High Quality Securitisation:
An Empirical Analysis of the PCS Definition

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Abstract

The risk and liquidity characteristics of securitisations vary greatly, posing challenges for investors and regulators alike. Recently, there has been interest in the possibility of identifying, through simple observable characteristics, a category of High Quality Securitisation (HQS) likely to exhibit lower risk and higher liquidity. Such securitisations might prove attractive to investors and merit favourable regulatory treatment. This paper (i) discusses existing ways of classifying securitisations employed by the industry, central banks and regulators and (ii) investigates statistically how securitisations satisfying key candidate characteristics for an HQS definition have performed in the past. We show that securitisations possessing these characteristics have indeed exhibited much lower risk and higher liquidity in recent years.

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SECTION 1 – INTRODUCTION

The poor credit and liquidity performance of some sub-sectors of the securitisation market contributed substantially to the recent financial crisis. Brunnermeier (2012) and Caprio, Demirgüç-Kunt and Kane (2010) describe how the collapse in credit quality and liquidity of US sub-prime Residential Mortgage Backed Securities (RMBS) provoked a global liquidity crisis, affecting financial institutions exposed to those securities. This spiralled out into a bank and sovereign credit crisis in Europe which, in turn, led to recession and weakness in European securitisations vulnerable to refinancing risk.

While some sectors of the securitisation market performed poorly, others remained robust even in the face of what turned out to be very extreme stress events. To illustrate, since 2007 GDP in countries such as the UK, France, Spain and Italy showed peak to trough GDP declines of 7.2%, 4.4%, 5.0%, and 7.2% respectively[2]. Yet, European securitisations exhibited default rates of 2.5% between 2007 and 2013 (see Standard & Poor's (2013)). This contrasted with outcomes in the United States where GDP declined by 4.3% peak to trough but US securitisations experienced default rates of 18.4%.

A large fraction of the defaults that made up the 2.5% for European securitisations was CDOs of ABS, many of which were exposed to US ABS tranches. Leaving out CDOs of ABS, the default rate was 1.8%. Also removing CMBS and other CDOs (including synthetic), the default rate drops to 0.12%. Retail and Small and Medium Enterprises (SME) loan backed securitisations in Europe proved strikingly robust to the crisis. RMBS, Other Consumer Asset Backed Securities (ABS), Credit Card ABS and SME CLOs experienced cumulative default rates of 0.10%, 0.13%, 0.00% and 0.41% respectively between 2007 and 2013 (again, see Standard & Poor's (2013)).[3]

The striking variation in the performance of different segments of the securitisation market has encouraged proposals to develop a High Quality Securitisation (HQS) category that could be used as a guide for investors or as a basis for differentiation in regulatory treatment.

In a recent joint statement, the Bank of England and European Central Bank (ECB) (see Bank of England-ECB (2014)) argue in favour of reviving the securitisation market in Europe and suggest that one way to achieve this might be to afford favourable regulatory treatment to securitisations that conform to a HQS definition. Earlier, the European Insurance and Occupational Pension Authority (EIOPA) included proposals for the use of such a distinction in Solvency II rules for European insurer capital (see EIOPA (2013a) and (2013b)).

[2] GDP peak to trough declines for all the countries discussed in this paragraph are calculated using quarterly data on Real GDP with constant prices from Reuters Ecowin. In all cases, peak GDP occurred between Q3 2007 and Q1 2008 and trough GDP between Q2 and Q4 2009.

[3] The credit performance of European markets benefited from the fact that securitisation in Europe is typically performed in a vertically integrated fashion by regulated banks that originate, service and retain most of the risk in their securitised loans. In contrast, in the US market, especially in the past, originate-to-distribute business models have been more prevalent. The operation of this approach to lending is described in Ashcroft and Shuerman (2009). By splitting the origination, servicing and risk bearing functions of bank lending between different organisations, the originate-to-distribute approach diluted incentives and produced conflicts of interest, leading to both moral hazard and adverse selection. A literature exists on the effect of securitisation on incentives in loan markets. Ashcroft and Schuerman (2008) describe the securitisation process as it operated in the US sub-prime market with a focus on incentive effects. Empirical studies of the impact on incentives may be found in Elul (2011), Keys, Mukherjee, Seru and Vig (2010), Mian and Sufi (2009), and Wang and Xia (2014). This literature is entirely based on US data and hence reflects the US approach to securitisation. The European securitisation market is somewhat different. First, asset pools behave differently because of the presence of recourse in lending. Second, an originate-to-distribute business model was never very common. Third, a higher fraction of origination was by regulated banking institutions.

A related industry-based initiative has been developed by Prime Collateralised Securities (PCS), an industry body launched in 2012. PCS labels individual securities that conform to its HQS definition. Its objective in this has been to confirm for investors that a given securitisation has a simple and transparent structure with good quality asset pools and hence is likely to exhibit lower risk.

This paper aims to analyse the relative performance of a selected HQS segment of the European securitisation market, which we identify using a simplified version of the PCS criteria. In evaluating performance, we focus on the liquidity and risk of individual securitisation tranches. We measure liquidity performance using the size of bid-ask spreads. To assess risk, we calculate volatilities (standard deviation of the log price changes) of individual tranches based on rolling windows of overlapping observations. We adjust for statistical bias using a technique proposed by Kiesel, Perraudin and Taylor (2001) and (2003).

Note that volatility is a natural and widely used measure of risk. As one example among many, it was used in assessing appropriate Solvency II capital charges for securitisations by EIOPA (2013b). The appropriate measure to employ for liquidity is more controversial. The EBA in its recent work on the Liquidity Coverage Ratio (LCR) actually employs volatility along with turnover ratio as the two indicators of "liquidity" on which it bases it recommendations for LCR asset class eligibility. Perraudin (2014) is critical of this choice, arguing that the single most obvious measure of liquidity is the bid-ask spread, as employed here.

We find that HQS tranches exhibit substantially lower risk (as measured by volatility) and somewhat higher liquidity (as measured by bid-ask spreads) than non-HQS tranches. The effects are clear within asset classes as well as for the market as a whole, and appear consistent over time. The superior performance of HQS tranches remains when we focus on securities with a given rating grade, AAA.

In the exercise just described, how do we go about identifying High Quality Securitisations (HQS)? The PCS HQS definition is complex and elaborate. In an empirical study like this, we must necessarily focus on a few key criteria instead of examining the large number of characteristics required by PCS. The criteria on which we focus are that the tranche (i) is the most senior in its structure, (ii) possesses the highest feasible rating, (iii) has a par value more than a given threshold, and (iv) has been originated by an institution that is not following an originate to distribute business model.

Strictly speaking, (ii) is not a binding restriction within the PCS label as the requirement is that the rating of a tranche be the highest possible rating within a jurisdiction at the publication date of the prospectus. In practice, all senior tranches have the topmost rating when they are issued. Our interest in this study is to see if an HQS category might merit favourable regulatory treatment, i.e., if it conveys important information over and above indicators that are already reflected in regulatory rules. Since these rules frequently include ratings, we think it more interesting to check if the HQS definition adds information over and above that contained in ratings.

For this reason, when we perform comparisons, we condition in a strict fashion on ratings, examining whether tranches identified with HQS characteristics have lower risk or higher liquidity holding ratings constant. For the analysis of risk (as measured by volatility), we focus on AAA-rated tranches alone. Our dataset of tranches for which we have bid-ask spread data is somewhat smaller, so in examining liquidity (as measured by bid-ask spreads), we condition on ratings being either AAA or AA.

To place the PCS HQS criteria in context, in Section 2 below, we compare them with alternative definitions of securitisation quality. These definitions include the collateral requirements employed by central banks. In particular, we describe the criteria employed by the Bank of England, Eurosystem

and the Federal Reserve System. Also relevant are the criteria used by financial regulators, such as those recently adopted by EIOPA in its proposed Solvency II capital rules for European insurers. Finally, one might consider the approach taken by the European Banking Authority (EBA) in its recommendations on the eligibility of securities for the Basel III Liquidity Coverage Ratio (LCR).

This paper is organised as follows. Section 2 discuses HQS categorisations employed or proposed in other contexts by central banks and regulators. Section 3 describes the data and methodologies we employ. Sections 4 and 5 present results on risk and liquidity, respectively. Section 6 contains a comparison with another asset class, Covered Bonds, that has received very favourable regulatory treatment in Europe. The last section concludes. Finally, the Appendix contains additional information on central bank collateral eligibility criteria.

SECTION 2 – HIGH QUALITY SECURITISATION DEFINITIONS

In this section, we discuss the PCS definition of HQS and compare it with some relevant alternatives. These alternatives include the criteria used by central banks in their rules on discount window lending and other monetary operations requiring collateral. Among these, we focus on the collateral eligibility rules employed by the Eurosystem (ECB), the Bank of England and the US Federal Reserve Bank System (FRB). We also compare the PCS HQS definition with the criteria used by the European financial regulators, EIOPA, in their proposals for insurance capital regulations.

The HQS requirements described in this section are likely to evolve in the near future as PCS is considering how it may align the PCS label requirements to a greater extent with existing central bank rules and proposed European regulatory criteria. The current official criteria including even central bank collateral rules are also likely to change in the near future if the ECB, Bank of England and other European public bodies successfully devise a satisfactory set of HQS classifications.

Before turning to the detailed PCS criteria, it is important to explain the four key pillars that PCS regards as the crucial, high level components of their label. These four pillars may be summarised as follows:

1. To exclude securitisations issued under an originate-to-distribute business model.
2. To exclude securitisations that involve creating highly rated securitisation tranches out of pools containing lower rated, already credit-tranched securitisations.
3. To rule out securitisations that attempt to effect maturity transformation.
4. To require transparency.

The motivation for 1 is that when financial institutions base their business models on originating loans which are then "sold" through securitisations, this dilutes their incentives to maintain high underwriting criteria at origination and to service and manage the loans prudently thereafter. 2 excludes re-securitisations the pricing and risk management of which has proved to be difficult.

On 3, while the large majority of securitisations are match funded (or, as is sometimes expressed, contain "self-liquidating" assets), some are subject to refinancing risk in that the securitisation can only pay back if one or more loans can be refinanced in the market within short windows of time (such as the period around the final maturity of the securitisation tranches). When market liquidity evaporates, maturity transforming securitisations typically face defaults.

Such problems do not just arise in the well-known case of Structured Investment Vehicles (SIVs) where short-dated liabilities were used prior to 2007 to finance long-dated, illiquid investments. They are also relevant for some CMBS. For such transactions, repayment of the underlying commercial mortgages at the maturity date of the securitisation, commonly requires refinancing of these

mortgages. If the maturity date occurs during a period of credit or liquidity scarcity, the refinancing risk may be serious, generating default in securitisation tranches.

PCS aims to enforce the above four pillars through its criteria although the detailed criteria also implement other requirements. The detailed PCS criteria are complex, comprising 37 pages of conditions that tranches must meet to obtain an HQS label. If harmonised with existing or proposed regulatory or central bank criteria, PCS criteria could potentially be used as a proxy for regulation, enforcing criteria that are or could be no weaker than official requirements.

In what follows, we will not attempt to list the detailed PCS criteria but instead will pick out and discuss some of the more important individual requirements. When we turn to our empirical evaluation, we will focus mainly on high level pillars although we will also apply some of the detailed criteria as well in our choice of HQS tranches.

PCS categorises its detailed criteria as follows:

1. Asset Eligibility
2. Structural Eligibility
3. Common Eligibility
    a. Quality Standards
    b. Transparency Standards
    c. Simplicity Standards
    d. Liquidity Standards
    e. General Standards
4. Asset-Specific Eligibility
5. Asset-Jurisdiction-Specific Eligibility
6. Jurisdiction-Specific Eligibility

Below, we discuss key requirements in these different categories. The first group of criteria, Asset Eligibility, include the restriction that HQS securitisations may only involve retail or SME corporate underlying assets. This aspect of an HQS definition is sometime questioned since if attachment points are high enough, some would argue that a tranche secured against almost any asset type will exhibit low risk.

A reasonable argument for restricting HQS to certain asset types is that some underlying asset types lack an extensive and well-documented history of stable behaviour and hence are not suitable for HQS status. Another argument is that certain asset classes, particularly CMBS but also some large corporate loans, are subject to refinancing risk associated with repayment of bullet type payments at the maturity of the tranche. Ruling out these asset classes serves the purpose of eliminating such risk. Note also that the choice of asset classes made in the PCS HQS definition happens also to imply granular pools which effectively eliminates idiosyncratic and recovery rate risk as a consideration.

The second criterion, Structural Eligibility, excludes re-securitisations and synthetic securitisations. Re-securitisations should clearly be omitted from HQS as the experience of the crisis shows the difficulty of analysing their credit quality. It is less obvious that synthetic securitisation should be ruled out but PCS has chosen to do so.

The third category of criteria, Common Eligibility, covers a wide range of heterogeneous requirements. These include Quality, Transparency, Simplicity, Liquidity and General criteria. Key "Common Eligibility" requirements are that the tranche be the most senior in the securitisation cash

flow waterfall and that, on the prospectus date, it must be rated in the highest category possible in the relevant jurisdiction by two rating agencies.

Requiring the "highest category possible in the relevant jurisdiction" mitigates the impact of sovereign ratings ceilings. Such ceilings are rules adopted by ratings agencies that restrict the rating of a tranche to be no more than a certain number of notches above the rating of the corresponding sovereign. Duponcheele et al. (2014a) discuss the effects of sovereign ceilings on the European securitisation market since the crisis.

One should also note the fact that the rating criterion only pertains to the prospectus publication date of the tranche. It is in this sense "non-dynamic". Since for almost all securitisations, the most senior tranche is in the highest rating category feasible (AAA unless a sovereign ceiling is binding), the non-dynamic rating criterion in the PCS definition has very little impact on whether, on a given date, a tranche is adjudged HQS or not.

The Common Eligibility criteria also include the requirement that the underlying assets were not originated with the intent to distribute (i.e., with the intention of transferring them to a third party) and that the underwriting decisions were not performed by a broker or similar intermediary. These criteria have the effect of ruling out transactions that suffer from the incentive problems discussed by Ashcroft and Schuerman (2008) and others in the context of the US securitisation market.

The transparency requirements relate to disclosure of information, either in the prospectus or to investors subsequent to issue. Simplicity requirements also relate to the information and arrangement of the prospectus. Liquidity requirements include criteria on the size of the issue and the number of joint lead managers and disclosure of the amounts of the issue retained and publicly and privately placed.

The PCS criteria also include Asset-Specific, Asset-Jurisdiction-Specific Criteria and Jurisdiction-Specific Criteria. These criteria include requirements designed for the particular legal contexts and market practices prevalent in particular countries. Market practitioners are well aware that Loan-to-Value ratios, for example, have varying implications in different markets. Ideally, it would be possible to include such detailed rules in a fully effective HQS definition. However, doing so appears more complex in the context of a regulatory capital or liquidity framework.

Table 1 summarises collateral eligibility conditions for securitisation tranches at three central banks: the Eurosystem, the Bank of England and the FRB. The central banks' requirements cover ratings, seniority, asset quality and transparency. (Additional information on the requirements of these central banks is provided in the Appendix.)

