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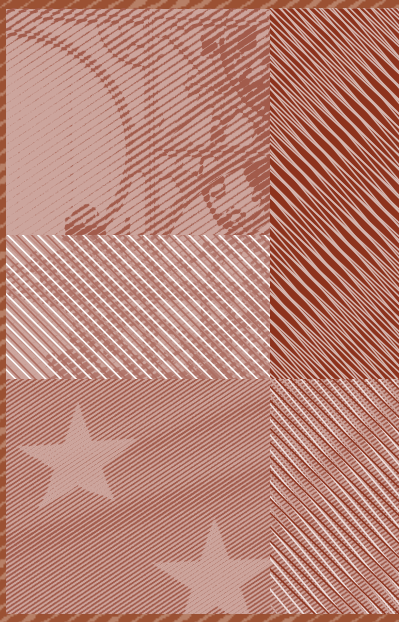

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PRUDENTIAL FILTERS, PORTFOLIO COMPOSITION AND CAPITAL RATIOS IN EUROPEAN BANKS [*]

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Abstract

European banks hold 10% of their total assets in portfolios that give rise to unrealised gains and losses which under Basel III will no longer be allowed to be removed from banks' regulatory capital. Using a sample of European banks, and taking advantage of the different treatment afforded, under Basel II, to such gains and losses among jurisdictions and instruments and over time, we find evidence that: a) the inclusion of unrealised gains and losses in capital ratios increases their volatility; b) the partial inclusion of unrealised gains and total inclusion of losses on fixed-income securities in regulatory capital, compared with the complete exclusion of both (neutralisation), reduces the volume of securities categorised as Available For Sale (AFS), thus potentially affecting liquidity management and demand for bonds (most of which are currently government bonds); and c) the higher the partial inclusion of gains from debt instruments, the lower the holdings of such instruments in the AFS category and the higher the regulatory Tier 1 capital ratio, thus affecting banks' capital buffer strategy. We do not find evidence that the removal of neutralisation would impact capital ratios.

Keywords: prudential regulation, regulatory capital, fair value accounting, prudential filters.

JEL Classification: G21, M41.

Resumen

El 10 % de los activos totales de los bancos europeos se encuentra en carteras que generan ganancias y pérdidas no realizadas que bajo Basilea III dejarán de poder ser eliminadas del capital regulatorio de los bancos. Utilizando una muestra de bancos europeos, y aprovechando la heterogeneidad que bajo Basilea II se da al tratamiento de las ganancias y pérdidas entre jurisdicciones, entre los instrumentos financieros que las generan y a lo largo del tiempo, encontramos evidencia de que: a) la inclusión de las ganancias y pérdidas no realizadas en las ratios de capital aumenta su volatilidad; b) la admisión parcial de las ganancias no realizadas junto con la inclusión de todas las pérdidas asociadas a valores de renta fija en el capital regulatorio reduce el volumen de los títulos clasificados como disponibles para la venta (AFS), en relación con la situación de exclusión completa de ambos (neutralización). Por lo tanto, el tratamiento de la deuda potencialmente afecta a la gestión de la liquidez y a la demanda de bonos (la mayoría de los cuales es actualmente deuda pública); c) cuanto mayor sea la proporción de las ganancias no realizadas derivadas de instrumentos de deuda incluidas en el capital, menor será la tenencia de dichos instrumentos en la categoría AFS y mayor será la ratio de capital *Tier1,* por lo que su tratamiento también afecta a la estrategia de los bancos sobre colchones de capital. No encontramos evidencia de que la desaparición de la neutralización pueda afectar a las ratios de capital.

Palabras clave: regulación prudencial, capital regulatorio, contabilidad a valor razonable, filtros prudenciales.

Códigos JEL: G21, M41.

1 Introduction

According to Basel II regulation, it was possible to remove from banks' regulatory capital unrealised gains or losses recognised on the balance sheet as "*other comprehensive income"* (OCI) through the application of a so called Prudential Filter. The main objective of these adjustments was to reduce a source of volatility and uncertainty, arising from the changes in the fair value of banks' securities portfolio (Chisnall, 2000; Allen and Carletti, 2008; Heaton et al., 2010), so as to preserve some of the characteristics of regulatory capital desired by supervisors in terms of quality[1].

However, the crisis has generated a debate on whether prudential filters have been an obstacle to the early identification of problems (Laux, 2012). Filters allow for some losses not to be recognised in the income statement, thus generating overstated balances in a crisis that can lead banks to take riskier positions as regulatory capital appears to be sufficient. The inclusion of unrealised gains and losses, whether or not they are temporary, may introduce bank regulatory discipline, as it acknowledges the underlying position.

Under Basel III this filter would no longer be available, which justifies the focus of the proposed analysis. The relevance of this change will depend on the amount of such gains and losses that are to be removed, the majority of which correspond to those arising from Available for Sale (AFS) securities, i.e. securities that are bought with the intention of not actively trading with them.

On average, 10% of total assets of European banks are held in portfolios that give rise to such gains and losses, while for most jurisdictions, the largest amount of AFS securities (around 80%) are debt securities. As the EU Capital Requirements Regulation is aligned with the Basel III proposal, with the final treatment that unrealised gains are to receive still under discussion, the potential impact of the new approach in EU banks can be rather large.

US and European banks have claimed that the removal of such filters would be associated with higher capital volatility, and that the greater uncertainty associated to an unfiltered approach would give rise to larger capital buffers and lower holdings of liquid assets (ABA et al. 2012, EBF, 2012). However, such effects would not preclude the desired regulatory objective of increased transparency and risk sensitivity in the face of liquidity shocks[2]. Moreover, capital ratios would move with the cycle, increasing in booms and falling in recessions, thus potentially affecting financial stability.

The purpose of this study is to provide empirical evidence on banks' claims. In particular it aims at analysing the impact of prudential filters on the relative size of the AFS portfolio and on regulatory capital, using data of European banks from 2005 to 2013. It focuses on the impact of the different prudential filters for unrealized fair value gains and losses of AFS assets, using publicly available data on prudential filters and banks' financial accounts. This project tries to provide evidence on whether banks' behaviour is consistent

1. Regulatory capital is expected to be permanent, readily available to absorb losses, reliable, and indisputable as to its amount. See BCBS (2015) for a literature review of the interplay of accounting and regulation and its impact on bank behavior.

2. See EBA (2013) for a discussion of the arguments in favour and against the introduction of a prudential filter for unrealised gains.

with addressing regulatory risk and in particular with the search for more stable regulatory capital. If this were the case, the Basel III proposal to remove the filter would affect capital and liquidity management.

First, we investigate whether the inclusion of unrealised gains and losses arising from fair value instruments increases the volatility of capital. We could expect large movements in capital under turbulent financial markets if there are no filters, which could give rise to costly changes in banks' investment and risk management behaviour.

Second, we test whether European banks have different portfolio composition when they face different prudential filters. We analyse the relationship between portfolio composition and the treatment of unrealised gains and losses applied in European jurisdictions during the period 2005-2013. To carry out the empirical analysis, we take advantage of the heterogeneity of treatment in the different jurisdictions and in relation to different financial instruments and the changes that have been implemented in such treatment.

And finally, we examine whether regulatory capital is affected by the type and amount of the prudential filters, under the assumption that regulatory risk increases with the absence of these filters. As far as banks try to minimise the probability of breaching minimum regulatory ratios we can expect different actual capital ratios under different prudential frameworks, even taking into account the counterbalancing effect of the economic cycle.

We gather evidence that the implementation of Basel III in relation to filtering may have an effect on capital buffers and investment decisions. In particular, we find evidence that a) if the AFS filter had been removed from capital during the period 2005 to 2013, so that unrealised gains and losses would have been fully recognised in capital, the changes in capital ratios would have been much larger than those actually observed; b) if unrealised gains and losses from fixed income securities are not admitted in regulatory capital (neutralised), banks hold a higher proportion of AFS assets in relation to securities valued at fair value than if losses are recognised and gains are fully, partially or not recognised at all; c) the proportion of gains from debt instruments that are allowed to be recognised in regulatory capital when losses are fully recognised reduces the weight of AFS debt on total assets at fair value; d) the regulatory capital ratios of banks subject to debt neutralisation, when controlling for other determinants, are lower than the ratios for banks that are subject to an asymmetric filter, but the difference is not statistically significant and e) observed regulatory capital ratios are higher, the larger the proportion of unrealised gains from debt allowed to be recognised as own funds, after taking into account the economic cycle.

