

# Impact of Regulation on Banks' Capital Markets Activities

*An ex-post assessment*



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## Foreword

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Last December an important milestone was reached, with the finalisation of the Basel III post crisis regulatory reforms concluding the global overhaul of the regulatory framework. Through the efforts of supervisors, policy makers and the industry, banks are now considerably better capitalised, with higher levels of liquidity than a decade ago and the overall financial system far more resilient to potential shocks. This fully intended outcome is to be welcomed and has been no small achievement. Of course, there is still much work to do in implementing these international agreements on a national and regional level, but we are now moving away from rule making and towards an evaluation of the impacts from what has gone before.

We believe now is the time to examine the *actual* impact of the post crisis regulations and to investigate how individual business lines have been affected. For this reason, we commissioned PwC to undertake an analysis of whether and if so how regulation, as distinct from other factors, affected banks' holdings of capital markets assets. The findings of this report indicate that banks had significantly reduced their holdings of most categories of capital markets assets, but especially in the areas of rates and credit, between 2010 and 2016. Moreover regulation, particularly capital rules, was by far the most important, although not the only, driver of this change. Despite mitigating actions by the banks, profitability also declined materially over this period.

As the remaining international proposals are implemented and the impacts from the recently introduced MiFIDII/MiFIR rules are better understood, then, other things being equal, we would expect a continuation of the trends set out in the report, of shrinking capital markets assets and pressure on bank profitability.

We therefore welcome the work by the international regulatory community, European Commission and the US authorities to re-evaluate the current regulatory framework, with a view to ensuring that it achieves an appropriate balance between underpinning financial stability and enabling effectively functioning markets. We also support further *ex post* cumulative impact studies which consider both unintended as well as intended impacts. In particular, such studies should specifically focus on how regulation impacts on the economics for providers of primary and secondary market capital market products, and hence their capacity and willingness to provide such products. We believe this assessment is particularly relevant in a European context as the EU pursues its Capital Markets Union project.

To maximise the benefits from all these initiatives it will be important for the industry to play its part in the evaluation process and in helping to refine and improve what has gone before. We hope that this report will provide a useful contribution to this ongoing work and thank PwC, colleagues and our members for assisting in its preparation.



**Michael Lever**  
Head of Prudential Regulation  
Association for Financial Markets in Europe



**Rick Watson**  
Head of Capital Markets  
Association for Financial Markets in Europe

# Impact of Regulation on Banks' Capital Markets Activities

An ex-post assessment



## Summary

The global financial crisis was followed by a significant strengthening of the regulatory architecture which, as intended, rightly improved the resilience of banks and the financial system. Nearly ten years on from the crisis and some seven years on from the beginning of the implementation of the post-crisis regulatory architecture, it is valuable to explore in detail how banks have adjusted their businesses in response to the suite of post-crisis regulations. While many studies of the effects

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of regulatory reform have sought to anticipate the impact of likely regulatory and economic changes (termed '*ex-ante*' studies), such studies are based upon calibrating economic relationships from past data and projecting likely future impacts. As a consequence of the unprecedented nature of the global financial crisis, and the extent of the necessary regulatory response, legislators had little choice but to rely heavily on *ex-ante* studies of potential regulatory and economic impact in order to define and calibrate new rules. However, as policy makers undertake reviews of the post-crisis reform programme and consider whether, and to what extent, regulations achieved their intended effects, it is important to draw upon more than *ex-ante* studies of potential impact. This study, therefore, seeks to interrogate how banks have *actually* responded to regulations: an '*ex-post*' study.

The full implementation of the post-crisis regulatory framework is not complete. Some of the architecture has only just been put in place (e.g. MiFID II/MiFIR came into force in January 2018 and the NSFR will not be fully implemented until 2021, possibly later). The finalisation of Basel III was only agreed in December 2017 and implementation both nationally and regionally will take place in the coming years. However, the main body of the post-crisis regulations has been known for some time now and has been influencing banks' strategic decision making and shaping their choices of businesses and products that they wish to engage in. As the FSB and Basel Committee are beginning to embark on a comprehensive assessment of the impact of the post crisis regulatory framework, the European Commission has finalised its first assessment of the post-crisis EU regulatory framework for financial services, and the US Treasury has published its reports on banking and capital markets. Therefore it is timely to analyse in some detail how the existing framework has influenced the activities of the firms to which it has been applied.

**The purpose of this study is therefore to examine in detail change in banks' balance sheets and the motivation behind these changes.** A key focus of the analysis is to assess the role of regulation on balance sheet changes, banks and countries, and to establish causal relationships and impacts. In doing so, we have sought to identify and account for other potential drivers of balance sheet changes such as commercial performance, macroeconomic and wider financial sector trends, technological change and individual banks' positions.

This study helps to provide an understanding of the relative importance of different channels of impact, and whether regulations have been an important driver of balance sheet changes. The study is therefore complementary to other studies that have examined changes in the overall banking sector, or the presence or otherwise of wider financial market impacts.

The study draws upon granular, business line data across a selection of 13 global banks<sup>1</sup> covering three years of data: 2005, 2010 and 2016 – the latter being the latest full year of granular data available. Our analysis, therefore, only captures bank responses up to 2016<sup>2</sup>. Notably this study covers a time period prior to the implementation of MiFID II/MiFIR and the full implementation of NSFR and Basel III capital reforms. This study should therefore be seen as part of an ongoing long-term process to evaluate reforms and the evolution of bank business models.

The purpose of this study is therefore to examine in detail change in banks' balance sheets and the motivation behind these changes

1 The 13 banks in the study are: Bank of America Merrill Lynch, Citi, Goldman Sachs, JP Morgan, Morgan Stanley, Barclays, BNP Paribas, Credit Suisse, Deutsche Bank, HSBC, Societe Générale, UBS and UniCredit

2 Overall results for 2017 suggest the trends evident until 2016 are little changed. Tricumen's Q4 2017 capital markets review (which covers a different sub-set of banks to this study) reported US\$169bn of operating revenue in FY17, 3% below FY16, and US\$35bn in 4Q17, a 10% year on year fall. Primary issuance revenue grew, but equities slipped and FICC dropped 10% year on year in 2017.

It has been outside the scope of this study to examine the potential impacts of bank balance sheet changes on the functioning of capital markets or on users of financial services. But, as discussed further below, we believe these are central issues for policy makers and market participants to focus on in the coming period, as the post-crisis reform programme is completed or fine-tuned.

Similarly, the study does not seek to anticipate any changes to banks' strategies resulting from Brexit. AFME and PwC have undertaken separate analysis on the operational impact of Brexit on wholesale banking and capital markets in Europe<sup>3</sup>, while other AFME publications have focused on practical challenges of Brexit<sup>4</sup> and examining potential impacts on European SMEs, corporates and investors<sup>5</sup>. The effects of Brexit on banks and market participants will also require close attention and examination in the period ahead.

### The key findings from this study are:

- The aggregate annual regulatory cost<sup>6</sup> that applies to capital markets activities across the 13 banks in our sample, which in total represent 70% of global capital markets activities, is estimated to be c. US\$37bn, representing 39% of total capital markets expenses in 2016.
- The largest regulatory impacts are from risk-based capital and leverage requirements, which account for almost 90% of the total regulatory impacts. Existing liquidity and funding regulatory impacts are only a small proportion of the total regulatory impacts to date (but are expected to rise as the full impacts of the NSFR are factored in).
- Regulation has driven a 14 percentage point reduction in (pre-tax) capital markets return on equity (ROE) from 2010 to 2016 (from 17% to 3%) before banks' mitigating actions via deleveraging, cost reductions or repricing. Following balance sheet reductions, and with other performance improvement steps taken by banks (such as cost reduction and business model changes), overall ROE (excluding one-off charges) recovered to 11% by 2016.
- Rates and credit have been most impacted by regulation in ROE terms – regulatory drivers are associated with ROE declines of 23% and 17% respectively from 2010 to 2016.
- Higher regulatory costs and low returns have been significant drivers of asset deleveraging in banks' capital markets activities.
- PwC's regression analysis suggests that the regulatory driver alone accounted for about two thirds of the 39% decline in capital markets assets across the sample between 2010 and 2016, with falls in assets particularly pronounced in rates, credit, commodities and equities.
- Other non-regulatory factors are also relevant: banks are also more likely to scale back activity in areas of lower future profitability. Macroeconomic factors, such as wider economic growth and monetary policy also explain some of the movement in assets. Some banks are also in better overall positions compared to their peers, which partly reflects their efforts to restructure and subsequent ability to grow.
- Some balance sheet changes reflect individual firms' strategic decisions to withdraw or expand in certain market segments. However, broad trends of deleveraging across regions suggests that trends are global in nature, and not limited to individual firms or regions.

3 AFME-PwC, "Planning for Brexit – Operational impacts on wholesale banking and capital markets in Europe", February 2017

4 AFME, "Implementing Brexit: Practical challenges to wholesale banking in adapting to the new environment", April 2017

5 AFME-BCG, "Bridging to Brexit: Insights from European SMEs, corporates and investors", July 2017.

6 Our measure of regulatory cost is used at a product and bank level to determine whether regulation is a driver of balance sheet changes. It is calculated as the economic cost of regulation on banks' 2010 balance sheets. It includes capital, funding and operational costs prior to any mitigation activities. It is not a cash cost.

### Assessing impacts beyond banks: market liquidity and end-users

PwC's and AFME's analysis demonstrates that there is an empirical connection between regulations and the size of regulated banks' balance sheet capacity in capital markets activities. While non-regulatory factors have also played a role, regulation has been by far the most significant driver of balance sheet changes.

The findings of this study give rise to important questions, particularly regarding the effects of asset deleveraging in banks' capital markets activities and whether such deleveraging will affect – or has already affected – the functioning of markets or users of financial services. These questions include:

- Can further business model adjustments by banks be expected, given relatively higher hurdle rates for capital markets business lines?
- Will the provision of risk management and financing products and services by banks remain economically viable?
- Will a critical mass of assets exist to support market liquidity in fair weather and stressed conditions?
- In what way will market costs, structures and behaviours evolve as a consequence of bank deleveraging?

While this study has not sought to address these questions, post-crisis analyses of certain areas suggests that conditions in financial markets have been evolving significantly in recent years. The views put forward in the IMF's Global Financial Stability Report of October 2017 provide a summary of issues to consider: "While GSIBs' declining exposure to financial markets will reduce their risk, there may be associated costs to market liquidity. Evidence that this change affects market liquidity in normal times is mixed, and greater participation by non-bank market intermediaries could help address the fragmentation of market liquidity. What is less clear is whether global banks' reduced capacity to intermediate in financial markets could affect the resilience of liquidity in periods of stress. Similarly, the supply of risk management services that require GSIB balance sheet space and capital could be reduced or provided to fewer clients. The balance between reduced GSIB riskiness and potential costs to liquidity during stress is an issue deserving of careful ongoing consideration."<sup>7</sup>

In accordance with the findings of this study, a more recent CGFS paper<sup>8</sup> concludes that many banks have reduced their exposure to capital markets activity. The report notes that while there is no clear evidence of systematic and long-lasting retrenchment of banks from credit intermediation, "crisis-era losses combined with regulatory changes have motivated a significant reduction in risk and scale in the non-equity trading and market making businesses of a number of global banks". The report acknowledges concerns that the liquidity of some market segments shows signs of fragility and a trend towards bifurcation.

The state of market liquidity is a key topic that has received significant attention from the financial industry and policy makers. PwC prepared a report on market liquidity on behalf of GFMA in 2015<sup>9</sup>, where it identified the reduction in banks' market making capacity as a contributing factor to a deterioration in liquidity conditions, especially in dealer-intermediated markets such as European corporate bonds. Various measures of liquidity and market depth have shown material falls since 2010, according to PwC's analysis. More stringent liquidity and collateral requirements have also caused banks to hoard liquid assets. This reduces their availability to support other trades, such as repo transactions which then have ripple effects across other capital markets. The lack of high quality collateral could also impact liquidity in secured markets, particularly in times of stress.

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7 IMF Global Financial Stability Report, October 2017. In accordance with the findings of this study, the IMF concluded that GSIBs have reduced their market-related functions, and that this move came as earlier overexpansion and excess capacity collided with regulatory changes, that increased risk-asset weighting and capital charges and drove a sharp decline in profitability of banks' other lines of business.

8 Committee on the Global System Papers No 60, "Structural changes in banking after the crisis", January 2018

9 PwC, on behalf of GFMA, "Global Financial Markets Liquidity Study", August 2015

Other substantial reports on this topic have been prepared by BIS<sup>10</sup>, Bank of England<sup>11</sup>, European Commission<sup>12</sup>, the UK FCA<sup>13</sup> and the SEC<sup>14</sup> and the joint staff<sup>15</sup> in the US. Considering the various studies, we believe there are sufficient early warning signals to suggest that regulation and other market factors are contributing to a reduction in certain aspects of secondary liquidity, particularly in fixed income markets, that is likely to be exacerbated by the unwinding of quantitative easing or another stressed market situation.

We therefore welcome that authorities have begun to examine the effects of the post-crisis regulatory and supervisory frameworks on the capital markets environment. The US Department of the Treasury has identified recommendations that can better align the financial system to serve issuers, investors, and intermediaries<sup>16</sup>. The European Commission has, meanwhile, undertaken several actions in response to its call for evidence on the coherence of EU financial services legislation.

The follow ups to these exercises will be important in ensuring that the regulatory framework continues to support capital markets and economic policy aims, together with financial stability objectives. This is particularly relevant in the European context as the EU pursues its project aimed at developing a Capital Markets Union (CMU). Banks play an essential role as intermediaries and providers of liquidity in capital markets. The coordination and reconciliation of two main initiatives in the EU policy agenda – the objective of a more stable and sustainable financial system and the renewed emphasis on growth, including through deeper and more integrated capital markets – remains a fundamental challenge, which can be successfully overcome if the links between the key pillars of the regulatory framework are adequately explored and understood. As previously noted, the impact of the UK's withdrawal from the EU is an additional significant factor to consider in the financial sector environment.

## Recommendations and policy actions

Building on the empirical analysis in this study, we recommend that **European and global authorities undertake further *ex-post* cumulative impact studies**. These should specifically examine how regulation impacts the economics for providers of primary and secondary market capital markets products, and hence their incentives and capacity to continue offering them to end users, such as corporates, and investor users of market making services.

Future *ex-post* assessments should be complemented by *ex-ante* analyses of reforms still under consideration, yet to be implemented or where *ex-post* evidence is otherwise not yet available. The preparation of impact assessments when new regulations are proposed, which is required in relation to EU legislative initiatives, is a good practice that should be strengthened and replicated in other jurisdictions.

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10 Committee on the Global System Publications No 52 “Market-making and proprietary trading: industry trends, drivers and policy implications”, November 2014 and No 55, “Fixed income market liquidity”, January 2016

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11 Bank of England Financial Stability Paper 34: The resilience of financial market liquidity, October 2015

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12 Risk Control, on behalf of the European Commission, “Drivers of Corporate Bond Market Liquidity in the European Union”, November 2017

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13 FCA, “New evidence on liquidity in the UK corporate bond market, February 2017. The report suggests there has been a decline in liquidity in the UK's corporate bond market over the past two years. The analysis, which combines both traditional and non-traditional measures of liquidity, indicates that trading conditions have generally become more difficult from 2014/2015 onward.

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14 SEC, “Access to Capital Market Liquidity”, report to Congress, August 2017. The SEC report suggests that evidence for the impact of regulatory reforms on market liquidity is mixed, with different measures of market liquidity showing different trends. The report notes that although estimated transaction costs have decreased, corporate bond trading activity in recent years has also become somewhat more concentrated in less complex bonds and bonds with larger issue sizes.

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15 Joint Staff Report: “The U.S. Treasury Market on October 15, 2014”, July 2015

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16 U.S. Department of the Treasury, “A Financial System That Creates Economic Opportunities”, July 2017

## Summary

The assessments should **interrogate the effects of reforms on:**

- **Capital markets product segments**, with a view to assessing the effects of the multi-layering of regulations on individual products and evaluating the impacts across instruments and asset classes to establish if such layering or specific reforms unduly penalise certain activities;
- **Financial stability and the sustainability of banking functions**, with a view to analysing dealer-bank incentives to expand or to shrink intermediation activities and to provide customer financing and risk management services; and
- **The primary and secondary markets environment**, with a focus on the functioning of secured funding markets and less liquid asset classes important to end users, as well as liquidity conditions in future stress scenarios or when unconventional monetary policies – including quantitative easing programmes – are unwound.

Specific focus in the assessments should be given to:

- how regulations are impacting market making activities, with an initial focus on capital, leverage and liquidity requirements in particularly affected areas such as credit and rates/repo activities; and
- how markets and conduct regulations may have negative or unintended effects on bank intermediation and different end users as for example the European Commission is expected to do in relation to the rules on listed SME equity research.

It is important to note that the non-regulatory drivers of shrinkage identified in this study – the competitive environment, macroeconomic conditions, monetary policy and electronification – will continue to evolve in the coming years. The interaction between these drivers and the regulatory environment should continue to be analysed and factored into future studies on the evolution of the financial system.

We provide below additional observations pertaining to prudential and markets reforms.

### Prudential reforms

While this study shows that the largest empirical regulatory impacts up to 2016 emanate from risk-based capital and leverage requirements, it is the view of AFME and PwC that this reflects not only the fact that these regulations are very significant, but also that their earlier adoption and often accelerated bank implementation has contributed to driving business decisions up to 2016, and which appear to have continued through 2017, based upon available reporting to date.

As noted above, a number of major prudential reforms have not been factored into this *ex-post* analysis, including the full implementation of the NSFR, the fundamental review of the trading book (FRTB) and other elements of the recently finalised Basel III proposals. The total regulatory impacts derived from these regulations are expected to rise as they are implemented and fully factored into business decisions.

In view of the evidence presented in this study, and other recent reports, we believe that the impact of capital, leverage and liquidity requirements in areas such as credit and rates/repo activities should be subject to careful review at this point.

Authorities should ensure that further reform packages are appropriately designed and calibrated prior to their adoption. In Europe, this would include addressing key issues in the Risk Reduction Package currently under consideration, in particular regarding the introduction of the NSFR and the FRTB, although other components such as the Leverage Ratio and the Standardised Approach for Counterparty Credit Risk (SA-CRR) are also important. Without reconsideration of some specific aspects of these proposals – including their calibration, the timing of their introduction, as well as safeguards for globally consistent implementation – the negative impact on the end users of capital markets would be significant<sup>17</sup>.

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<sup>17</sup> AFME has issued more detailed views and recommendations on these issues, available in the AFME report 'The links between the Risk Reduction package and the development of Europe's capital markets', December 2017, available at: <https://www.afme.eu/globalassets/downloads/publications/afme-rrm-and-cmu-2017-4.pdf>

### Markets and conduct related reforms

This study has not been able to incorporate empirical evidence arising from the implementation of the new MiFID II/MiFIR regime that took effect on 3 January 2018. This legislation introduces profound changes to the EU market conduct rulebook, the full impact of which will need to be reviewed over a period of time. The impact of MiFID II/MiFIR must be considered in conjunction with the above prudential reforms and several other European regulations that are implemented or still-to-be implemented. These include EMIR, SSR, SFTR, MAD/R, CSDR, 4AMLD (widened sanctions) and the recent Securitisation Regulation.

The evidence in this study covering business decisions up to 2016 (which appear to have continued through 2017 based upon reporting to date) should not be taken to mean that the impact of markets and conduct-related reforms, once fully factored in, will not be significant. It is reasonable to assume that the combined impact of these reforms is very likely to put further pressure on bank business areas where this study establishes regulatory-driven shrinkage has taken place. In the case of MiFID II/MiFIR, there is an industry-wide consensus that the new regime will add significant regulatory and operational complexity, at least in the near term.

The extent, if any, to which banks have been reducing their exposure to certain clients, or categories of clients, in response to new conduct rules and the risk of high penalties is also an area for further examination outside the scope of this study. The industry welcomes reforms designed to reinforce high standards of conduct across all activities, but at periodic intervals a review should take place as to unintended consequences of the relevant regimes.

As noted above, for this reason we recommend that the impact of markets and conduct-based regulations be continually monitored in the coming period, with a view to understanding their real benefits against potential costs and effects on the market environment.