The central banks are, in most cases, less demanding in credit grades than the PCS HQS definition but their ratings criteria are dynamic in the sense that the rating must satisfy conditions currently rather than at the prospectus date.

They also place some restrictions on particular underlying asset classes (for example, the Bank of England does not permit the use of leveraged loans and requires diversification in the pool) but are, over all, much less prescriptive in asset classes than PCS. Most notably, they do not seek to exclude asset classes that are subject to refinancing risk. On the other hand, the central banks, like PCS, exclude synthetic deals and re-securitisations.

Importantly and unlike the PCS label, the central bank criteria do not attempt to rule out the possibility that the underlying pool loans be issued on an originate-to-distribute basis and do not restrict aspects of the underwriting process. They also do not restrict the size of the issue.

The ECB has some rather specific requirements that one might note including ruling out deals from jurisdictions with clawback provisions, rejecting deals with heterogeneous pools and that the security be traded on a regulated market (see Table A1 in the Appendix).

Table 2 shows the requirements adopted by EIOPA in its draft proposals for a HQS definition to be used in Solvency II insurer capital rules (see EIOPA (2013)). That document provides a proposal for a high quality Type A securitisation definition, with other more risky securitisations being labelled Type B or "Other". As EIOPA explicitly state: "A number of the criteria are adaptations from the eligibility criteria for securitisations that the ECB uses in its refinancing operations."[4]

Table 1: Different treatments of Securitisations within Central Bank Collateral Frameworks

	Securitisations eligible as collateral denoted:	Credit Standards	Asset and Other Requirements		Transparency Requirements
Eurosystem Standard Collateral Framework	Marketable Assets Eligible for use as collateral in Eurosystem Credit Operations[1]	Best and second best ECAI score must be at least A- at issuance and over lifetime of transaction. Tranches must not be subordinated to other tranches of the same issue. Alternately, 2nd-best rating of BBB permissible given certain conditions.[2]	Acquisition of assets governed by law of EU member state and must be acquired in a 'True Sale'. Must not consist of tranches of other securitisations, credit-linked notes, derivatives instruments or synthetic securities. No severe clawback provisions. There must be no subordination in the cases of both enforcement and acceleration. Cash-flow generating assets must be homogenous. There must be only one asset type and heterogeneous asset pools are not allowed.		Loan-level data on the pool of cash flow generating assets required. ECAI must submit regular ratings and surveillance reports.
Bank of England	Level A Collateral	No Securitisations qualify as Level A	N/A	N/A	N/A
	Level B Collateral (previously denoted 'Wider collateral')[3].	Broadly equivalent to AAA. Most senior tranches only.	Assets must be prime and listed.	Securitisations' underlying assets must be cash: no synthetic or re-securitisations. Securities whose credit quality is on the basis of a guarantee or insurance provided by a third party ("a wrap") are not eligible. Securities must be capable of being delivered to the bank via delivery mechanisms. Certain asset-types have additional requirements (e.g. pool must be diversified, no leveraged loans permitted).	*Must release:* Loan level information, transaction documentation, transaction overviews, standardised monthly investor reports, and cash-flow models.
	Level C Collateral	Broadly equivalent to A3/A-. Most senior tranches/paper only.	Unlisted securities eligible at bank's discretion.		

[4] EIOPA say "This source has several advantages: First, the criteria have been in place for many years and have gone through extensive operational and legal due diligence. Second, they represent for a part of the EU a kind of market standard. This should make it easier for originators to comply with them. Third, the criteria for banking and insurance sector should in principle be similar. […] Some of the ECB criteria provided a useful starting point but had to be adapted. Others impose restrictions on eligible jurisdictions that reflect the role of the ECB as central bank for the Euro area (e.g. US securitisations are not eligible). […] Additional sources were criteria developed by rating agencies and market participants."

Federal Reserve	Discount Window Eligible Collateral[4].	All at least investment grade. Certain types of securitisations must be AAA (see asset requirements.)	Pledging institution must have rights in securities to grant an enforceable security interest to the FRB. Pledging process is DTC (although Agency-Backed Mortgages use FSS though DTC can be used on a limited basis). CDOs, CMBS and Private Label CMOs must be AAA rated. Agency Backed Mortgages (Pass Throughs and CMOs) and Private Label CMOs exclude IO, PO, Z, inverse floater, and residual tranches.

Notes: Sources - Bank of England Collateral Framework Sources: Bank of England (2010, 2013a, 2013b, and 2013c); Eurosystem Standard Collateral Framework Sources: European Central Bank, (2011, 2012, 2013a, 2013b, 2014); and Federal Reserve Discount Window Sources: Federal Reserve (2014a). Additional requirements for central bank collateral frameworks are given in Table A1.

1. The Eurosystem also permits non-marketable assets eligible as collateral - namely retail mortgage-backed debt instruments and credit claims. Marketable assets can be used for all monetary policy operations. Non-marketable assets can only be used for reverse open market transactions and the marginal lending facility and intraday credit - not outright transactions.
2. Securitisations with a second-best rating of BBB are permissible provided all underlying asset belong to the same asset class and that that asset class comprises one of residential mortgages, loans to SMEs, commercial mortgages, Auto-Loans, leasing, consumer finance, or credit card receivables. Additionally, the securitisation must not include non-performing loans at time of issuance or which are non-performing when incorporated in the securitisation during the life of the securitisation, or which are structured syndicated or leveraged at any time; counterparty submitting an securitisation cannot act as interest rate swap provider in relation to the securitisation; transaction documents must contain servicing continuity provisions; all other requirements and procedures applicable to securitisations must be fulfilled. These securitisations are subject to a 22% haircut. securitisations issued in GBP, JPY, or USD are eligible if issued and held by a Euro Area issuer established in the EEA.
3. For more information on Bank of England collateral framework eligible securitisations, see Tables A3 and A4.
4. For more information on Federal Reserve discount window eligible securitisations please see Table A2 in the Appendix.

Table 2: Requirements for the EIOPA Type A Class of Securitisations

	Required Characteristics of Type A Securitisations
1. Seniority	After the delivery of an enforcement notice and where applicable an acceleration notice the tranche is not subordinated to other tranches in respect of receiving principal and interest payment.
2. True legal sale	The cash flow generating assets backing the securitisation shall be acquired by the securitisation special purpose vehicle in a manner which is enforceable against any third party, and is beyond the reach of the seller and its creditors including in the event of the seller's insolvency.
3. No severe clawback	There are no severe clawback provisions in the jurisdiction of the seller. This includes but is not limited to rules under which the sale of cash flow generating assets backing the asset backed securities can be invalidated by the liquidator solely on the basis that it was concluded within a certain period ("suspect period") before the declaration of insolvency of the seller or where the transferee can prevent such invalidation only if it can prove that it was not aware of the insolvency of the seller at the time of sale.
4. Servicing continuity	There shall be provisions to ensure that a default by the servicer does not lead to a termination of servicing. In addition, there shall be provisions for the replacement of derivatives counterparties and liquidity providers.
5. Eligible underlying assets	The cash flow generating assets backing the securitisation shall belong to one of the following asset classes: (i) residential mortgages; (ii) loans to small and medium sized enterprises (SME); (iii) Auto-Loans; (iv) leasing; (v) consumer finance and (vi) credit card receivables.
6. Homogeneous cash flows	The cash flow generating assets backing the securitisation consist of only one type of assets as set out in [the eligible underlying asset criterion].
7. Type of underlying assets	The cash flow generating assets backing the securitisation shall not consist, in whole or in part, actually or potentially, of credit-linked notes, swaps, other derivatives instruments or synthetic securities. This restriction does

	not include derivatives used strictly for hedging foreign exchange and interest rate risks.
8. Rating requirements	The securitisations shall have a credit assessment of at least credit quality step 3 at issuance and at any time subsequently.
9. No credit impairment	The securitization shall not contain loans that were granted to credit impaired obligors.
10. No nonperforming loans	The cash flow generating assets backing a securitisation shall not contain loans which are in default as defined in point 44 of Annex VII to Directive 2006/48/EC at the time of issuance of the securitisation or when incorporated at any time after issuance.
11. At least one payment	The securitisation, except for securitisations backed by credit card receivables, shall be backed by loans for which at least one payment has been made.
12. Listing requirement	The securitisation shall be admitted to trading on a regulated market in the countries which are members of the EEA or the OECD.
13. Transparency, reporting and disclosure	Loan by loan reporting: Comprehensive loan-level data in compliance with standards generally accepted by market participants is made available to existing and potential investors and regulators at issuance and on a regular basis. Standards issued by central banks shall be considered as generally accepted. General reporting: Relevant information on the transaction in accordance with standards generally accepted by market participants is made available to existing and potential investors and regulators at issuance and on a regular basis.
14. No self certification	In the case of residential mortgage-backed securitisation, the securitisation shall not contain residential mortgages that were marketed and underwritten on the premise that the loan applicants and, where applicable, their intermediaries were made aware that any information provided might not be verified.
15. Process for assessing credit worthiness	For residential mortgages, the assessment of the creditworthiness shall meet the requirements as set out in [Art. 14 Par. 1 and Par. 2 (a) Mortgage Credit Directive] or equivalent requirements as set out in non-EEA jurisdictions. For consumer finance loans, the assessment of the creditworthiness shall meet the requirements as set out in [Art. 8 Par. 1 Consumer Credit Directive] or equivalent requirements as set out in non-EEA jurisdictions.

Source: EIOPA (2013b)

One may compare the EIOPA Type A securitisation criteria to the PCS HQS definition. Seniority and true legal sale requirements are similar. EIOPA adopts some of the rather specific criteria of the ECB including "no severe clawback", servicing continuity, homogeneous cash flow and listing requirements which differ from those of PCS.

Like PCS and unlike the central banks, EIOPA is quite prescriptive on asset classes, restricting acceptable securitisations to retail and SME-loan backed issues. Large corporate loan-backed transactions and CMBS are, therefore, excluded. On the other hand, re-securitisations and synthetic deals are excluded as they are by PCS and the central banks.

EIOPA's rating requirement is relatively undemanding in that tranches must be merely investment grade. But EIOPA's rating requirement, in contrast to that of PCS, is dynamic. This reinforces regulatory reliance on ratings, in contradiction to the publicly expressed objective of Europe's financial regulators.

The no credit impairment, no non-performing loans, at least one payment, transparency and no self-certification requirements as well as the process for assessing creditworthiness all differ from the PCS requirements which include comparable but different criteria.

SECTION 3 – DATA, CLASSIFICATION AND METHODOLOGY

Data

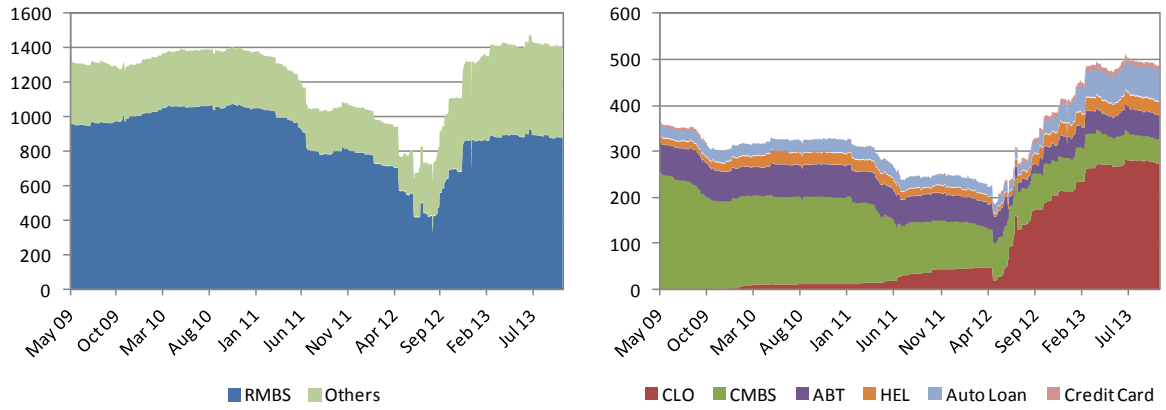
In this section, we set out the approach we take in assessing the riskiness and liquidity of HQS and non-HQS categories. We first describe the data we use, second, explain the HQS categorisation we employ (which depends on the data available to us), and, third, we provide information on techniques employed.

Our focus in this paper is on the risk and liquidity performance of different sub-sectors of the European securitisation market. In this, we use two datasets.

The first, somewhat smaller dataset was provided to us by S&P. It includes daily bid and ask quotes and characteristic information for a large number of securitisations. The sample period runs from the 26th May 2009 to the 30th September 2013. In this paper, we employ observations for securitisation tranches rated ECAI1 (i.e., with ratings ranging from AAA to AA-). In an earlier paper, (see Perraudin (2014)), I compared the liquidity of securitisations and covered bonds, focussing on a subset of this S&P dataset, namely those observations with AAA ratings. The total number of ECAI1-rated bid-ask spread observations available in the data is 1,797,646, of which 1,006,512 are RMBS observations.

Aspects of the distribution over time of the S&P securitisation tranche data are illustrated in Figure 1. We focus on ECAI1-rated tranches since the ECAI1 category is used in a variety of regulatory contexts (for example, in Basel eligibility definition of the Liquidity Coverage Ratio). Most of the observations in our sample consist of RMBS. In the middle part of the sample period, there was a marked decline in the number of observations, mostly reflecting downgrades and, in some cases, subsequent upgrades in ratings, and, to some extent, changes in the coverage of the S&P dataset. The breakdown of the non-RMBS data by asset class is shown in the right hand panel of the figure. As one may observe, there are considerable changes in the numbers of some asset classes within the sample, particularly CLOs and CMBS.

Figure 1: Distribution over Time of the S&P Data



Notes: The two graphs present the evolution of the S&P Data over time. In the left hand graph, Securitisation tranches are grouped by whether they are Residential Mortgage Backed Securities (RMBS) or not. On the right hand graph, all non-RMBS tranches are grouped by the securitisation sub-class to which they belong. The y-axis measures the number of tranche daily bid-ask spread observations. These are plotted against time. The graphs are stacked so that, for instance, in May 2009 there were approximately 1300 tranche observations. Of these, over 900 were RMBS and over 300 were of other types. Of these other types approximately 250 were Collateralised Mortgage Backed Securities (CMBS).