We conclude that the removal of the filters will be accompanied by increased capital volatility which will result in changes in banks' investment and capital strategy. On the one hand, we will observe a decline in AFS holdings of debt instruments by banks. As far as a high proportion of these instruments are government bonds, a contraction of trading in these markets could result. As a higher proportion of assets would be classified in other categories such as Held for Trading or Held to Maturity, liquidity management would become more costly. On the other hand, banks would be willing to hold higher capital buffers which would either require raising additional capital or reducing risk weighted assets, thus possibly affecting lending decisions.

Our research is linked to the literature that has been devoted to analyse whether banks use financial reporting discretion to circumvent capital adequacy requirements or to

smooth earnings. In particular, it is related to the analysis of the reporting on gains and losses on asset sales as an accounting choice. To our knowledge, it is the first study that analyses banks reaction to prudential filters using European bank data. The paper also contributes to the field of research that focuses on the interaction of fair value accounting and capital regulation (Laux and Leuz 2009).

Several studies, centered on the USA experience, do not find conclusive evidence of a significant association between regulatory capital and gains and losses on securities sales (Beatty et al. (1995), or Collins et al. (1995)), while other studies find evidence consistent with banks using realised securities gains and losses to increase regulatory capital (Moyer (1990)) or to smooth it (Barth et al. 2014).

As for the impact of regulation and accounting on portfolio composition, Chircop and Novotny-Farkas (2014), with data for the USA, conclude that AFS holdings would decline with the removal of the Accumulated Other Comprehensive Income (AOCI) filter. The studies that analyse banks' reaction to the adoption of the Statement of Financial Accounting Standards Number 115 (SFAS 115) in the US in 1993, by which equity accounts had to be adjusted to reflect changes in securities at fair value, show that banks classify less securities as AFS if unrealised gains and losses on these securities directly affect regulatory capital (Beatty (1995) and Hodder et al (2002)). Empirical evidence has also been gathered on the reaction of banks to the option to abandon fair value recognition for selected financial assets that was granted in October 2008 (amendment to IAS 39). In particular, the analysis presented in Bischoff et al. 2011, with US data, supports the hypothesis that the less restrictive the prudential filter for unrealised gains from AFS assets is, the greater the incentive to use the reclassification option when a bank expects a decrease in the fair value of the AFS asset. With European data, Fiechter (2011) finds that banks used such reclassification to improve their key financial indicators.

The remainder of the paper is structured as follows. In Section 2 we present a summary description of the current regulatory and accounting treatment of financial assets that are classified as AFS. Section 3 discusses the analytical framework and Section 4 the empirical strategy. Section 5 is devoted to the results on capital volatility while Section 6 and 7 present the results on the impact of the neutralisation and the asymmetric filter, respectively. Section 8 presents some robustness checks and Section 9 concludes. The Annex contains a Table with country data.

2 Treatment of financial assets and regulatory capital

Assets that are categorised as available for sale (AFS), so that banks do not have the intention of actively trading with them, but that can be sold as desired, are required to be measured at fair value[3]. Changes in such fair value are to be recorded as gain or loss in a separate component of shareholders' equity called "Accumulated Other Comprehensive Income". From a prudential regulation perspective accumulated unrealised gains and losses from AFS assets may be subject to filtering for prudential purposes, with major differences across countries on the type of filter applied. That is, such unrealised gains or losses do not need to be fully reflected in regulatory capital.

CEBS Guidelines on Prudential Filters for Regulatory Purposes issued in December 2004[4] were to be applied in European member states on a best effort basis by national supervisors. The Guidelines established that fair value changes for the AFS financial instruments, should receive a differentiated treatment that would depend on the type of financial instruments, and on whether it was a loss or a gain. In particular, for equity instruments, unrealised losses would be fully subtracted from capital and unrealised gains added at least partly in Tier2 capital (See Table 1). The part that had to be added was at least the tax effect. So that equity instruments were subject to a so-called asymmetric approach. Other AFS financial instruments, mostly debt instruments or financial instruments subject to interest rate risk had to be treated as either equity or follow the "neutralization" approach, by which neither unrealised gains nor losses were to be recognised in regulatory capital.

So, if the guidance was followed the main differences across jurisdictions would arise in a) the treatment of debt instruments (whether the jurisdiction applied the treatment for equity or the neutralisation one); b) the haircut to be applied on unrealised gains recognised in Tier2 capital and c) whether such haircut would be the same for equity than for debt instruments[5]. So, differences in filters applied in different jurisdictions could be rather large. We take advantage of such heterogeneity to carry out the analysis.

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3. Held for Trading (HFT) instruments, which are held for trading purpose, are also measured at fair value and their value changes are recognized in the Profit and Loss account. Held to maturity (HTM) securities which are bought with the intention of retaining them until the maturity date are measured at amortised cost. If instruments classified as HTM are sold, the bank is penalised.

4. CEBS Guidelines covered also cash flow hedge reserve; own credit risk; AFS equities, loans and receivables, other AFS assets; own used and investment properties. CEBS/04/91; https://www.eba.europa.eu/regulation-and-policy/own-funds/guidelines-on-on-prudential-filters-for-regulatory-capital.

5. Another difference is the choice between the portfolio-approach that aggregates all unrealised gains, versus the item by item approach, which is not analysed in this study. Moreover, CEBS Report (CEBS, 2007) showed that differences in implementation also resulted from whether a pre or a post tax approach had been followed. We normalize the data with expost treatment

TABLE 1. PRUDENTIAL FILTERS IN EUROPEAN COUNTRIES: INCLUSION OF UNREALISED GAINS AND LOSSES FROM AFS ASSETS IN REGULATORY CAPITAL

TYPE OF FILTER	INCLUDED IN REGULATORY CAPITAL: unrealised losses	INCLUDED IN REGULATORY CAPITAL: unrealised gains
	from AFS debt	
neutralisation	NO	NO
	from AFS debt/equity	
asymmetric	YES	NO/ONLY PARTIALLY
Basel III proposal: no filter	YES	YES

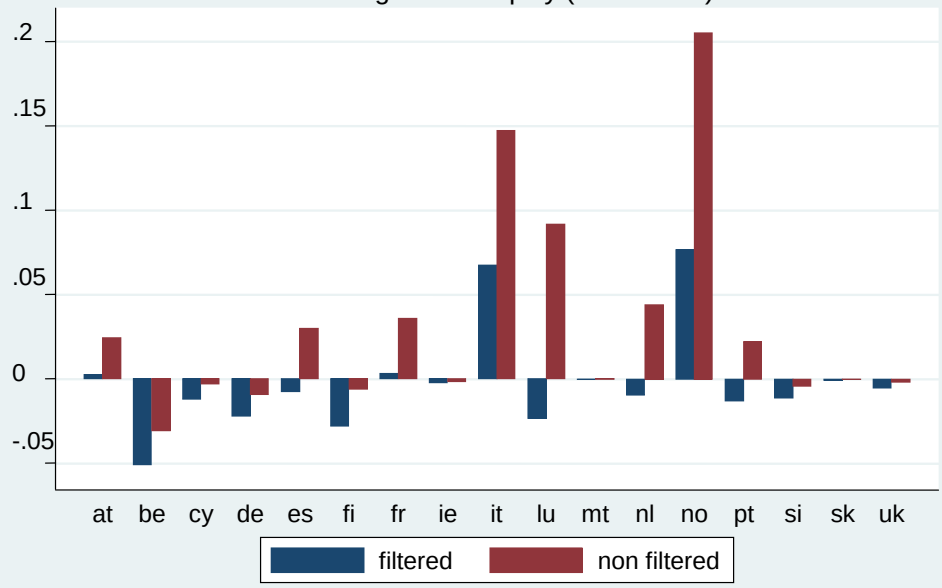
The potential relevance that the actual application of filters may have on observed capital can be captured by proxying the weight that net unrealised gains on AFS assets may have on capital ratios. Graphs 1 and 2 compare for debt and equity the average addition or subtraction to the capital ratio the filtered and the non filtered approach would have implied, *ceteris paribus,* in the period 2005-2013 by country, for those banks for which such information is available.

We observe that net unrealised gains on debt (Graph 1) have a larger impact on banks' capital than net unrealised gains on equity (Graph 2) when averaging the effect on banks by countries, because of the weight that the former have on assets. The additional capital arising from net unrealised gains from debt if there had not been any filters, would have not exceeded 0.8 percentage points on a country average, while the subtraction of losses would have not been larger than 2 percentage points. However, on an individual bank basis these figures are much larger, as they could account for declines up to 12.5 percentage points or increases up to 5.9 percentage points in the case of all net unrealised gains in AFS debt assets being transferred to capital.

