to calibrate the spread changes for the relevant ratings. The IRC model is validated quarterly by stressing key model parameters and reviewing the response of the model.

The IRC is a stand-alone charge generating no diversification benefit with other charges. We do not use weighted averages for calculating the liquidity horizon for the IRC measure. IRC relies on a range of liquidity horizons from three months, corresponding to the regulatory floor, to one year. A wide range of criteria can indicate the liquidity of a position. The liquidity horizon for the IRC measure depends on a set of factors such as issuer features, including rating, sector, geography and size of positions, including product, maturity and concentration.

The IRC transition matrices are calibrated using transition and default data published by three rating agencies (Standard & Poor's, Moody's and Fitch) as the starting point, in combination with internal rules for flooring. The average of the three matrices is computed for each sector, ignoring zero transition probabilities. The PDs are then floored: sovereign PDs are consistent with IRB, while a 3 basis point floor is applied to corporates' and banks' PDs.

The IRC correlation matrix is derived from historical CDS spreads data, covering the latest two-year VaR period. The returns estimation window is set equal to either three or 12 months, depending on the liquidity horizon of each obligor. First, each obligor is mapped to six sector/rating categories; then the correlation matrix is obtained by computing the arithmetic mean of correlations for each category.

The decrease in the period end IRC measure was driven from lower contribution from a number of issuers, including Brazil, Indonesia, UK, Mexico and Argentina sovereigns.

Prudent valuation adjustment

HSBC has documented policies and maintains systems and controls for the calculation of prudent valuation adjustment ('PVA'). Prudent value represents a conservative estimate with a 90% degree of certainty of a price that would be received to sell an asset or paid to transfer a liability in orderly transactions occurring between market participants at the balance sheet date. HSBC's methodology addresses fair value uncertainties arising from a number of sources; market price uncertainty, bid offer, uncertainty, model risk, concentration, administrative cost, unearned credit spreads and investing and funding costs.

Table 44: Prudential valuation adjustments (PV1)

	Equity	Interest rates	FX	Credit	Commodities	Total	Of which: in the trading book	Of which: in the banking book
	$m	$m	$m	$m	$m	$m	$m	$m
Closeout uncertainty	196	360	29	149	2	736	470	266
– of which:								
mid-market value	127	98	4	54	—	283	127	156
closeout cost	21	94	10	9	2	136	123	13
concentration	48	168	15	86	—	317	220	97
Early termination	—	—	—	5	—	5	5	—
Model risk	21	116	4	5	—	146	146	—
Operational risk	15	29	2	11	—	57	39	18
Investing and funding costs	—	95	1	2	—	98	98	—
Unearned credit spreads	1	90	7	19	3	120	120	—
Future administrative costs	—	5	—	4	—	9	9	—
Other	—	—	—	—	—	—	—	—
Total adjustment at 31 Dec 2018	233	695	43	195	5	1,171	887	284
Closeout uncertainty	200	391	32	182	4	809	486	323
– of which:								
mid-market value	111	95	7	83	3	299	135	164
closeout cost	19	79	7	8	1	114	101	13
concentration	70	217	18	91	—	396	250	146
Early termination	—	—	—	6	—	6	6	—
Model risk	30	73	5	13	—	121	118	3
Operational risk	13	24	2	13	1	53	33	20
Investing and funding costs	—	72	—	1	1	74	74	—
Unearned credit spreads	—	62	4	7	1	74	74	—
Future administrative costs	—	5	—	4	—	9	9	—
Other	—	—	—	—	—	—	—	—
Total adjustment at 31 Dec 2017	243	627	43	226	7	1,146	800	346

The PVA charge has increased by 2% over 2018. PVA movements were primarily driven by:

- a $79m decrease in concentration reflecting exposure reduction and improved liquidity conditions;
- a $46m increase related to unearned credit spreads uncertainty including close out costs, arising from an increase in accounting CVA and changes in recovery assumptions.

The types of financial instruments for which the highest PVA is observed include (i) multi callable interest rate derivatives, (ii) asset backed securities and valuation adjustments related to non-collateralised derivatives.

Structural foreign exchange exposures

Structural foreign exchange exposures represent net investments in subsidiaries, branches and associates whose functional currency is not the US dollar. An entity’s functional currency is normally that of the primary economic environment in which it operates.

Exchange differences on structural exposures are recognised in ‘Other comprehensive income’. We use the US dollar as our presentation currency in our consolidated financial statements because the US dollar and currencies linked to it form the major currency bloc in which we transact and fund our business.

Our consolidated balance sheet is, therefore, affected by exchange differences between the US dollar and all the non-US dollar functional currencies of underlying subsidiaries.

Our structural foreign exchange exposures are managed with the primary objective of ensuring, where practical, that our consolidated capital ratios and the capital ratios of individual banking subsidiaries are largely protected from the effect of changes in exchange rates. We hedge structural foreign exchange exposures only in limited circumstances. Details of our structural foreign exchange exposures are provided in the Market risk section, on page 138 of the Annual Report and Accounts 2018.

Interest rate risk in the banking book

Interest rate risk in the banking book ('IRRBB') is the potential adverse impact of changes in interest rates on earnings and capital. The component of IRRBB that can be economically neutralised in the market is transferred to BSM to manage, in accordance with internal transfer pricing rules. In its management of IRRBB, the Group aims to balance mitigating the effect of future interest rate movements, which could reduce net interest income against the cost of hedging. The monitoring of the projected net interest income and economic value of equity ('EVE') sensitivity under varying interest rate scenarios is a key part of this.

More details on our IRRBB may be found on page 83 of the Annual Report and Accounts 2018.

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Operational risk

Overview and objectives

Operational risk is the risk to achieving our strategy or objectives as a result of inadequate or failed internal processes, people and systems, or from external events.