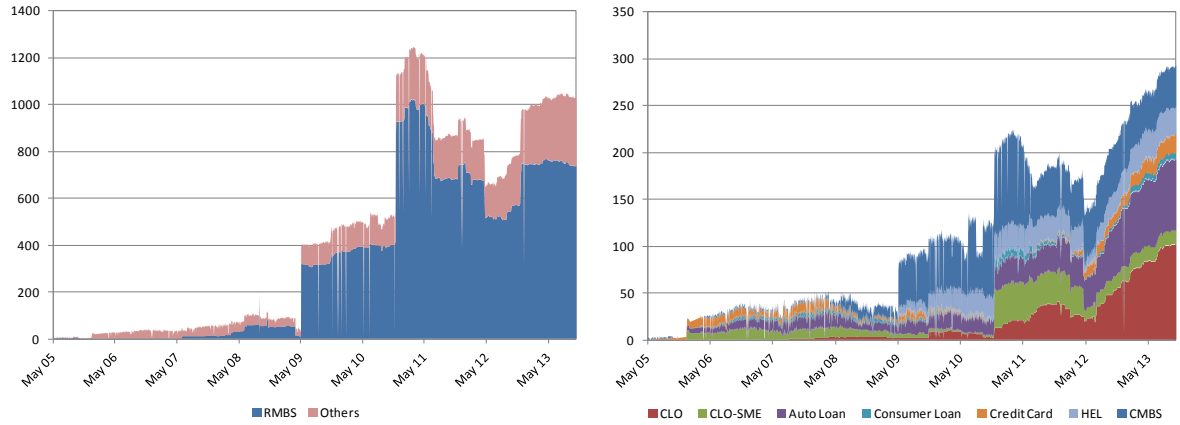
The S&P dataset just described has the advantage of containing bid and ask prices (which are generally very hard to come by for European securitisations). It covers a relatively short time span, however, and is concentrated on RMBS with some information about Auto-Loan ABS. There are very few data points for some other important asset classes such as Credit Card and Other Retail ABS.

For these reasons, we created a second, larger dataset for the analysis of price volatility performance, the second broad issue in which we are interested. This second data set is constructed both by extending the first dataset backwards in time and by adding data on additional securitisations from Bloomberg and Reuters.

The S&P ISINs from the first dataset are used to search for the same securities in the Eikon database, which extends further back than the S&P dataset: to 2005 instead of only to 2009. We add additional ISINs to our dataset by searching for all structured finance transactions on Bloomberg, filtering out all non-European transactions and only considering data after the start of 2005. We then apply a further filter to remove certain other asset types.[5]

Given the ISIN's, we search for the relevant data fields using information from both Bloomberg and Reuters (the Eikon database). Where information differs across the two systems, we take the values supplied by Reuters. Finally, we combine the data downloaded from Bloomberg and Eikon with the original S&P data employed in the liquidity calculations. Aspects of the distribution of the second dataset over time are illustrated by Figure 2, below.

Figure 2: Distribution over Time of the Second Dataset



Notes: The two stacked plots in Figure 2 display results for all AAA-rated securities in the second dataset. As for Figure 1, the y-axis displays the number of observations, plotted against time (on the x-axis).

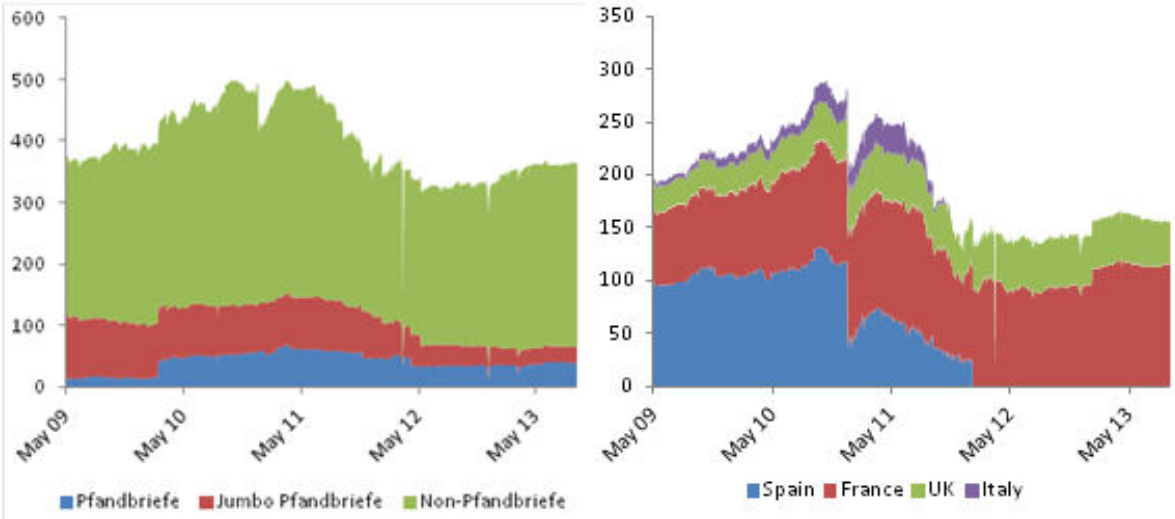
Finally, in Section 6, below, we employ data on European Covered Bonds to make a direct comparison of the risk and liquidity performance of HQS securitisations. The Covered Bond data we use is the same as that used in Perraudin (2014), a study of the relative liquidity of Covered Bonds and European securitisation tranches. That study did not attempt to identify and employ in the comparisons a narrower HQS subset of the universe of European securitisations and in that sense the comparison in this paper is an extension of the previous paper.

A description of the Covered Bond data is provided in Perraudin (2014). The securities we study are components of the Bank of America Merrill Lynch Euro Covered Bond Index (ECV0), in particular Euro-denominated investment grade covered bonds publicly traded in the Eurobond or Euro member

[5] After this filter is applied the securitisations remaining consist of the following types: CDO, CLO, CFO, Home Equity, Res B/C, Credit Card, Auto, Equipment Lease, Manufactured Housing, Student Loan, Airplane, Small Business and Other.

domestic markets. We filter the bonds, requiring that there be at least one year remaining term to final maturity, a fixed coupon schedule, and a minimum amount outstanding of EUR 250 million. We obtain daily bid and ask quotes from Bloomberg covering the period 1st January 2005 to the 30th of September 2013.[6] Figure 3 provides the distribution of the data over time by sub-category of Covered Bond and by jurisdiction.

Figure 3: Distribution over Time of the Covered Bond Data



Notes: The two graphs present the evolution of the Covered Bonds sample over time. On the left hand graph, Covered Bonds are grouped by subclass, specifically, whether they are Pfandbriefe, Jumbo Pfandbriefe or Non-Pfandbriefe. On the right hand graph Covered Bonds are grouped by country of issuance. The y-axis measures the number of daily Covered Bond, bid-ask spread observations, which are plotted against time on the x-axis. As is true for both the above figures, both graphs are stacked.

Classification

Given our two datasets, we classify the securities as either HQS or not. In so doing, we aim to use high level PCS-style criteria. The criteria we employ, described below, correspond to a broad, high-level version of the much more detailed PCS label requirements.

Table 3: Filters We Employ to Mimic Hard PCS Rule-book 'Eligibility Criteria'

PCS rule-book criteria	**Filter employed**	**Source**
Permitted asset classes		
(a) Auto Dealer Floorplan Loans; (b) Auto-Loans and Auto Leases; (c) Consumer Loans; (d) Credit Card Receivables; (e) Non-Auto Leases; (f) Residential Mortgage Loans; (g) SME Loans.	Data License Asset Classes from Reuters are used for the S&P data. Asset Classes from Bloomberg are used for the extension data.	Reuters and Bloomberg
Common Eligibility Criteria		
Most senior tranche	Used code for seniority to select most senior.	Bloomberg
Highest rating category for at least two agencies	AAA. Rating data is based on three rating agencies: S&P, Moody's and Fitch.	Reuters

[6] A description of the proprietary algorithm used by Bloomberg to calculate bid-ask spreads is given in Appendix 1 of Perraudin (2014).

Eligible currency	Currency in which the security was issued is one of the PCS eligible currencies.	Reuters and Bloomberg
The initial principal amount	Original Issue Amount (>100 million in eligible currency)	Reuters and Bloomberg

Notes: Eligible currencies are listed in Footnote 5 to Table 1. Source: PCS (2014)

Note that individual tranches in our dataset, that we designate HQS, may or may not have been labelled by PCS. This is because (i) our data extends back in time before the launch of the PCS label, (ii) the issuer might have not requested PCS certification or (iii) an issue might be ineligible for PCS HQS status because it falls down on one of the more fine-grained criteria employed by PCS.

To categorise tranches as HQS or non-HQS, we follow a 2-stage process. First, we generated a list of securities satisfying 'hard' filters specified in the PCS rule-book that were directly observable to us based on the data sources available (characteristics from the S&P dataset or readable from Reuters or Bloomberg). The filters in question are presented in Table 3.

In addition to the above "hard" criteria, we enforce versions of the high level PCS principles discussed in Section 2 above. Recall that these consist of:

1. Excluding originate-to-distribute deals.
2. Excluding re-securitisations.
3. Ruling out maturity transformation.
4. Requiring transparency.

As Stage 2 of our filtering exercise, to apply the above judgmental criteria, we proceed as follows.
By ruling out CMBS and only permitting the asset classes listed in Table 3, we effectively exclude maturity transformation. Similarly, our asset classes do not include securitisations that involve leverage in the PCS sense. We do not attempt, for the moment, to reflect in our analysis the transparency criterion. Obtaining data on the transparency of individual deals several years ago would be extremely difficult. This leaves us with the originate-to-distribute criterion. For this, we compile a list of issuers for each of the tranches satisfying the hard filters and then assess, based on guidance provided by PCS, whether the securities were issued on an originate-to-distribute basis, in which case we assign the non-HQS category to them.

Methodology

Our objective is to present evidence on the liquidity and risk of HQS and non-HQS (as defined in the last section) for different segments of the structured product market. As a measure of liquidity, we employ the average bid-ask spread at different points in time and averaged over the sample period. The bid-ask spreads we use have been collected by Standard & Poor's as part of their calibration of their securitisation valuation services using feeds from several banks.

As a measure of risk, we employ the average (over the securitisations in our sample) of the volatilities or standard deviations of changes in the log prices of individual securitisation tranches. Clearly, the price data we employ is not that of super liquid securities trading many times a day such as high quality government bonds or the equity prices of large corporations. Hence, volatility measures will be polluted by transitory market microstructure effects. It may also be the case that the price series will contain many missing observations. For these reasons, we think it inappropriate to focus on daily price volatilities and prefer instead to look at longer holding periods, in particular ten days. (This is the holding period that internationally active regulated banks are required to use under the Basel rules for their trading book risk.)

To estimate the log price volatility for individual tranches, we employ the square root of an overlapping observation estimator of the variance of log price changes. Below, we explain this overlapping observation estimator.

Suppose one is interested in the volatility of log securities prices over periods like a week or a month. A common procedure, if high frequency data (for example daily data) is available, is to calculate the standard deviation for daily log price changes and then to multiply by the square root of the number of days in the time period of interest. This approach is efficient (in that it uses all the information in the data) and is correct if the price data is generated by a Geometric Brownian motion. However, market microstructure distortions and high frequency dynamics in the data are often such that log price change volatility over longer time periods is not a simple scaling of the high frequency volatility.

One may estimate long holding period volatilities by using non-overlapping observations for the longer time periods, but this clearly involves discarding much of the information in the sample. Alternatively, one might try to use daily observations with overlapping periods. (So, the log price changes included in the volatility estimator correspond to periods: t to t+k, t+1 to t+k+1, t+2 to t+k+2 etc.) This approach does, apparently, use all the information in the sample but unfortunately the resulting estimator is biased.

Kiesel, Perraudin and Taylor (2001) developed an approach to dealing with this problem which consists of employing an overlapping observation estimator but then removing the bias by subtracting a theoretically derived bias adjustment. The technique uses the bias adjustment employed by Cochrane (1988) in a different context.

We describe the adjustment more formally in the next few paragraphs. We suppose that security prices are generated as the sum of a random walk and of a stationary component. Given daily data on securities' prices, the basic over-lapping observation estimator of the *k*-period volatility of the log price, x_t, is given by:

$$\bar{\sigma}_k^2 = \frac{1}{Tk}\sum_{j=k}^{T}\left[\left(x_j - x_{j-k}\right) - \frac{k}{T}\left(x_T - x_0\right)\right]^2 \tag{1}$$

Here, T is the length of the sample period. As mentioned above, this estimator is biased in small samples. To correct for this problem, consider the case in which the log price is a pure unit root process in that:

$$\Delta x_t = \mu + \epsilon_t \tag{2}$$

Where ϵ_t are independently and identically distributed with zero mean and volatility σ^2. This enables us to write the numerator of the estimator above, N_σ, as:

$$N_\sigma = \sum_{j=k}^{T}\left(\left(x_j - x_{j-k}\right) - \frac{k}{T}\left(x_T - x_0\right)\right)^2 \tag{3}$$

$$= \sum_{j=k}^{T}\left(k\mu + \sum_{v=0}^{k-1}\epsilon_{j-v} - \frac{k}{T}\left(T\mu + \sum_{v=0}^{T-1}\epsilon_{T-v}\right)\right)^2 \tag{4}$$

$$= \sum_{j=k}^{T}\left(\sum_{v=n-k+1}^{n}\epsilon_v - \frac{k}{t}\sum_{v=1}^{T}\epsilon_v\right)^2 \tag{5}$$

Then, by defining $Z_{j,k} = \sum_{v=j-k+1}^{j}\epsilon_v$ and using the fact that the ϵ_v are i.i.d., uncorrelated and of zero mean, we get:

$$E(N_\sigma) = \sum_{j=k}^{T}\left(E\left(Z_{j,k}^2\right) - \frac{2k}{t}E\left(Z_{j,k}Z_{T,T}\right) + \frac{k^2}{t^2}E\left(Z_{T,T}^2\right)\right) \tag{6}$$

$$= E(\epsilon^2)\sum_{j=k}^{T}\left(k - \frac{2k^2}{T} + \frac{k^2}{T}\right) = \sigma^2(T-k+1)(T-k)\frac{k}{T}. \quad (7)$$

and so, to obtain an unbiased estimator of σ^2, we multiply it by:

$$\frac{T}{k(T-k)(T-k+1)} \quad (8)$$

Hence, the Cochrane-estimator of the volatility over k-periods is therefore given by $\hat{\sigma}_k^2$, where:

$$\hat{\sigma}_k^2 = \frac{T}{k(T-k)(T-k+1)}\sum_{j=k}^{T}\left[\left(x_j - x_{j-k}\right) - \frac{k}{T}(x_T - x_0)\right]^2 \quad (9)$$

In the current context, as our holding period is ten days, $k = 10$. To estimate a volatility corresponding to a particular time period, t, we use a window of 125 observations stretching up to t. Hence, in the above notation, $T = 125$.

SECTION 4 – VOLATILITY RESULTS

Here, we present the volatility estimates of log price changes (i.e., returns) over ten day holding periods. Figure 4 shows rolling-window estimates of average volatilities for different dates in our sample period for all the asset classes we consider. The averages are across the volatilities of individual securitisation tranches.