## 1. Introduction

### 1. Introduction

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The global financial crisis resulted in a considerable package of reforms that have fundamentally changed the way the banking sector is regulated. The necessity of these reforms and the benefits that they brought through substantially strengthening the resilience of banks and the financial system is widely acknowledged.

Nevertheless, due to the unprecedented nature of the crisis much of the design and calibration of the reformed regulatory architecture could not solely rely on historical benchmarks to provide guidance. Policy makers and regulators needed to judge the likely impacts of reforms through the use of empirical studies, forward-looking economic models and insight from stakeholders. A key source of uncertainty in predicting regulatory impacts has been understanding the likely behavioural responses of banks to reforms. Such responses are governed by a complex range of commercial, strategic and management objectives.

#### Purpose of this study

This study interrogates how banks have *actually* responded to regulations: an '*ex-post*' study. Nearly ten years on from the global financial crisis, and nearly seven years on from the beginning of the implementation of the post-crisis regulatory architecture, it is valuable to explore in detail how banks have adjusted their businesses to respond to regulation, rather than

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relying on models that predict how banks may respond. The study does not, however, directly address the consequences of these responses for consumers of financial services or for the functioning of markets. In this respect it does not seek to draw a distinction between the intended and possible unintended effects of regulation. Instead it focuses on establishing a causal relationship between regulation and banks responses to it and on measuring the magnitude of those responses in terms of changes to banks' holdings of capital market assets.

A further advantage of an *ex-post* study is that it naturally takes into account banks' behavioural responses to new regulations, including any mitigating steps to reduce impact. Such mitigation effects are often difficult to incorporate into *ex-ante* studies.

Banks can respond to reforms in a number of ways: simply absorbing higher regulatory costs, cutting costs elsewhere in their businesses, increasing prices to customers to pass on higher regulatory costs, optimising balance sheet usage of scarce capital, shrinking activities that are no longer commercial or consume too much capital, or exiting certain business lines. This range of behaviours can have a very different impact on bank customers and the wider economy. At one end, where banks absorb regulatory costs, impact on customer costs may not be immediately apparent though banks will be more constrained in the resources they can deploy across business lines. At the other end, where banks exit business lines, banks customers can face reduced choice and/or higher cost of financial services. Understanding these responses is therefore critical to obtaining full understanding of the cumulative impact of banking regulatory reforms.

The findings of this study can be used to evaluate regulations or to help inform their finalisation or implementation.

Specifically, the purpose of this study is to examine in detail the extent of balance sheet changes in banks' product areas and the motivation behind these changes.

The full implementation of the post-crisis regulatory architecture is not complete. Some reforms are currently being implemented, or being implemented in a phased way, or have yet to be finalised. However, there is little merit in waiting until the full architecture is in place before undertaking such a backward-looking analysis. Rather, the findings of such analysis can be used to evaluate regulations or to help inform their finalisation or implementation. The findings can always help to inform other policy objectives, such as the development of a Capital Markets Union in the EU.

The rest of this report is structured as follows:

- Section 2 sets out the regulatory context for this study, and how it is different to others
- Section 3 sets out our data sources and overall approach
- Section 4 draws upon the data we collected for this study and shows where there have been changes in balance sheets in the global wholesale banking and capital markets sector
- Section 5 analyses the drivers of balance sheet changes in global wholesale banking and capital markets
- Section 6 provides our recommendations for further study and implications for banking sector regulatory development.

## 2. Regulatory context

## 2. Regulatory context

Shortly after the global financial crisis, the High-Level Group on Supervision in the EU, chaired by Jacques de Larosière, published a report in 2009 on the causes of the crisis and set out a new regulatory agenda, with stronger coordinated supervision and effective crisis management procedures<sup>18</sup>.

Similar work was undertaken by the Financial Stability Board (FSB), which was itself established after the G-20 London summit in April 2009 for the purpose of monitoring and making recommendations to improve the global financial system. Such reports and programmes of work informed international coordinators such as the Basel Committee on Banking Supervision (BCBS) and the International Organization for Securities Commissions (IOSCO), as well as legislative reforms in Europe (e.g. CRD IV), the US (e.g. Dodd-Frank) and beyond.

These reports, along with many others, demonstrated that there was no single cause to the global financial crisis. Structural weaknesses, legislative shortcomings and bad behaviour across the financial system combined to create the conditions for the crisis and amplified its effects. Therefore, it was no surprise that no single policy response or rule change could mitigate the risks of future crises. A comprehensive package of reforms which sought to improve firms' robustness, system resilience and regulatory oversight was required, while making it possible for firms to fail without detrimental effects rippling through the financial system.

Few studies have examined the overall coherence of banking reforms.

The financial market reforms ultimately aim to reduce the likelihood and magnitude of a future crisis and the impact of future stress events, but the implementation timescale has necessitated a component by component approach. The clear challenge of implementing many regulations, both across reform areas, but also across different jurisdictions is one of consistency and coherence. Reforms are more powerful when they complement, rather than overlap or conflict with each other, but regrettably few studies have examined the overall coherence of banking reforms. A recent study<sup>19</sup> reviewed nearly 400 studies and papers and found very few covered more than one regulatory topic.

With the main components of the reform landscape in place, regulators and legislators are looking at the coherence of the overall framework. This is to guide the required finalisation and implementation, as well as any necessity for further refinements to the existing rules.

### Studies of regulatory impact

Many studies of regulatory reform have sought to anticipate likely regulatory and economic impact (termed '*ex-ante*' studies). Such studies are based upon calibrating economic relationships from past data and projecting likely future impacts. These studies generally perform well when the new regulations are similar to past regulations, but when new regulations are unprecedented, or where the magnitude of change is unlike previous change, then there is a clear risk of inaccurate impact projections, and inappropriate calibration.

As a consequence of the unprecedented nature of the global financial crisis, and the extent of the necessary regulatory response, legislators had little choice but to rely heavily on *ex-ante* studies of potential regulatory and economic impact. Examples include the BIS study into the long-term economic impact of stronger capital and liquidity requirements<sup>20</sup>, and the HMT impact assessment of structural reforms<sup>21</sup>.

18 Report of The High-Level Group on financial supervision in the EU, Brussels 25 February 2009

19 Oliver Wyman "Interaction, Coherence and Overall Calibration of Post Crisis Basel Reforms", August 2016

20 BIS, An assessment of the long-term economic impact of stronger capital and liquidity requirements, 2009

21 [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/493716/BoE\\_Bill\\_Impact\\_Assessment\\_13\\_Jan\\_2016.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/493716/BoE_Bill_Impact_Assessment_13_Jan_2016.pdf)

As policy makers seek to finalise reforms that are still being shaped and calibrated, it is important to draw upon more than *ex-ante* studies of potential impact. They have therefore drawn upon a wider range of market insight and financial market studies in the post-reform banking environment. The FSB continues to monitor the implementation and effects of reforms<sup>22</sup>, including the effects of the reforms for potential unintended consequences on emerging markets<sup>23</sup>. The BCBS monitors Basel III implementation and consistency of adoption<sup>24</sup>. In 2015, the European Commission specifically issued a Call for Evidence on the cumulative impact of reforms. It received 255 responses, drawn mostly from those directly impacted by financial regulation<sup>25</sup>. Responses discussed unnecessary regulatory constraints on financing, proportionality, excessive compliance costs and complexity, reporting and disclosure obligations and overlaps, duplications and inconsistencies.

## Channels of regulatory impact

Studies of regulatory impact need to make explicit assumptions on the transmission of regulatory impacts. In Figure 1 below, we set out the four broad channels of regulatory impact. These are specified in more detail in individual studies, but this characterisation is helpful to frame where this study seeks to contribute to the regulatory discussion.

It is important to draw upon more than *ex-ante* studies.

Figure 1: Channels of regulatory impact

Cost absorption channel	Pricing channel	Pricing and balance sheet channel	Pricing and balance sheet channel with wider impacts
Banks absorb the costs of regulation.	Banks pass on the costs of regulation by increasing the price of financial services.	As well as re-pricing the cost of services, banks also exit businesses, restructure balance sheets and redesign business models.	Collective bank responses impact wider financial markets, e.g. through less choice, and lower market liquidity.

The **first** channel assumes that banks absorb the cost of regulation – both implementation costs and ongoing regulatory costs. Costs can be absorbed by banks by accepting lower levels of profitability, or cutting costs to mitigate the fall in profitability, or both. There is significant evidence that banks have absorbed substantial cost pressure through cost reduction programmes. PwC's study for AFME identified €25.7bn of cost savings programmes across ten large global banks from 2009 to 2014. This does not mean that there is no market impact as potential *future* capacity will be below what it otherwise would have been through lower retained earnings. However, the assumption is that *existing* levels of capacity are maintained and that as a result there is little impact on bank customers – i.e. service levels and pricing remain largely unchanged.

The **second** channel acknowledges that the banking sector is largely an intermediary in the flow of finance around the economy, from savers to borrowers and from those who do not want to bear risk to those who do. This means that any added costs in the banking system are ultimately likely to be passed onto the users of financial services. This second channel assumes that the mechanism for passing costs onto users is through the re-pricing of financial services – e.g. lending and deposit rates, bid-ask spreads and price of risk products and that product availability and services levels remain largely unaltered. Consistent with this channel is the view that the banking sector was not correctly pricing risks prior to the global financial crisis, either from a lack of transparency, or through taking advantage of the state's 'implicit guarantee'. Re-pricing in this context is therefore a market correction to a price that fully incorporates the cost of bearing risk.

Many economic studies of regulatory impact have been based upon this impact channel, partly because they can draw on extensive evidence of the impact of interest rates on the economy (monetary impact channels). By way of example, the BIS study on the long-term economic impact of stronger capital and liquidity requirements translated higher capital ratios and liquidity requirements into higher lending spreads, as an intermediary step before assessing the wider economic impact.

22 FSB, Implementation and Effects of the G20 Financial Regulatory Reforms, Third Annual Report, July 2017

23 FSB, Identifying the effects of regulatory reforms on emerging market and developing economies: a review of potential unintended consequences, 2012

24 BCBS, Implementation of Basel standards, July 2017

25 [http://ec.europa.eu/finance/consultations/2015/financial-regulatory-framework-review/docs/summary-of-responses\\_en.pdf](http://ec.europa.eu/finance/consultations/2015/financial-regulatory-framework-review/docs/summary-of-responses_en.pdf)

## 2. Regulatory context

Rather than being absorbed within the sector, banking reforms risk excessive shrinkage, with detrimental impact on banking customers

The **third** channel builds in a balance sheet response by banks<sup>26 27 28</sup>. At a business level, banks may exit from areas that are no longer commercially viable once the additional regulatory cost has been accounted for. Banks can also respond to regulatory reforms by shrinking their balance sheets or altering the mix of assets in their balance sheets towards less capital-intensive areas. This is likely to have a more substantial impact on banking customers and banking markets, as banking capacity is reduced. However, the impact on banking customers may be mitigated where banks develop new ways of providing services that utilise less balance sheet capacity, or where market-based financing can take the place of bank intermediated finance.

The **fourth** channel builds on the third by including potential wider impacts, particularly where there is insufficient market-based financing capacity to replace the loss in banking capacity. To date, the wider impacts that have received the most attention are:

- i. Competition:** data from the European Central Bank show that the Herfindahl Index – a measure of market concentration – has steadily increased over the last 10 years, and there has been greater dispersion of lending rates across the EU, indicating greater fragmentation of European credit markets.<sup>29</sup>
- ii. Movement of risk into other sectors:** the IMF has found that bank restrictions, low interest rates and demand for institutional cash pools have driven the growth of money market funds in the US.<sup>30</sup>
- iii. Market liquidity:** PwC identified the reduction in banks' market making capacity as a contributing factor to the deterioration in liquidity conditions.<sup>31</sup>

There is a clear risk that the cumulative market and economic impacts mean that the regulatory architecture is extended too far, where regulatory burdens on the banking sector cause unnecessary pricing increases, shrinkage and loss in market choice, liquidity and stability

### Policy implications of different channels

The policy implications of the different channels are wide ranging. If regulatory costs can be absorbed by banks (Channel 1), then, provided regulations have a demonstrable effect on reducing the probability and impact of future financial crises, regulations are likely to have positive economic impact. Even if regulations only have a pricing impact (Channel 2), most studies have shown that the negative impact of higher prices for financial services is likely to be strongly outweighed by the positive economic impact of reduced probability and impact of future financial crises.

However, once the added impact of balance sheet and capacity reductions is considered (Channel 3) and wider financial market and economic impacts (channel 4), then the trade-off becomes more finely balanced. This is particularly the case as the incremental benefit of additional reforms is likely to tail off, whereas the incremental costs of additional reforms are likely to rise.<sup>32</sup>

26 PwC, Structural Reform Study: Supplementary Report 2 – Inventory of bank responses,

27 Bank of England, Staff Working Paper No. 665 Dealer intermediation, market liquidity and the impact of regulatory reform Yuliya Baranova, Zijun Liu and Tamarah Shakir, July 2017.

28 IMF, Global Financial Stability Review Chapter 2 “Market liquidity: Resilient or Fleeting”, October 2015

29 ECB Structural Financial Indicators and Financial Stability Board (2015) “Global Shadow Banking Monitoring Report 2015”

30 IMF, “Global Financial Stability Report: Risk Taking, Liquidity, and Shadow Banking” October 2014

31 PwC, “Global financial market liquidity study”, 2014. Commissioned by the GFMA

32 The Independent Commission on Banking in the UK, among others, has assessed the total amount of losses incurred by large banks during the financial crisis. Source: Independent Commission on Banking Final Report, 2011 (Figure 4.4). Total losses as a proportion of RWAs for most banks were below 6% with only a few in double figures. This shows how capital levels above 10% will enable most banks to withstand severe negative shocks and retain sufficient capital to remain operating. This analysis also shows how further raising capital levels improves the safety of progressively fewer banks,

There is a clear risk that the cumulative market and economic impacts mean that the regulatory architecture is extended too far, where regulatory burdens on the banking sector cause unnecessary pricing increases, shrinkage and loss in market choice, liquidity and stability.

This means that policy makers need a clear understanding of the four channels set out above, as well as understanding how regulatory impacts are spread across the four channels. This will help to achieve a sound finalisation of further reform packages under consideration, with the aim of maximising positive economic and financial stability impact while mitigating detrimental effects.

In the context of the four channels set out above, this study is aimed at understanding the spread across the four channels and the particular role of shrinkage, which is a feature of Channel 3 and driver of Channel 4. This study is therefore complementary to other studies which have examined costs borne by the banking sector, changes in the banking sector, or the presence or otherwise of wider impacts.

### 3. Approach and methodology

## 3. Approach and methodology

Our 'outside-in' approach benefits from external expertise in drawing together banking data on a consistent basis

AFME commissioned PwC to provide the analysis for this study. The study has been supported by AFME staff, a working group of AFME members and a Steering Review Group.

The two main phases of the study were: (i) data collection, and (ii) analysis. AFME decided that its preferred approach was to obtain data from external, independent sources, rather than from its member banks. This 'outside-in' approach benefits from external expertise in drawing together banking data on a consistent basis. It can also be reconciled back to publicly-available data sources and is replicable by interested stakeholders.

### Data collection

We sourced data from Tricumen, which provide performance and benchmarking data for top tier investment and commercial banks<sup>33</sup>. Tricumen provided the study with granular product level data, as measured by assets, RWAs, revenues and expenses. Data was provided at the global, EU and rest of the world (RoW) level. The benefit of this approach is that data can be obtained on a reasonably consistent basis.

The data is drawn from a range of sources, which primarily rely on publicly-reported submissions (e.g. 10K, 10Q, annual reports, regulatory submissions, Pillar 3 and Federal Reserve reports e.g. FRY9C). There is also regulatory and statutory reporting on legal entities that can be mapped to certain activities (depending on the group structure). Investor communications and presentations often present an alternate view, and specific events, like restructurings, also provide an opportunity to obtain further data.

In order to obtain detailed product level data, allocations are often required. This is where Tricumen use appropriate allocation drivers, again from public sources. For example, market risk weighted assets (RWAs) are allocated on the basis of Value-at-Risk (VaR) in Pillar 3 disclosures. Derivative counterparty credit risk is separately allocated on the basis of derivative exposures and other areas of credit risk are allocated on the basis of other disclosures. Operational risk is more challenging given the significant variation in methodology across banks. Lastly, Tricumen also reaches out to its network of experts to validate and refine data, particularly in those areas with gaps.

All data is expressed in US\$. Income statement values that are not disclosed in US\$ are translated using period average market exchange rates. Balance sheet values which are not disclosed in US\$ are translated using period-end market exchange rates.

### Scope of data collection

The focus of this study is to understand balance sheet changes across the banking industry at a granular level of detail. We were therefore more interested in maximising the depth of data across banks, rather than the number of banks studied, or the degree of variation over time. We therefore obtained a granular dataset covering the years 2005, 2010 and 2016. We included global wholesale markets portfolio data from 13 large global banks covering a spread of markets across the US, Europe and the rest of the world (see Box 1). These banks cover around 70% of global capital markets activity.

### Data organisation

The data is segmented into different levels. At a most summary level there is: (i) capital markets activity and (ii) corporate and commercial lending and trade finance.

The first product level is for business areas such as "equities". The second product level is a sub-segment of the first level, such as "equity derivatives". In total the study covers eight Level 1 product segments and 22 Level 2 products. The product taxonomy is set out in [Appendix C](#).

<sup>33</sup> Tricumen provides in-depth, dynamic analysis of the financial markets, customised to the needs of each client, and delivers real insight based on more than 10 years of industry experience. The company offers actionable intelligence on financial performance, organisational structures, business models and working practices. Tricumen leverages its core staff by drawing on a global network of research partners. Tricumen's research centres are near Cambridge in the UK and in Croatia. The administrative office is in London.

Lastly, we also obtained additional publicly available data on banks' capital and funding costs and other drivers of the banking industry such as the impact of technology. Our data sources are specified throughout the report.

#### Limitations of the data

We focus on accounting metrics of banking activity and capacity (e.g. balance sheet and income statement), rather than business or trading volumes data (which is not published at a bank/product level). In many cases there will be a direct link between balance sheet size and ongoing activity levels. This is because inventories of financial assets are used to support secondary market trading, so the size of inventories has a direct linkage to the capacity to intermediate on behalf of clients. For areas of banking that are less reliant on balance sheet capacity (e.g. foreign exchange services), balance sheet measures are less helpful, but we retain a breadth of product areas, applied consistently in analysis to show the wide range of regulatory impacts.

A further limitation of using externally sourced data is that balance sheet data is obtained at period ends, so this study does not capture balance sheet movements outside period ends. However, we collect data consistently from period end to period end, so we should have captured the relevant long-term business movements, provided there was not a significant change in relationship between in-period business activity levels and period-end balances recorded on the balance sheet.

#### Analysis

The analysis is split into two parts. The first part sets out trends in overall and product level balance sheet usage. This shows where there has been the greatest amount of shrinkage, and product areas where banks have expanded their balance sheets.

No trends impacting named banks have been included in this report.

The second part of the analysis involves three steps:

- Creation of potential impact variables or drivers which seek to explain the movement in balance sheet assets at a product level;
- Regression analysis using balance sheet change and impact variables, by bank and product; and
- Use of regressions to deconstruct the movement in assets from 2010 to 2016.
- The detailed methodology for calculating impact variables and the regression approach is set out in Section 4 and [Appendix D](#).

#### Box 1: Banks included in the study

##### US banks

- Bank of America Merrill Lynch
- Citi
- Goldman Sachs
- JP Morgan
- Morgan Stanley

##### European including Swiss banks

- Barclays
- BNP Paribas
- Credit Suisse
- Deutsche Bank
- HSBC
- Societe Generale
- UBS
- Unicredit

We focus on accounting metrics of banking activity and capacity (e.g. balance sheet and income statement), rather than business or trading volumes data.