Operational risk is relevant to every aspect of our business. It covers a wide spectrum of issues, such as compliance, operational resilience, legal, security and fraud. Losses arising from breaches of regulation and law, unauthorised activities, error, omission, inefficiency, fraud, systems failure or external events all fall within the definition of operational risk.

We have historically experienced operational risk losses in the following major categories:

- mis-selling of payment protection insurance;
- external criminal activities, including fraud;
- breakdowns in processes/procedures due to human error, misjudgement or malice;
- system failure or non-availability;
- breach of regulatory and/or legislative requirements; and
- information and cyber security.

Table 45: Operational risk RWAs

	2018		2017	
	RWAs	Capital required	RWAs	Capital required
	$bn	$bn	$bn	$bn
By global business				
Retail Banking and Wealth Management	27.3	2.2	27.2	2.2
Commercial Banking	24.3	1.9	23.7	1.9
Global Banking and Markets	31.5	2.5	30.9	2.5
Global Private Banking	2.8	0.2	2.8	0.2
Corporate Centre	5.2	0.5	8.1	0.6
At 31 Dec	91.1	7.3	92.7	7.4
By geographical region				
Europe	27.3	2.2	29.0	2.3
Asia	39.5	3.2	37.1	3.0
Middle East and North Africa	6.8	0.5	7.0	0.5
North America	11.7	0.9	12.1	1.0
Latin America	5.8	0.5	7.5	0.6
At 31 Dec	91.1	7.3	92.7	7.4

Requirements under CRD IV include a capital requirement for operational risk, utilising three levels of sophistication as explained on page 17; we use the standardised approach. Table 45 reports our operational risk capital requirements by region and global business. RWAs decreased by $1.6bn primarily due to reduced contributions from the retail banking and payment and settlement business lines, partly offset by growth in commercial banking.

Developments during 2018

During 2018, our operational risk profile continued to be driven by compliance risks. Operational risk losses in 2018 are higher than in 2017, reflecting an increase in losses incurred relating to legacy conduct-related events.

Conduct-related costs included in significant items are outlined on page 66 of the Annual Report and Accounts 2018.

In 2018 we continued our ongoing work to strengthen those controls that manage our most material risks. We further developed controls to help ensure that we know our customers, ask the right questions, monitor transactions and escalate concerns to detect, prevent and deter financial crime risk.

Refer also to the ‘Top and emerging risks’ section on page 69 of the Annual Report and Accounts 2018 and to the ‘Regulatory compliance risk management’ section on page 84 of the Annual Report and Accounts 2018.

We recognise that operational risk losses can be incurred for a wide variety of reasons, including rare but extreme events.

The objective of our operational risk management is to manage and control operational risk in a cost-effective manner and within our risk appetite, as defined by GMB.

Organisation and responsibilities

Responsibility for managing operational risk lies with HSBC's employees. During 2018 we continued to strengthen our approach to managing operational risk as set out in the

operational risk management framework ('ORMF'). The approach sets out governance, appetite and provides a single view of non-financial risks that matter the most, and associated controls. It incorporates a risk management system to enable active risk management. The enhancement and embedding of the risk appetite framework for non-financial risk, and the improvement of the consistency of the adoption of the end-to-end risk and control assessment processes were a particular focus in 2018. While there remains more to do, we made progress in strengthening the control environment and the management of non-financial risk. Activity to strengthen the three lines of defence model, continued to be a key focus in 2018.

The first line of defence owns the risk and is responsible for identifying, recording, reporting, managing the risks and ensuring that the right controls and assessments are in place to mitigate these risks. The second line of defence sets the policy and guidelines for managing the risks and provides advice, guidance and challenge to the first line of defence on effective risk management. The third line of defence is Internal Audit, which independently ensures we are managing risk effectively.

More details on our ORMF may be found on page 84 of the Annual Report and Accounts 2018.

The Global Operational Risk Committee, which is a sub-committee of the GRMM, meets to discuss key risk issues and review the effective implementation of the ORMF.

Operational risk is organised as a specific risk discipline within Global Risk. The Group Head of Operational Risk is responsible for establishing and maintaining the ORMF, monitoring the level of operational losses and the effectiveness of the internal control environment supported by their second line of defence functions. The Group Head of Operational Risk is accountable to the Group Chief Risk Officer in respect of this element of the overall enterprise-wide risk management framework.

Measurement and monitoring

We have codified our ORMF in a high level standard, supplemented by detailed policies. These policies explain our approach to identifying, assessing, monitoring and controlling operational risk, and give guidance on mitigating actions to be taken when weaknesses are identified.

Monitoring operational risk exposure against risk appetite on a regular basis, and setting out our risk acceptance process, drives risk awareness in a more forward-looking manner. It assists management in determining whether further action is required.

Risk scenario analysis across material legal entities provides a top down, forward-looking assessment of risks to help determine whether they are being effectively managed within our risk appetite or whether further management action is required.

In each of our subsidiaries, business managers are responsible for maintaining an appropriate level of internal control, commensurate with the scale and nature of operations. They are responsible for identifying and assessing risks, designing controls and monitoring the effectiveness of these controls. The ORMF helps managers to fulfil these responsibilities by defining a standard risk assessment methodology and providing a tool for the systematic reporting of operational loss data.

Operational risk and control assessment approach

Operational risk and control assessments are performed by individual business units and functions. The risk and control assessment process is designed to provide business areas and functions with a forward-looking view of operational risks, an assessment of the effectiveness of controls, and a tracking mechanism for action plans so that they can proactively manage operational risks within acceptable levels.

Appropriate means of mitigation and controls are considered. These include:

- making specific changes to strengthen the internal control environment; and
- investigating whether cost-effective insurance cover is available to mitigate the risk.

Recording

We use a Group-wide risk management system to record the results of our operational risk management process. Operational risk and control assessments, as described above, are input and maintained by business units. Business management monitors and follow up the progress of documented action plans.