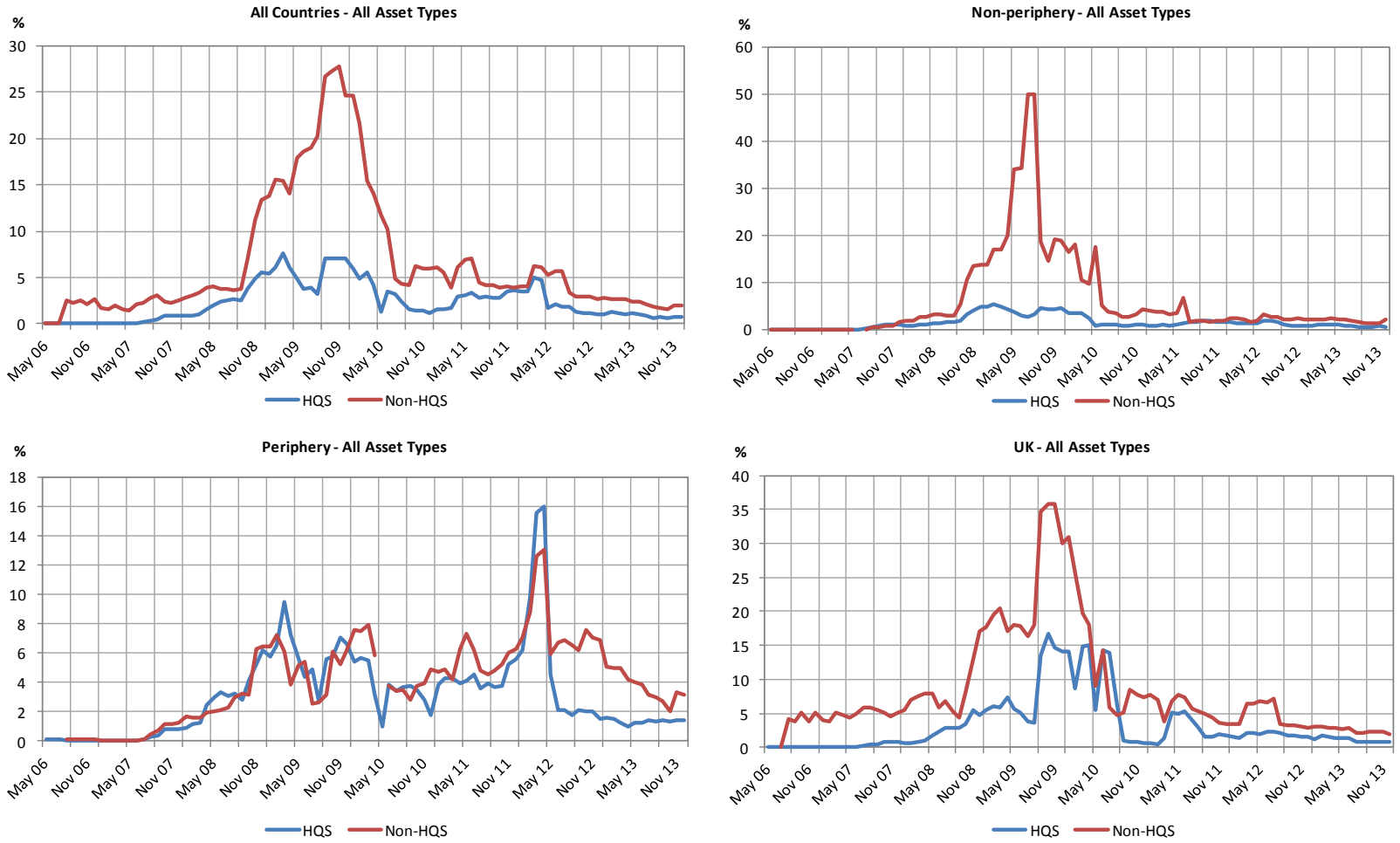
Note that the results shown here for any given date t are for securities rated AAA on date t. (This means that, logically, a security could conceivably have been rated AA earlier in the window of 125 time periods stretching up to date t and then have experienced an upgrade. Although we do not expect that this occurs often in our dataset.)

The reason why we focus in our comparisons on similarly rated tranches is that we wish to show that even when ratings are all the same, the HQS categorisation contains a lot of information about the riskiness of the securities involved. The key finding here is that, when we look at all assets and all countries, the spike of average volatility associated with the crisis evident in the non-HQS results is largely truncated in the HQS time plot. This suggests that the HQS category was distinctly more robust in its risk performance through the crisis period than the non-HQS category.

When we consider the individual country results, we see that that the average HQS volatility is most strikingly lower than the non-HQS average volatility for the non-periphery countries (Germany, Netherlands, Australia, France, Luxembourg, Belgium, Norway, Switzerland, Sweden, Austria) and the UK. In the case of periphery countries (Spain, Portugal, Italy and Ireland), the gap between HQS and non-HQS is less striking although in most time periods we see HQS volatilities as somewhat lower.

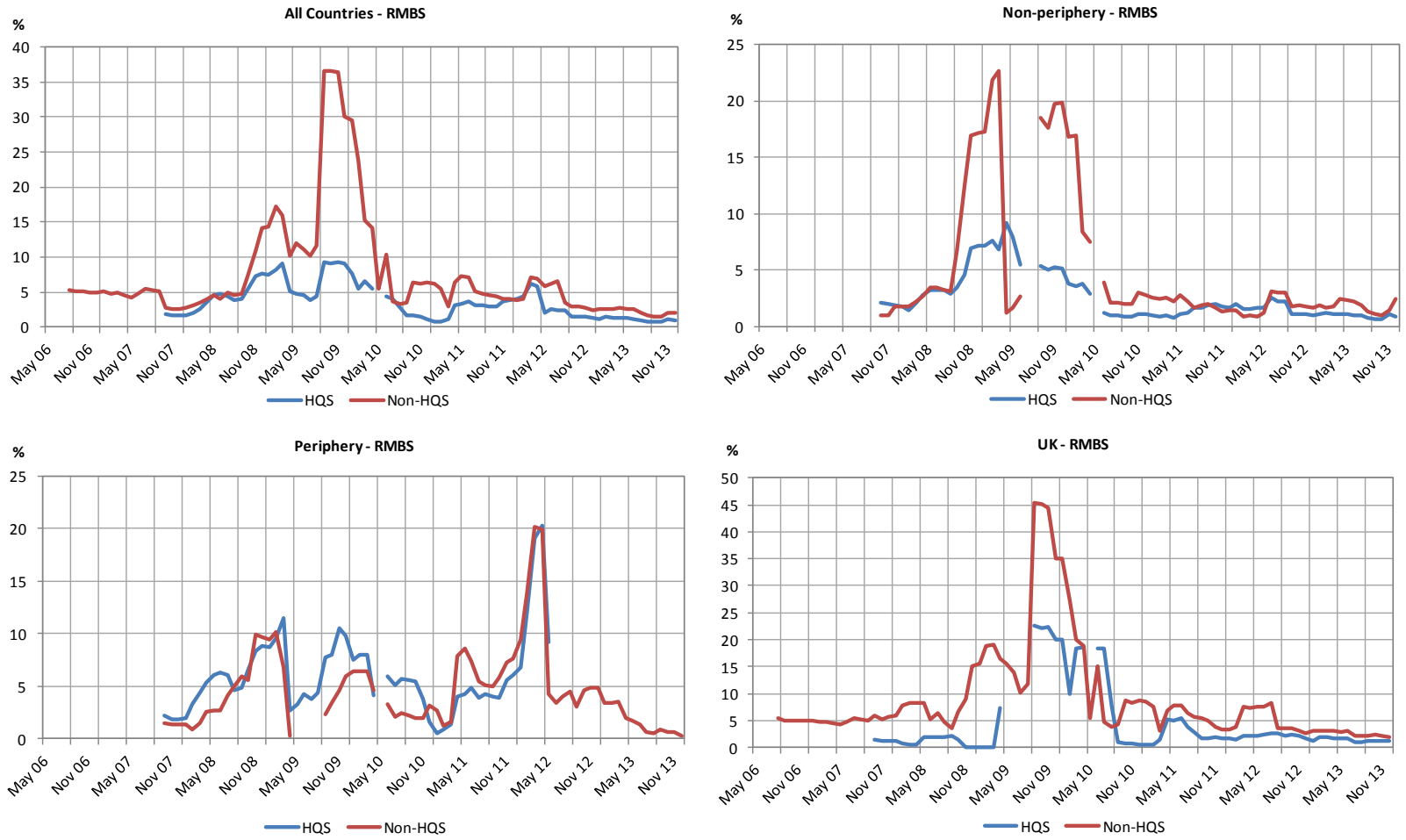
From Figure 4, there are some brief periods when, for periphery countries, HQS volatility exceeds that on non-HQS securities. We looked into the source of this finding in detail. First, the result turns out to be solely driven by Spanish RMBS. For Italian, Portuguese, Irish and Italian securities, the ranking of volatilities is intuitive with lower volatility for HQS. Upon detailed inspection, we found that for Spanish RMBS, all the HQS securities were originated by the Spanish savings banks or cajas that have been at the centre of the financial. On the other hand, the non-HQS were originated by a broader set of banks many of which were less severely affected by the crisis.

Figure 4: Volatility Time Series for All Asset Classes



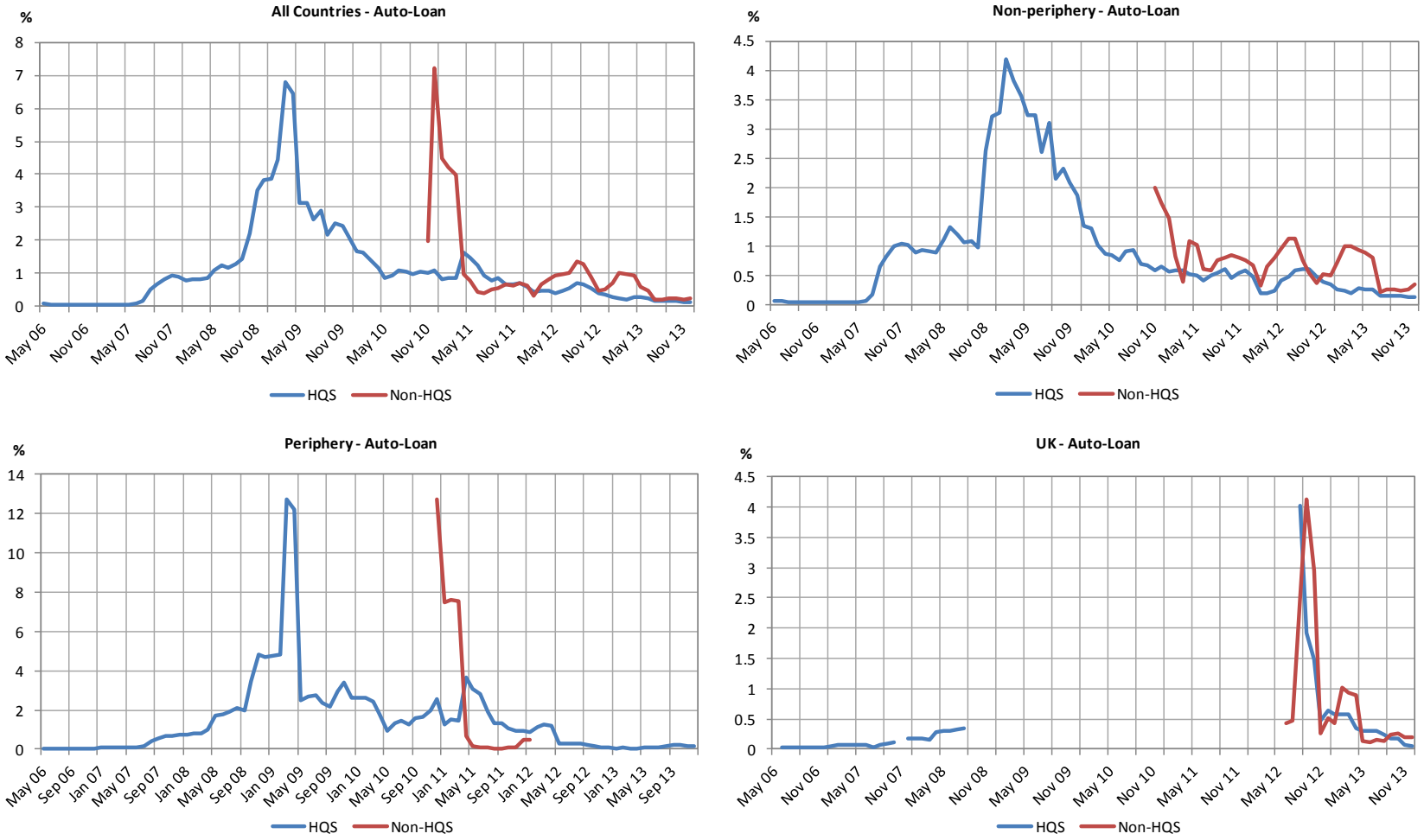
Notes: The figures above display the evolution of volatilities of both High Quality Securitisations and Non-High Quality Securitisations over time for all asset types in four different country-groupings: all countries, non-periphery countries, periphery countries and the UK. Average volatilities are calculated as annual percentages using the methodology described in the previous section. The estimated volatility in each period is measured on the y-axis and this is plotted against time on the x-axis. For instance, in February 2010, the estimated volatility for all HQS asset types in all countries was approximately 5%, compared to a volatility of approximately 15% for non-HQS assets.

Figure 5: Volatility Time Series for All RMBS



Notes: The volatility results displayed in this figure are calculated in the same way as in Figure 4, above. However, the results given here are for RMBS only.

Figure 6: Volatility Time Series for Auto-Loan ABS



Notes: The volatility results displayed in this figure are calculated in the same way as in Figure 4, above. However, the results given here are for RMBS only.

Hence, we interpret the smaller gap between HQS and non-HQS volatilities for periphery countries in the earlier period of the crisis as reflecting Spanish-bank-specific selectivity effects. In this sense, it is uninformative about the ceteris paribus impact of the characteristics used in our definition of HQS. One should note that after the start of 2012, when a clear "Draghi effect"[7] appears in the periphery mean volatility time series, again a large gap opens up, with the HQS securitisations recovering sharply while the non-HQS volatilities come down only slowly.

Figure 5 shows results for RMBS tranches. As we showed in the data section above, RMBS represent most of the data in our sample so, unsurprisingly, the RMBS results echo in qualitative terms those for the sample as a whole. Again, the Spanish-bank selectivity effect is evident in the periphery country results and the comments above remain relevant that the higher volatility for periphery country HQS RMBS is uninformative about the ceteris paribus impact of the HQS definition characteristics. The effect of these characteristics may more dependably be judged from the non-periphery plot.

Figure 6 shows results for Auto-Loan ABS. In general, the volatilities are much lower than for RMBS and the All Asset results (when one compares the results for a particular country or for the group of all countries). We do not possess data on non-HQS Auto-Loan ABS before late 2010. After that date, the same qualitative results are evident in that HQS volatilities are lower than their non-HQS equivalents.

Table 4 summarises our volatility findings by presenting sample period averages of the mean volatilities shown in the figures. In the table we also show sample period averages of mean volatilities for asset classes other than RMBS and Auto-Loan ABS, namely Collateralised Loan Obligations (CLOs), CLOs of SME loans, Consumer Loan ABS, Credit Card ABS and Home Equity Loans (HEL) ABS.

The table also shows mean tranche prices (revealing the average level of discount (or premium) compared to a par of 100), the average price standard deviation (which shows how much, averaging over the sample period, the prices of individual tranches varied in the cross-section), and the average (over the sample period) sample size.