The impact on capital through equity net gains is much smaller, just going above 0.20 points as additions and not surpassing -0.5 for subtractions in terms of country average. As before, individual bank data show that the impact is much larger, with reductions of 1.7 percentage points or increases up to 4.8 percentage points when considering all unrealised gains and losses arising from AFS equity. Banks in 12 out of the 17 countries included in the sample have experienced on average declines in their capital ratios as a result of their holding of AFS equity in their portfolio. Such figure would reduce to 8 if there had been no filters, as more unrealised gains would have been allowed to be included.

Graph 1. Average additional/less capital ratio arising from treatment of unrealised gains on debt (2005-2013) in %

Graph 2. Average additional/less capital ratio arising from treatment of unrealised gains on equity (2005-2013) in %



3 Analytical framework

We assume that banks have the objective of minimising regulatory risk arising from capital fluctuations, thus minimising regulatory capital compliance cost[6].

We have argued that the lack of filters introduces higher volatility in regulatory capital than under a filtered environment, which banks, wishing to minimise regulatory risk, will try to counterbalance. We assume that banks facing the risk of not meeting minimum capital requirements because of such additional volatility can react in two ways. On the one hand, they may hold a larger buffer over regulatory capital requirements so as to reduce the probability of hitting such minimum in spite of incurring larger capital fluctuations. On the other, they may reorganise their portfolio to stabilise their capital, thus reducing their holdings of instruments generating or contributing to capital volatility. In the latter case, we could expect that the existence and intensity of filters could affect the total volume of instruments generating gains or losses that can be subject to filtering that banks are willing to hold in their portfolio. We postulate that, in general, we would observe that in those jurisdictions without filters, the weight of financial instruments potentially generating gains and losses that can be filtered is less than in those jurisdictions where such filters exist. We also postulate that we will observe larger capital buffers in jurisdictions without filters, except if the procyclical effect of gains and losses counterbalances such reaction[7]. We could observe either or both of such reactions.

We propose analysing the differential effect of, on the one hand, being subject to an asymmetric framework in relation to being subject to the so called “neutralisation” approach and, on the other hand, of being subject to an asymmetric approach in relation to a non-filtered framework. Table 2 summarises the expected effects on the proportion of AFS instruments in the portfolio and on the regulatory capital ratio of changing from an asymmetric treatment to a neutralization framework and to a non-filtered approach in the first row and from neutralization to a non filtered framework in the second row.

As for the first comparison, and as far as AFS holdings do provide a net benefit, in terms of liquidity management and as a hedging instrument, we would expect higher securities classified as AFS in banks that are subject to a neutralisation approach than in banks that are subject to asymmetric treatment. Under neutralisation, banks may capture all the benefits arising from AFS holdings without having to face its costs, in terms of regulatory risk. Moreover, as under an asymmetrical approach, unrealised losses are systematically translated into less regulatory capital, while unrealised gains are not, we can expect larger buffers in banks subject to such filters than in banks operating under a neutralization approach. A neutralisation approach minimizes or eliminates the pro-cyclical impact of accounting on bank capital regulation, and isolates capital from valuation fluctuations, thus reducing the incentives to hold a larger capital buffer and effectively reducing regulatory risk.

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6. Models that postulate that banks try to maximise the return on equity to satisfy their investors do not predict any capital buffer, even in the face of increased capital volatility (Adrian and Shin,2010). Banks would be expected to operate at the capital requirement level. The short term focus would also support banks' taking higher risk in the face of higher volatility, thus increasing their holdings of assets that give rise to higher variation when filters are removed. Under such an approach, high returns can be appropriated by bank managers and shareholders in the form of extra profits, while very low returns cause insolvency and consequently losses either for depositors or deposit insurance agencies.(Suárez,1998)

7. Thus, following the Basel III proposal of removing filters on unrealised gains and losses of financial assets measured at fair value would result in less AFS and/or more HTM instruments and higher capital ratios.

Therefore, we can expect that banks that are subject to neutralisation will show higher AFS debt holdings and lower capital ratios than banks operating in jurisdictions that apply an asymmetric treatment to unrealised gains and losses (upper left end of Table 2).

TABLE 2. EXPECTED EFFECT ON CAPITAL AND PORTFOLIO COMPOSITION WHEN CHANGING THE TYPE OF PRUDENTIAL FILTER APPLIED

		TOWARDS			
		neutralization		*no filter (Basel III proposal)*	
		% of AFS instruments	regulatory capital	% of AFS instruments	regulatory capital
FROM	*asymmetric filter*	+	-	-	+
	neutralization			-	+

On the other hand, there is more volatility and thus larger regulatory risk under a non filtered approach than under an asymmetrically filtered one. In fact, if the filter is complete only losses are going to affect regulatory capital. Thus we could expect less AFS holdings if the filter is not there so as to reduce such induced volatility in capital. Moreover, we would also observe higher capital buffers on average under an unfiltered approach to face increased regulatory risk (upper right end of Table 2). The same arguments would hold when changing from a neutralization framework to a non-filtered one (lower right end of Table 2).

4 Empirical strategy

We use the values for the prudential filters applied in European countries obtained from the surveys carried out in 2005, 2007 and 2009 by CEBS (CEBS, 2007) and the 2009 update. We normalise the filters to their after tax expression, using the corporate tax rates provided by EUROSTAT for those jurisdictions that define the filters in relation to before tax unrealised gains. As we use after tax filters, some of the observed changes in filters are not regulatory driven, but arise from changes in tax rates.

As reflected in Table 3, with data for the prudential filters actually applied in EU countries in 2007, seven out of the eighteen jurisdictions included in the sample made use of the neutralization approach for debt in 2007, and five additional jurisdictions did not allow the inclusion of any part of unrealised gains on debt into regulatory capital, although losses had to be deducted. Similarly, eight did not allow the inclusion of any part of unrealised gains arising from equity instruments into regulatory capital, although requiring the deduction of all unrealised losses arising from these instruments. Five countries applied a different treatment to unrealised gains arising from debt than those arising from equity. So, there is heterogeneity in the treatment of unrealised gains on financial instruments among countries in the European area, in the treatment of unrealised losses on debt and between equity and debt within a same jurisdiction and changes along the time dimension[8].

8. Portugal and Germany changed in 2009 from the asymmetrical to the neutralization approach, while Spain and Italy introduced the change in 2010. Luxembourg allowed choice of treatment from 2009 (we assume neutralization is chosen since).

TABLE 3.
PRUDENTIAL FILTERS IN EUROPEAN COUNTRIES. 2007

(% of gains admitted in regulatory capital)

	Arising from AFS equity	Arising from AFS debt	neutralization of debt instruments
AUSTRIA	30	30	NO
BELGIUM	10	0	YES
CYPRUS	0	0	NO
FINLAND	0	0	NO
FRANCE	31.4	0	YES
GERMANY	26.59	30	NO
IRELAND	0	0	NO*
ITALY	50	50	NO
LUXEMBOURG	0	0	NO
MALTA	0	0	NO
NETHERLAND	0	0	YES
NORWAY	37.5	0	YES
PORTUGAL	38.78	40	NO
SLOVAKIA	0	0	YES
SLOVENIA	20	0	YES
SPAIN	33.33	48.15	NO
UNITED KINGDOM	0	0	YES
MEAN	26.88	24.66	

*choice of treatment, subject to consistent application

The empirical analysis is applied to consolidated annual data, publicly provided by SNL, for the period 2005 to 2013 for at most 159 banks, excluding subsidiaries of the same group, whose distribution among 17 European jurisdictions can be found on Table A.1 of the Annex. Data availability defines the sample size for each specification. We assume that since 2009, no changes to the filters have been implemented, except for the change to neutralisation in debt and changes arising from tax modifications.

We first test whether the inclusion of all fair value unrealised gains and losses would have had an impact on the volatility of regulatory capital if they would have been allowed to be recognised. We expect that such recognition would have implied an increase in overall capital volatility.

For this part, we compute volatility measures for capital ratios with and without filters and compare them.

We then analyse the impact of neutralisation on both portfolio composition and capital. Given that neutralisation can only discretionally be applied to fixed income securities we focus the analysis of the effects of this type of filter on the portfolio of debt instruments. We estimate robust regressions with portfolio composition and capital as dependent variables and the filter variable as the explanatory variable of interest.

Finally, we analyse the impact of the asymmetric filter on portfolio composition and capital and cover both debt and equity instruments, using a similar approach.