Operational risk loss reporting

To ensure that operational risk losses are consistently reported and monitored at Group level, all Group companies are required to report individual losses when the net loss is expected to exceed $10,000 and to aggregate all other operational risk losses under $10,000. Losses are entered into the group-wide risk management system and are reported to governance on a monthly basis.

Pillar 3 Disclosures at 31 December 2018

Other risks

Pension risk

We operate a number of pension plans throughout the world for our employees. Our plans are either defined benefit or defined

contribution plans, which expose the Group to different types of risks. We have a global pension risk management framework and accompanying global policies on the management of these risks, which is overseen by the Global Pensions Oversight Forum.

Details of our management of pension risk may be found in ‘Pension risk management’ on page 87 of the Annual Report and Accounts 2018.

Table 46: Non-trading book equity investments

		2018			2017		
		Fair value through other comprehensive income (FVOCI)	Mandatorily measured at fair value through profit and loss	Total	Available for sale	Designated at fair value	Total
	Footnotes	$bn	$bn	$bn	$bn	$bn	$bn
Private equity holdings		—	1.9	1.9	1.0	0.3	1.3
Investment to facilitate ongoing business	1	1.7	1.1	2.8	1.6	—	1.6
Other strategic investments		—	0.3	0.3	1.3	—	1.3
At 31 Dec		1.7	3.3	5.0	3.9	0.3	4.2

1 Includes holdings in government-sponsored enterprises and local stock exchanges.

Non-trading book exposures in equities

At 31 December 2018, we had equity investments in the non-trading book of $5.0bn (2017: $4.2bn). These consist of investments held for the purposes shown in table 46.

We make investments in private equity primarily through managed funds that are subject to limits on the amount of investment. We risk-assess these commitments to ensure that industry and geographical concentrations remain within acceptable levels for the portfolio as a whole, and perform regular reviews to substantiate the valuation of the investments within the portfolio.

Exchange traded investments amounted to $0.7bn (2017: $0.7bn), with the remainder being unlisted. These investments are held at fair value in line with market prices and are mainly strategic in nature. The implementation of IFRS 9 resulted in the removal of the available-for-sale category; the majority of equity exposures therein have been classified as mandatorily measured at fair value through profit and loss, as have equities formerly classified within designated at fair value through profit and loss. A number of exposures formerly reported as other strategic investments have been reassessed as investments to facilitate ongoing business in the process.

Unrealised gains on FVOCI equities of $0.4bn at 31 December 2018 were fully recognised in CET1.

Details of our accounting policy for equity investments measured at FVOCI and the valuation of financial instruments may be found on page 228 of the Annual Report and Accounts 2018. A detailed description of the valuation techniques applied to private equity may be found on page 253 of the Annual Report and Accounts 2018.

Risk management of insurance operations

We operate an integrated bancassurance model that provides insurance products principally for customers with whom we have a banking relationship.

The insurance contracts we sell relate to the underlying needs of our banking customers, which we can identify from our point-of-sale contacts and customer knowledge. The majority of sales are of savings and investment products and term and credit life contracts.

By focusing largely on personal and small- and medium-sized enterprises ('SMEs') lines of business, we are able to optimise volumes and diversify individual insurance risks.

We choose to manufacture these insurance products in HSBC subsidiaries based on an assessment of operational scale and risk appetite. Manufacturing insurance allows us to retain the risks and rewards associated with writing insurance contracts by keeping

part of the underwriting profit and investment income within the Group.

We have life insurance manufacturing subsidiaries in Argentina, mainland China, France, Hong Kong, Malaysia, Malta, Mexico, Singapore and the UK. We also have a life insurance manufacturing associate in India.

Where we do not have the risk appetite or operational scale to be an effective insurance manufacturer, we engage with a handful of leading external insurance companies in order to provide insurance products to our customers through our banking network and direct channels. These arrangements are generally structured with our exclusive strategic partners and earn the Group a combination of commissions, fees and a share of profits. We distribute insurance products in all of our geographical regions.

Insurance products are sold through all global businesses, but predominantly by RBWM and CMB through our branches and direct channels worldwide.

The risk profile of our insurance manufacturing businesses is measured using an economic capital approach. Assets and liabilities are measured on a market value basis, and a capital requirement is defined to ensure that there is a less than one-in-200 chance of insolvency over a one-year time horizon, given the risks to which the businesses are exposed. The methodology for the economic capital calculation is largely aligned to the pan-European Solvency II insurance capital regulations.

Subsidiaries engaged in insurance activities are excluded from the regulatory consolidation by excluding assets, liabilities and post-acquisition reserves, leaving the investment of these insurance subsidiaries to be recorded at cost and deducted from CET1 subject to thresholds (amounts below the thresholds are risk-weighted).

Further details of the management of financial risks and insurance risk arising from the insurance operations are provided on page 86 of the Annual Report and Accounts 2018.

Liquidity and funding risk

Strategies and processes in the management of liquidity risk

HSBC has an internal liquidity and funding risk management framework ('LFRF'), which aims to allow it to withstand very severe liquidity stresses. It is designed to be adaptable to changing business models, markets and regulations. The management of liquidity and funding is primarily undertaken locally (by country) in our operating entities in compliance with the Group's LFRF, and with practices and limits set by the GMB

through the RMM and approved by the Board. Our general policy is that each defined operating entity should be self-sufficient in funding its own activities.

Structure and organisation of the liquidity risk management function

The Group Treasurer, who reports to the Group Chief Financial Officer, has responsibility for the oversight of the LFRF. Asset, Liability and Capital Management ('ALCM') teams are responsible for the application of the LFRF at a local operating entity level.

The elements of the LFRF are underpinned by a robust governance framework, the two major elements of which are:

- Group, regional and entity level asset and liability management committees ('ALCOs'); and
- annual internal liquidity adequacy assessment process ('ILAAP') used to validate risk tolerance and set risk appetite.