As one might expect, there is a strong positive relation between the average volatilities and the degree to which the mean tranche prices are less than the par value of 100. The standard deviation of prices show is also positively related to this discount.

On an average day in our sample, we had volatility estimates for 150 HQS securities and 370 non-HQS. The average volatility across all asset types and all time periods was 2.32% for HQS and 6.64% for non-HQS. A similar doubling of volatility between HQS and non-HQS is evident for RMBS in that average HQS and non-HQS volatilities for the sample period as a whole are 3.59% and 7.42%, respectively.

For the reasons discussed above, the RMBS result is reversed for periphery countries because of a Spanish bank selectivity effect, in that the Spanish HQS happen to be overwhelmingly issued by distressed cajas whereas the non-Spanish RMBS are issued by a broader and more financial stable set of banks.

Table 4 reinforces the conclusion that HQS securities are significantly lower in risk. As well as the periphery country RMBS, there are a few (four) cases in which, against intuition, HQS volatilities are higher, most notably in the cases of UK credit cards and non-periphery and UK CLO-SME. Upon inspection, we found that these results reflected the fact that, in these cases, the non-HQS data was available for the post crisis period which the HQS data was primarily available for the crisis period. Hence, these results reflect sample period selectivity rather than a dependable conclusion about the

[7] ECB President, Mario Draghi, announced a Longer Term Refinancing Operations (LTROs) programme on December 8th, 2011 (see Draghi (2011)).

relative size of HQS and non-HQS volatilities. As one may observe from Table 4, the cases in which HQS volatility is higher than non-HQS correspond to sub-categories for which we have very few observations (except for the case of periphery RMBS which we have already discussed at length).

Table 4: Volatility Summary

		HQS				Non-HQS			
		Mean Price	Avg Price SD	Avg Volatility	Avg Sample Size	Mean Price	Avg Price SD	Avg Volatility	Avg Sample Size
All Asset Types	All	97.41	3.96	2.32	150.05	96.82	7.77	6.64	372.36
	Non-periphery	98.32	2.16	1.54	69.86	95.63	6.61	6.17	99.40
	Periphery	96.19	4.42	3.14	44.18	94.61	5.66	4.10	43.09
	UK	98.47	3.81	3.25	36.01	98.21	7.81	8.54	229.87
RMBS	All	96.79	4.33	3.59	98.91	98.05	6.51	7.42	266.70
	Non-periphery	97.34	2.58	2.57	47.35	95.59	6.13	4.99	65.62
	Periphery	94.65	4.50	5.97	26.78	93.12	5.27	4.60	17.79
	UK	98.76	4.00	4.36	24.78	98.39	6.39	8.92	183.28
CLO	All	99.01	2.19	1.16	1.86	100.29	3.17	2.90	14.60
	Non-periphery	100.01	0.00	0.62	0.14	101.33	2.71	2.46	9.29
	Periphery	97.51	0.00	1.65	1.01	94.21	3.81	4.63	2.68
	UK	100.75	0.69	0.57	0.71	95.30	4.70	2.74	2.62
CLO-SME	All	94.44	4.37	2.16	5.53	95.45	4.15	3.31	8.51
	Non-periphery	96.82	0.96	0.39	1.92	97.55	0.75	0.25	1.08
	Periphery	90.93	2.36	3.22	2.77	94.09	4.84	7.04	6.64
	UK	99.44	0.74	0.98	0.84	97.44	2.50	0.70	0.79
Auto Loan	All	99.07	1.12	1.09	20.52	99.58	0.54	1.15	4.45
	Non-periphery	99.33	0.69	0.89	15.67	99.68	0.52	0.77	2.82
	Periphery	98.36	1.40	1.49	3.67	98.02	0.00	2.69	0.15
	UK	100.09	0.09	0.36	1.17	100.15	0.22	0.84	1.48
Consumer Loan	All	97.45	1.47	1.73	2.99	84.55	6.71	23.27	0.28
	Non-periphery	99.17	0.33	0.79	1.16	84.55	6.71	23.27	0.28
	Periphery	96.00	1.44	2.26	1.71	-	-	-	0.00
	UK	101.70	0.00	0.93	0.12	-	-	-	0.00
Credit Card	All	98.21	1.11	2.07	5.09	99.33	0.27	1.06	1.12
	Non-periphery	-	-	-	0.00	-	-	-	0.00
	Periphery	-	-	-	0.00	-	-	-	0.00
	UK	98.21	1.11	2.07	5.09	99.33	0.27	1.06	1.12
HEL	All	99.42	1.74	1.06	4.16	98.49	3.47	3.03	8.99
	Non-periphery	96.83	1.62	0.88	1.08	97.83	1.45	2.02	2.78
	Periphery	-	-	-	0.00	84.69	0.00	7.09	0.29
	UK	100.27	0.45	1.27	3.09	99.31	2.16	2.88	5.91

Notes: Table 1 above displays key summary statistics for time series of securitisations grouped by securitisation sub-class and by whether or not they qualify as HQS according to PCS's criteria. Time series for each securitisation sub-class are further divided by whether they belong to the Non-periphery countries (Netherlands, Germany, Australia, France, Luxembourg, Belgium, Norway, Switzerland, Sweden, Austria), Periphery countries (Italy, Ireland, Spain, and Portugal), the United Kingdom, or all countries (Periphery, non-Periphery and UK). For each aggregation the mean price, average price standard deviation, average volatility (with a window of 125 days) and average sample size are displayed.

To investigate the relative contribution of the different HQS criteria, we performed a series of calculations, in which we successively dropped individual requirements in the HQS definition. The criteria we investigated in this way were the "Not Originate to Distribute", "Senior Tranche", "Not CMBS" and "Principal amount greater than 100 million". The results of these calculations are shown in Table 5.

Table 5: Incremental Contribution of Individual HQS Requirements on Average Volatility

		Full criteria		Relax not OTD		Relax most senior tranche		Relax not CMBS		Relax principal amount > 100m		Relax all criteria
		HQS	Non-HQS	HQS	Non-HQS	HQS	Non-HQS	HQS	Non-HQS	HQS	Non-HQS	
All Asset Types	All	2.32	6.64	2.58	6.54	2.80	9.72	2.76	6.50	2.37	6.66	4.97
	Non-periphery	1.54	6.17	1.89	5.61	1.81	12.86	1.62	6.13	1.54	6.18	3.29
	Periphery	3.14	4.10	3.20	4.19	3.14	4.44	3.15	4.10	3.15	4.22	3.73
	UK	3.25	8.54	4.27	8.43	3.77	11.31	4.85	8.44	3.38	8.56	7.09
RMBS	All	3.59	7.42	4.06	7.23	4.40	11.43	3.59	7.42	3.68	7.45	6.58
	Non-periphery	2.57	4.99	3.17	3.92	2.76	6.69	2.57	4.96	2.56	4.97	3.77
	Periphery	5.97	4.60	5.85	4.56	5.73	4.22	5.97	4.60	5.66	4.78	5.50
	UK	4.36	8.92	6.79	8.71	5.08	15.37	4.36	8.92	4.39	8.96	8.58

Note: entries are annualised volatilities, expressed in percent, averaged across securities and time periods.

In inspecting Table 5, one may focus first on the relative size of the average volatilities under (i) the full criteria case and (ii) cases in which we have dropped a single criterion. For example, when we drop the "Most senior tranche" requirement, the average volatility rises from 2.32% to 2.80%. This factor has the largest impact on volatility. Dropping the "Not OTD", "Not CMBS" and "Principal>100m" boost volatility from 2.32% in the base case to 2.58%, 2.76% and 2.37%, respectively. In this sense, our results suggest that the order of our HQS criteria when ranked by their contribution to risk is "Senior tranche", "Not CMBS", "Not OTD" and "Principal > 100m". When we drop all the HQS criteria together, the average volatility goes from 2.32% to 4.97%, a more than doubling of volatility. The effects of relaxing criteria are generally intuitive and, in many cases, sizeable in magnitude (with the exception of some of the periphery country RMBS results).

SECTION 5 – LIQUIDITY RESULTS

In this section, we present analysis of the relative liquidity of HQS and non-HQS securitisation tranches. The indicator of liquidity we employ is the average magnitude of bid-ask spreads as a percentage of par values. This appears to us the most obvious starting point for an analysis of liquidity although we fully recognise that there are several other dimensions of liquidity and hence possible indicators, for example, trading volume and measures of market resilience (i.e., how much do prices change when a (large) trade occurs?).[8]

As explained in the data section, bid-ask spread data for securitisations are difficult to obtain. We were assisted in obtaining suitable data by Standard & Poor's who kindly made available to us daily quote data from banks that they employ to calibrate their valuation services for investors in

[8] In analysing asset class-specific liquidity based on MiFID transactions data (for making recommendations on LCR eligibility), EBA (2013) employs multiple indicators of liquidity but relies on imperfect proxies for the bid-ask spread. See Perraudin (2014) for comments on this approach.

securitisations. The Standard & Poor's data is only available for the period from the 26th May 2009 to 4th of November 2013.

Figure 7 shows time series of average bid-ask spreads for securitisation tranches. Here, the averages are taken over the cross-sections of individual securitisation tranches that appear in our dataset on a given day. The tranches considered are all AAA or AA-rated on the day in question. Note that in the volatility analysis of the last section, we conditioned on AAA-rated tranches. Here, we condition on AAA and AA-rated securities because the number of data observations was somewhat smaller.

The results in the figure again suggest significant differences between HQS and non-HQS securitisation tranches. Early in the sample period, at the height of the crisis, there was little difference between bid-ask spreads. But since 2010, HQS tranches have exhibited noticeably narrower bid-ask spreads than non-HQS securities. This result appears most marked in the case of non-periphery securitisations although differences are still apparent with periphery country tranches. The non-periphery data is affected by the same Spanish-bank sample selectivity issue discussed in the last section, namely that the HQS Spanish RMBS are all issued by distressed cajas whereas the non-HQS are issued by a wider set of less financially distressed banks.

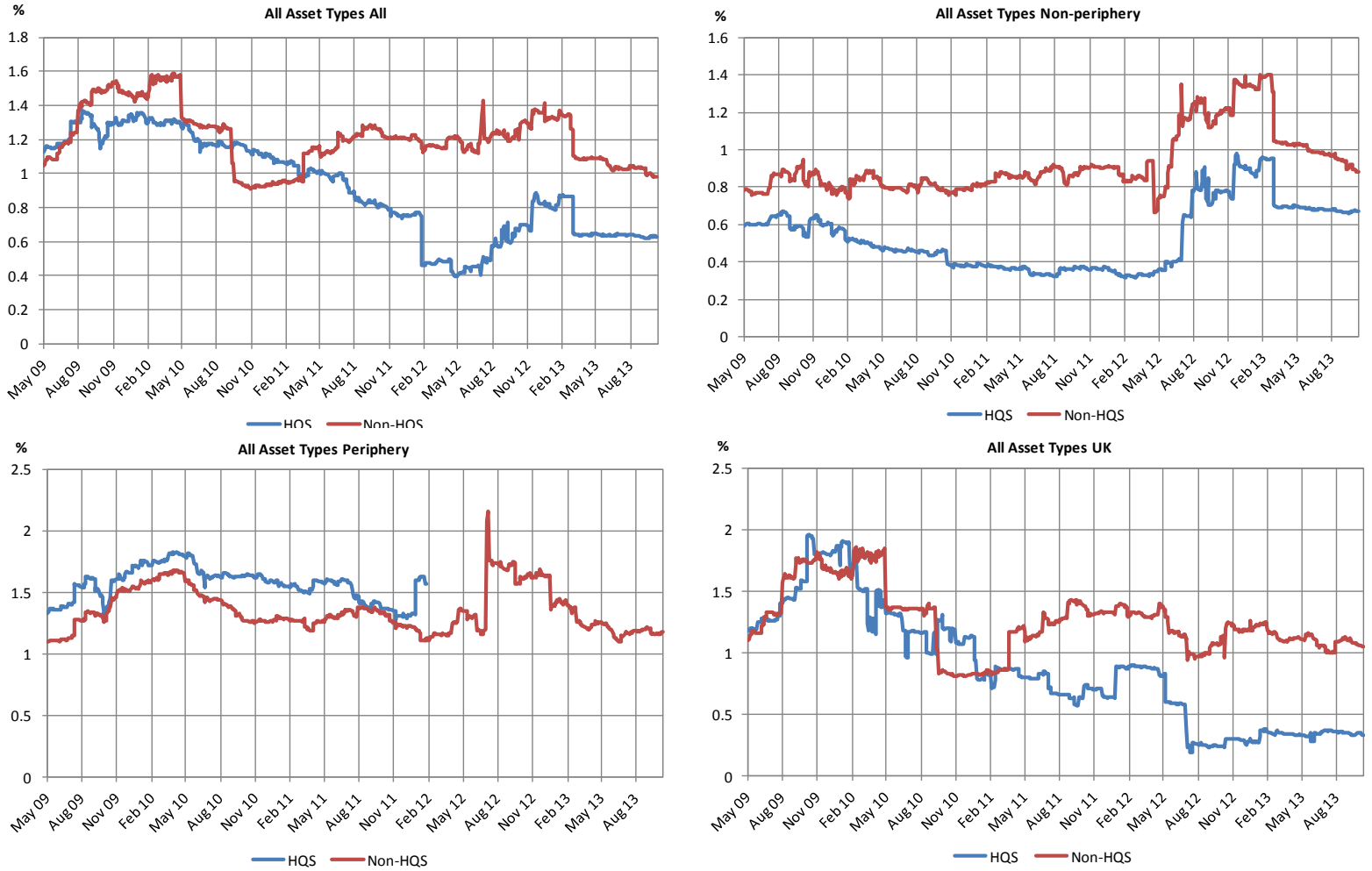
The non-periphery all-asset-type HQS bid-ask spreads, (which are likely to be a better guide to the ceteris paribus impact of the HQS characteristics) were 30-40 basis points lower than those of the non-HQS securities for significant parts of the sample period considered. As one might expect, the pattern of results for RMBS (see Figure 8) is qualitatively similar to that for the All Asset Types (as shown in Figure 7).

In Figure 9, we show results for Auto Loan backed ABS. These securitisation tranches exhibit noticeably lower spreads than the other exposures we consider. The results suggest that HQS spreads are systematically lower including for the Eurozone periphery countries and for the UK. The level of spreads during much of the sample period is just 20 basis points. After 2010, this is even true for periphery countries.

Table 6 contains a summary of the liquidity results. For all asset types, the mean bid-ask spread is 0.916% for HQS compared to 1.211% for non-HQS. As one might expect, for non-periphery countries, the average spreads are significantly lower with 0.533% for HQS and 0.927 for non-HQS. The RMBS results are similar although the periphery RMBS show the issue discussed in earlier sections concerning Spanish bank selectivity effects. Auto Loan bid-ask spreads are extremely low with HQS spreads of 0.244% and 0.560% for non-HQS.