## 4. Balance sheet changes in global wholesale banking and capital markets

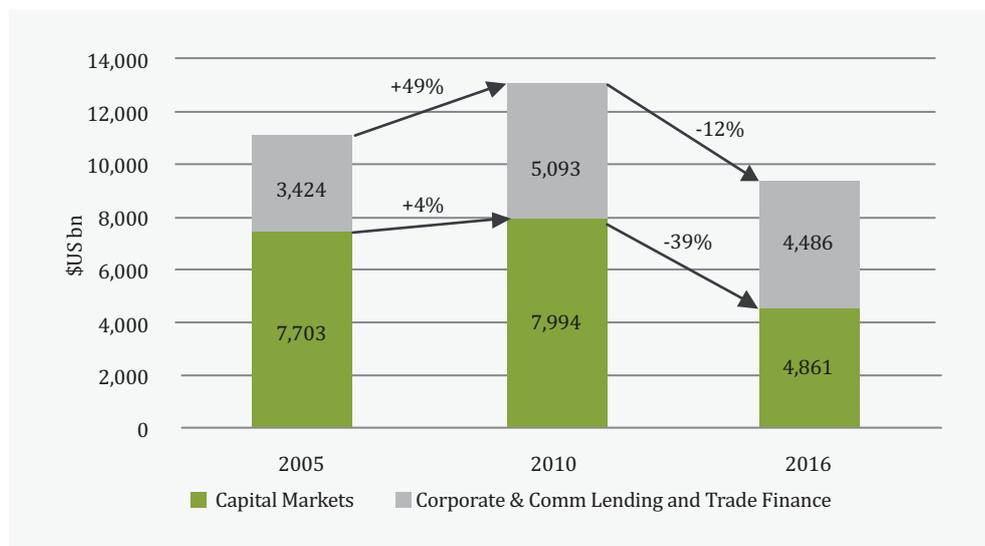
### 4. Balance sheet changes in global wholesale banking and capital markets

The data collected from Tricumen allows us to show that there have been changes in balance sheet usage across global wholesale banking and capital markets activities over the period 2010 to 2016. This is at both the overall level and product level.

#### Overall changes

First, we show the overall trends in capital markets, and corporate and commercial lending and trade finance assets for 2005, 2010 and 2016. The inclusion of 2005 allows comparison to the period of regulatory rules implementation from 2010 to 2016.

Figure 2: Total assets for 13 global bank sample



Source: PwC analysis of Tricumen data

There has been a significant decline in capital markets assets, falling 39% from 2010 to 2016.

For capital markets activities, Figure 2 above shows little movement in balance sheet assets between 2005 and 2010 (up 4%). While there were balance sheet increases up to 2008, and quick deterioration in the aftermath of the global financial crisis, much of the immediate response had passed by 2010. This supports the use of 2010 as an appropriate point of comparison, sufficiently distant from the global financial crisis of 2007/8, but prior to the implementation of major reforms from 2010 onwards. Corporate and commercial lending and trade finance grew more strongly over the period 2005 to 2010.

Figure 2 then shows the significant decline in capital markets assets from 2010 to 2016, falling 39% over the period. Corporate and commercial lending and trade finance also fell, but only by 12%, and is still above its 2005 level. This shows that shrinkage has been mostly confined to capital markets activities.

Whereas overall capital markets shrinkage is geographically consistent across EU and RoW activities, the change in commercial lending is somewhat different. Asset loan growth in commercial lending outside of the EU is considerably stronger than within the EU. This is likely to be driven by wider economic factors. In particular the US and RoW experienced a faster economic recovery following the global financial crisis and this is likely to have increased wholesale banking demand at a faster rate.

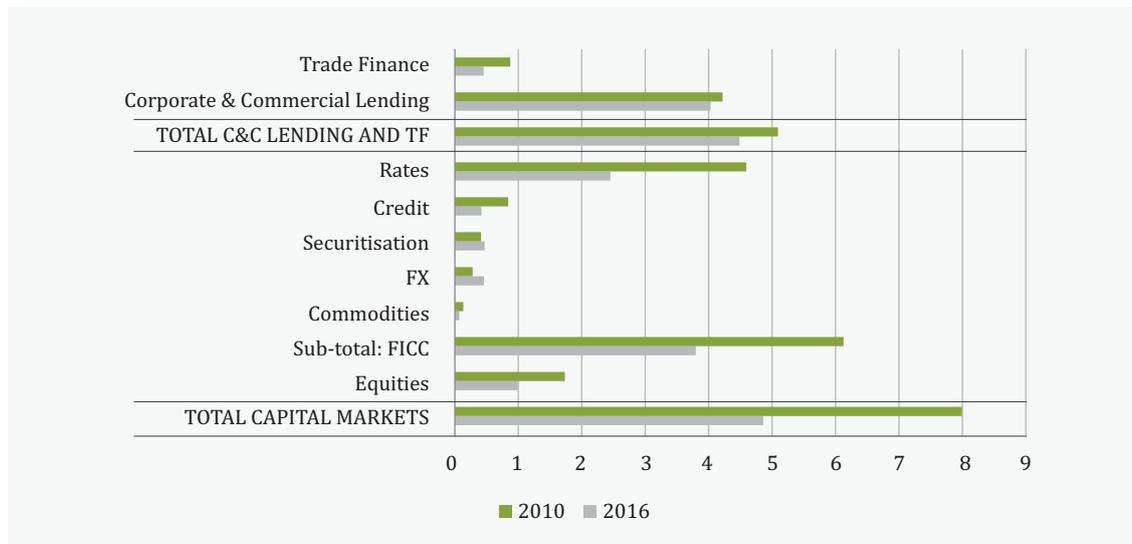
## 4. Balance sheet changes in global wholesale banking and capital markets

Overall results for 2017 suggest the trends evident until 2016 are little changed. Tricumen's Q4 2017 capital markets review (which covers a broadly similar sub-set of banks to this study) reported US\$169bn of operating revenue in FY17, 3% below FY16, and US\$35bn in 4Q17, a 10% year on year fall.

### Product level shrinkage

In Figure 3, we then expand on the 2010 to 2016 shrinkage by Level 1 product segments, aggregated across the 13 banks in our sample. This also shows the totals for capital markets, and corporate and commercial lending and trade finance, as well as a sub-total for FICC.

Figure 3: Total assets for 13 global bank sample, by Level 1 products



Source: PwC analysis of Tricumen data

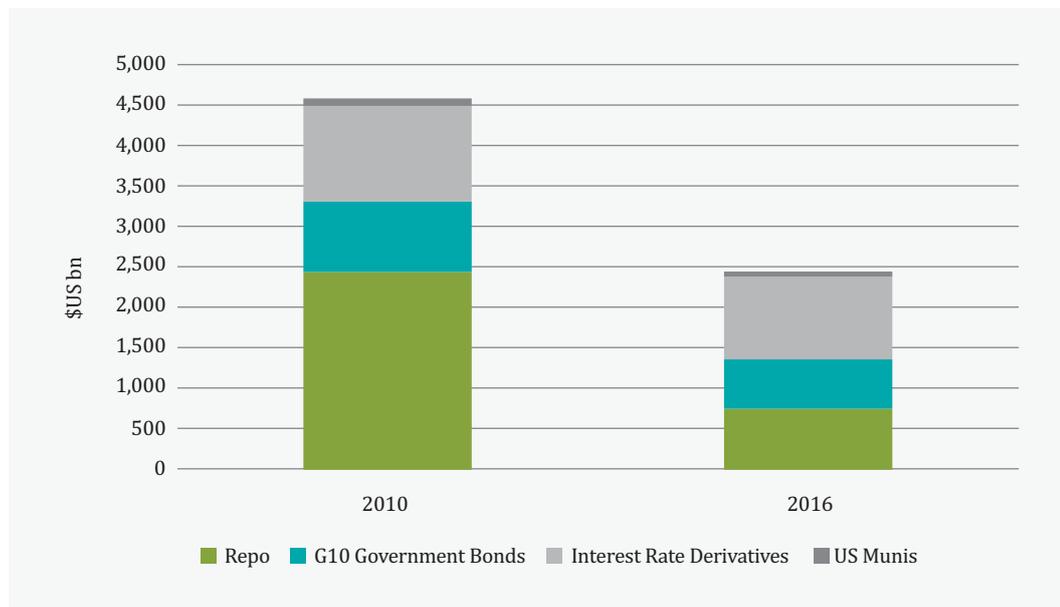
Though representing a, relatively, much smaller amount of bank assets, the **FX product** segment grew in assets over the period 2010 to 2016, which may be due to specific events occurring in that period driving demand for foreign exchange risk management activity.

The **rates** product segment has shrunk substantially by around 47% over the period 2010 to 2016. Within this segment, the most striking is the fall in repo balances both in the EU and the RoW, which have fallen by around 70%. The repo share of total capital markets activity halved, falling from 18% to 9% over this period. This reduction in repo activity has been driven by plentiful supply of central bank liquidity, low external funding costs, regulations that constrain low risk activities (such as the leverage ratio) and lower levels of trading in other asset classes which leaves less collateral to repurchase. The reduction in the rates product segment is set out in Figure 4 showing the marked reduction in repo balances.

Repo balances have fallen by around 70% and share of capital markets activity halved from 18% to 9%.

#### 4. Balance sheet changes in global wholesale banking and capital markets

Figure 4: **Assets in rates product segment for 13 global bank sample and component parts**

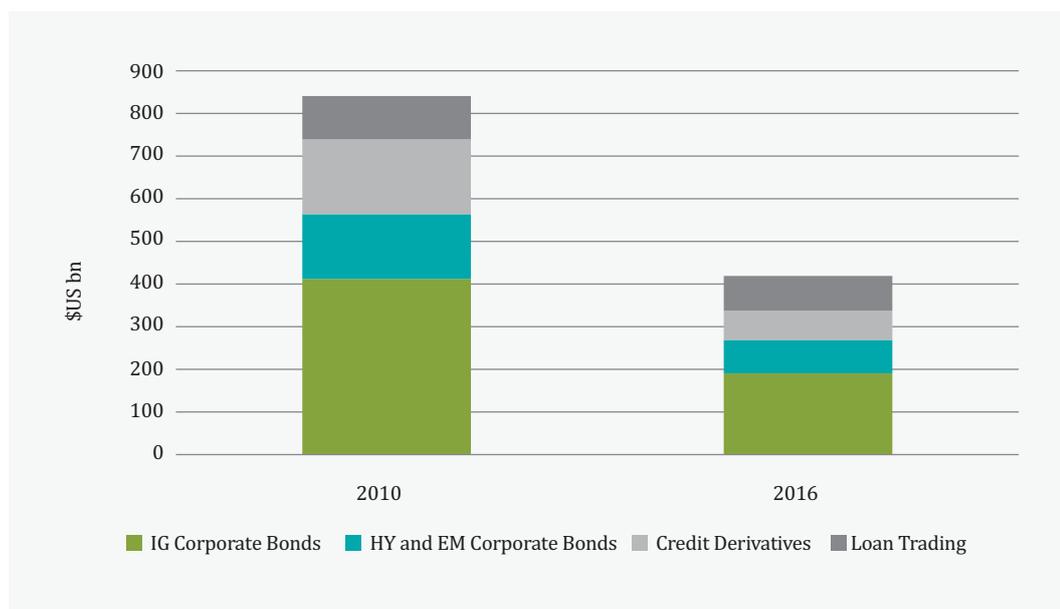


Source: PwC analysis of Tricumen data

The **securitisation** product segment is a combination of very different markets. The financing of US residential mortgages (most of which are securitised through state-backed agencies: “Ginnie Mae, Fannie Mae” and “Freddie Mac”) has recovered with the improving US residential housing market (up 52% over the period 2010 to 2016). In contrast, European asset-backed securitisation markets (principally residential mortgages, auto loan and cards portfolios) have still not recovered significantly from the financial crisis. EU policy reforms (within the EU’s Capital Markets Union agenda) will support market development going forward.

The **credit** product segment has shrunk markedly (down 50% from 2010 to 2016) and this is consistent across most banks in our sample. Shrinkage is also consistent across all credit products, including investment grade, high yield and emerging market debt and loan trading, as shown in Figure 5 below.

Figure 5: **Assets in credit product segment for 13 global bank sample and component parts**



Source: PwC analysis of Tricumen data

There has been shrinkage across all credit products, including investment grade, high yield and emerging market debt and loan trading.

## 4. Balance sheet changes in global wholesale banking and capital markets

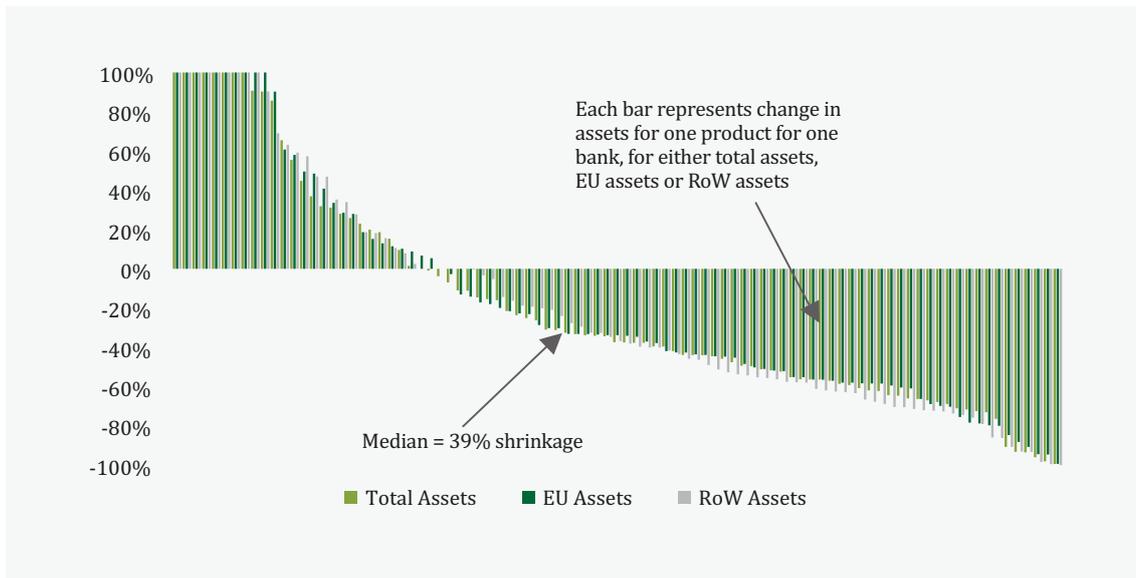
The commodities product segment represents a much smaller amount of bank assets and is much more specialised in nature. While assets have shrunk there is a marked variation across banks; some have substantially scaled back principal trading exposure to this segment, ceding market share to specialist commodity traders.

In overall terms, balance sheets in the **FICC segment** have declined by 38%<sup>34</sup>.

The **equities** product segment has also declined materially over the period 2010 to 2016 (down 43%). This decline is concentrated in equity derivatives, as well as private equity and stock lending services.

In Figure 6 we set out the proportionate change by Level 1 products across our 13 banks. This is set out for total assets, EU assets and RoW assets and is presented in descending order.

Figure 6: **Proportionate change in assets (2010-2016)**



Source: PwC analysis of Tricumen data

Figure 6 demonstrates that there is significant variation in the change in assets over the period 2010 to 2016 across product areas. For some areas, banks saw an increase, such as with securitisation and certain FX activity. However, the majority of product areas have experienced shrinkage, particularly in rates, credit and equities.

Strikingly, across the whole sample of banks and products, there is little difference in the distribution of asset movements, as measured in total terms, or deconstructed into EU and RoW components. This suggests product level movements are more important than regional movements in explaining overall trends. This means there are likely to be more fundamental drivers of the changes in assets rather than a simple regional explanation.

The detailed data for Level 2 product level movements is provided in [Appendix E](#).

This section has established that there has been a significant shrinkage across banking assets, particularly in capital markets areas. It has also identified significant product variation which cannot on the face of it, be solely explained by territorial differences, or attributed to certain banks. This means other fundamental drivers of shrinkage are at work. In the next chapter we identify potential drivers of this shrinkage.

There is significant variation in the change in assets for different products and different banks

<sup>34</sup> This trend appears to have continued into 2017. Tricumen's Q4 2017 capital markets review (which covers a broadly similar sub-set of banks to this study) reported that FICC revenues dropped 10% year on year in 2017.

### 5. Drivers of balance sheet changes in the wholesale banking and capital markets

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In this section we both identify and bring together data on potential drivers of balance sheet changes across our sample of banks. While the purpose of this study is to assess the role of regulation on balance sheet changes, it is important to identify and control for other potential drivers of change. This helps to avoid identifying spurious correlation and helps to understand the role of regulation in comparison to other drivers.

We have identified the following potential drivers of balance sheet changes:

- Regulation;
- Commercial performance;
- Macroeconomic and wider financial sector trends;
- Technological change; and
- Individual banks' positions.

There may be other drivers of balance sheet changes which we have not identified, or were unable to source detailed data for. We discuss this further in the conclusion section. In the rest of this section we set out the five drivers in more detail, and then summarise the econometric approach we use to assess the relative importance and impact of each of these. We then conclude this section by deconstructing the movement in bank assets according to the five drivers.

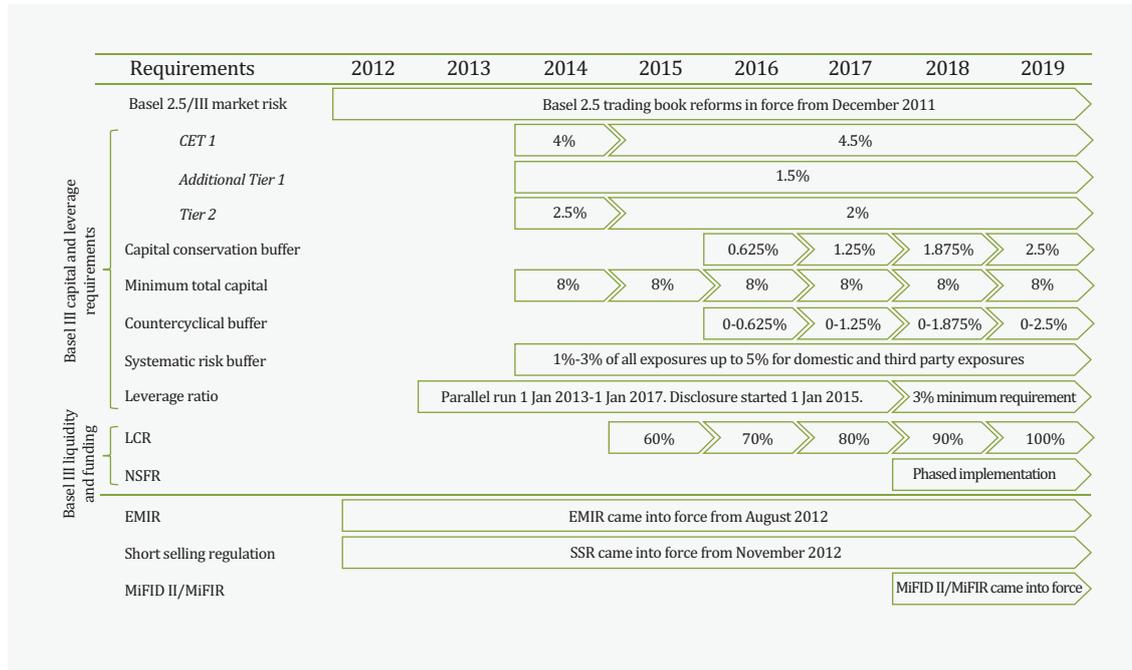
Some Basel III capital and liquidity requirements are still being phased in, and the longer term impacts of the NFSR, MiFID II/MiFIR and other EU markets regulations have yet to be observed.