Liquidity and funding are predominantly managed at a country level. Where appropriate, management may be expanded to cover a consolidated group of legal entities or narrowed to a principal office (branch) of a wider legal entity to reflect the management under internal or regulatory definitions.

The RMM reviews and agrees annually the list of countries, legal entities or consolidated groups it directly oversees and the composition of these entities ('principal operating entities'). This list forms the basis of liquidity and funding risk disclosures.

Asset, Liability and Capital Management

Asset, Liability and Capital Management ('ALCM') teams provide oversight at both an individual entity and Group level. Regional and local ALCM teams are responsible for the implementation of Group-wide and local regulatory policy at a legal entity level.

Liquidity Risk Assurance

Liquidity risk assurance is provided by Risk in HSBC Bank plc, HSBC UK Bank plc, HSBC North America Holdings and Hongkong and Shanghai Banking Corporation. For all other operating entities, it is provided by the local Finance and ALCM teams. Second line liquidity risk assurance performs the following activities:

- reviews and challenges assumptions of current liquidity and funding risk management framework;
- reviews and challenges methods and calculation processes of all aspects of liquidity and funding risk;
- reviews results of liquidity and funding metrics against limits and proposed limit changes prior to approval at governance forums; and
- reviews risk items that require escalation.

There are plans in place to broaden Risk's assurance role across more operating entities in 2019.

Scope and nature of liquidity risk reporting and measurement

Where possible, the Group maintains standardised platforms utilising common data feeds in order to ensure consistency of standard internal and regulatory reporting and flexibility to deliver ad hoc requests.

Hedging and mitigating liquidity risk at HSBC

Management of liquidity and funding risk

Liquidity coverage ratio

The liquidity coverage ratio ('LCR') aims to ensure that a bank has sufficient unencumbered high-quality liquid assets ('HQLA') to meet its liquidity needs in a 30 calendar day liquidity stress scenario. For the calculation of the LCR, HSBC follows the guidelines set by the European Commission.

Net stable funding ratio

HSBC uses the net stable funding ratio ('NSFR') as a basis for establishing stable funding around the Group. The NSFR requires institutions to maintain sufficient stable funding and reflects a

bank's long-term funding profile (funding with a term of more than one year).

Liquid assets of HSBC's principal operating entities

Liquid assets are held and managed on a stand-alone operating entity basis. Most are held directly by each operating entity's BSM department, primarily for the purpose of managing liquidity risk in line with the LFRF.

The liquid asset buffer may also include securities in held-to- maturity portfolios. To qualify as part of the liquid asset buffer, held-to-maturity portfolios must have a deep and liquid repo market in the underlying security. Liquid assets also include any unencumbered liquid assets held outside BSM departments for any other purpose. The LFRF gives ultimate control of all unencumbered assets and sources of liquidity to BSM.

Overall adequacy of liquidity risk management at HSBC

All operating entities are required to prepare an internal liquidity adequacy assessment ('ILAA') document, in order to ensure that:

- liquidity resources are adequate, both as to the amount and quality;
- there is no significant risk that liabilities cannot be met as they fall due;
- a prudent structural funding profile is maintained;
- adequate liquidity resources continue to be maintained; and
- the operating entity's liquidity risk framework is adequate and robust.

The key objectives of the ILAAP are to:

- demonstrate that all material liquidity and funding risks are captured within the internal framework;
- validate the operating entity's risk tolerance/appetite by demonstrating that reverse stress testing scenarios are acceptably remote and vulnerabilities have been assessed through the use of severe stress scenarios; and
- provide review and challenge of the operating entity's ILAA document.

The final conclusion of the Group ILAAP, approved by the Board of Directors, is that each operating entity:

- maintains liquidity resources, which are adequate in both amount and quality at all times, and ensures that there is no significant risk that its liabilities cannot be met as they fall due; and
- ensures its liquidity resources contain an adequate amount of HQLA and maintains a prudent funding profile.

HSBC's business strategy and overall liquidity risk profile

The key aspects of the internal LFRF which is used to ensure that HSBC maintains an appropriate overall liquidity risk profile are:

- stand-alone management of liquidity and funding by operating entity;
- minimum LCR requirement;
- minimum NSFR requirement;
- legal entity depositor concentration limit;
- three-month and 12-month cumulative rolling term contractual maturity limits covering deposits from banks, deposits from non-bank financial institutions and securities issued;
- annual individual liquidity adequacy assessment by principal operating entity;
- minimum LCR requirement by currency;
- intra-day liquidity;
- liquidity funds transfer pricing; and
- forward-looking funding assessments.

The internal LFRF and the risk tolerance limits were approved by the RMM and the Board on the basis of recommendations made by the Group Risk Committee.

Concentration of funding and liquidity sources

Depositor concentration and term funding maturity concentration

The LCR and NSFR metrics assume a stressed outflow based on a portfolio of depositors within retail, corporate and financial deposit segments. The validity of these assumptions is challenged if the portfolio of depositors is not large enough to avoid depositor concentration.

Operating entities are exposed to term re-financing concentration risk if the current maturity profile results in future maturities being overly concentrated in any defined period.

At 31 December 2018, all principal operating entities were within the risk tolerance levels set for depositor concentration and term funding maturity concentration. These risk tolerances were established by the Board and are applicable under the LFRF.

Currency mismatch in the LCR

In times of stress it cannot automatically be assumed that one currency can always be converted for another, even if those currencies are ‘hard’ currencies. LCR must therefore be assessed by currency, if the currency is material.

In some currencies, convertibility is restricted by regulators and central banks and this restriction results in local currency not being convertible offshore or even onshore.

In the vast majority of cases, the only way to convert currencies for funding purposes is via deliverable foreign exchange swaps and, to a lesser extent, cross-currency repo. Access to foreign exchange swaps markets can be impacted by both market wide stress and idiosyncratic stress. Idiosyncratic stress arises from the fact that settlement of the two currency legs occurs at different times during the day, exposing the counterparty who has to settle (pay) first to intra-day credit risk on the entire principal amount, until the other counterparty pays the other currency; this is often referred to as ‘Herstatt Risk’.