Our basic specification for the analysis of the impact of filters on portfolio composition and capital uses a difference in difference approach so as to be able to interpret the effect of the prudential filters, which may change by year and jurisdiction, in terms of causality[9]. In particular, when we analyse the impact of neutralization, we define the *AFS prudential filter* variable neutral as the interaction term of the country dummy and the years when neutralisation was in place. That is, the prudential filter variable would take value 1 all the years in a given jurisdiction when neutralisation of debt instruments was applied and 0 when any other treatment was in place. When we analyse the effects of the different levels of the quantitative asymmetric filter, the *AFS prudential filter* variables (debt_filter and equi_filter) are specified as the interaction between country and the filter size, so that it would have different values for a given jurisdiction over time. In particular, the larger the value of these filter variables is, the lower the filtered amount of unrealised gains is.

We postulate that the determinants of portfolio composition (1) and capital ratios (2) can be expressed as alternative specifications of equations of the form:

$$(1)\ ta_{ikt} = \alpha_{0\,i} + \alpha_1\ AFS\ Prudential\ Filter_{ikt} + \Sigma\ \alpha_j\ Controls_{ikt-1} + \varepsilon_{ikt}$$

$$(2)\ k_{ikt} = \beta 0i + \beta_1\ AFS\ Prudential\ Filter_{ikt} + \Sigma\ \beta j\ Controls_{ikt-1} + \varepsilon_{ikt}$$

where ta_{jkt} is the indicator of bank i's trading activity in country k at time t, that we proxy as the proportion of assets than can be subject to filtering over fair value assets and k_{ikt} would be

9. We must remember that the initial regulatory situation of different jurisdictions is not identical; that different jurisdictions have chosen different dates to carry out the intervention (the regulatory change) and that the implemented changes are not identical for all jurisdictions.

the capital ratio of bank i in country k at time t. Our parameters of interest would be α_1 and $\beta_1$and we would test for their statistical significance and sign.

The equations would also include a set of j control variables that are bank and time dependent or that are country dependent. In particular, we would use in the portfolio equation, individual bank data to capture risk appetite, size, and idiosyncratic volatility as well as economic growth and banks' profitability, size, business model, liquidity and macroeconomic variables such as economic growth in the capital equation.

We first estimate these equations by OLS on the pooled sample including year and country dummies, to control for common country and time unobservable effects. In order to control for banks' fixed effects (that would be captured by α_{0i}) we also estimate the equations using a fixed effect estimator (FE) and also estimate by OLS the equations in first differences, but removing country dummies to avoid multicollinearity.

5 Capital volatility and unrealised gains and losses

To test whether capital volatility would have been higher if unrealised gains and losses from securities at fair value would have been fully translated into regulatory capital, we compute simple volatility measures using both total capital ratios and Tier1 capital ratios. We calculate the standard deviation of the observed total capital ratio (upper block in Table 4) and of Tier1 capital ratio (lower block in Table 4) by bank. We then construct "adjusted" capital ratios by adding all unrealised gains and losses that have been effectively filtered into the observed ratios and calculate the standard deviation of these adjusted capital ratios[10] ("adjusted" column in Table 4). We calculate the mean volatility by bank, by country and by year using both total and Tier1 capital ratios and for both values of the ratio and compare them.

TABLE 4. VOLATILITY OF CAPITAL RATIOS. EUROPEAN BANKS (2005-2013)

	Mean capital ratio volatility (1)		
TOTAL	**Observed**	**Adjusted**	**t ratio**
by bank	**2.41**	**2.70**	**6.32**
by country	**3.86**	**4.16**	**4.87**
by year	**4.75**	**5.00**	**3.34**
Tier 1			
by bank	**2.22**	**2.52**	**6.54**
by country	**3.70**	**4.00**	**2.17**
by year	**4.34**	**4.55**	**1.98**

(1) Proxied as standard deviation. t-ratio of the null hypothesis that the adjusted and unadjusted volatilities are equal

We expect that the volatility captured by the standard deviation of the adjusted capital ratios thus constructed would be larger than the corresponding one for the observed variable. As the results in Table 4 show, the inclusion of net unrealised gains and losses increases the mean volatility of capital for all the different definitions and such increase is statistically significant, as reflected by the t-ratios recorded in the last column. Therefore, we could expect that the removal of the filters proposed by Basel III will lead to higher capital volatility if banks do not react to counterbalance it.

10. They are adjusted by net "other comprehensive income", as a proxy for such unrealized gains and losses.

6 The neutralization filter for debt instruments

The first filter that we analyse is debt neutralisation and we try to establish its effects on portfolio composition and regulatory capital.

6.1 Debt portfolio composition and neutralization

The dependent variable that is proposed in order to analyse the effects of the neutralisation filter on portfolio composition is the proportion of AFS debt over total debt measured at fair value that includes available for sale plus held for trading debt (**tafsdebt**) [11]. We would expect a positive sign for the prudential filter variable (**neutral**).

Bank's risk attitude could have an impact on the securities portfolio as it would affect the level and sources of income. Firm's tolerance to risk is captured through the variable **risk** that is constructed as the ratio of risk weighted assets over total assets, so that the higher its value the lower the risk aversion[12]. The intrinsic risk associated with a given instrument is independent from its allocation to the AFS or HFT portfolio. However, AFS assets allow a more prudent liquidity management, so that we could expect that more risk lover banks are willing to hold higher proportions of such instruments to compensate. We postulate a positive sign for the coefficient in this variable.

Another independent variable that has been included is a proxy of uncertainty or volatility associated to the amount of unrealised gains, as more uncertainty would give rise to higher probability of breaching capital requirements. It is computed as the difference of the standard deviation of the changes in unrealised gains over time for each bank in relation to the average standard deviation of changes in unrealised gains every year (**uncertainty**). We can expect that the larger such deviation, the larger the volatility that unrealised gains and losses in AFS assets could potentially introduce in capital. We can expect a negative coefficient, as the more isolated is regulatory capital from value uncertainty (the smaller the value of **uncertainty**), the higher the proportion of assets giving rise to such uncertainty those banks would be willing to hold.

Firm's size is captured through the natural log of assets (**size)**, expecting a positive impact, as the larger the firm the larger the volatility that they are able to admit. Moreover, diversification benefits could weight on a firm's decision to take more AFS assets that give rise to uncertain outcomes. The "too-big-to-fail" argument suggests that larger banks would benefit from an implicit guarantee that, other things equal, decreases their cost of funding and allows them to take more risk. A quadratic variable is also included to capture non linearities in this relationship (**size2**)

The macroeconomic environment is included through **gdp**, the real GDP growth rate. We could expect that, in a downturn, firms trying to minimise regulatory risk would reduce the possible source of capital declines that arises with a high proportion of assets that

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11. We can expect that the larger the proportion of assets that may generate gains or losses in a portfolio of a bank, the larger those unrealised gains and losses are going to be. Therefore, the larger the HFT portfolio, the larger the weight of unrealised gains or losses in net income and therefore in the P&L account. Net of taxes they will be part of regulatory capital. By the same token, the larger the AFT portfolio, the larger the proportion of unrealised gains or losses recognised on the balance sheet as other comprehensive income, (so in the revaluation reserve) and only if they are not filtered, they will become part of regulatory capital.

12. Under the assumption that regulatory weights adequately capture risk.

may generate losses that are reflected in the regulatory capital ratio. Both, AFS and HFT assets do give rise to such losses, but while the impact of HFT on capital is certain, the impact arising from AFS depends on the existence of filters. If gains and losses from AFS debt are neutralised, we can expect that the cycle will not have an impact on the proportion of AFS debt over debt valued at fair value, so that the impact of the economic growth variable under neutralization would be nil. To test for such hypothesis with an F-test (F_test_gpd) we include a multiplicative variable (**neutral*gdp**) expecting a similar value than the one obtained for the coefficient on **gdp** but with opposite sign. We could expect either a nil or positive sign for **gdp**, as in a boom unrealised gains may provide some leverage, while in a downturn, unrealised losses would be minimised.

We include in the specification an indicator variable for the existence of interest rate contracts that takes value 1 if there are interest rate derivative contracts and zero otherwise (**int_contract**) to proxy for the bank's hedging activity that may affect the desired investment portfolio holdings. The portfolio composition could also be influenced by the overall recorded past gains from all securities (**past_gains(t-1)**) as banks could try to hold those instruments that give rise to higher gains. We also test for the inclusion of the proportion of AFS equity over total equity at fair value (**tafsequi**) and for the equity filter (**equi_filter**) as it could be argued that banks could decide on the choice of composition between AFS debt and total debt at fair value, taking into account the choice they made for the equity portfolio and its corresponding regulatory treatment.