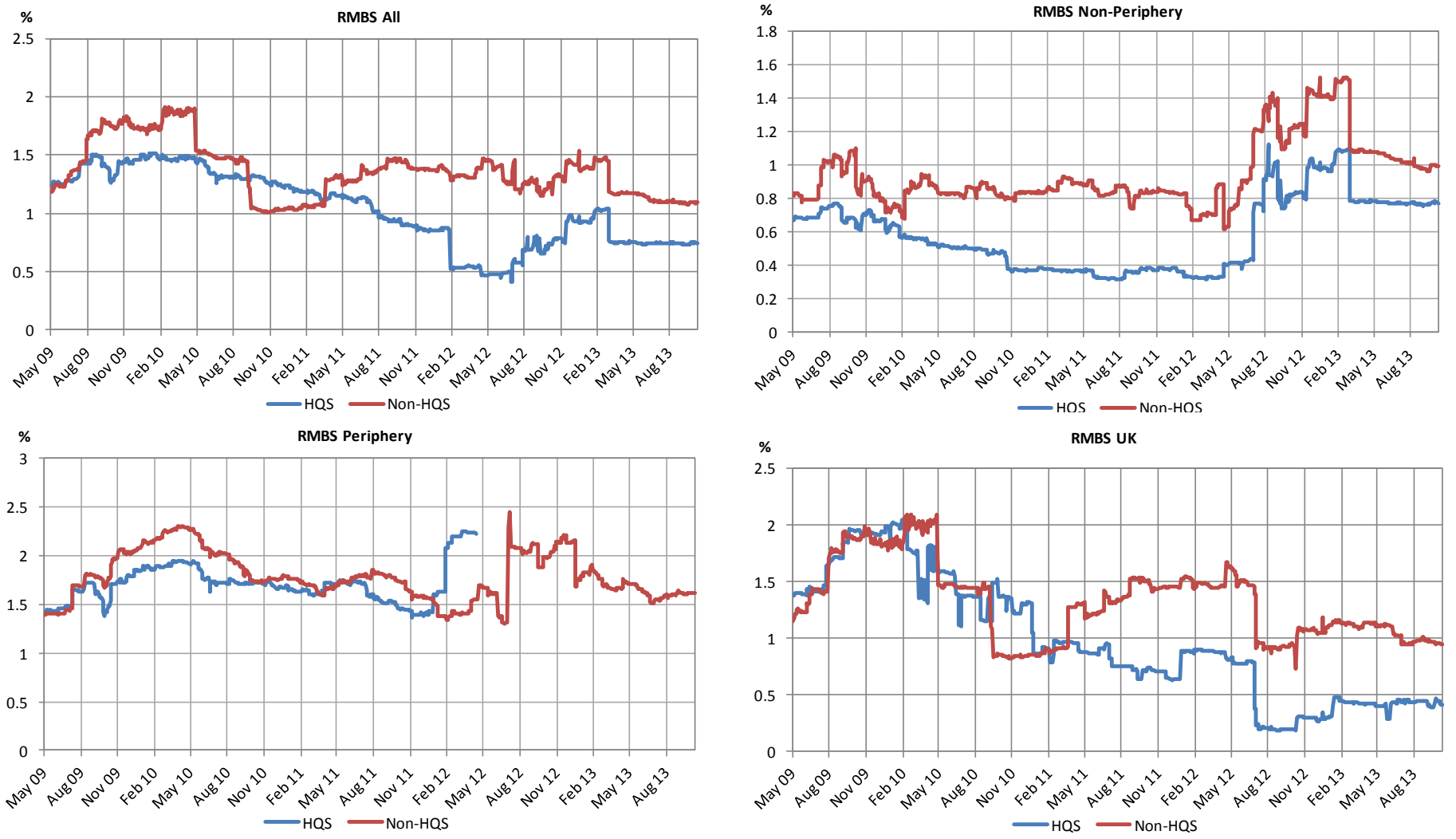
Table 6 also shows quantiles and standard deviations of the cross-sectional distribution of bid-ask spreads averaged over the sample period. These show that qualitative features of the means remain true of the distributions more generally. So, in particular, the 10% quantiles, which correspond to the most liquid securities, are much lower for HQS than for non-HQS, being 0.131% and 0.231% respectively. Similarly, the standard deviations of the cross sections of spreads (averaged over the sample period) are noticeably lower for HQS.

Figure 7: All Asset Types Bid-Ask Spreads



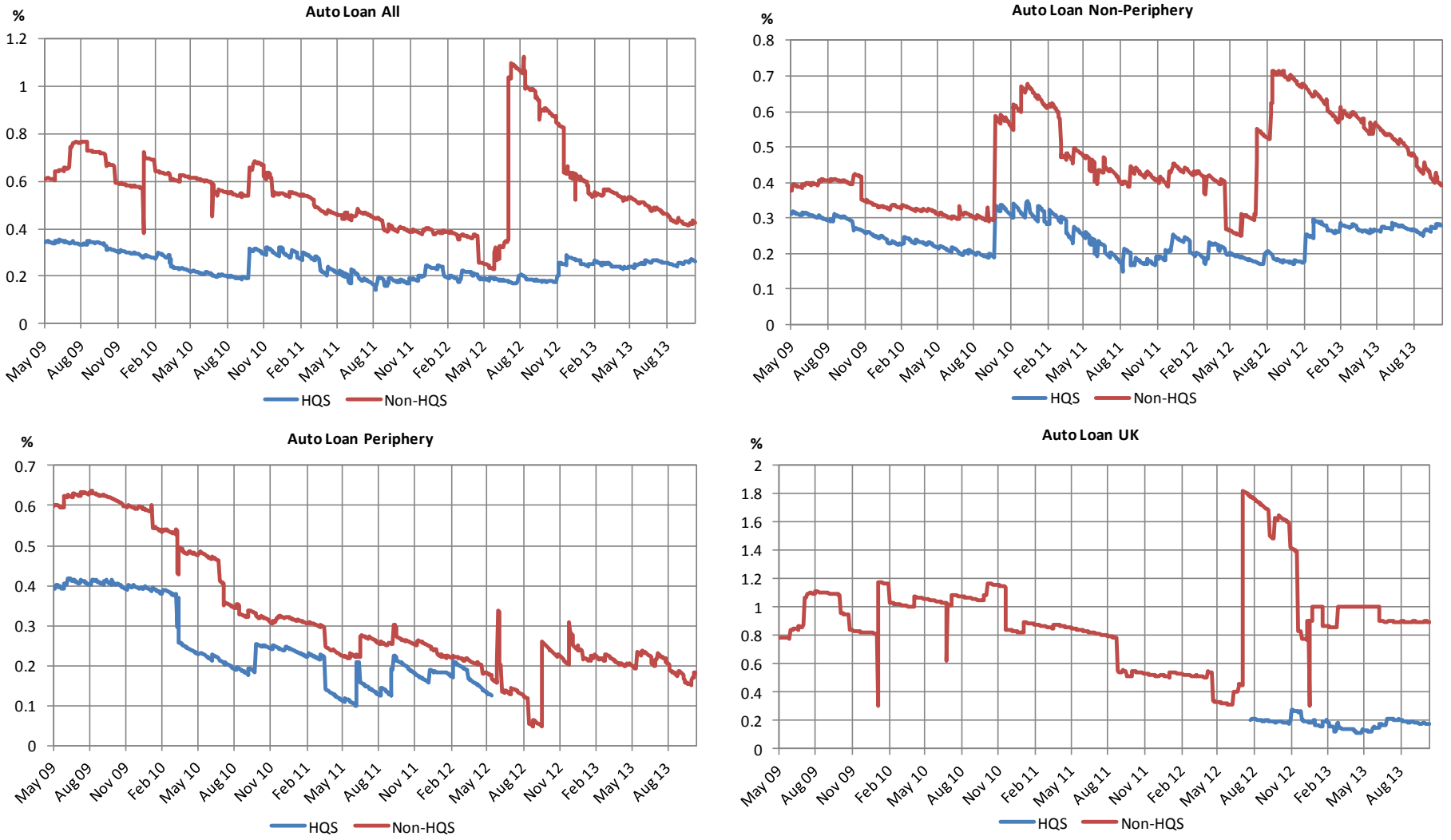
Notes: The plots display the evolution of average bid-ask spreads of both HQS and Non-HQS over time for all asset types in four different country-groupings: all countries, non-periphery countries, periphery countries and the UK. Individual security bid-ask spreads have been estimated by Standard & Poor's. The y-axis shows the average bid-ask spreads measured on a given date as a percentage of the bond's par value plotted against time (on the x-axis).

Figure 8: RMBS Bid-Ask Spreads



Notes: The volatility results displayed in this figure are calculated in the same way as in Figure 7, above. However, the results given here are for RMBS only.

Figure 9: Auto Loan ABS Bid-Ask Spreads



Notes: The volatility results displayed in this figure are calculated in the same way as in Figure 7, above. However, the results given here are for Auto-Loan ABS only.

Table 6: Bid-Ask Spread Summary

Bid-ask Spread

		HQS				Non-HQS			
		Mean	Avg SD	Avg 10% quantile	Avg 90% quantile	Mean	Avg SD	Avg 10% quantile	Avg 90% quantile
All asset types	All	0.916	0.839	0.131	2.013	1.211	1.186	0.231	2.66
	Non-periphery	0.533	0.531	0.103	1.165	0.927	0.892	0.229	1.82
	Periphery	1.518	0.816	0.352	2.342	1.352	1.068	0.314	2.76
	UK	0.859	0.841	0.158	1.703	1.254	1.232	0.191	3.08
RMBS	All	1.033	0.871	0.165	2.113	1.364	1.312	0.239	2.99
	Non-periphery	0.584	0.561	0.116	1.234	0.945	1.041	0.197	1.88
	Periphery	1.705	0.714	0.461	2.434	1.784	1.108	0.521	3.13
	UK	0.965	0.889	0.082	1.096	1.321	1.217	0.203	3.19
Auto Loan	All	0.244	0.131	0.070	0.317	0.560	0.347	0.130	0.95
	Non-periphery	0.243	0.128	0.055	0.241	0.456	0.277	0.028	0.24
	Periphery	0.251	0.115	-	-	0.321	0.116	0.006	0.04
	UK	0.180	0.064	-	-	0.914	0.156	-	-

Notes: The table displays key summary statistics for time series of bid-ask spreads by sub-class and by whether or not they qualify as HQS according to PCS's criteria. Time series for each sub-class are further divided by whether they belong to the non-periphery countries (Netherlands, Germany, Australia, France, Luxembourg, Belgium, Norway, Switzerland, Sweden, Austria), periphery countries (Italy, Ireland, Spain, and Portugal), the United Kingdom, or all countries (both periphery and non-periphery). For each aggregation, the mean bid-ask spread, average bid-ask spread standard deviation, and average 10% and 90% quantiles are displayed.

SECTION 6 – COMPARISONS WITH COVERED BONDS

It is interesting to compare the risk and liquidity properties of HQS exposures to those of Covered Bonds. Covered Bonds have been afforded favourable regulatory treatment by regulators, especially in Europe. The LCR eligibility rules proposed by the EBA (see European Banking Authority (2013)) suggest that some Covered Bonds are inferior in liquidity only to the most liquid sovereign issues and hence should be admitted to the 2a category for LCR purposes, while a wider set of covered bonds should be admitted to the 2b category. Among securitisations, according to the EBA's recommendations, only certain RMBS should be admitted to the 2b category. Similarly, the capital treatment of securitisations is inferior to that of Covered Bonds under both proposed Basel and Solvency II rules.

In Figure 10, we present volatility calculations averaged over individual securities, using the techniques described above, for AAA-rated HQS and Covered Bonds. The figure shows comparisons for all types of securitisation and Covered Bonds for (i) all European countries in our sample, (ii) non-periphery Eurozone countries (as defined above), (iii) periphery countries (Ireland, Spain, Portugal and Italy) and (iv) for the UK. Recall that by average volatility, we mean 10-day volatilities averaged over the individual securities in the category in question at a given date using a window of 125 daily data observations stretching up to that date.

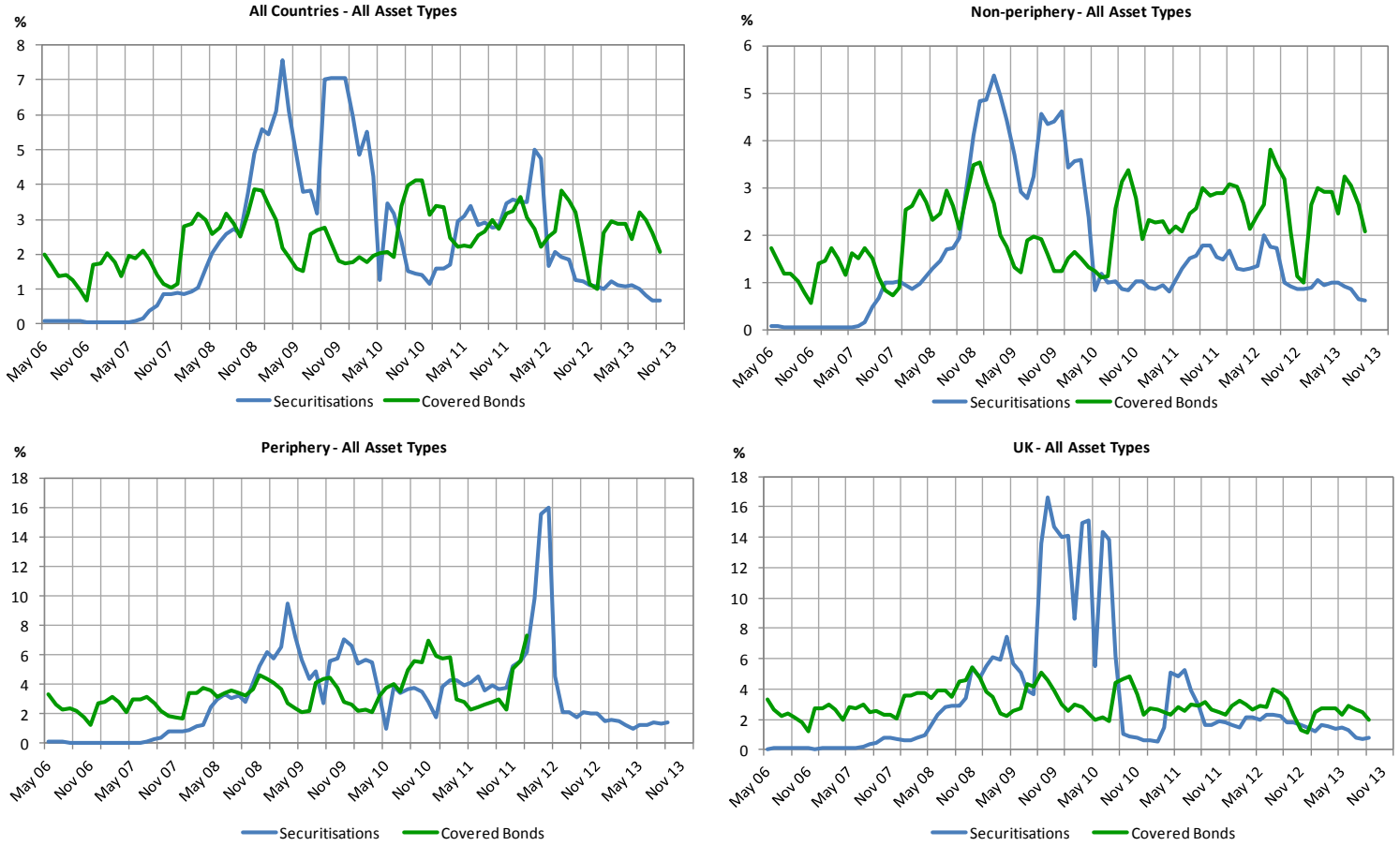
When all countries are considered together, the HQS volatilities are lower than those of Covered Bonds for much of the sample period. The exception is the early 2008-2009 phase of the crisis when securitisation volatilities were particularly high and sovereign bailouts of banks were still reasonably credible. The result is even clearer for non-periphery HQS securitisations and covered bonds where the covered bonds clearly exhibit higher volatility with the exception of the period November 2008 to May 2010. Similar results may be observed for the UK. The results for the periphery countries are, once again, affected by the fact that the HQS category consists of issues by distressed cajas.