The Group’s internal liquidity and funding risk management framework requires all operating entities to monitor single currency LCR. Limits are set in consultation with Group Treasury and approved by Group Treasury before being approved by
local ALCO.

Liquidity management across HSBC

The structure of the Group means that liquidity and funding risk cannot practically be managed on a consolidated Group basis and can only be managed by entity on a standalone basis. The Group’s LFRF requires all operating entities to manage liquidity and funding risk on a standalone basis in accordance with the Group’s LFRF and the liquidity and funding risk tolerances set out in the Group RAS.

The Group’s internal LFRF does not therefore seek to manage liquidity and funding risk on a consolidated basis, other than to ensure that the position of the consolidated group meets the minimum regulatory requirements.

Liquid assets of HSBC’s principal operating entities

The unweighted liquidity value of assets categorised as liquid for HSBC’s principal operating entities is shown on page 133 of the Annual Report and Accounts 2018. This information is used for the purposes of calculating the LCR metric for the Group for which the weighted value of assets is shown in the table on the following page. This reflects the stock of unencumbered liquid assets at the reporting date, using the regulatory definition of liquid assets. The amount recognised by entity at the Group level is different from the amount recognised at a solo entity level, reflecting where liquidity cannot be freely transferred across HSBC.

Table 47: Level and components of HSBC Group consolidated liquidity coverage ratio (LIQ1)

	Quarter ended 31 Dec 2018		Quarter ended 30 Sep 2018		Quarter ended 30 Jun 2018		Quarter ended 31 Mar 2018	
	Total unweighted value $m	Total weighted value $m	Total unweighted value $m	Total weighted value $m	Total unweighted value $m	Total weighted value $m	Total unweighted value $m	Total weighted value $m
Number of data points used in the calculation of averages	12		12		12		12	
High quality liquid assets								
Total high quality liquid assets ('HQLA')		534,179		524,596		511,709		495,669
Cash outflows								
Retail deposits and small business funding	741,411	76,615	741,913	76,674	740,245	77,213	731,827	77,117
– of which:								
stable deposits	287,536	14,242	287,497	14,213	274,684	13,571	260,992	12,888
less stable deposits	453,229	62,193	453,929	62,330	465,196	63,541	470,590	64,156
Unsecured wholesale funding	607,166	284,286	600,879	282,783	597,418	283,398	580,629	277,055
– operational deposits (all counterparties) and deposits in networks of cooperative banks	193,015	46,773	188,451	45,473	184,319	44,496	175,839	42,504
– non-operational deposits (all counterparties)	404,498	227,860	402,004	226,886	402,288	228,091	393,154	222,915
– unsecured debt	9,653	9,653	10,424	10,424	10,811	10,811	11,636	11,636
Secured wholesale funding		13,715		13,891		13,232		12,459
Additional requirements	310,452	92,082	307,886	92,078	305,162	92,292	298,534	89,956
– outflows related to derivative exposures and other collateral requirements	42,877	41,792	44,036	42,700	44,778	43,549	43,395	42,381
– outflows related to loss of funding on debt products	—	—	—	—	—	—	—	—
– credit and liquidity facilities	267,575	50,290	263,849	49,378	260,385	48,743	255,140	47,575
Other contractual funding obligations	91,238	34,808	90,509	35,833	87,183	36,916	81,249	36,266

Other contingent funding obligations	353,187	12,663	356,545	12,750	356,876	12,725	346,555	12,349
Total cash outflows		514,169		514,009		515,776		505,202
Cash inflows								
Secured lending transactions (including reverse repos)	286,098	42,100	274,982	43,404	265,368	41,443	252,539	37,666
Inflows from fully performing exposures	116,612	85,698	116,346	85,452	112,998	83,420	107,814	79,999
Other cash inflows	86,832	46,413	79,620	46,530	81,346	48,566	79,168	47,273
(Difference between total weighted inflows and total weighted outflows arising from transactions in third countries where there are transfer restrictions or which are denominated in non-convertible currencies)		—		—		—		—
(Excess inflows from a related specialised credit institution)		—		—		—		—
Total cash inflows	489,542	174,211	470,948	175,386	459,712	173,429	439,521	164,938
Fully exempt inflows	—	—	—	—	—	—	—	—
Inflows Subject to 90% Cap	—	—	—	—	—	—	—	—
Inflows Subject to 75% Cap	455,505	174,211	436,698	175,386	431,838	173,429	421,442	164,938
Liquidity coverage ratio (Adjusted value)								
Liquidity Buffer		534,179		524,596		511,709		495,669
Total net cash outflows		339,959		338,623		342,347		340,264
Liquidity coverage ratio (%)		157.1%		155.0%		150.0%		146.0%

Analysis of on-balance sheet encumbered and unencumbered assets and off-balance sheet collateral

On-balance sheet encumbered and unencumbered assets

Thetable on the following page summarises the total on-balance sheet assets capable of supporting future funding and collateral needs, and shows the extent to which they are currently pledged for this purpose. This disclosure aims to facilitate an understanding of available and unrestricted assets that could be used to support potential future funding and collateral needs.

Off-balance sheet collateral

The fair value of assets accepted as collateral that we are permitted to sell or repledge in the absence of default was $483bn at 31 December 2018 (2017: $409bn). The fair value of any such collateral actually sold or repledged was $329bn (2017: $242bn). We are obliged to return equivalent securities. These transactions are conducted under terms that are usual and customary to standard reverse repo, stock borrowing and derivative transactions.