Finally, we also include a variable that captures the more stringent market conditions surrounding the crisis years (**crisis**). It is a dummy variable that takes value 1 from 2009 to 2013 and zero, otherwise. It could be the case that banks are affected by market conditions in relation to the AFS holdings as a result of the crisis. The higher liquidity tensions associated with the crisis would suggest the need to hold a higher proportion of AFS assets, so that the expected sign is positive.

The results of the estimation under Ordinary Least Squares (OLS) (col 1), Fixed Effects (FE) (col 2) and OLS in first differences (col 3) with robust t-ratios are recorded in Table 5, where the results for the test of the irrelevance of year dummies (F_test_for_years) and country dummies (F_test_for_country) are also included. The specification in first differences does not include year dummies as most regulatory changes take place around the same year, thus generating multicollinearity.

The results show a positive and statistically significant sign for the neutralisation filter variable, which is in accordance with our hypothesis of bank's attitude towards regulatory risk. Such results imply that if unrealised gains and losses arising from AFS debt are to be recognised in regulatory capital, as Basel III is proposing, firms will tend to hold lower proportion of these assets than under the regime where neither unrealised losses nor gains on AFS debt securities are recognised in regulatory capital.

As for the rest of the control variables, we find statistical evidence that larger uncertainty in gains is associated with lower holdings of AFS debt, supporting our hypothesis that banks try to minimise regulatory risk, as uncertainty could be associated with higher capital volatility and thus with an increased probability of breaching the regulatory minimum. We also find that the larger the proportion of gains from equity admitted in regulatory capital the lower the holdings of AFS debt, and that the higher the AFS equity held the higher the AFS debt held, so that both instruments could play a complementary role. In fact, when we

run a regression (not shown) where the explained variable is the sum of AFS debt and equity over total debt and equity at fair value, we also find that neutralization has a positive impact on AFS holdings and the equity filter a negative impact. Contrary to what we could expect, past gains show a statistically significant negative impact on the proportion of AFS debt (col 1 and 3), which could be due to the fact that available data does not allow us to distinguish among sources of gains. The results presented in col 4 to 6 in Table 7 show that past gains do have a positive impact on AFS equity holdings. We also find statistical evidence that during the crisis years more AFS debt was being held, possibly to ease liquidity management. On the other hand, we do not gather evidence of a statistically significant impact of the cycle on the share of AFS debt. We obtain the opposite sign for the multiplicative coefficient (**neutral*gdp**) in all cases, but the F tests does not provide support for the hypothesis that they cancel each other. So we do not gather evidence that neutralisation isolates capital ratios from the economic cycle. So, our results point at GDP growth not playing a role in the decisions to distribute debt holdings between the HFT and the AFS portfolio. For the rest of the control variable the coefficient is not statistically significant. It therefore seems that the presence of a neutralisation filter increases the share of fair value debt that is classified as AFS, independently of uncertainty, the hedging activity, past gains, the proportion of AFS equity held or the equity regulatory treatment.

TABLE 5. EFFECT OF THE NEUTRALIZATION FILTER ON THE WEIGHT OF DEBT ASSETS IN BANK PORTFOLIO. (2005-2013) (1)

	OLS	FE	OLS 1st DIFF
VARIABLES	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)
	(1)	(2)	(3)
neutral(t)	10.656***	11.868***	4.939***
	(3.20)	(3.70)	(2.85)
risk(t)	-0.004	-0.027	0.13
	(-0.06)	(-0.18)	(1.28)
size(t)	6.255	42.259	2.829
	(0.59)	(1.00)	(0.06)
gdp(t)	0.578	0.417	-0.159
	(0.73)	(0.99)	(-0.59)
uncertainty(t)	-0.064*	-0.134**	-0.072*
	(-1.84)	(-2.49)	(-1.72)
neutral*gdp(t)	-0.583	-0.592	0.2
	(-0.89)	(-1.43)	(0.68)
size2(t)	-0.227	-1.117	0.095
	(-0.77)	(-0.97)	(0.08)
equi_filter(t)	-1.786**	-1.825***	-0.064
	(-2.30)	(-3.07)	(-0.20)
tafsequi(t)	0.396***	0.166***	0.085*
	(11.66)	(3.06)	(1.93)
int_contract(t)	-0.039	-3.251	0.528
	(-0.02)	(-1.22)	(0.35)
past_gains(t-1)	-2.592***	-0.286	-0.364*
	(-3.13)	(-0.62)	(-1.93)
crisis	4.598	16.479***	
	(1.19)	(4.00)	
year_dummies	Yes	Yes	No
country_dummies	Yes	No	No
Observations	981	981	816
Adj_R-sqr	0.462	0.369	0.02
F_test_gdp	0.995	0.708	0.507
F_test_for_years	0.134	0.006	
F_test_for_country	0		

(1) tafsdebt (equi)=afs debt(equity) over the sum of afs and hft debt(equity); neutral: dummy variable that takes value 1 when the bank is allowed to neutralise (exlude) unrealised gains and losses from regulatory capital and 0 otherwise; debt (equi)_filter: % of unrealised gains from AFS debt (equity) admitted as capital; int_contract: dummy variable that takes value 1 if bank has at time t interest rates derivatives and 0 otherwise; past_gains: lagged ratio of realised and unrealised gains over total asets; kratio*neutral: interaction between kratio (risk based capital ratio) and neutral; risk: risk weighted assets over total assets; size: ln of total assets; gdp: real GPD growth; uncertainty: deviation of standard deviation of changes in recognised and unrecognised gains over total equity by firm; neutral*gdp: interaction variable between neutral and gdp; size2=squared ln of total assets; crisis: dummy variable that takes value 1 if year>= 2009 and zero, otherwise. Estimated with annual data of individual banks from 2005 to 2013, being an incomplete panel. Robust t ratios in brackets. (*), (**) statistically significant at 10% and 5% level of confidence, respectively. F_test records p value of corresponding F test, where test_gdp tests for gdp+neutral*gdp=0; test_for_years tests for all year dummies=0 and _test_country tests for all country dummies=0.

6.2 Regulatory capital and AFS debt neutralization

To test for the effects of the neutralisation filter on observed capital ratios we use Tier1 ratio over risk weighted assets as the variable to be explained (**t1ratio**)[13]. We would expect a negative sign for the prudential filter variable (**neutral**).

In this equation, we control for bank profits, as they are a source of capital, proxying them with the return on average assets that is provided by the SNL dataset (**roaa**). The intuition is that retained earnings are the cheapest way to increase the capital-to-asset ratio, so that we would then expect a positive relationship.

We use the ratio of net loans to total assets as the measure of bank's lending activity (**net loans**) and include it as a determinant of bank's capital. Loans might be more profitable than other types of assets such as securities, but might be more costly to produce being associated with higher risk and thus requiring higher capital if regulatory risk is a driver of bank's behaviour. Alternatively, banks' lending activity is associated to traditional banking and thus to less risk, thus giving rise to a lower capital buffer. Depending on which effect dominates we can obtain a positive or a negative relationship.

We could expect that banks with a high level of liquid assets in spite of potentially receiving lower interest income than banks with less liquid assets, and thus having lower profits, are also less risk lovers, so they would also show higher capital ratios. The individual banks' ratio of liquid assets (cash and public debt) to total liabilities (**liquidity**) is used as a proxy of bank liquidity. The expected sign for the coefficient is positive.

Again, we include the cycle and bank's size as additional control variables. Larger banks have better risk diversification opportunities and thus lower cost of funding than smaller ones, so that we could expect a negative relation between capital and size (**size**). On the other hand, we can expect that the cycle (**gdp**) has a negative impact on the capital ratio, generating a procyclical effect, as banks would try to minimise regulatory risk in a downturn, while acting less prudently in a boom. The interaction variable **neutral*gdp** would capture the compensating effect under neutralisation.

The regulatory treatment of alternative financial instruments (**equi_filter**), besides the treatment of debt, could also influence capital decisions. Moreover, a bank can increase capital by selecting securities with an average unrealized gain larger than the average for all securities in the investment portfolio. So the previously defined past gains on securities variable (**past_gains(t-1)**) is also included in the specification.

Finally, the dummy variable **crisis** tries to capture the possible effects of the market conditions during the crisis on regulatory capital, which are not captured through the cycle variable.

As was in the case for portfolio composition, the analysis of the effects of neutralization on capital ratios, presented in Table 6, is carried out using OLS (col 1), and FE (col 2) and OLS in first differences (col 3), to control for individual banks' effects. We find that the coefficient of the dummy variable is negative, as postulated, although not statistically significant. We therefore do not find evidence of neutralisation leading to lower capital ratios, when compared to an asymmetric treatment.