#### 1. Regulation

The new regulatory landscape is substantially different from that which existed prior to the financial crisis. In Figure 7 we set out some of the main elements of the new rules. It is notable that, even in 2018, there are still further changes and ongoing implementation efforts to be finalised. Some Basel III capital and liquidity requirements are still being phased in, and the longer term impacts of the NFSR, MiFID II/MiFIR and other EU markets regulations have yet to be observed.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

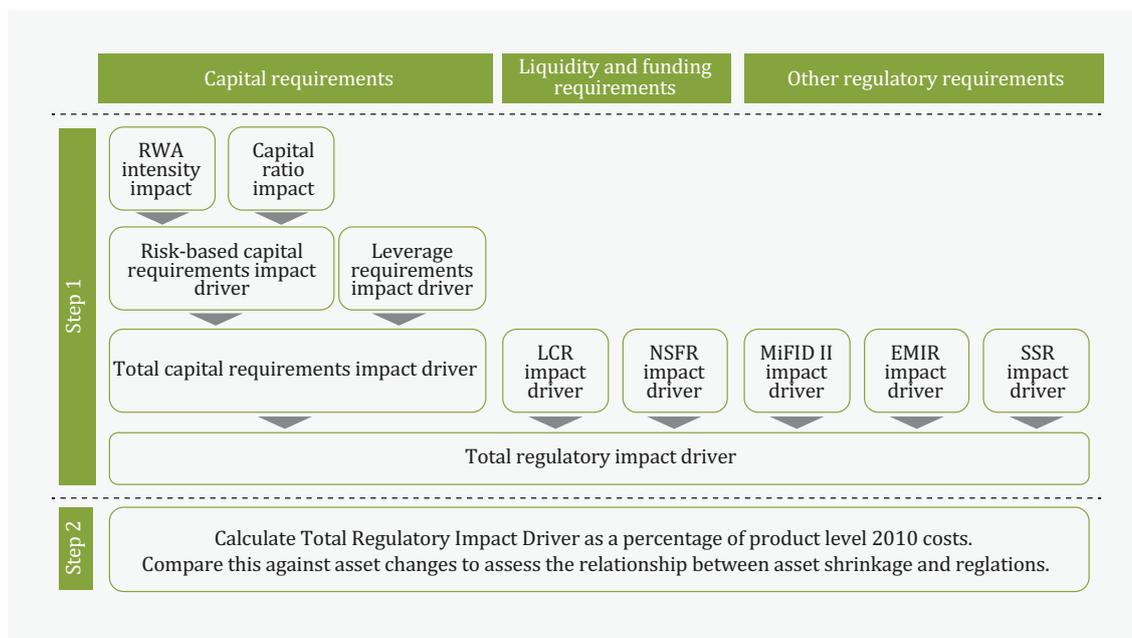
Figure 7: **New regulatory landscape**



One of the challenges of analysing cumulative regulatory impact is that regulations are very different, by design, and therefore the impacts need to be aggregated into a common, comparable metric. Our approach is to aggregate all regulatory impacts into an equivalent annual cost, which we term a “regulatory impact driver”. In this way, we combine capital, liquidity and operational impacts. This analysis is undertaken at the Level 1 product level of granularity.

Our overall approach for estimating our regulatory impact is set out in Figure 8. It is further explained in [Appendix D](#).

Figure 8: **Approach to creating a single regulatory driver**



## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

BIS analysis in 2010 showed that changes in the definition of capital was expected to result in a 41.3% decline in Common Equity Tier1 level.

Brito used a stylised model to show that capital charges would increase by up to 232% and 182% under the standardised and internal models respectively.

There are four regulatory drivers of higher capital:

- **Stricter requirements for qualifying capital:** BIS analysis in 2010 showed that changes in the definition of capital were expected to result in a 41.3% decline in Common Equity Tier1 levels.<sup>35</sup>
- **Higher RWA requirements:** increase in RWA capital charges for banking book and trading book (market risk framework stressed VaR models, counterparty risk charges, restricted netting, and charges for securitisation exposures).
- **Increase in regulatory minimum capital and buffers:** see Figure 5.
- **Increase in leverage requirements:** note that this takes the form of the 5% supplementary leverage ratio for US Systemically Important Banks (SIBs), while Basel III will impose a G-SIB leverage ratio buffer in Europe. The changes to the calculation of risk-weighted assets were anticipated to have a significant impact on capital requirements. BIS analysis in 2010 for large banks (Group 1<sup>36</sup>) shows that RWAs were expected to increase by 23% on a like-for-like basis moving from Basel II to Basel III (including retail and commercial banking activities). These effects are likely to differ significantly by product, with capital markets activities disproportionately impacted. Brito (2015)<sup>37</sup> used a stylised trading portfolio<sup>38</sup> approach to assess the impact of capital charges. He estimated that capital charges would increase by up to 232% and 182% under the standardised and internal models respectively.

Structured credit products are particularly affected by stressed VaR charges, the incremental risk charge, the securitisation charge and correlation trading. Varotto (2011) in a study of US corporate bond portfolios shows that the introduction of the incremental risk charge substantially increases required capital (ranging from 39% to 173%).<sup>39</sup>

Our analysis of changes in RWA capital intensity at Product Level 2 in Figure 9 shows marked differences in changes in intensity from 2010 to 2016. Credit and commodities products bear the greatest increase in RWA intensity, whereas foreign exchange, rates, commercial lending and equities are much less impacted. Within these areas it is typically the derivatives that have a higher RWA intensity (compared to cash products), principally driven by OTC derivatives, which are not centrally cleared<sup>40</sup>. There are some product areas where bank mitigation activities and movement in the mix of assets held within the product segment results in a decline in RWA intensity. This does not necessarily mean that the regulations have become less stringent, rather the behavioural responses of banks have reduced the regulatory impact.

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35 BIS, "Results of the comprehensive quantitative impact study", December 2010

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36 Group 1 banks are those that have Tier 1 capital in excess of €3 billion, are well diversified, and are internationally active.

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37 Brito, "Market risk charge of the trading book, a comparison of Basel II and Basel III", January 2015

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38 A stylised trading portfolio is an assumed, or representative, mix of trading assets.

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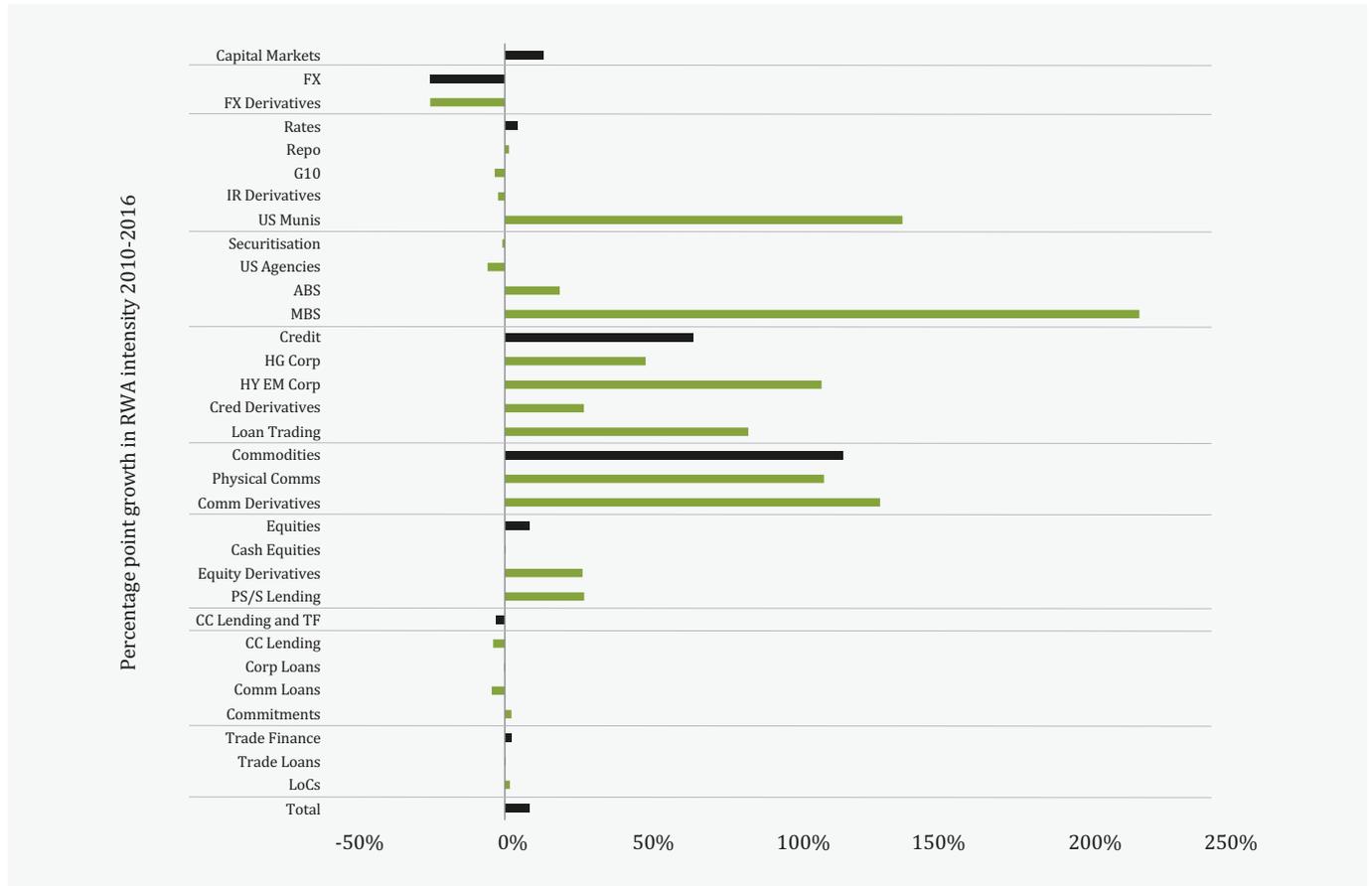
39 Varotto, "Liquidity Risk, Credit Risk, Market Risk and Bank Capital", January 2011

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40 Basel III rules increase the amount of regulatory capital required to protect against the counterparty risk inherent in OTC derivatives. The increase comes principally from a new capital charge designed to protect against variations in the credit valuation adjustment (CVA), which measures asset valuation changes related to counterparty credit risk.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 9: **Change in RWA intensity, by product 2010-2016**



Source: Tricumen and PwC analysis. Black for Level 0 and Level 1 and Green for Level 2 products

Other capital impacts are spread more evenly across products. By definition, more stringent capital definitions and higher minimum capital ratios impact those products which require more capital.

There is an important interplay between risk-based capital requirements and non-risk based capital requirements. We combine RWA intensity changes with movements in capital ratios (capital/RWAs) to identify risk-based regulatory impacts, and then changes in capital/asset ratios<sup>41</sup> to identify leverage regulatory impacts. This is particularly relevant in the case of repos, which have a low RWA intensity (as shown in Figure 9) but consume a large amount of balance sheet capacity and therefore are particularly impacted by leverage requirements.

Credit and commodities products bear the greatest increase in RWA intensity, whereas foreign exchange, rates, commercial lending and equities are much less impacted.

Within these areas it is typically the derivatives that have a higher RWA intensity (compared to cash products).

<sup>41</sup> Our approach does not take into account the full exposures measure to calculate regulatory leverage ratios. We conducted sensitivity analysis to consider the extent to which such adjustments may affect our results. We sourced adjusted average assets data as reported by CapitalIQ for 2010 and 2016 for three banks where such data was available. This metric is more aligned to the exposure measure used to calculate regulatory leverage ratios (but excludes adjustments for off-balance exposures). We applied this to the product levels using their share of total bank assets, sourced from CapitalIQ. For all three banks tested, the difference in regulatory impact driver was less than 10% (using the adjusted average assets basis) as compared to our base approach of using only balance sheet assets.

More recent information on banks' off-balance sheet leverage exposures (as disclosed in Pillar 3 reports) suggest that off-balance sheet exposures are also a reasonably stable component of total leverage exposure (at least between 2014 and 2016). To the extent that banks have reduced their off balance sheet exposures as a proportion of total exposure since 2010, our estimates of the regulatory impact are conservative.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

We then identify the binding constraint on banks at the product/regional level by taking the maximum of additional capital required, as a result of risk-based requirements or leverage requirements.

We then calculate an annual cost of capital impact by multiplying incremental capital by a bank specific 2016 cost of equity figure to incorporate into our regulatory impact driver.

Liquidity and stable funding requirements impose costs on those products which require higher amounts of high quality liquid assets to be held, or higher levels of required longer term stable funding. The overall cost of liquidity can be calculated as the increase in liquid assets held, multiplied by the cost of liquid assets (which is, in turn, the yield spread of liquid assets in comparison to the average yield across assets). The cost of stable funding is the difference between longer-term stable borrowing and short-term funding.

While the underlying determinants of liquidity requirements (e.g. contributions to 30 day cash outflows measures) at a product level are difficult to discern from publicly available sources, it is possible to observe both the difference in liquidity and stable funding requirements and differences in product mix across banks. We use these relationships to estimate the liquidity and funding requirements, that banks might have faced had regulations been in place in 2010. We can then use business volumes to allocate the cost of holding this hypothetical additional liquidity and stable funding to product classes, to calculate regulatory impact drivers.

Other regulations typically add both complexity and operational cost. For example, transparency requirements in MiFID II/MiFIR require new systems for reporting pre-trade and post-trade activity. We have therefore drawn upon external impact studies (see [Appendix D](#)) of the ongoing cost of new regulations. These have then been allocated across products according to business volumes in the areas of impact.

Implementation costs are substantial, and during the current implementation period, implementation programmes have the potential to divert bank resources from other transformation priorities.

We have not incorporated any group-level regulations, which have limited direct impact on the provision of products and client services. Examples include Board-level governance changes and creating living wills. Ring-fencing in the UK has the potential to impact governance costs, as well as divisional funding costs. Furthermore, we have not incorporated any implementation costs in our regulatory impact driver. This is because these are 'one-off', so should not have any lasting impact on financial markets. However, implementation costs are substantial, and during the current implementation period, implementation programmes have the potential to divert bank resources from other transformation priorities. In many cases the implementation costs are a multiple of one year ongoing costs. For example, the European Commission MiFID II/MiFIR impact assessment suggested implementation costs would be \$2 billion, which is four times expected ongoing costs. Greenwich Associates surveyed dealer-brokers and found that annual expenditure on fixed income "reg-tech" (i.e. technology to support a wide range of regulatory requirements) is currently running at \$15bn to \$20bn.<sup>42</sup>

Our total, or aggregate, regulatory impact is expressed in annual cost terms. This is not a necessarily a cash cost, rather a revealed opportunity cost in 2016 in comparison to the how banks responded to the regulatory environment in 2010.

The purpose of creating the regulatory impact driver at a granular level is to detect whether this is an important driver of balance sheet changes. However, it is still instructive to look at the overall impact, which is set out in Figure 8 below. We focus on capital markets activities, as this is where regulatory impacts are concentrated (RWA intensity is little changed in corporate and commercial lending – see Figure 9).

42 Greenwich Associates, "The Benefits of Trader Augmentation", November 2017

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 10: **Regulatory impact driver**

Regulation impact to 2016 (13 sample banks)	Total regulatory impact driver for total capital markets activity US\$bn (per annum)
Risk-based capital and leverage requirements	33
Short-term liquidity requirements (LCR)	0.6
Long-term funding requirements (NSFR)	3
MiFID II / MiFIR (based on European Commission estimates)	0.5
EMIR (based on BIS estimates)	0.4
Short selling regulation (Based on EC estimates)	Negligible
<b>Total</b>	<b>c. \$37 billion/year</b>

Source: PwC analysis, BIS, European Commission

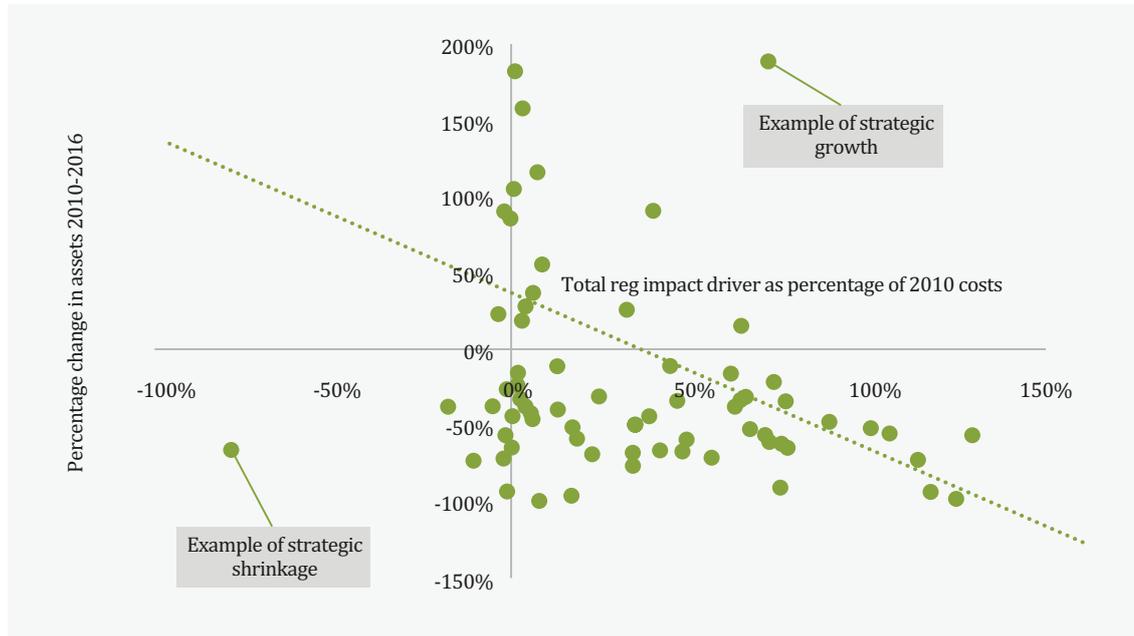
Figure 10 shows how capital and leverage requirements are the most substantial drivers of regulatory costs. There is a likelihood that we have omitted other non-capital, non-liquidity regulatory costs, but these are likely to be small in comparison to capital, leverage and liquidity effects.

Before considering other potential drivers of capital market balance sheets, it is helpful to present the simple relationship between regulatory impact and balance sheet changes at Product Level 1. This is presented in Figure 11 below. This sets out the degree of balance sheet change on the vertical axis and the regulatory impact driver for each Level 1 product, for each bank on the horizontal axis.

Our annualised cost of regulation for our 13 banks is c. \$37bn per year.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 11: Relationship between balance sheet change and regulatory impact driver for global capital markets activities



Source: PwC analysis. Total regulatory requirements impact driver as a percentage of 2010 expenses is restricted to the range -200% to +200%. This removes the distortionary effects of outliers. Each observation represents a specific product area for each bank (FX, commodities, rates, credit, equities and securitisations). The outlier in the top right of quadrant is an example of a product class where the bank has pursued strategic growth, whereas the outlier in the bottom left quadrant is an example of strategic shrinkage.

Higher degrees of regulatory impact are associated with bigger amounts of shrinkage.

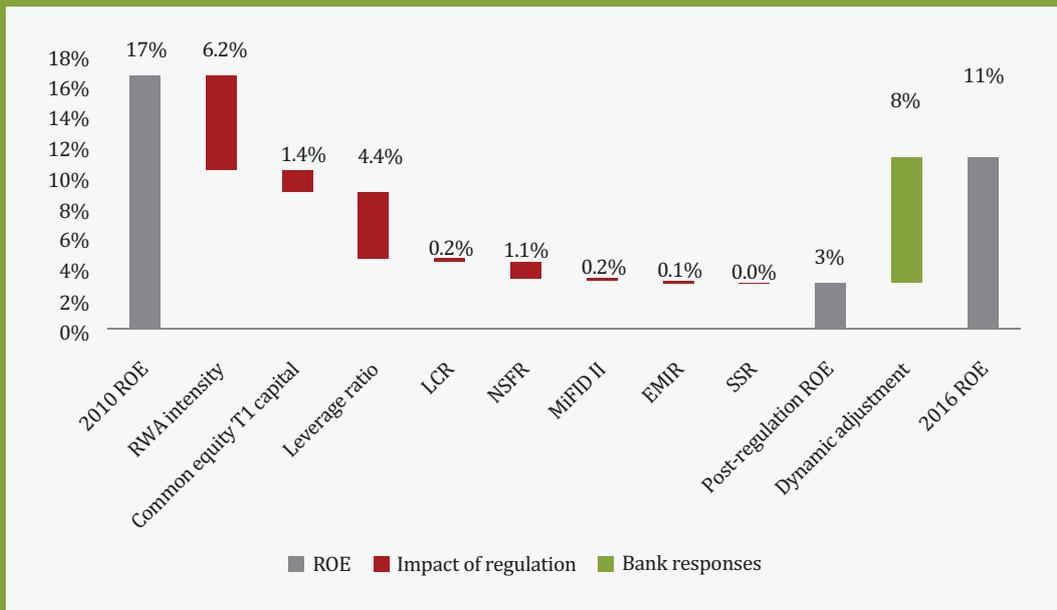
Figure 11 shows a general downward sloping relationship. This means that higher degrees of regulatory impact are associated with bigger amounts of shrinkage. Figure 11 also shows:

- **A significant amount of variation:** so there must be other factors which explain the movement in assets aside from regulatory impact.
- **Some exceptions:** in one observation the regulatory impact (net) is reducing, but so is shrinkage, and in one observation the net regulatory impact is increasing, but assets have grown. In these cases banks have taken clear strategic steps to shrink or expand, counter to the prevailing regulatory pressures.
- **Growth in assets rarely takes place where there has been increasing regulatory impact:** where there has been growth, such as with the US agency sectors of securitisation and certain FX activity, the regulatory impact driver was more modest.
- **High regulatory impact usually accompanies shrinkage in assets:** the majority of the observations are in the bottom right quadrant, where the biggest increases in regulatory costs are associated with shrinkage in assets. This is particularly the case in credit and commodities products. In contrast, where there is little regulatory impact (around the vertical axis), then other factors are more important, and this leads to a wide dispersion of outcomes, ranging from substantial expansion in assets to substantial shrinkage in assets.