The fair value of collateral received and re-pledged in relation to reverse repos, stock borrowing and derivatives is reported on a gross basis. The related balance sheet receivables and payables are reported on a net basis where required under IFRS offset criteria. As a consequence of reverse repo, stock borrowing and derivative transactions where the collateral received could be sold or re-pledged but had not been, we held $154bn (2017: $166bn) of unencumbered collateral available to support potential future funding and collateral needs at 31 December 2018.
Under the terms of our current collateral obligations under derivative contracts (which are ISDA compliant CSA contracts and contracts entered into for pension obligations), and based on an estimate of the positions at 31 December 2018, we calculate that we could be required to post additional collateral of up to $0.2bn (2017: $0.3bn) in the event of a one-notch downgrade in third-
party agencies' credit rating of HSBC's debt. This would increase to $0.4bn (2017: $0.5bn) in the event of a two-notch downgrade.
For further details on liquidity and funding risk management, see page 80 onwards of the Annual Report and Accounts 2018.

Pillar 3 Disclosures at 31 December 2018

Table 48: Analysis of on-balance sheet encumbered and unencumbered assets

	Assets encumbered as a result of transactions with counterparties other than central banks			Assets positioned at central banks	Unencumbered assets not positioned at central banks				
	As a result of covered bonds	As a result of securitisations	Other	(i.e. pre-positioned plus encumbered)	Assets readily available for encumbrance	Other assets capable of being encumbered	Reverse repos/stock borrowing receivables and derivative assets	Assets that cannot be encumbered	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Cash and balances at central banks	—	—	—	493	155,813	24	—	6,513	162,843
Items in the course of collection from other banks	—	—	—	—	—	—	—	5,787	5,787
Hong Kong Government certificates of indebtedness	—	—	—	—	—	—	—	35,859	35,859
Trading assets	—	—	68,877	3,221	137,589	8,493	18,279	1,671	238,130
– treasury and other eligible bills	—	—	2,367	2,357	17,707	209	—	34	22,674
– debt securities	—	—	44,000	864	83,640	1,803	—	232	130,539
– equity securities	—	—	22,510	—	36,242	2,070	—	74	60,896
– loans and advances to banks	—	—	—	—	—	2,768	6,753	904	10,425
– loans and advances to customers	—	—	—	—	—	1,643	11,526	427	13,596
Financial assets designated and otherwise mandatorily measured at fair value	—	—	1,177	—	2,135	7,601	605	29,593	41,111

through profit or loss									
– treasury and other eligible bills	—	—	627	—	—	—	—	43	670
– debt securities	—	—	—	—	297	4	—	6,246	6,547
– equity securities	—	—	—	—	1,676	1,035	—	22,638	25,349
– loans and advances to banks and customers	—	—	—	—	162	6,331	605	619	7,717
– other assets	—	—	550	—	—	231	—	47	828
Derivatives	—	—	—	—	—	—	207,825	—	207,825
Loans and advances to banks	—	—	170	2,367	1,947	45,992	—	21,691	72,167
Loans and advances to customers	6,621	7,653	4,036	58,737	15,867	847,301	28	41,453	981,696
Reverse repurchase agreements – non-trading	—	—	—	—	—	—	242,804	—	242,804
Financial investments	—	670	28,723	21,310	285,374	5,157	—	66,199	407,433
– treasury and other eligible bills	—	276	1,079	5,377	88,556	1,235	—	798	97,321
– debt securities	—	394	27,644	15,933	196,436	3,466	—	64,485	308,358
– equity securities	—	—	—	—	382	456	—	819	1,657
– other investments	—	—	—	—	—	—	—	97	97
Prepayments, accrued income and other assets	—	3	35,407	88	3,609	33,060	—	38,404	110,571
Current tax assets	—	—	—	—	—	—	—	684	684
Interest in associates and joint ventures	—	—	—	—	15	21,994	—	398	22,407
Goodwill and intangible assets	—	—	—	—	—	—	—	24,357	24,357
Deferred tax	—	—	—	—	—	—	—	4,450	4,450
	6,621	8,326	138,390	86,216	602,349	969,622	469,541	277,059	2,558,124

At 31 Dec
2018

Table 48: Analysis of on-balance sheet encumbered and unencumbered assets (continued)

	Assets encumbered as a result of transactions with counterparties other than central banks			Assets positioned at central banks (i.e. pre-positioned plus encumbered)	Unencumbered assets not positioned at central banks				
	As a result of covered bonds	As a result of securitisations	Other		Assets readily available for encumbrance	Other assets capable of being encumbered	Reverse repos/stock borrowing receivables and derivative assets	Assets that cannot be encumbered	Total
	$m	$m	$m	$m	$m	$m	$m	$m	$m
Cash and balances at central banks	—	—	7	128	172,567	206	—	7,716	180,624
Items in the course of collection from other banks	—	—	—	—	—	—	—	6,628	6,628
Hong Kong Government certificates of indebtedness	—	—	—	—	—	—	—	34,186	34,186
Trading assets	—	—	93,867	4,630	143,811	10,234	17,120	18,333	287,995
– treasury and other eligible bills	—	—	2,017	4,210	11,233	71	—	2	17,533
– debt securities	—	—	36,367	420	69,934	657	—	108	107,486
– equity securities	—	—	33,209	—	62,644	3,407	—	—	99,260
– loans and advances to banks	—	—	8,215	—	—	2,430	7,611	7,799	26,055
– loans and advances to customers	—	—	14,059	—	—	3,669	9,509	10,424	37,661
Financial assets designated at fair value	—	—	—	—	1,331	64	—	28,069	29,464
– treasury and other eligible bills	—	—	—	—	540	—	—	65	605
– debt securities	—	—	—	—	447	—	—	3,644	4,091
	—	—	—	—	344	64	—	24,352	24,760