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13. We do not have information on Pillar 2 capital requirements, which is confidential, so that we cannot measure the actual desired buffer.

TABLE 6. EFFECT OF THE NEUTRALIZATION FILTER ON THE REGULATORY CAPITAL RATIO. (2005-2013) (1)

	OLS	FE	OLS 1st DIFF
VARIABLES	t1ratio(t)	t1ratio(t)	t1ratio(t)
	(1)	(2)	(3)
neutral(t)	-0.423	-0.217	-0.207
	(-0.84)	(-0.42)	(-0.90)
roaa(t)	1.027***	0.755***	0.867***
	(4.94)	(3.22)	(4.43)
size(t)	-0.656***	-2.645***	-2.836***
	(-4.49)	(-2.71)	(-6.15)
gdp(t)	0.099	0.107	-0.032
	(1.01)	(1.63)	(-1.23)
net_loan(t)	-0.080***	-0.038	0.041
	(-3.62)	(-1.03)	(1.15)
liquidity(t)	-0.003	0.005	0.133***
	(-0.11)	(0.10)	(4.00)
neutral*gdp(t)	-0.092	-0.147**	-0.032
	(-1.05)	(-2.34)	(-0.60)
equi_filter(t)	0.06	0.021	0.123*
	(0.89)	(0.29)	(1.77)
past_gains(t-1)	0.994***	0.35	0.125
	(3.24)	(1.45)	(0.68)
crisis	3.002***	1.467***	
	(3.55)	(3.49)	
year_dummies	Yes	Yes	No
country_dummies	Yes	No	No
Observations	758	758	641
Adj_R-sqr	0.396	0.352	0.308
F_test_gdp	0.936	0.596	0.996
F_test_for_years	0	0	
F_test_for_country	0		

(1) t1ratio:tier1 capital ratio; neutral: dummy variable that takes value 1 when the bank is allowed to neutralise (exlude) unrealised gains and losses from regulatory capital and 0 otherwise; equi(debt)_filter: % of unrealised gains from AFS equity (debt) admitted as capital; past_gains: lagged ratio of realised and unrealised gains over total asets; roaa: net income over average assets (SNL); size: ln of total assets; gdp: GPD growth; net loans: % of net loans over assets ; liquidity: cash and public debt over liabilities; neutral*gdp: interaction variable between neutral and gdp; crisis: dummy variable that takes value 1 if year>= 2009 and zero, otherwise. Estimated with annual data of individual banks from 2005 to 2013, being an incomplete panel. Robust t ratios in brackets. (*), (**) statistically significant at 10% and 5% level of confidence, respectively. F_test records p value of corresponding F test, where test_gdp tests for gdp+neutral*gdp=0; test_for_years tests for all year dummies=0 and _test_country tests for all country dummies=0.

As for the rest of the determinants of capital holdings, we find that profits have the expected positive impact on capital as shown from the positive and statistically significant sign of **roaa**. So, higher returns on average assets lead to higher solvency. We also find a negative relationship between size and regulatory capital, a result that is usually obtained in empirical analysis. The lower capital buffers that larger banks hold could result from moral hazard associated to the too big to fail hypothesis. Liquidity has also the expected positive sign, when individual effects are controlled for, so that, in general, banks that hold more liquid assets also show larger capital buffers. The share of net loans on total assets does not have a

clear effect on Tier1 capital. In fact, when the coefficient of net_loan is statistically significant (col 1) it shows a negative sign. It therefore seems that the size of the traditional business line could affect decisions on capital, so that the more traditional the business line is, the lower the regulatory capital that we will observe. Moreover, past gains seem to have a positive impact on the capital ratio but also only when the estimation is carried out without taking into account individual banks' effects (col 1. Finally, the dummy crisis is also statistically significant and it shows a positive sign, so that higher capital ratios were observed during the crisis years. We do not find evidence that the cycle or the regulatory treatment of equity does impact capital.

7 Asymmetric treatment of unrealized gains and losses of AFS instruments

The role of an asymmetric filter on portfolio composition and capital is addressed next. For debt, we use, as before, the ratio of AFS debt over total debt at fair value (**tafsdebt**)**.** For equity, we define the variable **tafsequi** as the share of AFS equity over total equity at fair value. We can expect that lower or reductions in the asymmetric filters (**debt_filter** and **equi_filter**) would result in lower AFS securities and higher capital.

7.1 Portfolio composition and asymmetric filters

The results of the analysis of the impact of the asymmetric filters on AFS debt and equity holdings estimated with OLS (col 1, and 4), with FE (col 2 and 5) and with OLS in first differences (col 3 and 6) is presented in Table 7.

In particular, cols 1 to 3 report the results for the debt portfolio and show that the debt filter has the expected positive and statistically significant coefficient, so that the higher the unrealised gains from debt allowed to be included in regulatory capital, the lower the holdings of AFS debt in banks' portfolio as to avoid increased uncertainty. On the other hand, the results obtained for the effects on the equity portfolio (cols 4 to 6) show that only when the estimation is carried out in first differences the equity filter has a negative and statistically significant impact. The lack of statistical significance of the coefficient of the filter variable in the estimation does not support the hypothesis that removing filters would result in less AFS equity. So, the asymmetric filter seems to have the expected effect mainly on debt portfolio.

Rather similar results in the debt portfolio equation are obtained for the rest of the explanatory variables, as when neutralization was being tested, although the statistical significance of some of them declines. The main differences arise in two control variables: on the one hand, the interaction between neutrality and growth is statistically significant (col 1 and 2) and in fact, the hypothesis that under neutralization the cycle does not affect the decision on the proportion of AFS debt that banks hold cannot be rejected (col 2, F_test_gdp); and on the other, uncertainty appears as statistically significant, but with a positive coefficient, in contrast to the results recorded in cols 1 and 2 of this same Table 7 and the results in Table 5. The high correlation between uncertainty, some specific years, and growth could explain such positive coefficient. In fact, when the year dummies are dropped, we again get a negative sign for this variable.

TABLE 7. EFFECT OF THE ASYMMETRIC FILTER ON THE WEIGHT OF AFS DEBT OR EQUITY IN BANKS PORTFOLIO. (2005-2013) (1)

	OLS	FE	OLS 1st DIFF	OLS	FE	OLS 1st DIFF
VARIABLES	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)	tafsequi(t)	tafsequi(t)	tafsequi(t)
	(1)	(2)	(3)	(4)	(5)	(6)
debt_filter(t)	-0.170***	-0.182***	-0.039**	-0.074	-0.099**	-0.028
	(-2.88)	(-3.90)	(-1.97)	(-1.20)	(-2.41)	(-1.12)
equi_filter(t)	-1.024	-0.967*	-0.359	0.339	0.04	-0.676**
	(-1.34)	(-1.67)	(-0.97)	(0.44)	(0.07)	(-2.05)
risk(t)	-0.002	-0.016	0.093	0.055	-0.037	-0.042
	(-0.03)	(-0.10)	(0.92)	(0.91)	(-0.31)	(-0.33)
size(t)	6.162	39.663	3.25	35.900***	32.814	2.586
	(0.58)	(0.91)	(0.07)	(3.94)	(0.90)	(0.06)
gdp(t)	0.514	0.356	-0.129	-0.937	-1.409*	0.149
	(0.65)	(0.81)	(-0.30)	(-1.05)	(-1.78)	(0.26)
uncertainty(t)	-0.061*	-0.614***	0.302***	0.077**	-0.097	0.192
	(-1.83)	(-5.36)	(2.97)	(2.09)	(-0.89)	(1.56)
neutral*gdp(t)	-1.154*	-1.230***	-0.329	0.423	0.111	-0.51
	(-1.75)	(-2.87)	(-1.21)	(0.61)	(0.21)	(-1.56)
size2(t)	-0.224	-1.039	0.033	-1.158***	-1.044	-0.274
	(-0.76)	(-0.88)	(0.03)	(-4.55)	(-1.03)	(-0.21)
int_contract(t)	-0.161	-3.648	0.227	5.012**	5.032*	6.295**
	(-0.08)	(-1.38)	(0.14)	(2.20)	(1.82)	(2.35)
past_gains(t-1)	-2.711***	-0.424	-0.356*	0.595	0.706*	0.854***
	(-3.39)	(-0.87)	(-1.65)	(0.52)	(1.78)	(3.56)
equifv(t)	0.397***	0.169***	0.065			
	(11.68)	(3.06)	(1.45)			
debtfv(t)				0.429***	0.176***	0.092
				(11.00)	(2.77)	(1.46)
crisis	7.277**			-7.910**		
	(1.97)			(-2.08)		
year_dummies	Yes	Yes	Yes	Yes	Yes	Yes
country_dummies	Yes	No	No	Yes	No	No
Observations	981	981	816	981	981	816
Adj_R-sqr	0.462	0.363	0.035	0.396	0.176	0.063
F_test_gdp	0.421	0.089	0.759	0.52	0.042	0.417
F_test_for_years	0.265	0	0	0.636	0.02	0.011
F_test_for_country	0			0		