Panel a) of Table 7 summarises the results of Figure 10 by presenting averages, over the sample period, of the mean volatilities. It is striking that the average volatilities for each of the geographical regions are lower than the corresponding volatility averages for Covered Bonds. This finding is in stark contrast to the favourable regulatory treatment that Covered Bonds receive in Europe.

Figure 11 presents comparisons of bid-ask spreads, averaged across AAA and AA rated individual securities, at given points in time. In the first half of the sample period, bid-ask spreads for HQS securitisation tranches were consistently higher than those for Covered Bonds. In 2011, spreads for the two asset classes became more comparable across the two asset classes, with Covered Bond bid-ask spreads actually being higher in non-periphery countries and the UK. In the latest period, securitisation spreads for non-periphery countries rose again for HQS tranches although they remained low and comparable to Covered Bond spreads in the UK. This has made Covered Bonds relatively more liquid again.[9]

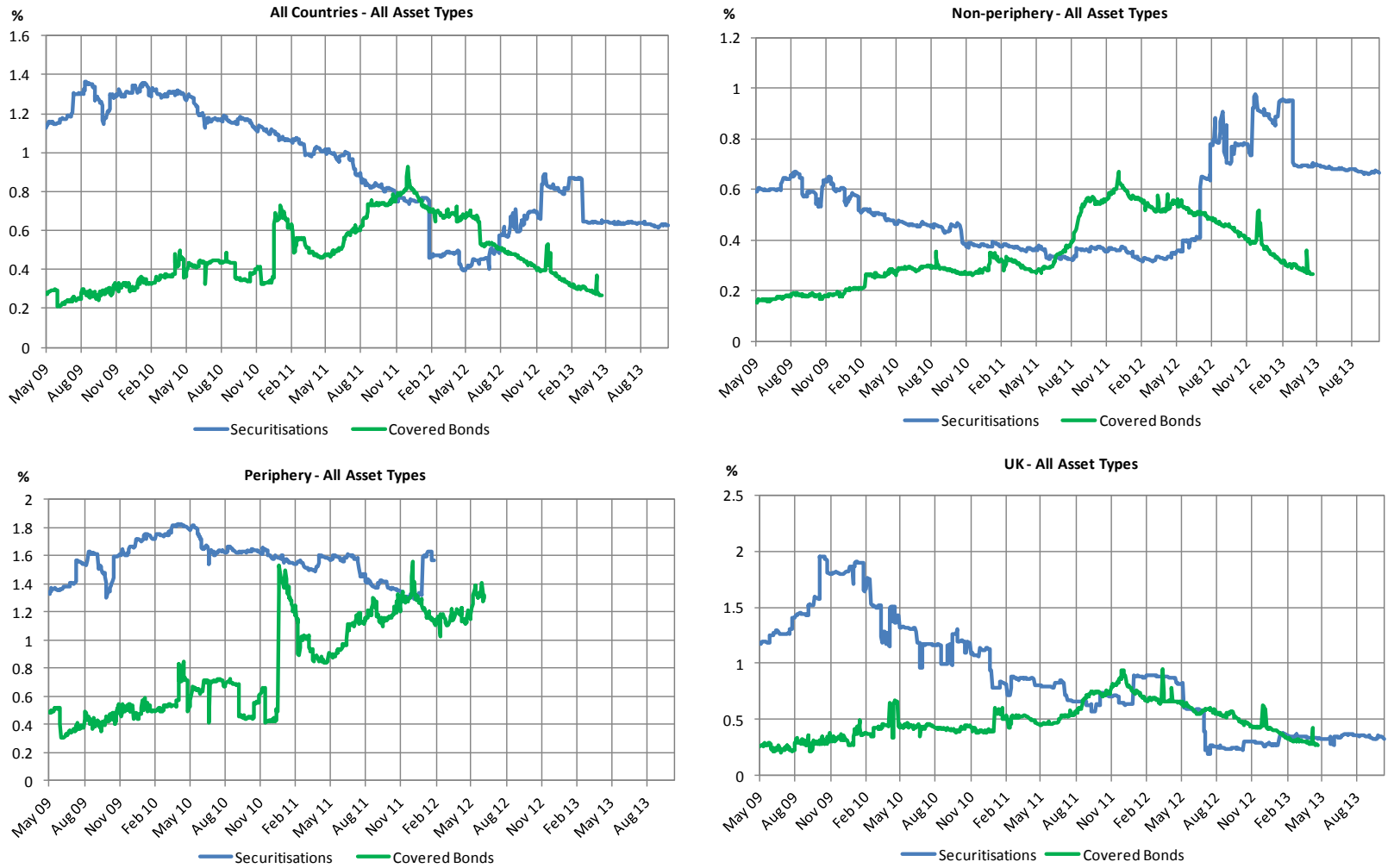
[9] It is worth noting that the increasingly favourable treatment provided by regulators to Covered Bonds compared to securitisations is likely to have affected their respective levels of liquidity.

Figure 10: Volatility Comparisons for HQS and Covered Bonds



Notes: The plots display the evolution of volatilities of both High Quality Securitisations and Covered Bonds over time for all asset types in four different country-groupings: all countries, non-periphery countries, periphery countries and the UK. Average volatilities are calculated as annual percentages using the methodology described in the previous section. The estimated volatility in each period is measured on an annualised basis in percent on the y-axis and this is plotted against time on the x-axis.

Figure 11: Bid-Ask Spread Comparisons for HQS and Covered Bonds



Notes: The figures above display the evolution of bid-ask spreads of both High Quality Securitisations and Covered Bonds over time for all asset types in four different country-groupings: all countries, non-periphery countries, periphery countries and the UK. Bid-ask spreads have been estimated by Standard & Poor's. The y-axis shows the bid-ask spreads measured as a percentage of the bond's par value plotted against time (on the x-axis).

Table 7: Comparisons of HQS and Covered Bonds

a) Volatility

		Securitisations				Covered Bonds			
		Mean Price	Avg Price SD	Avg Volatility	Avg Sample Size	Mean Price	Avg Price SD	Avg Volatility	Avg Sample Size
All Asset Types	All	97.33	4.01	2.37	147.27	101.49	5.65	2.43	547.11
	Non-periphery	98.27	2.15	1.57	66.93	102.45	5.39	2.12	397.24
	Periphery	96.15	4.37	3.20	45.28	97.42	4.60	3.36	111.15
	UK	98.42	3.87	3.33	35.06	100.29	4.17	2.97	38.73

b) Bid-ask spread: AAA only

	Securitisations				Covered Bonds			
	Mean	Avg SD	Avg 10% quantile	Avg 90% quantile	Mean	Avg SD	Avg 10% quantile	Avg 90% quantile
All	0.903	0.829	0.131	1.963	0.425	0.374	0.119	0.76
Non-periphery	0.533	0.531	0.103	1.165	0.336	0.227	0.110	0.60
Periphery	1.518	0.816	0.352	2.342	0.691	0.584	0.278	1.33
UK	0.859	0.841	0.158	1.703	0.458	0.316	0.213	0.67

c) Bid-ask spread: AA's and AAA

	Securitisations				Covered Bonds			
	Mean	Avg SD	Avg 10% quantile	Avg 90% quantile	Mean	Avg SD	Avg 10% quantile	Avg 90% quantile
All	0.916	0.839	0.131	2.013	0.454	0.417	0.119	0.84
Non-periphery	0.533	0.531	0.103	1.165	0.331	0.230	0.110	0.60
Periphery	1.518	0.816	0.352	2.342	0.784	0.608	0.325	1.48
UK	0.859	0.841	0.158	1.703	0.459	0.312	0.213	0.67

Notes: Panel a), above displays volatility results for both Securitisations and Covered Bonds in four country groups: All countries, non-periphery countries, periphery countries and the UK. For each asset type and each country we display the mean price, average price standard deviation, average volatility, and average sample size are displayed. Panels b) and c) display similar results for, respectively, the liquidities of both AAA only and both AA and AAA Securitisations and Covered Bonds in, again: all countries, non-periphery countries, periphery countries and the UK. For each asset type and each country we display the mean, average standard deviation, average volatility and average sample size.

Panels b) and c) of Table 7 present summaries of the results in Figure 11, specifically, time series averages of the mean bid-ask spreads shown in the figure. The mean bid-ask spreads for HQS tranches in Panel b) were 0.903 compared to 0.425 for Covered Bonds. The cross-sectional standard deviations of bid-ask spreads averaged over the sample period were 0.829 for HQS and 0.374 for Covered Bonds.

The most liquid assets within each asset class had bid-ask spreads below 0.131 for HQS and 0.119 for Covered Bonds measured by the time series averages of the 10% quantile of the bid-ask spreads. For the other geographical regions considered, non-periphery, periphery and UK, the 10% quantile bid-ask spreads were actually lower for HQS than for Covered Bonds suggesting that the more liquid HQS are more liquid than the more liquid Covered Bonds throughout the countries we consider except for periphery Eurozone countries.

CONCLUSIONS

What is the significance of the HQS results reported in this paper? European policy-makers face difficult problems of managing the economy while bank funding remains weak. They are therefore interested in ways of reviving secured funding markets if this can be done in a prudent manner, for example, by providing differentiated regulatory treatment of high quality securitisations.

The Basel proposals on securitisation capital (see BCBS (2012b) and (2013)) represent a very conservative tightening of capital standards, raising regulatory capital for securitised assets much above what would constitute neutrality with underlying pool capital[10] or indeed capital for comparable exposures like Covered Bonds or senior loans to Special Purpose Vehicles. At the same time, Basel proposals on the Liquidity Coverage Ratio eligibility (see BCBS (2012a)) are conservative on securitisations while surprisingly favourable to Covered Bonds.

The policy stance implicit in the Basel proposals may make sense in a US context where securitisations as an asset class have proved so risky and illiquid and where bank investors play a limited role as investors in securitisations[11]. However, such an approach makes less sense in Europe where much of the securitisation market performed well in the crisis (reflecting its different structure and practices), and where bank access to funding remains weak and banks have provided a major part of the buy side. Greater reliance on Covered Bonds by European banks is not a full solution as their use erodes the recovery value of a bank's un-secured liabilities including the implicit liability to the deposit insurance system.[12]

If one could show that, conditioning on rating, high quality securitisations, defined in an unambiguous way, possess markedly lower risk and better liquidity than other securitisation tranches, policy-makers could justify, within a prudent regulatory framework, less conservative capital and more accommodating LCR eligibility treatment for a segment of the market.

This paper aims to set out statistical evidence on the relative risk and liquidity of securitisation tranches distinguished on the basis of a High Quality Securitisation (HQS) definition. We show that, holding rating constant, an HQS definition based on asset class, seniority, size and a no-originate-to-distribute flag, adds substantial information in identifying less risky and more liquid securitisations. Our HQS definition is a simplified version of the more detailed and elaborate categorisation of high quality securitisation tranches employed in the industry-sponsored Prime Collateralised Securities label.

REFERENCES

Ashcraft, Adam and Til Schuermann, (2008) "The Seven Deadly Frictions of Subprime Mortgage Credit Securitization," *The Investment Professional*, Fall, 2-11.

Bank of England (2010) "Bank of England Market Notice: Information Transparency for ABS", Bank of England Market Notice, July, http://www.bankofengland.co.uk/markets/Documents/marketnotice100719a.pdf.

Bank of England (2012) "The Bank of England's Sterling Monetary Framework", Bank of England, January, http://www.bankofengland.co.uk/markets/Documents/money/publications/redbook.pdf.

[10] In response the industry has developed a parallel set of proposals for regulatory capital. This approach, built on a number of principles including capital neutrality (before prudent add-ons) is set out in a comprehensive series of papers: Duponcheele et al (2013a), (2013b), (2013c), (2013d), (2014a), (2014b), and (2014c).

[11] Non-bank investors are much more significant fraction of the buy side in the US market and the bulk of residential securitisation activity is channelled through government agencies.

[12] To place this comment in context, note that in the case of a much studied major bank failure, namely Continental Illinois, the recovery rate on total liabilities has been estimated at 95% (see Kaufman, 1994). One may wonder what would be the fractional recovery value on unsecured liabilities for major European banks with extensive Covered Bond programs.

Bank of England (2013a) "Sterling Monetary Framework: Summary of collateral eligible for the Bank's operations", Bank of England Summary Table, October, http://www.bankofengland.co.uk/markets/Documents/money/publications/summary_collateral.pdf.

Bank of England (2013b) "Sterling Monetary Framework: Level B Collateral Set", Bank of England Note, October, http://www.bankofengland.co.uk/markets/Documents/money/publications/levelbcollateral.pdf.

Bank of England (2013c) "Sterling Monetary Framework: Level C Collateral Set", Bank of England Note, October, http://www.bankofengland.co.uk/markets/Documents/money/publications/levelccollateralsecurities.pdf

Bank of England (2013d) "Sterling Monetary Framework: Summary of haircuts for securities eligible for the Bank's lending operations", Bank of England Summary Table, October, http://www.bankofengland.co.uk/markets/Documents/money/publications/summary_haircuts.pdf.

Brunnermeier, Markus (2009) "Deciphering the Liquidity and Credit Crunch 2007-08," *Journal of Economic Perspectives*, 23(1), Winter, pp. 77-100, https://www.princeton.edu/~markus/research/papers/liquidity_credit_crunch.pdf.

Caprio, Gerard, Aslı Demirgüç-Kunt and Edward J. Kane (2010) "The 2007 Meltdown in Structured Securitization: Searching for Lessons, not Scapegoats," *World Bank Research Observer*, 25(1), pp. 125-55.

Cochrane, John H., 1988, "How Big Is the Random Walk in GNP?", *Journal of Political Economy*, 893-920.

Draghi, Mario (2011) "Introductory Statement to the Press Conference (with Q&A)," European Central Bank Speech, 8th December, http://www.ecb.europa.eu/press/pressconf/2011/html/is111208.en.html.

Duponcheele, Georges, William Perraudin and Daniel Totouom-Tangho (2013a) "A Principles-Based Approach to Regulatory Capital for Securitisations," BNP-Paribas mimeo, April. http://www.riskcontrollimited.com/public/Regulatory_capital_for_securitisations.pdf.