– equity securities									
– loans and advances to banks and customers	—	—	—	—	—	—	—	8	8
Derivatives	—	—	—	—	—	—	219,818	—	219,818
Loans and advances to banks	—	—	3,599	5,699	1,906	56,542	1,160	21,487	90,393
Loans and advances to customers	4,990	8,296	7,851	69,768	11,923	834,177	3,719	22,240	962,964
Reverse repurchase agreements – non-trading	—	—	—	—	—	—	201,553	—	201,553
Financial investments	—	44	26,772	22,285	264,587	8,815	—	66,573	389,076
– treasury and other eligible bills	—	—	315	3,848	73,098	1,297	—	292	78,850
– debt securities	—	44	26,457	18,437	190,119	5,951	—	65,300	306,308
– equity securities	—	—	—	—	1,370	1,567	—	981	3,918
Prepayments, accrued income and other assets	—	—	2,876	—	5,527	25,647	—	33,141	67,191
Current tax assets	—	—	—	—	—	—	—	1,006	1,006
Interest in associates and joint ventures	—	—	310	—	55	22,101	—	278	22,744
Goodwill and intangible assets	—	—	—	—	—	—	—	23,453	23,453
Deferred tax	—	—	—	—	—	—	—	4,676	4,676
At 31 Dec 2017	4,990	8,340	135,282	102,510	601,707	957,786	443,370	267,786	2,521,771

Reputational risk

Reputational risk is the risk of failing to meet stakeholder expectations as a result of any event, behaviour, action or inaction, either by HSBC, our employees or those with whom we are associated. Any material lapse in standards of integrity, compliance, customer service or operating efficiency may represent a potential reputational risk. Stakeholder expectations constantly evolve, and so reputational risk is dynamic and varies between geographical regions, groups and individuals. We have an unwavering commitment to operate at the high standards we set for ourselves in every jurisdiction.

For further details of our reputational risk management, see page 86 of the Annual Report and Accounts 2018.

Sustainability risk

Sustainability risk arises from the provision of financial services to companies or projects which indirectly result in unacceptable impacts on people or on the environment.

Sustainability risk is:

- measured by assessing the potential sustainability effect of a customer's activities and assigning a sustainability risk rating to all high-risk transactions;
- monitored quarterly by the RMM and monthly by the Group's Sustainability Risk function; and
- managed using sustainability risk policies covering project finance lending and sector-based sustainability policies for sectors and themes with potentially large environmental or social impacts.

For further details on sustainability risk management, see page 87 of the Annual Report and Accounts 2018.

Business risk

The PRA specifies that banks, as part of their ICAAP, should review their exposure to business risk.

Business risk is the potential negative effect on profits and capital from the Group not meeting our strategic objectives, as a result of unforeseen changes in the business and regulatory environment, exposure to economic cycles and technological changes.

We manage and mitigate business risk through our risk appetite, business planning and stress testing processes, so that our business model and planned activities are monitored, resourced and capitalised in a way that is consistent with the commercial, economic and risk environment in which the Group operates. This also means that any potential vulnerabilities of our business plans can be identified at an early stage so that mitigating actions can be taken.

Dilution risk

Dilution risk is the risk that an amount receivable is reduced through cash or non-cash credit to the obligor, and arises mainly from factoring and invoice discounting transactions.

Where there is recourse to the seller, we treat these transactions as loans secured by the collateral of the debts purchased and do not report dilution risk for them. For our non-recourse portfolio we obtain an indemnity from the seller that indemnifies us against this risk. Moreover, factoring transactions involve lending at a discount to the face-value of the receivables, which provides protection against dilution risk.

Remuneration

The Group's remuneration policy, including the remuneration committee membership and activities, remuneration strategy and remuneration details of HSBC's Identified Staff and Material Risk Takers, is set out in the Directors' Remuneration Report on page 172 of the Annual Report and Accounts 2018. An overview of our Group approach to remuneration is available on our website (http://www.hsbc.com/our-approach/corporate-governance/remuneration).

Appendix I

Additional tables

Table 49 sets out IRB exposures by obligor grade for central governments and central banks, institutions and corporates, all of which are assessed using our 23-grade CRR master scale. We benchmark the master scale against the ratings of external rating agencies. Each CRR band is associated with an external rating grade by reference to long-run default rates for that grade, represented by the average of issuer-weighted historical default rates.

The correspondence between the agency long-run default rates and the PD ranges of our master scale is obtained by matching a smoothed curve based on those default rates with our master scale reference PDs. This association between internal and external ratings is indicative and may vary over time. In these tables, the ratings of S&P are cited for illustration purposes, although we also benchmark against other agencies' ratings in an equivalent manner.

Table 49: Wholesale IRB exposure – by obligor grade

			Central governments and central banks			Institutions			Corporates[2]		
Default risk	CRR	PD range	Average net carrying values[1]	Undrawn commit-ments	Mapped external rating	Average net carrying values[1]	Undrawn commit-ments	Mapped external rating	Average net carrying values[1]	Undrawn commit-ments	Mapped external rating
		%	$bn	$bn		$bn	$bn		$bn	$bn	
	0.1	0.000 to 0.010	182.6	1.0	AAA	2.4	—	AAA	—	—	
Minimal	1.1	0.011 to 0.028	77.4	0.9	AA+ to AA	32.1	2.1	AA+ to AA	28.7	12.6	AAA to AA
	1.2	0.029 to 0.053	22.5	0.4	AA- to A+	17.6	1.4	AA-	64.6	39.1	AA-
	2.1	0.054 to 0.095	8.1	0.3	A	13.1	2.8	A+ to A	89.9	50.3	A+ to A
Low	2.2	0.096 to 0.169	10.6	—	A-	11.9	3.3	A-	106.9	73.1	A-
	3.1	0.170 to 0.285	2.6	—	BBB+	3.1	0.7	BBB+	125.2	68.9	BBB+
Satisfactory	3.2	0.286 to 0.483	1.9	—	BBB	3.7	0.3	BBB	113.8	59.8	BBB
	3.3	0.484 to 0.740	2.8	0.2	BBB-	2.4	0.2	BBB-	104.4	47.5	BBB-
	4.1	0.741 to 1.022	1.8	0.1	BB+	0.9	0.2	BB+	75.9	33.7	BB+
Fair	4.2	1.023 to 1.407	0.3	0.1	BB	0.4	0.2	BB	54.2	28.8	BB
	4.3	1.408 to 1.927	1.5	0.1	BB-	0.3	0.1	BB-	49.4	19.8	BB-
	5.1	1.928 to 2.620	2.6	—	BB-	0.1	—	BB-	82.2	30.8	BB-
Moderate	5.2	2.621 to 3.579	—	—	B+	0.2	—	B+	24.0	10.1	B+
	5.3	3.580 to 4.914	0.2	—	B	—	—	B	19.6	8.5	B
Significant	6.1	4.915 to 6.718	0.1	—	B	—	—	B-	11.7	4.8	B-
	6.2		0.3	0.1	B-	—	—	B-	6.0	1.9	B-