### Box 2: Why shrink balance sheets?

Section 2 of this report shows that banks have shrunk their balance sheets, and Section 3 shows that regulatory drivers play a role, but this does not explain the mechanism of shrinkage. Part of the answer can be found by examining trends in return on equity (ROE). Using the same Tricumen data, we can estimate 2010 ROE<sup>36</sup> and then show the impact of the regulatory changes on ROE. This is presented in Figure 12 below.

Figure 12: Impact of regulations on capital markets RoE



Source: PwC analysis

Figure 12 shows that the combined impact of regulations takes 2010 capital markets ROE from 17% to 3%, absent other changes, with capital regulations contributing the largest impact. At a product level some of these movements are even more stark. ROE moves from 20% in 2010 to 3% after regulatory impact in the credit product segment and from 17% to -6% in the rates product segment. Banks do at times remain in businesses with negative ROEs if the product line is strategic to a broader client relationship, which is profitable overall.

This illustrates the compelling need for banks to respond. This is captured in the “dynamic adjustment” bar in Figure 12, which is contrasted to the static impacts from the eight regulatory impacts. In fact, banks have restored ROE to 11% in 2016 through a mixture of cost control, new business models, balance sheet restructuring and re-pricing of services.

Given the scale of the challenge, it is little surprise that banks have had to use multiple levers to restore ROE. One inevitable lever has been the more efficient use of capital and shrinking balance sheets. The benefit of an ex-post study, such as this, is that it helps to reveal how much banks have chosen to shrink as part of their response to the ROE challenge.

43 ROE excludes one-off and exceptional items such as fines and redress and restructuring costs.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

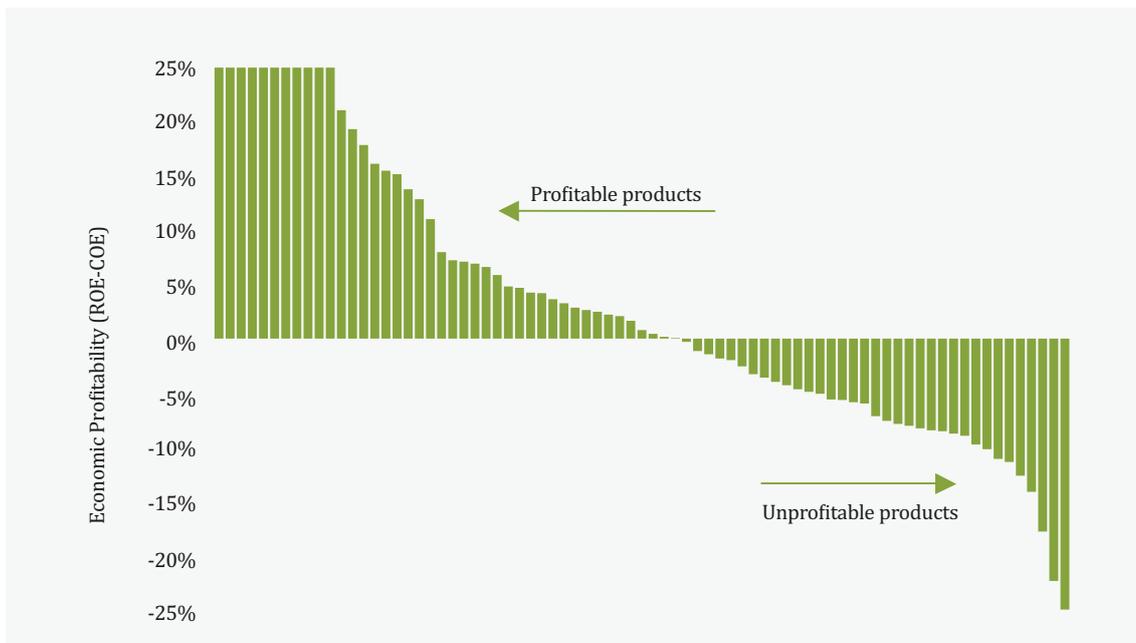
### 2. Commercial performance

We anticipate that banks will invest in profitable or strategic business areas and shrink those that are commercially unviable over long periods, without providing other strategic benefit. A common benchmark of commercial viability is whether a business division or product is earning sufficient returns to match or exceed its cost of capital (also termed economic profitability). This metric does not capture whether the product or service provides wider benefits to the banking group. It also typically relies on somewhat simplistic allocations of shared group costs and may be influenced by cyclical factors. So while banks will not make strategic decisions on an overly simple set of performance metrics, there should still be commercial incentives to expand products with returns above the cost of capital and shrink products with returns below the cost of capital, even if one accepts that judgments may be made taking account of the blended returns from several separate, but related, areas.

A significant number of product areas are not returning a sufficient amount to meet their cost of equity.

In Figure 13, we set out the variation in product level returns across banks. We focus on the returns on (allocated) equity in comparison to the cost of equity<sup>44</sup>, which is calculated on a firm-wide basis. We note there is significant variation in returns, and a significant number of product areas which are not returning a sufficient amount to meet their cost of equity. Absent other reasons, we would expect these areas to shrink.

Figure 13: **Product level economic profitability (2016)**



Source: PwC analysis. Using Level 1 products, by bank in descending order

44 We do not use a cost of equity which varies by product. Given the high returns variation, product-level variation in cost of equity would be unlikely to influence our results significantly. Further, many banks use a firm-wide cost of equity target across all activities in appraising performance.

### 3. Macroeconomic and wider financial sector trends

Banking sector performance is intrinsically linked to the broader economic and wider financial market environment. Banks typically perform well during economic upswings and rising markets. During the period from 2010 to 2016 economic growth across major markets recovered from the global financial crisis, but was still disappointing relative to long-term growth trends. Following the crisis, there was also a sector-wide fall in risk appetite, and management attention focussed on restructuring businesses.

The period was also marked by particularly low interest rates and unconventional monetary policies (including Quantitative Easing - QE). Low interest rates typically reduce bank profitability (across banking and capital markets activities), so generally does not support sector growth. QE can have contradictory effects: while it supports asset prices (which is positive for most capital markets businesses), it can also restrict the supply of available financial instruments for trading and introduce unbalanced markets (where the monetary authorities are the main buyers of government debt and there is little trading among other market participants).

### 4. Technological change

In a fast-paced business environment, technological change can have greater impacts than regulation or the economic cycle. In the long-term technology is likely to define the shape of markets, business models and ultimately determine which firms are successful.

It is hard to isolate technological change into one variable for inclusion in aggregate impact analysis. One area where technology is changing markets is the electronification of trading, using trading platforms rather than direct client broking. More asset classes are moving towards electronic trading, as shown in Figure 14. Some have already achieved a high degree of electronification, but others, such as high-yield credit, still require broker contact due to the bespoke and illiquid nature of the asset class. MiFID II/MiFIR provides incentives towards further electronification of trading processes.

Electronification has also been driven by regulatory requirements for central clearing<sup>45</sup>/trading and efforts to reduce the risk of banks becoming a source of liquidity contagion (BIS, 2016)<sup>46</sup>. This shows that there are potential interlinkages between our potential drivers of balance sheet changes.

The likely impact of electronic trading on banks' balance sheets is difficult to discern. It may allow banks to reduce costs, and thereby improve profitability and provide incentives to expand activities. Alternatively, it may encourage competition from outside the banking sector and result in banking sector shrinkage.

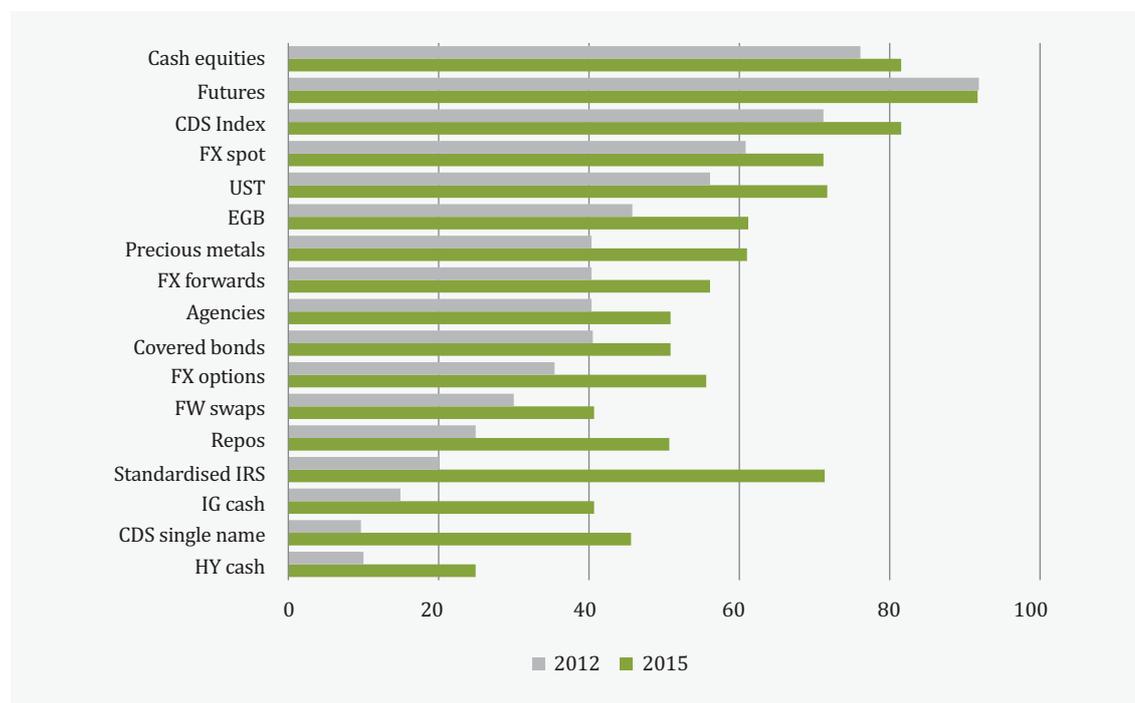
The likely impact of electronic trading on banks' balance sheets is difficult to discern.

45 This work is ongoing. The FSB, BIS, IOSCO and CPMI have launched a qualitative survey on the incentives to centrally clear derivatives. <http://www.fsb.org/2017/12/call-for-responses-to-surveys-on-incentives-to-centrally-clear-otc-derivatives/>

46 BIS (2016), "Electronic trading in fixed income markets"

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 14: Trends in the elctronification of capital markets (2012-2015). Measured by percentage of electronic trading



Source: BIS, Greenwich Associates and McKinsey

### 5. Individual banks' positions

The last potential driver we explore is the variation in individual banks' positions. Some banks were more heavily impacted by the global financial crisis, as clearly demonstrated by those that went into administration or required support<sup>47</sup>. Others fared much better with much lower losses, either due to a more cautious risk appetite or portfolio diversification. Regardless of the reasons for banks being in stronger or weaker positions during the period 2010 to 2016, it is likely that bank-specific characteristics and challenges will have some bearing on balance sheet management over this period.

#### Regression analysis

In order to assess the relative importance of these five potential drivers of banking sector balance sheet changes<sup>48</sup>, we need to use a multivariable econometric technique.

Because we have sourced information for only two periods (2010 and 2016) our data measures the step change in both balance sheet and potential drivers over this period, rather than repeated observations over time. This limits the techniques available to cross-sectional approaches, and so we select an ordinary least squares (OLS) approach<sup>49</sup>. Our econometric technique seeks to explain balance sheet changes (the dependent variable) measured as the percentage change in bank assets for each bank, for each product (Level 1) according to our regulatory impact driver and the four other control variables:

$$BS\ REDUCTION = \alpha + \beta REG + \gamma CONTROLS + \epsilon$$

47 We excluded banks with direct Government equity injections (e.g. RBS) from our analysis as shrinkage in this specific situation is likely to be driven by Government-shareholder requirements rather the factors we are analysing.

48 We tested for other potential drivers including geographic shares of activity, conduct costs and monetary policy, as distinct from macroeconomic effects.

49 Our OLS regression is augmented so that it is robust to heteroscedasticity and the presence of outliers (particularly those generated via measurement error).

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

The effect of each bank's individual characteristics (fixed effects) is proxied by introducing bank dummies (a variable for each bank in the sample which takes the value of one or zero).

In this specification, the constant ( $\alpha$ ) captures the macroeconomic and wider financial sector trends that impact all banks and products. This therefore incorporates all macroeconomic and sector wide trends (which are not differentiated by bank, or product). We cannot therefore deconstruct this effect into macroeconomic effects for individual banks.

The regression results are presented in Figure 15. This lists the coefficients and the overall statistical measures of the regression fit.

Figure 15: **Results of balance sheet regression**

Dependent variable: % reduction in assets 2010-16 (BS REDUCTION)	Coefficient
Constant (macroeconomic factors)	-0.419
Regulatory impact driver (REG)	-1.022*
Economic profit (ROE-COE)	3.418*
Change in electronification (2012-15) <sup>50</sup>	0.230
Bank effects	Ranging from -0.302 to 1.279
Number of observations	66
Probability > F	0.0059
R <sup>2</sup>	0.26

\*Indicates significance at 10% level and \*\* indicates significance at 5% level.

The negative constant means that, absent changes in the other variables, assets for any given bank's product area would fall over the period 2010 to 2016. The constant is not statistically significantly different from zero however, which suggests that the effect of the macroeconomic and broader sector factors on balance sheet changes over the period is weak.

This regression specification shows that higher regulatory impacts are associated with larger asset shrinkage (the negative -1.022 coefficient). This coefficient is statistically significant, which means we can conclude that, with reasonable certainty, the regulatory impact driver has an impact on banking sector shrinkage.

By way of interpretation, an increase in regulatory cost drivers (as a % of 2010 costs) of 10 percentage points is associated with a 10% reduction in assets.

Higher economic profitability (ROE less cost of equity (COE) in 2016) is associated with an increase in assets between 2010 and 2016, which suggests that banks do expand into more profitable areas, or conversely shrink activity in lower profitability or loss-making areas.

The change in electronification is not statistically significant. However, some of the effect of electronification may have already been picked up by other factors such as regulatory impact or economic profitability.

An increase in regulatory cost drivers (as a % of 2010 costs) of 10 percentage points is associated with a 10% reduction in assets.

<sup>50</sup> The electronification changes are measured over the period 2012-2015, which does not perfectly match the product level data of 2010-16, but we expect the trends evident over the period 2012-15 to apply over the longer 2010-16 period.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

We tested alternative regression specifications. The share of EU business is not a statistically significant explanatory factor – this suggests that regulatory changes and other drivers are more fundamental and global in nature. Conduct cost is not a statistically significant explanatory factor either, as one-off factors are likely to be less important in explaining structural changes to banks' business models. The impact of monetary policy across different asset classes<sup>51</sup> is also not a significant explanatory factor.

The overall regression explains 26% of the overall variation in banks' asset movements at a product level. The regulatory impact driver explains 20% points of total variation observed, which means that the regulatory impact driver explains 77% of total explained variation.

The fact that the regression is only explaining 26% of total variation in assets means that there is a considerable amount of variation which is not explained by our regulatory, market, economic, commercial and strategic factors. Figure 11 shows that where there is little regulatory impact, there is a wide dispersion of the movement in assets over the period 2010 to 2016. This is to be expected in a dynamic financial market place, where we would expect significant movements in asset balances during the ordinary course of business, for example:

- Movement of staff or teams from one bank to another as part of acquisitions or business restructuring, causing one bank to grow and another to shrink;
- Good trading years in some banks' product areas and bad years for others;
- Different sub-product market conditions around the 2010 and 2016 year-end; and
- Reclassification of product areas causing one to rise and one to fall.

Importantly, for all of these reasons there is symmetric variation – i.e. there is as much increase as there is reduction in asset balances. Further, by definition this variation is not related to the other drivers we have identified, which means it is driven at the product level, rather than by systematic economic, regulatory or market reasons. This unexplained variation therefore has limited market or economic consequence, which means that for policy makers, this unexplained variation need not restrict the use of the identified regulatory impact for refining regulatory policy.

### Deconstructing the movement in assets from 2010 to 2016

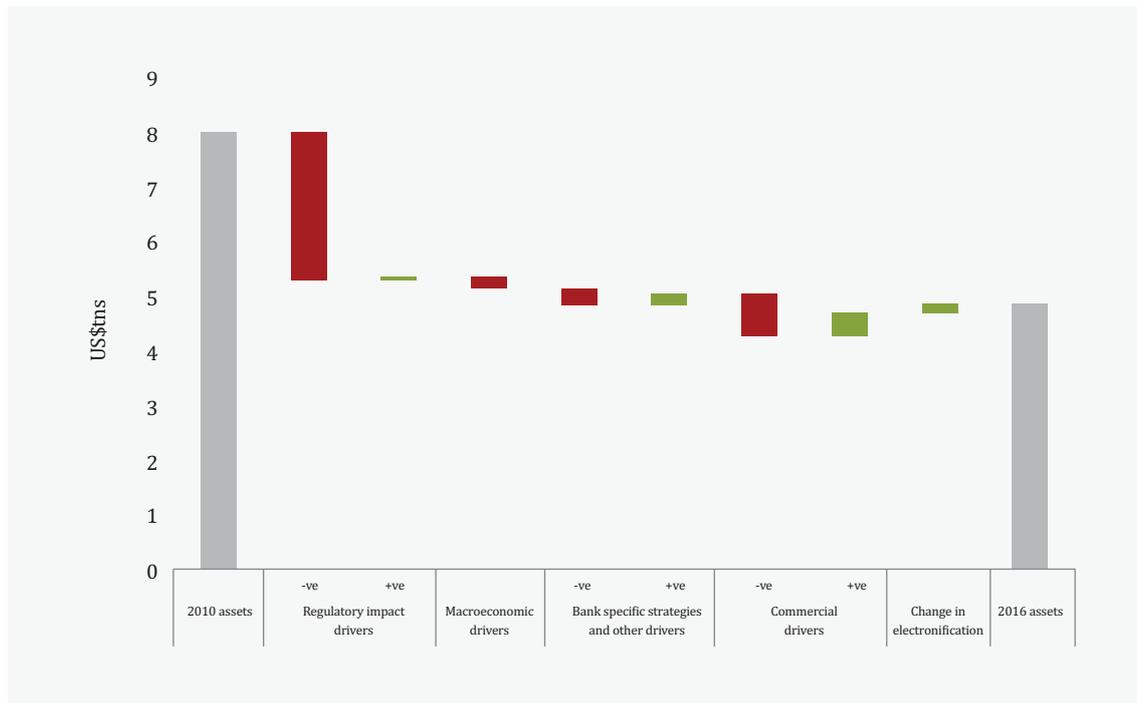
We can use the regression analysis to decompose the impact of the different drivers on the movement in aggregate assets from 2010 to 2016. This is shown in Figure 16 below. This incorporates the movement in assets attributable to five drivers, but does not show the additional variation (both positive and negative) from non-systematic factors. The net effect of these non-systematic factors is zero.

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51 Based upon the work by the Bank of England (2011)

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 16: **Decomposition of asset movement across drivers**



Source: PwC analysis

Figure 16 shows the extent of the regulatory impact driver – the first and largest negative block in the diagram. This shows that regulation is attributable for 67% of the total shrinkage that is explained by our five drivers. The non-regulation drivers are less substantial, and often work in opposite directions – e.g. some banks deciding to grow for strategic reasons, while others shrinking, and some product segments performing well, while others less so.