Duponcheele, Georges, William Perraudin and Daniel Totouom-Tangho (2013a) "A Principles-Based Approach to Regulatory Capital for Securitisations," BNP-Paribas mimeo, April. http://www.riskcontrollimited.com/public/Regulatory_capital_for_securitisations.pdf.

Duponcheele, Georges, William Perraudin and Daniel Totouom-Tangho (2013c) "Maturity Effects in Securitisation Capital: Total Capital Levels and Dispersion Across Tranches," BNP-Paribas mimeo, September.http://www.riskcontrollimited.com/public/Maturity_Effects_in_Securitisation_Capital.pdf.

Duponcheele, Georges, William Perraudin, Alastair Pickett and Daniel Totouom-Tangho (2013d) "Granularity, Heterogeneity and Securitisation Capital," BNP-Paribas mimeo, September. http://www.riskcontrollimited.com/public/Granularity_Heterogeneity_and_Securitisation_Capital.pdf.

Duponcheele, Georges, William Perraudin and Daniel Totouom-Tangho (2014a) "Reducing the Reliance of Securitisation Capital on Agency Ratings," BNP-Paribas mimeo, February. http://www.riskcontrollimited.com/public/Reducing_the_Reliance.pdf.

Duponcheele, Georges, William Perraudin and Daniel Totouom-Tangho (2014b) "Calibration of the Simplified Supervisory Formula Approach," BNP-Paribas mimeo, March. http://www.riskcontrollimited.com/public/Calibration_of_SSFA.pdf.

Duponcheele, Georges, William Perraudin, Alexandre Linden and Daniel Totouom-Tangho (2014) "Calibration of the CMA and Regulatory Capital for Securitisations," BNP-Paribas mimeo, April. http://www.riskcontrollimited.com/public/Calibration_of_CMA.pdf.

Elul, Ronel, (2011) "Securitization and Mortgage Default," Working Paper 09-21R, Federal Reserve Bank of Philadelphia, May.

European Banking Authority (2013) "Report on appropriate uniform definitions of extremely high quality liquid assets (extremely HQLA) and high quality liquid assets (HQLA) and on operational requirements for liquid assets under Article 509(3) and (5) CRR", December, https://www.eba.europa.eu/documents/10180/16145/EBA+BS+2013+413+Report+on+definition+of+HQLA.pdf.

European Central Bank, (2011) "Guideline of the ECB of 20 September 2011 on monetary policy instruments and procedures of the Eurosystem (recast)", European Central Bank Guideline, (14), September, https://www.ecb.europa.eu/ecb/legal/pdf/l_33120111214en000100951.pdf.

European Central Bank, (2012) "Guideline of the ECB of 26 November 2012 amending Guideline ECB/2011/14 on monetary policy instruments and procedures of the Eurosystem" European Central Bank Guideline, (25), November, https://www.ecb.europa.eu/ecb/legal/pdf/l_34820121218en00300041.pdf.

European Central Bank (2013a) "Collateral Eligibility Requirements: A Comparative Study across Specific Frameworks", European Central Bank Study, July, http://www.ecb.europa.eu/pub/pdf/other/collateralframeworksen.pdf.

European Central Bank, (2013b) "Decision of the ECB of 26 September 2013 on additional temporary measures relating to Eurosystem refinancing operations and eligibility of collateral, European Central Bank Decision, (36), September, https://www.ecb.europa.eu/ecb/legal/pdf/l_30120131112en00130014_.pdf.

European Central Bank, (2013c) "Guideline of the ECB of 20 March 2013 on additional temporary measures relating to Eurosystem refinancing operations and eligibility of collateral and amending Guideline ECB/2007/9 (recast), European Central Bank Guideline, (4), March, https://www.ecb.europa.eu/ecb/legal/pdf/l_09520130405en00230030.pdf.

European Central Bank (2014) "Marketable Assets" [web page], https://www.ecb.europa.eu/mopo/assets/standards/marketable/html/index.en.html, [24/04/2014].

European Insurance and Occupational Pensions Authority (2013a) "Discussion Paper on Standard Formula Design and Calibration for Certain Long Term Investments", EIOPA Discussion Paper (163), April, available at: https://eiopa.europa.eu/consultations/consultation-papers/2013-closed-consultations/april-2013/discussion-paper-on-standard-formula-design-and-calibration-for-certain-long-term-investments/index.html?no_cache=1&cid=5670&did=30663&sechash=728402e0.

European Insurance and Occupational Pensions Authority (2013b) "Technical Report on Standard Formula Design and Calibration for Certain Long-Term Investments", EIOPA Technical Report (513, December, available at: http://eiopa.europa.eu/fileadmin/tx_dam/files/publications/reports/EIOPA_Technical_Report_on_Standard_Formula_Design_and_Calibration_for_certain_Long-Term_Investments__2_.pdf.

Federal Reserve (2014a) "Federal Reserve Collateral Guidelines", Federal Reserve Guideline, http://www.frbdiscountwindow.org/frcollguidelines.pdf.

Federal Reserve (2014b) "Federal Reserve Discount Window & Payment System Risk Collateral Margins Table", Federal Reserve Summary Table, January, http://www.frbdiscountwindow.org/frcollguidelines.pdf, [24/04/2014].

Kaufman, George (1994) "Bank Contagion: A Review of the Theory and Evidence," Journal of Financial Services Research, April, pp. 123–50.

Keys, Benjamin, T. Mukherjee, A. Seru and V. Vig, (2010) "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans," *The Quarterly Journal of Economics*, February.

Kiesel, Rüdiger, William Perraudin, and Alex Taylor (2003) "The Structure of Credit Risk," *Journal of Risk*..

Kiesel, Rüdiger, William Perraudin, and Alex Taylor (2001) "Estimating Volatility for Long Holding Periods," in Measuring Risk in Complex Stochastic Systems edited by Jurgen Franke, Wolfgang Hardle and Gerhard Stahl, Springer Lecture Notes in Statistics 147, Springer Verlag, New York.

Mian, Atif and Amir Sufi (2009) "The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis," *Quarterly Journal of Economics*, 124(4), pp. 1449-1496.

Prime Collateralised Securities, info@pcsmarket.org (2013) "EIOPA/13/163: Discussion Paper on Standard Formula Design and Calibration for Certain Long-Term Investments" [email] Message to European Insurance and Occupational Pensions Authority (LTI@eiopa.europa.eu). Sent 28th May 2013. Available at: http://pcsmarket.org/wp-content/uploads/2013/05/PCS-Response-to-EIOPA-consultation.pdf. Accessed on: 4th April 2014.

Perraudin, William (2014) "Covered Bond versus ABS Liquidity: A Comment on the EBA's Proposed HQLA Definition," Risk Control Limited Research Paper, 17, January, http://www.afme.eu/WorkArea/DownloadAsset.aspx?id=10360.

Prime Collateralised Securities (2014) "Prime Collateralised Securities: Rulebook", 6th Edition, January, http://pcsmarket.org/download-popup?file=/uploads/2014/01/PCS-Rule-Book2.pdf.

Standard & Poor's (2013) "Transition Study: Six Years On, Only 1.5% of European Structured Finance Has Defaulted", S&P Capital IQ, December, https://www.globalcreditportal.com/ratingsdirect/renderArticle.do?articleId=1224833&SctArtId=218785&from=CM&nsl_code=LIME.

Standard & Poor's (2014) "EIOPA's Revised Solvency II Calibration Still Risks Turning European Insurers Away From Securitizations", Standard and Poor's Structured Finance Research, March.

Wang, Yihui and Han Xia (2014) "Do Lenders Still Monitor When They Can Securitize Loans?" *Review of Financial Studies*, 27(4).

APPENDIX – CENTRAL BANK COLLATERAL FRAMEWORKS

Table A1: Additional Requirements of Central

	Securitisations eligible as collateral denoted:	Haircuts/ Margins	Currency	Issuance/Geographic Requirements
Eurosystem Standard Collateral Framework	Marketable Assets Eligible for use as collateral in Eurosystem Credit Operations	10% (although may be subject to additional haircuts). If asset is rated BBB, and fulfils all other criteria, then a 22% haircut is applicable instead.	EUR. If asset fulfils the BBB criteria, then GBP, JPY, and USD are also permissible.	*Place of issue:* EEA; *Type of issuer/debtor/guarantor:* central banks, public sector, private sector, and international and supernational institutions; *Place of establishment of:* issuer - EEA (or non-EEA G10) countries, debtor - EEA, guarantor - EEA. *Acceptable Markets*: regulated markets (or non-regulated markets accepted by the ECB), *Place of Settlement*: Euro Area.
Bank of England	Level A Collateral	N/A	N/A	N/A
	Level B Collateral (previously denoted 'Wider collateral').	*Yes:* Haircuts depend on asset class and maturity.	GBP, EUR, USD, AUD, CAD, SEK and CHF.	*Place of issue:* EEA, UK, US (some restrictions may apply). Participant originated assets not allowed.
	Level C Collateral	*Yes:* Haircuts depend on asset class and maturity.	GBP, EUR, USD, AUD, CAD, SEK and CHF.	*Place of issue:* EEA, UK, US (some restrictions may apply)
Federal Reserve	Discount Window Eligible Collateral.	Margins, based on asset class and duration, are applied to the FRB's internal fair market.[1]	USD, JPY, EUR, AUD, CAD, GBP, DKK, CHF and SEK.	

Sources: Bank of England Collateral Framework Sources: Bank of England (2010, 2013a, 2013b, and 2013c); Eurosystem Standard Collateral Framework Sources: European Central Bank, (2011, 2012, 2013a, 2013b, 2014); and Federal Reserve Discount Window Sources: Federal Reserve (2014a).

1. The Federal Reserve seeks to value all pledged collateral at internal fair market value estimate (IFMVE). Margins are applied to Feds IFMVE based on risk characteristics of pledged asset and anticipated volatility of IFMVE over estimated liquidation period. Securities typically valued using external vendors' prices. Eligible securities for which a vendor price cannot readily be obtained will be assigned an internally modelled price. Margins for securities are estimated using a Value-at-Risk analysis which develops margins from historical price volatility of asses within each collateral category. Securities margins are assigned based on asset type and duration. Any security not assigned a price by an external vendor receives the lowest margin for that asset type.

Table A2: Federal Reserve Discount Window & Payment System Risk Collateral Margins

Collateral Category[1]	**Rating/Type**	**Margins for Securities** (% of market value or internal fair market value estimate)[2]		
		Duration Buckets		
		0-5	**>5-10**	**>10**
Asset Backed Securities	AAA	98%	95%	83%
	BBB-AA	89%	86%	82%
Collateralised Debt Obligations	AAA	92%	91%	90%
Commercial Mortgage Backed Securities	AAA	97%	93%	92%
Agency Backed Mortgages[3] - Pass Throughs		98%	96%	95%
Agency Backed Mortgages[3] - CMOs		98%	96%	90%
Private Label CMOs - AAA rated	AAA	90%	84%	83%
Term Deposit Facility - Term Deposits		100%		
Certificates of Deposit, Bankers' Acceptances, Commercial Paper, ABCP		97%		

Notes: Sources: Federal Reserve (2014b)

1. Obligations of the pledging depository institution are not eligible collateral
2. Eligible securities for which a third party price is not available are assigned an internally modelled value. The margin for the >10 duration bucket is applied to such securities.
3. Includes structured Guaranteed Notes issued by the FDIC or NCUA which may be backed by loans, RMBS, CMBS, or ABS.

Table A3: Eligible Collateral High Level Summary Table

	Intraday Liquidity	**Operational Standing Facilities**	**Short-Term Repo**	**Indexed Long-Term Repo**	**Discount Window Facility**	**Contingent Term repo Facility**
Level A (e.g. highly liquid high-quality sovereign debt)	✓	✓	✓	✓	✓	✓
Level B (e.g. liquid high quality sovereign supranational, mortgage and corporate bonds)	×	×	×	✓	✓	✓
Level C (e.g., less liquid securitisations, own-name securities and portfolios of loans)	×	×	×	✓	✓	✓

Notes: Sources: Bank of England (2013d)

Table A4: Summary of Securitisations Eligible as collateral for the Bank of England's Operations

Collateral	Level A	Level B	Level C		Haircuts: Fixed						
				Haircuts Floating	<1 yr	1-3 yrs	3-5 yrs	5-10 yrs	10-20 yrs	20-30 yrs	>30 yrs
UK and EEA RMBS	No	Yes (only the most senior tranches of prime UK ad Dutch of the highest credit quality broadly equivalent to AAA).	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	12	12	14	15	17	19	22	24
UK, US ad EEA ABS backed by credit cards	No	Yes (the most senior tranches of the highest credit quality, broadly equivalent to AAA and must be prime).	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	15	15	17	18	20	22	25	27
UK, US and EEA ABS backed by Auto-Loans and certain equipment leases	No	Yes (the most senior tranches of the highest credit quality, broadly equivalent to AAA and must be prime).	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	15	15	17	18	20	22	25	27
US ABS backed by student loans and consumer loans	No	Yes (the most senior tranches of the highest credit quality, broadly equivalent to AAA and must be prime).	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	15	15	17	18	20	22	25	27
UK and EEA ABS backed by student loans and consumer loans	No	No	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	15	15	17	18	20	22	25	27
UK, US and EEA CMBS. Securities containing construction loans will not be eligible. The pool must be diversified.	No	No	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	25	25	27	28	30	32	35	37
UK, US and EEA covered bonds or ABS backed by certain export credit agency guarantee loans. These will be subject to individual review.	No	No	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above)	3	3	5	6	8	10	13	15
UK, US and EEA securitised portfolios of senior secured or on balance sheet corporate loans or SME loans. Leveraged loans are not permitted.		No	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above and must be a diversified pool).	20	20	22	23	25	27	30	32
UK, US and EEA securitised portfolios of corporate bonds. Portfolios containing high-yield bonds are not permitted.	No	No	Yes (the most senior tranches, of credit quality broadly equivalent to A3/A- or above and must be a diversified pool).	20	20	22	23	25	27	30	32
Some types off UK, US and EEA ABCP of credit quality broadly equivalent to a short term rating of A-1+/P1/F1+. Only the most senior paper will be accepted and the eligibility of individual programmes must be agreed with the bank. Underlying assets must be of a type that is eligible for the operation.	No	No	Yes	From 12-30 percentage points depending on the underlying asset classes and the diversification of the pool.							

Notes: Sources: Bank of England (2012 and 2013d). Additional notes: 6pp is added to haircuts to allow for currency volatility when securities are non-sterling denominated. An additional 2ppt is added to JPY, AUD and NZD denominated securities to allow for higher exchange rate volatility. 5pp is added to eligible collateral for which no market price is observable. For the discount window facility a haircut add-on of 5 percentage points is applied to own-name eligible RMBS, CMBS, ABS and portfolios of corporate bonds. A haircut add-on may be applied to portfolios of corporate bonds that are not well diversified where the largest single bond concentration by market value exceeds 2% of the total market value of corporate bonds delivered. Note on calculation: adjusted collateral value (post-haircut) = collateral value * (100 – haircut)