(1)See notes in Table 5

As for the control variables in the equity portfolio equation, we find statistical evidence that hedging activity affects the proportion of AFS equity that banks hold. In particular, the presence of interest rate derivative contracts results in higher AFS equity holdings. We also find evidence that past gains have a positive impact on the proportion of AFS equity that banks hold, in contrast to the negative impact obtained for AFS debt, a result that could be reflecting that the main source of such gains is AFS equity. We also find evidence that the regulatory treatment of debt and the proportion of AFS debt affect AFS equity holdings in a similar fashion as the regulatory treatment of equity and the proportion of

AFS equity held affects AFS debt portfolio: the regulatory treatment has a negative impact on AFS equity and the debt holdings have a positive impact. The bank's size also seems to affect the proportion of AFS equity held. In particular, in the specification that does not control for fixed effects, the variable size appears as positive and statistically significant which can interpreted as indicating that larger banks tend to adopt more volatile but also more liquid portfolios in terms of AFS equity, but at a declining rate, as reflected by the negative sign in size2. Finally, during the crisis years, the holdings of AFS equity declined, in contrast to AFS debt, that increased.

7.2 Regulatory capital and asymmetric filters

The effect of asymmetric filters on the level of banks' Tier1 capital ratios is recorded in Table 8 and again analysed with OLS (col 1, and 4), with FE (col 2 and 5) and with OLS in first differences (col 3 and 6). Cols 1 to 3 reflect the effects of the debt filter on regulatory capital where we have restricted the population to banks operating in jurisdictions that do not allow neutralisation in order to isolate the effect of the quantity of unrealised gains allowed to be included in capital. Cols 4 to 6 reflect the effects of the equity filter on capital ratios.

The results suggest that, in accordance with our hypothesis, the impact on regulatory capital of the asymmetric filter on debt instrument is positive, and statistically significant, but only when banks unobservable heterogeneity is taken into account (cols 2 and 3). Such results indicate that the debt filter has an effect on observed capital ratios, so that the higher the proportion of unrealised gains admitted as regulatory capital, the higher the capital ratio that banks will hold. In particular, these results tell us that the removal of asymmetric filters on unrealised gains and losses on debt could lead to larger regulatory capital ratios.

On the other hand, the equity filter does not have a statistically significant effect on capital holdings, which may result from the low weight that such instruments have on banks' portfolio. So we could expect that the removal of asymmetric filters on unrealised gains and losses on equity would not necessarily lead to larger regulatory capital ratios.

For the rest of the determinants of Tier1 capital ratio, the results show for most of them the expected sign, so that we find empirical evidence that profits have a positive impact on bank's capital, while size has a negative impact. As for the business line, the ratio of net loans appears again with a negative sign, so that the more focused on traditional activities a bank is the lower the capital ratio it holds, although it is not statistically significant if banks' fixed effects are accounted for. Again, if unobservable heterogeneity is not taken into account, past gains positively affect capital. We also find evidence that the crisis resulted in higher capital ratios.

TABLE 8. EFFECT OF THE UNREALISED GAINS ASYMMETRIC FILTER ON REGULATORY CAPITAL RATIOS. (2005-2013) (1)

	OLS	FE	OLS 1st DIFF	OLS	FE	OLS 1st DIFF
VARIABLES	t1ratio(t) when neutral filter=0	t1ratio(t) when neutral filter=0	t1ratio(t) when neutral filter=0	t1ratio(t)	t1ratio(t)	t1ratio(t)
	(1)	(2)	(3)	(4)	(5)	(6)
debt_filter(t)	0.147	0.186**	0.232***			
	(1.36)	(2.17)	(2.65)			
equi_filter(t)				0.042	0.012	0.116
				(0.68)	(0.19)	(1.59)
roaa(t)	1.189***	0.713***	1.025***	1.032***	0.758***	0.857***
	(3.41)	(4.29)	(3.47)	(4.97)	(3.24)	(4.38)
size(t)	-0.770***	-3.900***	-2.565**	-0.659***	-2.669***	-1.589
	(-2.60)	(-3.53)	(-2.02)	(-4.51)	(-2.76)	(-1.40)
gdp(t)	0.025	0.054	0.046	0.089	0.101	0.058
	(0.15)	(0.67)	(0.58)	(0.92)	(1.64)	(1.02)
net_loan(t)	-0.101**	-0.064	0.031	-0.080***	-0.038	0.048
	(-2.48)	(-1.00)	(0.62)	(-3.61)	(-1.03)	(1.30)
liquidity(t)	-0.019	0.043	0.092**	-0.003	0.005	0.122***
	(-0.46)	(0.85)	(2.24)	(-0.11)	(0.10)	(3.67)
neutral*gdp(t)				-0.074	-0.138**	-0.012
				(-0.86)	(-2.07)	(-0.26)
past_gains(t-1)	1.390***	0.165	0.303	0.997***	0.352	0.145
	(10.44)	(1.18)	(1.34)	(3.24)	(1.48)	(0.75)
crisis				2.504***	1.345***	
				(4.55)	(4.49)	
year_dummies	Yes	Yes	Yes	Yes	Yes	Yes
country_dummies	Yes	No	No	Yes	No	No
Observations	290	290	217	758	758	632
Adj_R-sqr	0.495	0.397	0.236	0.397	0.352	0.186
F_test_gdp				0.867	0.634	0.417
F_test_for_years	0	0	0.293	0	0	0.064
F_test_for_country	0			0		

(1)See notes in Table 6

8 Robustness tests

We next present a series of robustness checks for the different hypothesis that we have tested. First we carry out robustness checks for the effects of both types of filters on the portfolio composition and then move to the capital equation.

8.1 Effects on portfolio

In order to control for the effects that could arise because of the use of accounting data, we present in Table 9 the results obtained when the three types of regressions (OLS, FE, OLS in first diff) are run with all explanatory variables, except the filter variable and the crisis years lagged one period. The first three columns test for the relevance of the neutralization filter on debt portfolio[14], columns 4 to 6 present the results for the asymmetric debt filter on the debt portfolio, as well, and columns 7 to 9 the results of the effects of the equity filter on the equity portfolio. The control variables are the ones used in Tables 5 and 7.

In all these cases, the sign and statistical significance of the coefficient for the filter variables do not change in relation to the results already recorded: banks subject to neutralization show a larger proportion of AFS debt in their debt portfolio and the higher the amount of unrealised gains from debt allowed being included in capital, the lower the proportion of AFS debt in the debt portfolio. Moreover, there is evidence of a negative effect of the asymmetric equity filter on AFS equity, but such evidence is not systematic.

We can therefore expect changes in debt portfolio composition arising from the removal of the filters and possible changes also in equity portfolio.

14. Similar results are obtained when we restrict the sample to those banks operating in jurisdictions that did not allow neutralization before 2007.