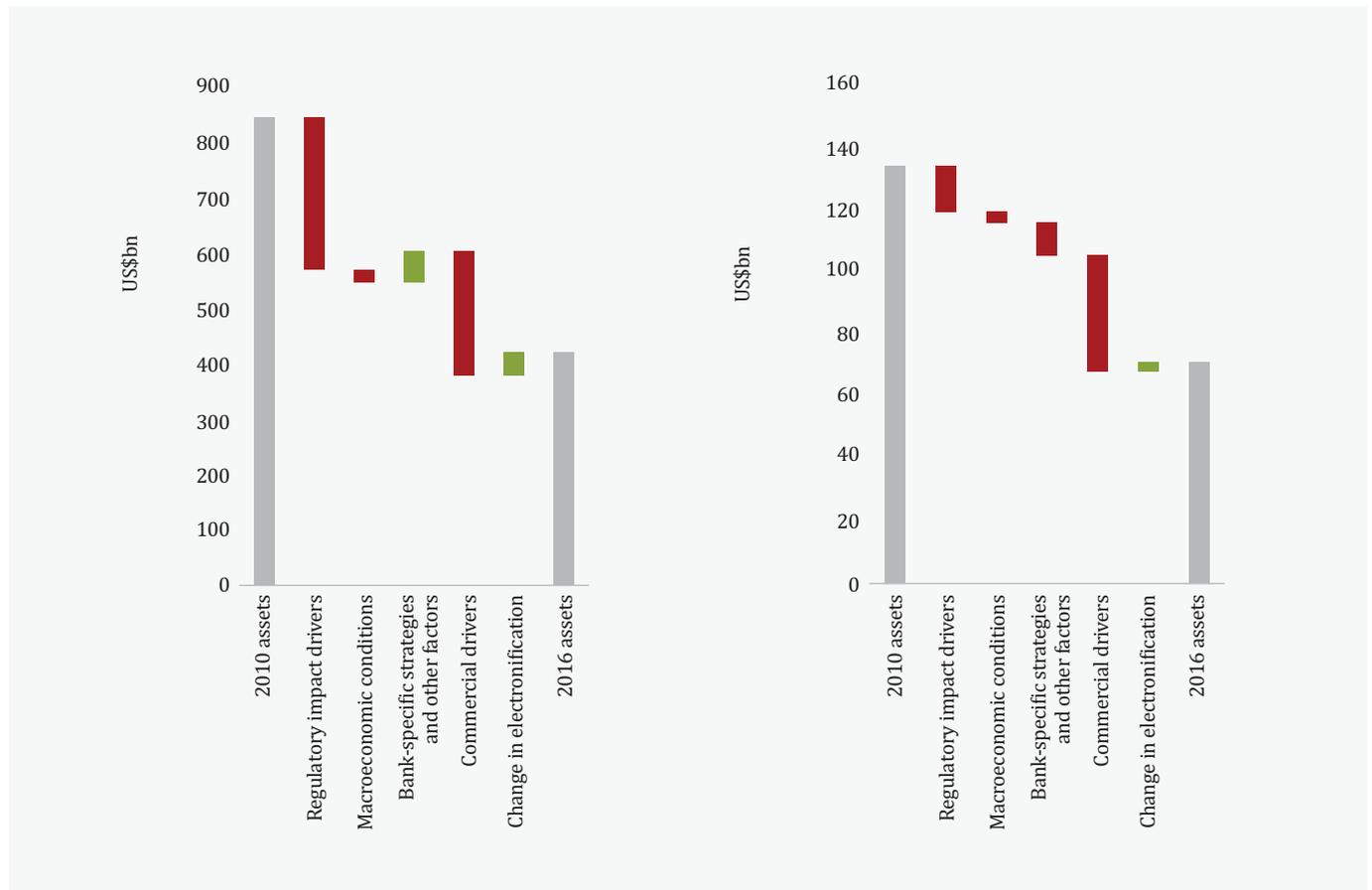
The regulatory impact driver is the largest contributor to the reduction in bank assets.

The impact of the different drivers also varies across product segment. Figures 17 and 18 set out the same analysis for the credit product segment and the commodities product segment. Whereas for credit, the regulatory impact is high, driven mostly by much higher capital requirements. Banks' credit segments have shrunk due to regulatory impact and additional commercial pressures (some banks have expanded due to bank-specific strategies and other factors, which partly offsets the overall decline). However, in the commodities product segment, the regulatory impact is proportionately smaller, but banks appear to have taken strategic decisions to further reduce assets. Given the regression coefficients, the impact of macroeconomic drivers and electrification is small in both cases.

## 5. Drivers of balance sheet changes in the wholesale banking and capital markets

Figure 17: Drivers of movements in assets (credit)

Figure 18: Drivers of movements in assets (commodities)



Source: PwC analysis

## 6. Policy considerations

This study has examined in detail the changes in balance sheets across banks' product areas and the motivation behind these changes.

We have found significant asset deleveraging in banks' capital markets activities since the crisis – capital markets assets for our sample of 13 banks which in aggregate represent 70% of global capital markets activities have fallen by 39%, and this is particularly pronounced in rates, credit, commodities and equities. Our multivariate regression analysis suggests that change in regulations are a strong driver of asset shrinkage. An increase in regulatory cost drivers (as a % of 2010 costs) of 10 percentage points is associated with a 10% reduction in assets. Regulatory impact drivers account for about two thirds of the explained shrinkage in capital markets assets between 2010 and 2016 and are by far the biggest drivers, of those we have identified.

Other non-regulatory factors are also relevant: banks are also more likely to scale back activity in areas of lower future profitability. Macroeconomic factors, such as wider economic growth and monetary policy also explain some of the movement in assets. Some banks are also in better overall positions compared to their peers, which partly reflects their efforts to restructure and subsequent ability to grow.

There are reform impacts which have not been captured in our analysis. These are currently being implemented, or being implemented in a phased way, or have yet to be finalised. Examples include:

- Implementation of MiFID II/MiFIR from 3 January 2018 (our 2016 data only captures early anticipated responses);
- Full NSFR implementation will not be until at least 2021;
- Phasing of capital requirements under Basel III, many of which run until 2022 and beyond; and
- Further refinements to the Basel framework announced on 7th December 2017 which although not part of this analysis may influence banks' future strategies.<sup>52</sup>

There are reform impacts which have not been captured in our analysis.

It is therefore likely that continued implementation of regulation will exacerbate existing shrinkage trends.

We have also not factored in any potential impacts from Brexit. It is therefore likely that continued implementation of regulation will exacerbate existing shrinkage trends<sup>53</sup>. This means there is likely to be further impact on the capital markets, clients/customers and the wider economy. For example, and as set out in our 'Channel 4', this will place further pressure on banking market concentration and customer choice; market liquidity and cost of finance for corporates and households; and further movement of activity outside of the banking sector with uncertain effects.

### Policy actions and areas for further assessment

Our analysis demonstrates that there is an empirical connection between regulations and the size of regulated banks' balance sheet capacity in capital markets activities. While non-regulatory factors have also played a role, regulation has been by far the most significant driver of balance sheet changes.

52 BIS, "High-level summary of Basel III reforms", December 2017

53 Overall results for 2017 suggest the trends evident until 2016 are little changed. Tricumen's Q4 2017 capital markets review (which covers a different sub-set of banks to this study) reported US\$169bn of operating revenue in FY17, 3% below FY16, and US\$35bn in 4Q17, a 10% year on year fall. Primary issuance revenue grew, but equities slipped and FICC dropped 10% year on year in 2017.

## 6. Policy considerations

While some of the changes resulting from regulation were undoubtedly intended, reductions in bank balance sheets are likely to translate into less capacity on the part of banks to provide services to clients and intermediate in financial markets. It has been outside the scope of this study to examine the potential impacts of reduced bank intermediation capacity on the functioning of capital markets or on users of financial services. But we believe these are central questions for policy makers and market participants to focus on in the coming period as the post-crisis reform programme is completed or fine-tuned.

Similarly, the study does not seek to anticipate any changes to banks' strategies resulting from Brexit. AFME and PwC have undertaken separate analysis on the operational impact of Brexit on wholesale banking and capital markets in Europe<sup>54</sup>, while other AFME publications have focused on practical challenges of Brexit<sup>55</sup> and examining potential impacts on European SMEs, corporates and investors<sup>56</sup>. The effects of Brexit on banks and market participants will also require close attention and examination in the period ahead.

Building on the empirical analysis in this study we recommend that European and global authorities undertake further *ex-post* cumulative impact studies.

Building on the empirical analysis in this study we recommend that European and global authorities undertake further *ex-post* cumulative impact studies. These should specifically examine how regulation impacts the economics, for providers of primary and secondary market capital markets products and hence their incentives and capacity to continue offering them to end users, such as corporates, and investor users of market making services.

Future *ex-post* assessments should be complemented by *ex-ante* analyses of reforms still under consideration, yet to be implemented or where *ex-post* evidence is otherwise not yet available. The preparation of impact assessments when new regulations are proposed, which is required in relation to EU legislative initiatives, is a good practice that should be strengthened and replicated in other jurisdictions.

The assessments should **interrogate the effects of reforms on:**

- **Capital markets product segments**, with a view to assessing the effects of the multi-layering of regulations on individual products and evaluating the impacts across instruments and asset classes, to establish if such layering or specific reforms unduly penalise certain activities;
- **Financial stability and the sustainability of banking functions**, with a view to analysing dealer-bank incentives to expand or to shrink intermediation activities, and to provide customer financing and risk management services; and
- **The primary and secondary markets environment**, with a focus on the functioning of secured funding markets and less liquid asset classes important to end users, as well as liquidity conditions in future stress scenarios or when unconventional monetary policies – including quantitative easing programmes – are unwound.
- Specific focus in the assessments should be given to:
  - how regulations are impacting **market making activities**, with an initial focus on capital, leverage and liquidity requirements in particularly affected areas such as **credit and rates/repo activities**; and
  - how markets and conduct regulations may have negative or unintended effects on bank intermediation and different **end users** as for example the European Commission is expected to do in relation to the rules on listed **SME equity research**.

It is important to note that the non-regulatory drivers of shrinkage identified in this study – the competitive environment, macroeconomic conditions, monetary policy and electronification – will continue to evolve in the coming years. The interaction between these drivers and the regulatory environment should continue to be analysed and factored into future studies on the evolution of the financial system.

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54 AFME-PwC, "Planning for Brexit: Operational impacts on wholesale banking and capital markets in Europe", February 2017

55 AFME, "Implementing Brexit: Practical challenges to wholesale banking in adapting to the new environment", April 2017

56 AFME-BCG, "Bridging to Brexit: Insights from European SMEs, corporates and investors", July 2017.

We welcome that authorities have begun to examine the effects of the post-crisis regulatory and supervisory frameworks on the capital markets environment. The US Department of the Treasury has identified recommendations that can better align the financial system to serve issuers, investors, and intermediaries<sup>57</sup>. The European Commission has, meanwhile, undertaken actions in response to its call for evidence on the coherence of EU financial services legislation, including convening an expert group to examine the state of European corporate bond markets and make recommendations<sup>58</sup>. The follow ups to these exercises will be important in ensuring that the regulatory framework continues to support capital markets and economic policy aims, together with financial stability objectives.

The above areas for further assessment are particularly relevant in the European context as the EU pursues its project aimed at developing a Capital Markets Union (CMU). Banks play an essential role as intermediaries and providers of liquidity in capital markets. The coordination and reconciliation of two main initiatives in the EU policy agenda – the objective of a more stable and sustainable financial system and the renewed emphasis on growth, including through deeper and more integrated capital markets – remains a fundamental challenge, which can be successfully overcome if the links between the key pillars of the regulatory framework are adequately explored and understood. As previously noted, the impact of the UK's withdrawal from the EU is an additional significant factor to consider in the financial sector environment.

We provide below additional observations pertaining to prudential and markets reforms.

### Prudential reforms

While this study shows that the largest empirical regulatory impacts up to 2016 emanate from risk-based capital and leverage requirements, it is the view of AFME and PwC that this reflects not only the fact that these regulations are very significant, but also that their earlier adoption, and often accelerated bank implementation, has contributed to driving business decisions up to 2016, and which appear to have continued through 2017, based upon available reporting to date.

As noted above, a number of major prudential reforms have not been factored into this *ex-post* analysis, including the full implementation of the NSFR, the fundamental review of the trading book (FRTB) and other elements of the recently finalised Basel III proposals. The total regulatory impacts derived from these regulations are expected to rise as they are implemented and fully factored into business decisions.

In view of the evidence presented in this study, and other recent reports, we believe that the impact of capital, leverage and liquidity requirements in areas such as credit and rates/repo activities should be subject to careful review at this point.

Authorities should ensure that further reform packages are appropriately designed and calibrated prior to their adoption. In Europe, this would include addressing key issues in the Risk Reduction Package currently under consideration, in particular regarding the introduction of the NSFR and the FRTB, although other components such as the Leverage Ratio and the Standardised Approach for Counterparty Credit Risk (SA-CRR) are also important. Without reconsideration of some specific aspects of these proposals – including their calibration, the timing of their introduction, as well as safeguards for globally consistent implementation – the negative impact on the end users of capital markets would be significant.<sup>59</sup>

We welcome that authorities have begun to examine the effects of the post-crisis regulatory and supervisory frameworks on the capital markets environment.

Without reconsideration of some specific aspects of NSFR, FRTB, leverage ratio and SA-CRR proposals – including their calibration, the timing of their introduction, as well as safeguards for globally consistent implementation – the negative impact on the end users of capital markets would be significant.

57 U.S. Department of the Treasury, “A Financial System That Creates Economic Opportunities”, July 2017

58 European Commission, “Improving European Corporate Bond Markets, Report from the Commission Expert Group on Corporate Bonds”, November 2017

59 AFME has issued more detailed views and recommendations on these issues, available in the AFME report ‘The links between the Risk Reduction package and the development of Europe’s capital markets’, December 2017, available at: <https://www.afme.eu/globalassets/downloads/publications/afme-rrm-and-cmu-2017-4.pdf>

## 6. Policy considerations

### Markets and conduct related reforms

This study has not been able to incorporate empirical evidence arising from the implementation of the new MiFID II/MiFIR regime that took effect on 3 January 2018. This legislation introduces profound changes to the EU market conduct rulebook, the full impact of which will need to be reviewed over a period of time. The impact of MiFID II/MiFIR must be considered in conjunction with the above prudential reforms and several other European regulations that are implemented or still-to-be implemented. These include EMIR, SSR, SFTR, MAD/R, CSDR and the recent Securitisation Regulation.

The evidence in this study covering business decisions up to 2016 (which appear to have continued through 2017 based upon reporting to date) should not be taken to mean that the impact of markets and conduct-related reforms, once fully factored in, will not be significant. It is reasonable to assume that the combined impact of these reforms is very likely to put further pressure on bank business areas where this study establishes regulatory-driven shrinkage has taken place. In the case of MiFID II/MiFIR, there is an industry-wide consensus that the new regime will add significant regulatory and operational complexity, at least in the near term.

We recommend that the impact of markets and conduct-based regulations be continually monitored in the coming period.

The extent, if any, to which banks have been reducing their exposure to certain clients or categories of clients in response to new conduct rules and the risk of high penalties is also an area for further examination outside the scope of this study. The industry welcomes reforms designed to reinforce high standards of conduct across all activities, but at periodic intervals a review should take place as to unintended consequences of the relevant regimes.

As noted above, for this reason we recommend that the impact of markets, and conduct-based regulations be continually monitored in the coming period, with a view to understanding their real benefits against potential costs and effects on the market environment.

In the European context, it will also be relevant to interrogate how the legislative and non-legislative initiatives under the CMU project interact with the post-crisis reform agenda. Beyond the work on securitisation, the EU is pursuing a range of actions to promote capital markets financing, including in areas such as infrastructure and sustainable finance, FinTech, post-trading, SME listings, covered bonds and insolvency law, among others. It will be valuable to explore how these initiatives may influence and shape banks' capital markets activities, incentives and business models in Europe, and consequently how the European financial system may evolve as the CMU is developed.



## Appendix A: Glossary

## Acronyms

Acronym	Definition
<b>4AMLD</b>	4 <sup>th</sup> Anti-Money Laundering Directive
<b>AFME</b>	Association for Financial Markets in Europe
<b>ASF</b>	Available stable funding
<b>BCBS</b>	Basel Committee on Banking Supervision
<b>BIS</b>	Bank for International Settlements
<b>BoE</b>	Bank of England
<b>CAPM</b>	Capital Asset Pricing Model
<b>CET1</b>	Common equity tier 1 capital
<b>CRD IV</b>	Capital Requirements Directive IV
<b>CSDR</b>	Central Securities Depositories Regulation
<b>DCM</b>	Debt capital markets
<b>EC</b>	European Commission
<b>ECM</b>	Equity capital markets
<b>EMIR</b>	European Market Infrastructure Regulation
<b>EU</b>	European Union
<b>FICC</b>	Fixed income, Currencies and Commodities
<b>FSB</b>	Financial Stability Board
<b>FX</b>	Foreign Exchange
<b>G-SIB</b>	Globally Systemically Important Bank
<b>HQLA</b>	High quality liquid assets
<b>HMT</b>	Her Majesty's Treasury (UK)
<b>IMF</b>	International Monetary Fund
<b>IOSCO</b>	International Organization for Securities Commissions
<b>LCR</b>	Liquidity Coverage Ratio
<b>MAD/R</b>	Market Abuse Directive / Regulation
<b>MiFID II / MiFIR</b>	Markets in Financial Instruments Directive II / Regulation
<b>NSFR</b>	Net Stable Funding Ratio
<b>OTC</b>	Over-the-counter
<b>PwC</b>	PricewaterhouseCoopers
<b>QE</b>	Quantitative easing
<b>ROE</b>	Return on equity
<b>RoW</b>	Rest of world
<b>RSF</b>	Required stable funding
<b>RWA</b>	Risk-weighted assets
<b>SFTR</b>	Securities Financing Transactions Regulation
<b>SSR</b>	Short Selling Regulation
<b>US</b>	United States
<b>VaR</b>	Value at Risk

## Technical Terminology

Term	Definition
<b>10K</b>	An annual report that gives a summary of a company's financial performance. Required by the US Securities and Exchange Commission (SEC).
<b>10Q</b>	A quarterly report that gives a summary of a company's performance. Required by the US Securities and Exchange Commission (SEC).
<b>Basel Committee on Banking Supervision</b>	A committee established to provide a forum for cooperation of banking supervisory authorities on banking supervisory matters.
<b>Bid-ask spreads</b>	The difference between the asking or quoted price and the bid or offer price of a given security
<b>Counterparty risk charges</b>	A requirement to hold capital based upon bearing the risk a counter-party to a transaction or loan defaults
<b>Derivative</b>	A form of security whereby the price is derived from at least one underlying asset.
<b>Dodd-Frank</b>	The Dodd-Frank Wall Street Reform and Consumer Protection Act is a piece of financial legislation passed in the US in response to the financial crisis.
<b>Emerging Market</b>	An economy that is progressing toward becoming an advanced economy, usually characterised by rapid growth and industrialisation.
<b>G20</b>	A forum comprised of, and for, the governments and central banks of the world's largest advanced and emerging economies (see above). Together members cover about 85 per cent of global gross domestic product and over 75 per cent of global trade.
<b>Herfindahl Index</b>	A measure of the concentration of a given market; i.e. the extent to which few firms dominate a given market.
<b>Incremental Risk Charge</b>	For un-securitised credit products in the trading book, the Incremental Risk Charge is an estimate of default and migration risk. It is an additional capital charge that is not covered by Value at Risk charges.
<b>Investment Grade</b>	A rating that indicates a given bond has a relatively low risk of default.
<b>Market-based financing</b>	Represents financing where the market is able to match lenders and borrowers directly without the need for a financial intermediary e.g. borrowing via the bond market
<b>Multivariable regression</b>	An economic and statistical technique whereby an outcome or dependent variable is predicted by multiple independent variables
<b>Over-the-counter</b>	OTC trading is a method of trading that does not take place on an organised venue, such as an exchange or Multilateral Trading Facility.
<b>Pillar 3</b>	Annual Pillar 3 disclosures provide information on the basis of calculations used for Basel III Capital Requirements
<b>Quantitative easing</b>	A form of 'unconventional' expansionary monetary policy during which a central bank purchases government and other securities from market participants.
<b>Risk-weighted assets</b>	Risk-weighted assets are a bank's assets and off-balance sheet exposures weighted according to risk.
<b>VaR charges</b>	Value at Risk (VaR) charges
<b>Wholesale banking</b>	Banking services conducted between banks and larger (non-retail) clients.