	7.1	6.719 to 8.860	8.861 to 11.402	0.1	—	CCC+	—	—	CCC+	3.1	1.0	CCC+
High	7.2	11.403 to 15.000	—	—	CCC+	0.1	0.1	CCC+	2.0	0.6	CCC+
	8.1	15.001 to 22.000	—	—	CCC+	—	—	CCC	2.5	1.5	CCC
Special Management	8.2	22.001 to 50.000	—	—	CCC+	—	—	CCC- to CC	1.0	0.4	CCC- to CC
	8.3	50.001 to 99.999	—	—	CCC to C	—	—	C	0.4	0.2	C
Default	9/10	100.000	—	—	Default	—	—	Default	4.3	1.2	Default
At 31 Dec 2018			315.4	3.2		88.3	11.4		969.8	494.6	
	0.1	0.000 to 0.010	195.2	0.7	AAA	2.4	—	AAA	—	—	
Minimal	1.1	0.011 to 0.028	70.6	0.8	AA+ to AA	20.7	1.6	AA+ to AA	27.7	10.4	AAA to AA
	1.2	0.029 to 0.053	23.3	0.5	AA- to A+	29.3	2.5	AA-	61.3	39.3	AA-
	2.1	0.054 to 0.095	9.3	0.1	A	17.2	2.6	A+ to A	82.2	53.1	A+ to A
Low	2.2	0.096 to 0.169	10.1	—	A-	10.8	3.9	A-	101.5	65.6	A-
	3.1	0.170 to 0.285	2.4	—	BBB+	4.2	1.0	BBB+	112.8	70.9	BBB+
Satisfactory	3.2	0.286 to 0.483	2.3	—	BBB	3.5	0.5	BBB	105.8	57.6	BBB
	3.3	0.484 to 0.740	1.4	—	BBB-	1.7	0.7	BBB-	91.1	46.5	BBB-
	4.1	0.741 to 1.022	1.0	—	BB+	1.3	0.4	BB+	75.0	34.4	BB+
Fair	4.2	1.023 to 1.407	1.0	—	BB	0.5	0.2	BB	49.0	23.6	BB
	4.3	1.408 to 1.927	1.5	—	BB-	0.2	0.1	BB-	48.0	22.2	BB-
	5.1	1.928 to 2.620	0.7	—	BB-	0.2	—	BB-	71.5	28.9	BB-
Moderate	5.2	2.621 to 3.579	1.8	—	B+	0.1	—	B+	23.6	10.2	B+
	5.3	3.580 to 4.914	0.2	0.1	B	—	—	B	19.0	8.8	B
	6.1	4.915 to 6.718	0.1	0.1	B	—	—	B-	14.2	6.6	B-
Significant	6.2	6.719 to 8.860	—	—	B-	—	—	B-	7.6	2.8	B-

High	7.1	8.861 to 11.402	—	—	CCC+	—	—	CCC+	3.2	1.0	CCC+
	7.2	11.403 to 15.000	—	—	CCC+	0.1	0.1	CCC+	1.8	0.5	CCC+
Special Management	8.1	15.001 to 22.000	—	—	CCC+	—	—	CCC	3.4	1.8	CCC
	8.2	22.001 to 50.000	—	—	CCC+	0.1	—	CCC- to CC	1.3	0.5	CCC- to CC
	8.3	50.001 to 99.999	—	—	CCC to C	—	—	C	0.3	0.1	C
Default	9/10	100.000	—	—	Default	—	—	Default	4.7	1.4	Default
At 31 Dec 2017			320.9	2.3		92.3	13.6		905.0	486.2	

1 Average net carrying value are calculated by aggregating the net carrying values of the last five quarters and dividing by five.

2 Corporates excludes specialised lending exposures subject to supervisory slotting approach.

Pillar 3 Disclosures at 31 December 2018

PD, LGD, RWA and exposure by country/territory

The following tables 50. a-n analyse the exposure-weighted average PD, exposure-weighted average LGD, RWAs and exposure by location of the lending subsidiary or branch for the Group's IRB exposures. The tables exclude specialised lending exposures subject to the supervisory slotting approach, securitisation exposures and non-credit obligations.

Table 50.a: PD, LGD, RWA and exposure by country/territory – wholesale IRB advanced approach all asset classes

	At 31 Dec 2018				At 31 Dec 2017			
	Exposure-weighted average PD	Exposure-weighted average LGD	RWAs	Exposure value	Exposure-weighted average PD	Exposure-weighted average LGD	RWAs	Exposure value
	%	%	$bn	$bn	%	%	$bn	$bn
Europe								
UK	1.87	35.6	90.4	188.0	2.15	36.0	91.8	181.0
France	1.99	29.0	16.7	36.1	1.88	30.2	15.2	34.7
Germany	0.11	39.5	0.3	1.3	0.16	41.6	0.3	1.5
Switzerland	0.03	42.3						