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## Appendix C: Product taxonomy

Summary level	Level 1	Level 2 <sup>60</sup>
<b>Capital Markets</b>		
	FX	
		FX Cash
		FX Derivatives
	Rates	
		Repo
		G10
		IR Derivatives
		US Municipals
	Securitisation	
		US Agencies (GNMA, FNMA, FHLMC)
		ABS
		MBS
	Credit	
		Investment Grade Corporate Bonds
		High Yield & Emerging Market Corporate Bonds
		Credit Derivatives
		Loan Trading
	Commodities	
		Physical Comms
		Comm Derivatives
	Equities	
		Cash Equities
		Equity Derivatives
		Prime Services/Securities Lending
<b>Corporate and commercial lending and Trade finance</b>		
	CC Lending	
		Corporate Loans
		Commercial Loans
		Commitments
	Trade Finance	
		Trade Loans
		Letters of Credit

60 Level 2 products are aggregated into Level 1 products. FICC is the sum of FX, Rates, Securitisation, Credit and Commodities

## Appendix D: Calculation of regulatory impact driver

### Introduction

Our total regulatory impact driver is a commonly-used metric which is used to convert the impacts of a variety of different regulations into a single, annual economic cost (which is not necessarily equivalent to a cash cost) that is comparable. It is calculated at the (Level 1) product and regional level for a given bank. Therefore the total regulatory impact driver is an estimate of the economic cost of the included regulations on the regional activities of a bank at the Level 1 product level.<sup>61</sup>

The regulatory areas included in our total regulatory impact driver are listed in Figure 19.

Figure 19: **Regulatory impacts captured in total regulatory impact driver**

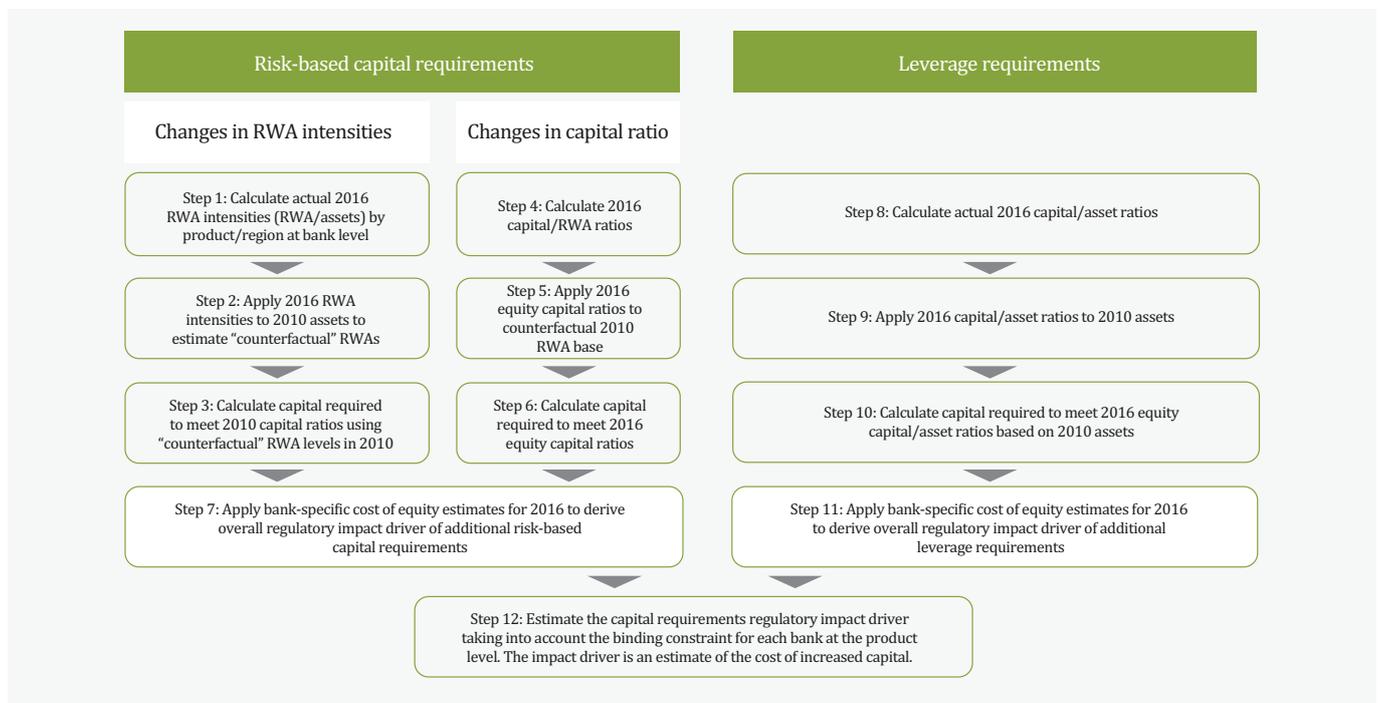
Capital Requirements	Liquidity and funding requirements	Other regulatory requirements
RWA intensity impact	Short term liquidity requirements (LCR)	MiFID II/MiFIR impact
Capital ratio impact	Long-term funding requirements (NSFR)	EMIR impact
Leverage requirements impact		Short selling regulation impact

Figure 8 in Section 4 illustrates at a high level the approach taken to calculate our total regulatory impact driver. This appendix provides further detail as to how we estimated the impact of individual areas of regulation, and how these were aggregated to calculate the total regulatory impact driver.

### Capital Requirements

To estimate the total capital requirements impact driver, we first calculate the impact of risk-based capital requirements and leverage requirements separately. A high-level summary of the approach is illustrated in Figure 20 below.

Figure 20: **Total capital requirements impact driver**



61 For example, we estimate the total regulatory impact on the credit product class for the EU activities of a given bank.

## Appendix D: Calculation of regulatory impact driver

### Risk-Based Capital Requirements

To calculate the regulatory impact driver for risk-based capital, we considered two main channels:

- The RWA intensity impact, and
- The capital ratio impact.

#### RWA intensity impact

The RWA intensity impact<sup>62</sup> captures the effect of an increase in capital intensity, i.e. holding the increase in the level of capital required holding the level of assets and the capital ratio constant. The RWA intensity impact is largely driven by changes to regulatory risk weights, along with shifts in product mixes toward (or away from) activities that attract higher risk weights. The approach to calculating the RWA intensity impact comprises the following steps which are summarised in Figure 20 above:

**Step 1:** Use Tricumen data to calculate RWA intensities (RWA/Assets) in 2016. These calculations are undertaken at the product and regional activities level for each bank.

**Step 2:** Apply 2016 RWA intensities to 2010 actual assets (sourced from Tricumen) to estimate 2010 'counterfactual' RWAs. If 2016 RWA intensity is excessively high, 2010 actual RWAs are used. This prevents anomalously high outliers skewing results excessively.

**Step 3:** Use Tricumen data on equity capital for banks' capital markets activities and allocate to banks' business lines based on RWAs. Allocations are conducted at the product and regional activities level for a given bank. We then calculate the *additional* capital required to meet 2010 actual capital ratios (capital/RWAs) using 2010 allocated capital and 2010 'counterfactual' RWAs.

#### Capital ratio impact

The capital ratio impact captures the effect of an overall increase in banks' capital ratios, i.e. banks holding higher levels of capital for every unit of RWAs. The approach to calculating capital ratio impact comprises the following steps:

**Step 4:** Use Tricumen data on equity capital for banks' capital markets activities and allocate to banks' business lines based on RWAs. We then calculate 2016 actual capital ratios using Tricumen data and allocated capital across business lines, again based on RWAs. Calculations are conducted at the product and regional activities level for a given bank.

**Step 5:** Apply 2016 actual capital ratios to the 2010 'counterfactual' RWAs.

**Step 6:** Calculate the *additional* capital required to meet 2016 capital ratios.

#### Calculating the estimated economic cost of risk-based capital requirements

**Step 7:** Apply bank-specific cost of equity estimates for 2016 to the *additional* capital identified as being required from both channels. We then sum these figures together to calculate the risk-based capital requirements impact driver, which represents the annual, revealed economic cost of risk-based capital requirements. We apply the 2016 cost of equity for each firm, calculated using the Capital Asset Pricing Model - CAPM (we don't differentiate across product areas). We use a 2016 cost of equity estimate to take account of de-risking across the banking sector.

#### Illustrated example

Our approach to calculating the risk-based capital requirements impact driver is presented in a stylised example shown in Figure 21 and Figure 22 below.<sup>63</sup> The increase in RWA intensity between 2010 and 2016 results in higher 2010 'counterfactual' RWA (\$150). This increases the amount of capital required by 5, holding 2010 assets (\$100) and the capital ratio (10%) constant.

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62 RWA Intensity is defined as RWAs divided by assets.

63 This example is at the product and regional level for a given bank. For example, the commodities related EU activities of a given bank.

The increase in capital ratios between 2010 and 2016 (10% to 16%) results in an increase in required capital of 9, based on the 2010 'counterfactual' RWA (\$150). The *additional* capital required is, in total, 14. To this figure we then apply a bank-specific cost of equity to evaluate the economic cost of risk-based capital requirements and this would form our risk-based capital requirements impact driver.

Figure 21: **Illustrated base data**

	2010	2016
Assets, \$	100	100
RWA, \$	100	150
RWA Intensity (RWA/Assets)	1.0	1.5
Capital, \$	10	24
Capital ratios (Capital/RWAs)	10%	16%

Figure 22: **Estimate of additional capital required in illustrated example**

	RWA intensity impact	Capital ratio impact	Total increased capital
2016 RWA intensity	1.5		
2010 Assets, \$	100		
2010 'counterfactual' RWA, \$	150	150	
Capital required, \$	15	24	
Capital ratio	10%	16%	
Additional capital required, \$	5	9	14

### Leverage Requirements

Higher leverage requirements can also increase the capital that banks are required to hold against their asset base. Therefore we calculated a leverage requirements impact driver. A high-level summary of the approach is illustrated in Figure 20 above. The calculation of the leverage requirements impact driver comprised the following steps:

**Step 8:** Use Tricumen data on equity capital for banks' capital markets activities and allocate to banks' business lines based on assets. We then calculate the 2016 actual capital/asset ratio. Calculations are conducted at the product and regional activities level for a given bank.

**Step 9:** Apply 2016 actual capital/asset ratios to 2010 actual assets.

**Step 10:** Use 2016 capital/ asset ratios and 2010 allocated capital to calculate *additional* capital required to meet 2016 actual capital/ asset ratios.

**Step 11:** Apply bank-specific cost of equity estimates for 2016 to the *additional* capital required to meet 2016 capital/ asset ratios. This derives the leverage requirements impact driver, which represents the annual, revealed economic cost of leverage requirements.

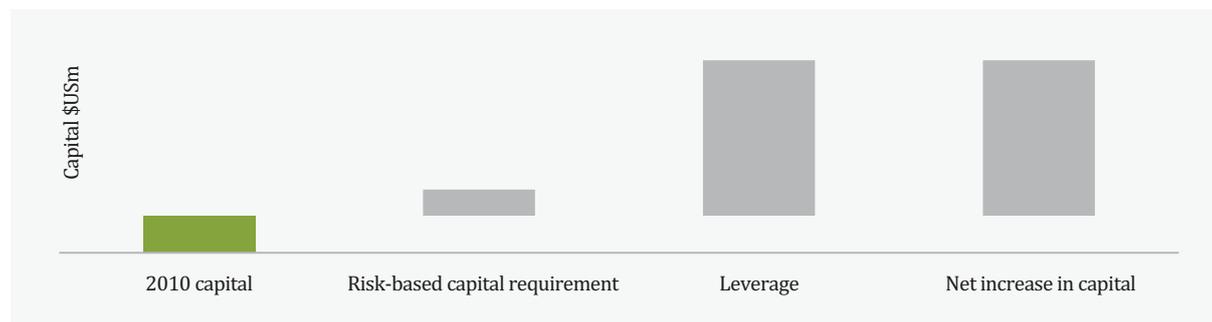
### Total capital requirements impact driver

**Step 12:** To calculate the total capital requirements impact, we aggregate economic costs from both risk-based requirements and leverage requirements. The impact of risk-based capital requirements and leverage requirements cannot be considered in isolation as increasing the amount of capital held helps to meet both requirements. Therefore we take into account the 'binding constraint', which is the higher of the risk-based or leverage requirements.

This is Illustrated Example A below. In this case, the binding constraint is the leverage requirements, whereas in Illustrated Example B, the risk-capital requirements induce the binding constraint.

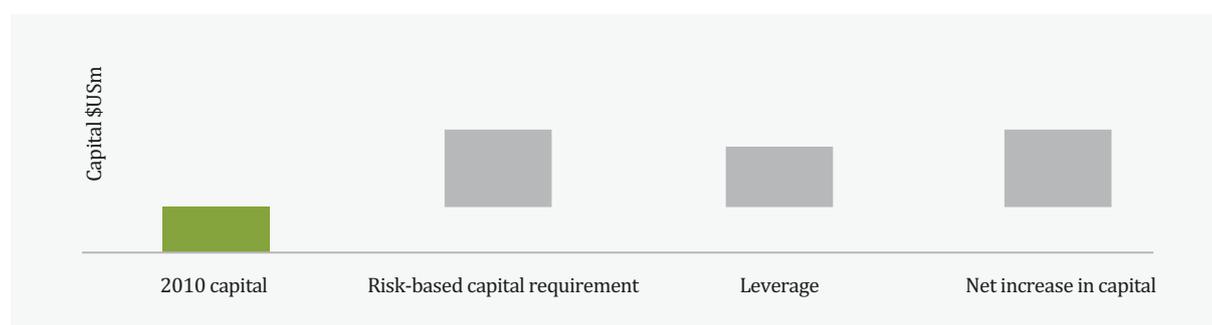
## Appendix D: Calculation of regulatory impact driver

Figure 23: **Illustrated Example (A): Equities (Rest of World)**



Source: PwC

Figure 24: **Illustrated Example (B): Credit (Rest of World)**



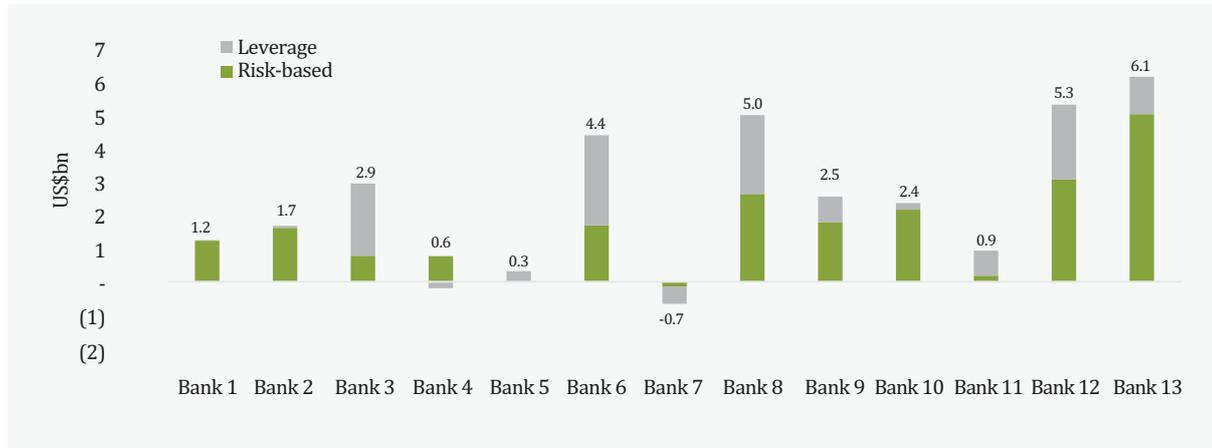
Source: PwC

This is assessed at the product and regional level for a given bank. The binding constraint for each bank can differ across products and region due to differences in the relative size of RWAs and assets for each product area. To identify whether risk-based capital or leverage requirements are the binding constraint, we consider whether risk-based capital or leverage requirements induce the need for a greater amount of *additional* capital.<sup>64</sup>

Summing the total capital requirements impact driver across all (capital markets) products and regions for a given bank, and across all banks in our sample, gives a total annual economic cost of capital requirements for banks in our sample. This aggregated figure is \$33bn for capital markets activities. The bank-by-bank contribution to this total figure is illustrated in Figure 25.

<sup>64</sup> The transformation of additional capital to regulatory impact driver is made using a bank-specific cost of capital which is the same for both leverage and risk-based requirements. Therefore this methodology is equivalent to comparing the size of the regulatory impact drivers.

Figure 25: **Capital requirements regulatory impact driver (aggregated to bank level) for capital markets activities<sup>65</sup>**

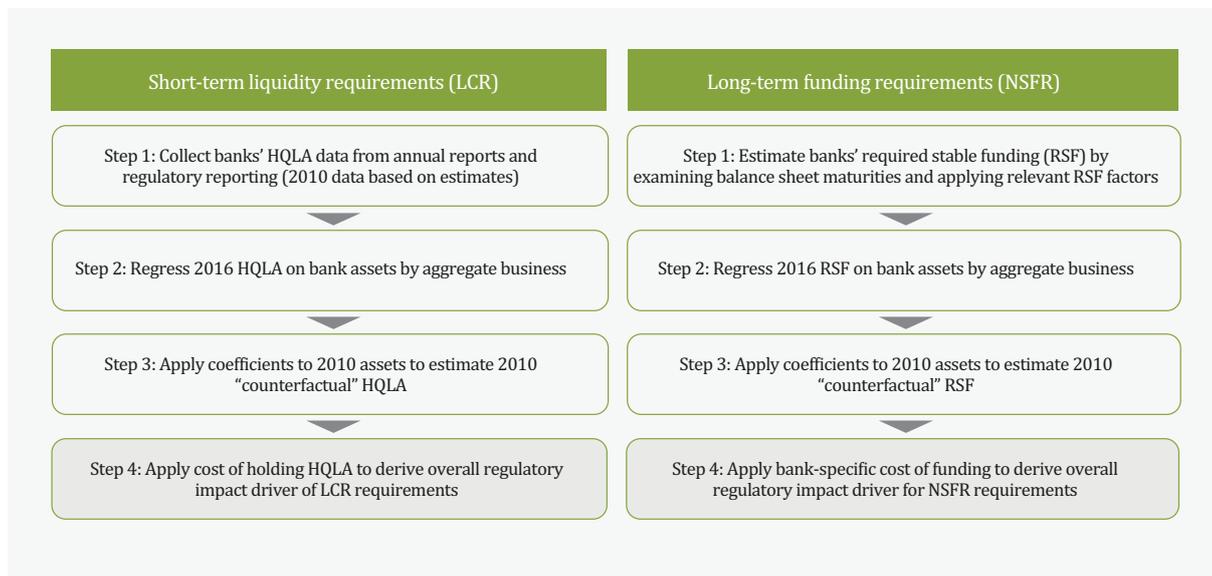


Source: PwC Analysis

### Liquidity and Funding Requirements

We estimate an impact driver for short-term liquidity requirements (LCR), and an impact driver for long-term funding requirements (NSFR)<sup>66</sup>. Our adopted approach is illustrated in Figure 26 and explained in more detail below.

Figure 26: **Regulatory impact driver for liquidity and funding requirements**



65 Some values are negative as some banks may have: (1) lower capital/RWA ratios in 2016 than in 2010; (2) reduced RWA intensities between 2010 and 2016; and (3) reduced their capital/ assets ratio as part of broader deleveraging. Although some banks may have experienced a reduction in RWA intensity, they may also have experienced an increase in required capital as, for example, the capital ratio impact can dominate. Bank 7 experienced a reduction in RWA intensity, as well as asset declines across most asset categories.

66 We note that NSFR implementation is still ongoing and therefore our regulatory impact driver captures the impact of NSFR to date, but may not capture its full impact.

## Appendix D: Calculation of regulatory impact driver

We explored a number of approaches for estimating the regulatory impact drivers for liquidity and funding requirements drawing on a variety of data sources (see Figure 27).

Existing (*ex-ante*) evidence suggests that the costs associated with liquidity and funding requirements are smaller in magnitude than those associated with risk-based and leverage capital requirements. Most studies analyse the impact of liquidity requirements by considering banks' funding/ liability structures, rather than looking at bank assets at the product level. In addition, there is limited publicly-available data for LCR and NSFR components, this is especially the case for 2010.

Figure 27: **Estimated liquidity and funding impact under various approaches**

Regulation	Total estimated ongoing economic cost (aggregated regulatory impact driver across all products, regions and banks)	Study that provides base data
LCR	US\$240m across sample of 13 banks Driven by 15 bps increase in cost across product lines (based on estimated median impact)	BIS (2010) <sup>67</sup>
LCR	US\$152m across sample of 13 banks Driven by 8-11 bps increase in cost across product lines	IMF (2012) <sup>68</sup>
NSFR	US\$400m across sample of 13 banks Driven by 25 bps increase in cost across product lines (based on estimated median impact)	BIS (2010) <sup>69</sup>
NSFR	US\$210m across sample of 13 banks Driven by 10-16 bps increase in cost across product lines	IMF (2012) <sup>70</sup>
LCR+NSFR	US\$3.5bn across sample of 13 banks Driven by ROE reductions as follows: FX: -2 pp, rates: -1 pp, credit: -1 pp, commodities: -2 pp, equities: -2 pp	McKinsey (2012) <sup>71</sup>

The remainder of this section outlines the approach we took to estimating regulatory impact driver for liquidity and funding requirements.

### Short-term liquidity requirements (LCR)

Our approach to calculating a regulatory impact driver for short-term liquidity requirements comprised the following steps:

**Step 1:** Obtain data on 2016 high-quality liquid assets (HQLAs) from banks' annual reports and regulatory reporting. Collect estimated 2010 HQLAs (e.g. cash and equivalents plus further HQLA).

**Step 2:** Regress 2016 HQLAs on assets (capital markets, CC lending and total) to identify relationship between volume of business activities and HQLA. This is a revealed approach to how banks have responded to higher liquidity requirements, rather than one that looks at specific liquidity drivers.

**Step 3:** Apply coefficients from the step 2 regression to volume of 2010 business activities to evaluate 'counterfactual' 2010 HQLAs. Adjustments for inflation are made (based on US GDP deflators) to ensure comparability with 2016 estimates.<sup>72</sup>

67 BIS, Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements, August 2010

68 IMF (Andrew Oliveira Santos and Douglas Elliot), Estimating the Costs of Financial Regulation, September 2012

69 BIS, Mapping capital and liquidity requirements to bank lending spreads, November 2010

70 IMF (Andrew Oliveira Santos and Douglas Elliot), Estimating the Costs of Financial Regulation, September 2012

71 McKinsey, Global Corporate and Investment Banking: An Agenda for Change, 2012

72 All banks are assumed to be LCR-compliant in 2016. Note that some banks have reduced HQLA, such that the estimated counterfactual HQLA for 2010 is lower than actual HQLA.

**Step 4:** Apply the cost of holding HQLA (or the cost of holding liquid assets), measured as the difference between the yield of a US Government bond and an average investment-grade corporate bond yield, to the difference in actual and “counterfactual” HQLAs.<sup>73</sup> This calculates a bank level regulatory impact driver for short-term liquidity requirements (LCR).

**Step 5:** The bank level regulatory impact driver is allocated to product classes using share of total assets as an allocation basis. Therefore, we estimate a regulatory impact driver for short-term liquidity requirements at the product and regional level for a given bank.

Summing the regulatory impact driver for short-term liquidity requirements across all products, regions and banks in our sample gives an annual total annual economic cost of short-term liquidity requirements for banks in our sample. This aggregated figure is \$0.6bn for capital markets activities.

### Long-term funding requirements (NSFR)

Our approach to calculating a regulatory impact driver for long-term funding requirement comprises the following steps:

**Step 1:** Obtain data on 2016 and proxy 2010 required stable funding (RSF). Collect this data by examining balance sheet maturities and applying relevant RSF factors.

**Step 2:** Regress 2016 RSF on assets (capital markets, CC lending and total) to identify relationship between volume of business activities and RSF.

**Step 3:** Coefficients from the step 2 regression are applied to 2010 assets to evaluate a ‘counterfactual’ 2010 RSF. Adjustments for inflation are made (based on US GDP deflators) to ensure comparability with 2016 estimates.<sup>74</sup>

**Step 4:** We assume that RSF is 100% matched with additional available stable funding (ASF). The cost of additional ASF is calculated based on banks’ specific cost of borrowing which is applied to the difference in actual and “counterfactual” ASF.<sup>75</sup> This calculates a bank level regulatory impact driver for long-term funding requirements (NSFR).

**Step 5:** The bank level regulatory impact driver is allocated to product classes using share of total assets as an allocation basis. Therefore, we estimate a regulatory impact driver for long-term funding requirements at the product and regional level for a given bank.

Summing the regulatory impact driver for long-term funding requirements across all products, regions and banks in our sample gives an annual total annual economic cost of long-term funding requirements for banks in our sample. This aggregated figure is \$3bn for capital markets activities.

### Other regulatory areas

In addition to including the impact of capital requirements and liquidity and funding requirements in our total regulatory impact driver, we also estimated the economic impact of a variety of further regulations at the product and regional level for each bank in our sample. These further regulations were:

- MiFID II/MiFIR
- EMIR
- Short selling regulation (SSR)

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<sup>73</sup> Estimates based on data from S&P Capital IQ.

<sup>74</sup> All banks are assumed to be NSFR-compliant in 2016 for the purposes of our modelling. However, we note that NSFR implementation is still ongoing, and therefore the full impact of NSFR compliance may be greater than that captured using our methodology. Note that some banks have reduced RSF, such that the estimated counterfactual RSF for 2010 is lower than actual RSF.

<sup>75</sup> Estimates based on data from S&P Capital IQ, measured as interest on deposits and other debt.

## Appendix D: Calculation of regulatory impact driver

### MiFID II

To calculate the regulatory impact driver for MiFID II/MiFIR we followed the following steps:

**Step 1:** Obtain estimates for the increase in operating expenses resulting from MiFID II/MiFIR. These estimates were collected for both one-off costs and ongoing costs and were sourced from the European Commission's impact assessment.<sup>76</sup>

**Step 2:** Obtain 2010 operating expenses data from S&Ps Capital IQ.

**Step 3:** Calculate one off and on-going costs of MiFID II/MiFIR by applying estimates for increase in operating costs resulting from MiFID II/MiFIR to 2010 operating expenses data (sourced from Tricumen) for European Banks and EU activities of US banks. This gives the bank level regulatory impact driver for MiFID II/MiFIR.

**Step 4:** Allocate regulatory impact driver of MiFID II to rates and credit product lines using 2010 assets as an allocation basis. Therefore, we estimate a regulatory impact driver for MiFID II/MiFIR at the product and regional level for a given bank.

Only the on-going economic costs are included in our total regulatory impact driver, as one off economic costs should not have any lasting impact on financial markets. Summing the regulatory impact driver for MiFID II all products, regions and banks in our sample gives an estimate of the annual total ongoing economic cost of MiFID II for banks in our sample. This aggregated figure is \$0.5bn for capital markets activities.

### EMIR

To calculate the regulatory impact driver for EMIR we followed the following steps:

**Step 1:** Obtain estimates for the on-going cost increase resulting from EMIR. These estimates were sourced from BIS.<sup>77</sup>

**Step 2:** Obtain 2010 operating expenses data from S&P's Capital IQ.

**Step 3:** Calculate on-going cost of EMIR by applying estimates for increase in operating costs resulting from EMIR to 2010 operating expenses data for European Banks and EU activities of US banks. This gives the bank level regulatory impact driver for EMIR.

**Step 4:** Allocate regulatory impact driver of MiFID II to all capital markets product lines using 2010 assets as an allocation basis. Therefore, we estimate a regulatory impact driver for EMIR at the product and regional level for a given bank.

Only the on-going economic costs are included in our total regulatory impact driver at the bank level, as one off economic costs should not have any lasting impact on financial markets. Summing the regulatory impact driver for EMIR for all products, regions and banks in our sample gives an estimate of the annual total on-going economic cost of EMIR for banks in our sample. This aggregated figure is \$0.4bn for capital markets activities.

### SSR

To calculate the regulatory impact driver for short selling regulations we followed the following steps:

**Step 1:** Obtain estimates of on-going costs associated with compliance and reporting for SSR from European Commission studies. This gives the bank level regulatory impact driver for SRR.

**Step 2:** Allocate this cost to EU rates and equities activities using 2010 assets as an allocation basis.

Only the on-going economic costs are included in our total regulatory impact driver at the bank level, as one off economic costs should not have any lasting impact on financial markets. Summing the regulatory impact driver for SSR all products, regions and banks in our sample gives an estimate of the annual total on-going economic cost of SSR for banks in our sample. This aggregated figure is negligible for capital markets activities.

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<sup>76</sup> EC, Impact assessment: Accompanying MiFiD II and MiFIR proposal, October 2011

<sup>77</sup> BIS, Macroeconomic impact assessment of OTC derivatives regulatory reforms, August 2013

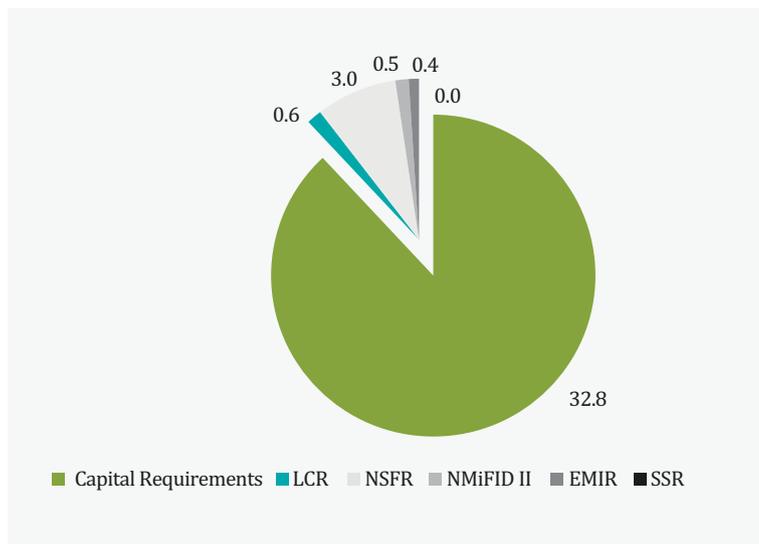
### The total regulatory impact driver

The total regulatory impact driver is calculated at the product level for the regional activities of a given bank. As illustrated in Figure 8 in section 4, each total regulatory impact driver is calculated by aggregating the regulatory impact drivers associated with capital requirements, liquidity and funding requirements, and other regulatory requirements, across products and regions for each bank.

In order to analyse the relationship between regulation impact and asset shrinkage, we considered regulatory impact as a percentage of product level 2010 costs (as sourced from Tricumen), which was compared against asset shrinkage, as explained in Section 4. This analysis was conducted at the product and regional level for a given bank.

While our metric for total regulatory impact is a bank and product level figure, it is useful to see the relative contribution of different regulations at the aggregate level. Figure 28 below illustrates the aggregated contribution of regulatory impact drivers across our sample of banks to the total aggregated regulatory impact of \$37bn for capital markets activities.

Figure 28: **Contribution of aggregated regulatory impact drivers (\$USbn)**



Source: PwC Analysis

## Appendix E: Level 1 &amp; Level 2 product assets and RWAs

## Assets, US\$ million

Product	Assets (2010)			Assets (2016)		
	Total	EU	RoW	Total	EU	RoW
<b>Capital Markets</b>	<b>7,993,667</b>	<b>3,333,217</b>	<b>4,660,450</b>	<b>4,860,668</b>	<b>2,021,566</b>	<b>2,839,102</b>
FICC	6,259,875	2,515,212	3,744,664	3,868,456	1,622,436	2,246,021
<b>FX</b>	<b>279,330</b>	<b>159,099</b>	<b>120,232</b>	<b>457,683</b>	<b>291,057</b>	<b>166,626</b>
FX Cash	0	0	0	0	0	0
FX Derivatives	279,330	159,099	120,232	457,683	291,057	166,626
<b>Rates</b>	<b>4,594,067</b>	<b>1,882,670</b>	<b>2,711,397</b>	<b>2,452,508</b>	<b>1,077,624</b>	<b>1,374,885</b>
Repo	2,447,367	736,208	1,711,159	755,171	244,602	510,569
G10	870,901	472,708	398,193	611,079	240,476	370,603
IR Derivatives	1,184,868	673,754	511,114	1,022,666	592,546	430,120
US Munis	90,930	0	90,930	63,592	0	63,592
<b>Securitisation</b>	<b>412,225</b>	<b>54,884</b>	<b>357,341</b>	<b>468,565</b>	<b>24,167</b>	<b>444,398</b>
US Agencies	247,086	0	247,086	376,248	0	376,248
ABS	51,214	23,870	27,344	43,393	18,060	25,333
MBS	113,925	31,014	82,911	48,924	6,107	42,817
<b>Credit</b>	<b>840,818</b>	<b>352,299</b>	<b>488,518</b>	<b>418,941</b>	<b>193,749</b>	<b>225,192</b>
IG Corp	412,031	160,364	251,667	190,339	98,076	92,263
HY&EM Corp	151,735	68,854	82,881	78,480	31,618	46,862
Cred Derivatives	175,355	90,720	84,635	68,459	38,684	29,776
Loan Trading	101,697	32,362	69,336	81,663	25,372	56,291
<b>Commodities</b>	<b>133,435</b>	<b>66,260</b>	<b>67,176</b>	<b>70,759</b>	<b>35,839</b>	<b>34,920</b>
Physical Comms	87,617	36,936	50,682	46,718	18,393	28,326
Comm Derivatives	45,818	29,324	16,494	24,041	17,446	6,594
<b>Equities</b>	<b>1,733,791</b>	<b>818,005</b>	<b>915,786</b>	<b>992,212</b>	<b>399,130</b>	<b>593,082</b>
Cash Equities	721,273	355,151	366,122	671,989	252,855	419,134
Equity Derivatives	129,982	61,070	68,911	108,430	54,108	54,322
PS/S Lending	882,537	401,784	480,753	211,793	92,167	119,626
<b>CC Lending and TF</b>	<b>5,093,488</b>	<b>2,648,919</b>	<b>2,444,569</b>	<b>4,485,534</b>	<b>2,295,322</b>	<b>2,190,212</b>
<b>CC Lending</b>	<b>4,220,458</b>	<b>2,321,119</b>	<b>1,899,339</b>	<b>4,032,042</b>	<b>2,126,694</b>	<b>1,905,348</b>
Corp Loans	1,512,825	884,511	628,315	1,109,529	622,895	486,634
Comm Loans	1,304,590	719,651	584,939	1,194,649	618,875	575,774
Commitments	1,403,043	716,958	686,085	1,727,863	884,924	842,940
<b>Trade Finance</b>	<b>873,030</b>	<b>327,800</b>	<b>545,230</b>	<b>453,492</b>	<b>168,628</b>	<b>284,864</b>
Trade Loans	45,914	22,928	22,986	36,002	19,717	16,285
LoCs	827,116	304,872	522,244	417,490	148,910	268,579
<b>Total</b>	<b>13,087,155</b>	<b>5,982,136</b>	<b>7,105,019</b>	<b>9,346,202</b>	<b>4,316,888</b>	<b>5,029,314</b>

Source: PwC analysis of Tricumen data

## Risk-weighted assets, US\$ million

Product	RWAs (2010)			RWAs (2016)		
	Total	EU	RoW	Total	EU	RoW
<b>Capital Markets</b>	<b>2,459,389</b>	<b>995,938</b>	<b>1,463,450</b>	<b>2,131,292</b>	<b>789,204</b>	<b>1,342,088</b>
FICC	1,784,224	723,762	1,060,462	1,662,086	622,302	1,039,784
<b>FX</b>	<b>187,218</b>	<b>94,675</b>	<b>92,543</b>	<b>189,519</b>	<b>95,449</b>	<b>94,070</b>
FX Cash	0	0	0	0	0	0
FX Derivatives	187,218	94,675	92,543	189,519	95,449	94,070
<b>Rates</b>	<b>675,939</b>	<b>278,586</b>	<b>397,353</b>	<b>464,970</b>	<b>208,819</b>	<b>256,151</b>
Repo	280,881	85,989	194,892	97,625	33,586	64,038
G10	71,975	27,389	44,586	29,262	12,251	17,010
IR Derivatives	298,785	165,208	133,577	234,249	162,981	71,268
US Munis	24,298	0	24,298	103,835	0	103,835
<b>Securitisation</b>	<b>306,712</b>	<b>51,994</b>	<b>254,718</b>	<b>344,653</b>	<b>17,127</b>	<b>327,526</b>
US Agencies	100,902	0	100,902	131,385	0	131,385
ABS	24,173	9,297	14,876	28,665	11,520	17,145
MBS	181,637	42,697	138,940	184,602	5,607	178,995
<b>Credit</b>	<b>476,666</b>	<b>245,640</b>	<b>231,026</b>	<b>507,764</b>	<b>248,174</b>	<b>259,591</b>
IG Corp	183,828	84,744	99,084	176,958	109,972	66,986
HY&EM Corp	129,409	77,601	51,808	152,295	67,591	84,705
Cred Derivatives	95,944	61,175	34,770	56,044	30,019	26,025
Loan Trading	67,485	22,120	45,364	122,467	40,592	81,875
<b>Commodities</b>	<b>137,689</b>	<b>52,867</b>	<b>84,822</b>	<b>155,180</b>	<b>52,734</b>	<b>102,446</b>
Physical Comms	89,009	34,332	54,677	98,659	31,950	66,709
Comm Derivatives	48,680	18,536	30,145	56,521	20,784	35,737
<b>Equities</b>	<b>675,165</b>	<b>272,176</b>	<b>402,989</b>	<b>469,206</b>	<b>166,902</b>	<b>302,304</b>
Cash Equities	131,657	52,532	79,125	124,676	46,425	78,251
Equity Derivatives	214,476	80,662	133,813	207,851	65,165	142,686
PS/S Lending	329,032	138,982	190,050	136,679	55,311	81,368
<b>CC Lending and TF</b>	<b>3,293,692</b>	<b>1,793,673</b>	<b>1,500,019</b>	<b>2,767,283</b>	<b>1,522,866</b>	<b>1,244,416</b>
<b>CC Lending</b>	<b>2,771,925</b>	<b>1,612,948</b>	<b>1,158,977</b>	<b>2,486,222</b>	<b>1,427,521</b>	<b>1,058,701</b>
Corp Loans	1,092,292	710,638	381,654	798,364	476,136	322,227
Comm Loans	1,160,491	625,358	535,134	1,008,903	598,167	410,736
Commitments	519,141	276,952	242,189	678,955	353,218	325,737
<b>Trade Finance</b>	<b>521,767</b>	<b>180,724</b>	<b>341,042</b>	<b>281,060</b>	<b>95,345</b>	<b>185,716</b>
Trade Loans	36,942	17,054	19,888	29,032	14,720	14,312
LoCs	484,825	163,671	321,155	252,028	80,625	171,404
<b>Total</b>	<b>5,753,081</b>	<b>2,789,611</b>	<b>2,963,469</b>	<b>4,898,574</b>	<b>2,312,070</b>	<b>2,586,504</b>

Source: PwC analysis of Tricumen data





## Contacts

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**Michael Lever**  
Managing Director, Head of Prudential Regulation  
Michael.Lever@afme.eu  
+44 (0)20 3828 2707



**Rick Watson**  
Managing Director, Head of Capital Markets  
Rick.Watson@afme.eu  
+44 (0)20 3828 2737



**Pablo Portugal**  
Director, Advocacy  
Pablo.Portugal@afme.eu  
+32 2 788 39 74



**Nick Forrest**  
Director, Financial Economics, PwC  
nick.forrest@pwc.com  
+44 (0)20 7804 5695

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**London Office**

39th Floor  
25 Canada Square  
London, E14 5LQ  
United Kingdom  
+44 (0)20 3828 2700

**Brussels Office**

Rue de la Loi, 82  
1040 Brussels  
Belgium  
+32 (0)2 788 3971

**Frankfurt Office**

Skyper Villa  
Taunusanlage 1  
60329 Frankfurt am Main  
Germany  
+49 (0)69 5050 60590

**Press enquiries**

Rebecca Hansford  
Head of Media Relations  
rebecca.hansford@afme.eu  
+44 (0)20 3828 2693

**Membership**

Elena Travaglini  
Head of Membership  
elena.travaglini@afme.eu  
+44 (0)20 3828 2733

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