TABLE 9. ROBUSTNESS TEST FOR THE EFFECTS OF THE NEUTRALIZATION AND ASYMMETRIC FILTER ON THE WEIGHT OF AFS DEBT OR EQUITY IN BANKS PORTFOLIO. (2005-2013) (1)

	OLS	FE	OLS 1st DIFF	OLS	FE	OLS 1st DIFF	OLS	FE	OLS 1st DIFF
VARIABLES	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)	tafsdebt(t)	tafsequi(t)	tafsequi(t)	tafsequi(t)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
neutral(t)	10.192***	13.057***	4.090**						
	(2.62)	(4.14)	(2.32)						
debt_filter(t-1)				-0.119*	-0.152***	-0.033*	-0.075	-0.078**	-0.016
				(-1.73)	(-3.33)	(-1.81)	(-1.10)	(-2.21)	(-0.76)
equi_filter(t)	-2.176**	-2.283***	-0.183	-1.666	-1.613***	-0.725**	0.053	-0.348	-0.916**
	(-2.15)	(-5.10)	(-0.87)	(-1.65)	(-3.84)	(-2.33)	(0.05)	(-0.74)	(-2.43)
risk(t-1)	0.001	-0.022	0.055	0	-0.018	-0.045	0.148**	0.088	0.238**
	(0.01)	(-0.14)	(0.52)	(-0.00)	(-0.11)	(-0.41)	(2.25)	(0.82)	(2.13)
size(t-1)	10.669	49.299	15.978	10.85	57.623	27.035	0.181	45.612	-7.787
	(0.92)	(1.22)	(0.57)	(0.94)	(1.37)	(1.03)	(0.03)	(1.54)	(-0.85)
gdp(t-1)	1.368	1.117*	0.227	1.235	1.002	0.531	-0.407	-0.756	-0.196
	(1.48)	(1.67)	(0.93)	(1.36)	(1.56)	(1.47)	(-0.48)	(-1.51)	(-0.43)
uncertainty(t-1)	-0.043	-0.594***	0.056*	-0.04	-0.662***	0.297***	0.071**	-0.181*	0.197**
	(-1.39)	(-5.52)	(1.66)	(-1.32)	(-6.26)	(4.56)	(2.03)	(-1.68)	(2.22)
neutral*gdp(t-1)	-0.86	-1.010**	-0.252	-0.693	-0.781*	-0.25	0.331	0.183	-0.24
	(-1.23)	(-2.07)	(-0.92)	(-1.00)	(-1.74)	(-0.99)	(0.48)	(0.57)	(-0.94)
size2(t-1)	-0.352	-1.328	-0.31	-0.356	-1.514	-0.754		-1.311	0.272
	(-1.10)	(-1.21)	(-0.41)	(-1.12)	(-1.34)	(-1.07)		(-1.57)	(0.85)
debtifv(t-1)							0.431***	0.163***	0.011
							(10.78)	(2.81)	(0.21)
equifv(t-1)	0.377***	0.119**	0.014	0.379***	0.128**	-0.002			
	(10.18)	(2.29)	(0.45)	(10.23)	(2.38)	(-0.07)			
int_contract(t-1)	-0.289	-3.583	-1.133	-0.385	-4.119*	-2.435*	3.648	-0.387	-3.526**
	(-0.13)	(-1.44)	(-0.83)	(-0.17)	(-1.67)	(-1.71)	(1.51)	(-0.19)	(-2.25)
past_gains(t-2)	-2.421***	-0.079	0.319	-2.521***	-0.25	0.282	-0.722	-0.016	-0.269
	(-2.90)	(-0.19)	(1.49)	(-2.94)	(-0.54)	(1.41)	(-0.86)	(-0.04)	(-0.60)
year_dummies	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
country_dummies	Yes	No	No	Yes	No	No	Yes	No	No
Observations	820	820	668	820	820	668	820	820	668
Adj_R-sqr	0.439	0.342	0.002	0.436	0.321	0.031	0.393	0.131	0.052
F_test_gdp	0.559	0.794	0.342	0.539	0.585	0.172	0.926	0.213	0.947
F_test_for_years	0	0		0	0	0	0.501	0.002	0.006
F_test_for_countr	0			0			0		

(1)See notes in Table 5

8.2 Effects on capital

As for the robustness checks of the effects of the filters on the capital equation, we present the results obtained for neutralization in Table 10 and for the asymmetric filters in Table 11. In both cases, we first test whether it is not Tier 1 capital, but total capital that is affected by the treatment of unrealised gains and losses arising from debt instruments, so that we estimate the capital equation using total capital (kratio) as the variable to be explained. We then also carry out the estimation using lagged values of the explanatory variables (except the dummy variables for the filters and the crisis years) so as to control for the use of accounting data.

As recorded in cols 1 to 3 of Table 10, the results previously obtained and recorded in Table 6 do not change: the debt neutralisation filter does not impact capital ratios, neither when we look at Tier 1 nor when the impact is on total regulatory capital. By the same token, when lagged explanatory variables are used as regressors (cols 4 to 6 in Table 10), these results do not change: we cannot find statistical evidence of neutralization impacting the capital ratio.

As for the effects of the asymmetric debt filter on capital, we again restrict the analysis to the banks which operate in jurisdictions that do not neutralise (col 1 to 6 in Table 11) so as to interpret the results in terms of the value of the asymmetric filter.

The results recorded in columns 1 to 3 in Table 11 do not find evidence that the debt filter affects total capital, as it did with Tier 1 capital ratios. This could support the hypothesis that banks build quality capital in the face of the uncertainty of breaching regulatory requirements, associated to the regulatory treatment of unrealised gains on debt. On the other hand, the results obtained with lagged explanatory variables (cols 4 to 6) support the initial results when we control for banks' unobserved heterogeneity: Tier 1 capital increases with the proportion of unrealised gains allowed to be accepted as regulatory capital.

The results of the robustness test for the effects of the equity filter on the AFS equity portfolio are recorded in cols 7 to 12 of Table 11. Either when the variable to be explained is the total capital ratio (cols 7 to 9) or when the explanatory variables are lagged one period (cols 10 to 12) the qualitative result is the same: we still do not find evidence that the treatment of unrealised gains and losses from equity affect regulatory capital ratios.

TABLE 10. ROBUSTNESS TESTS FOR THE EFFECT OF THE NEUTRALIZATION FILTER ON REGULATORY CAPITAL (1)

	OLS	FE	OLS 1st DIFF	OLS(2)	FE(2)	OLS 1st DIFF(2)
VARIABLES	kratio(t)	kratio(t)	kratio(t)	t1ratio(t)	t1ratio(t)	t1ratio(t)
	(1)	(2)	(3)	(4)	(5)	(6)
neutral(t)	-0.511	-0.096	-0.053	-0.074	-0.158	-0.375
	(-0.97)	(-0.17)	(-0.19)	(-0.14)	(-0.39)	(-1.55)
equi_filter(t)	0.107	0.108	0.118	0.017	-0.032	0.086
	(1.28)	(1.38)	(1.30)	(0.19)	(-0.38)	(1.04)
roaa(t)	0.903***	0.821***	0.799***	0.777***	0.289	-0.19
	(4.60)	(3.49)	(4.09)	(3.18)	(1.03)	(-0.77)
size(t)	-0.549***	-2.798***	-2.650***	-0.674***	-2.163***	-0.257
	(-3.92)	(-3.25)	(-5.75)	(-4.14)	(-2.63)	(-0.63)
gdp(t)	0.214**	0.167**	-0.062*	0.147	0.179**	0.047
	(2.02)	(2.24)	(-1.80)	(1.27)	(2.57)	(1.37)
net_loan(t)	-0.061***	-0.008	0.047	-0.120***	-0.107***	-0.098***
	(-2.85)	(-0.22)	(1.26)	(-4.77)	(-3.30)	(-2.91)
liquidity(t)	0.016	0.015	0.131***	-0.042*	-0.088*	-0.086***
	(0.71)	(0.27)	(3.72)	(-1.66)	(-1.92)	(-2.67)
neutral*gdp(t)	-0.108	-0.118	0.005	-0.099	-0.146*	-0.137**
	(-1.20)	(-1.60)	(0.09)	(-1.00)	(-1.78)	(-2.06)
past_gains(t-1)	0.866***	0.353	0.114	0.605***	-0.112	-0.144
	(3.20)	(1.37)	(0.59)	(2.86)	(-0.61)	(-1.05)
crisis	3.765***	1.715***		3.429***	3.658***	
	(4.12)	(3.57)		(3.47)	(5.27)	
year_dummies	Yes	Yes	No	Yes	Yes	No
country_dummies	Yes	No	No	Yes	No	No
Observations	759	759	642	641	641	527
Adj_R-sqr	0.355	0.295	0.238	0.39	0.363	0.055
F_test_gdp	0.305	0.553	0.448	0.691	0.759	0.044
F_test_for_years	0	0		0	0	
F_test_for_country	0			0		

(1)See notes in Table 6. kratio:risk based capital ratio;

(2) Explanatory variables are lagged one period, except for neutral, debt_filter, equi_filter and crisis.

TABLE 11. ROBUSTNESS TESTS FOR THE EFECTS OF THE ASYMMETRIC FILTER ON REGULATORY CAPITAL (1)

	OLS	FE	OLS 1st DIFF	OLS(2)	FE(2)	OLS 1st DIFF(2)	OLS	FE	OLS 1st DIFF	OLS(2)	FE(2)	OLS 1st DIFF(2)
VARIABLES	kratio(t) when neutral filter=0	kratio(t) when neutral filter=0	kratio(t) when neutral filter=0	t1ratio(t) when neutral filter=0	t1ratio(t) when neutral filter=0	t1ratio(t) when neutral filter=0	kratio(t)	kratio(t)	kratio(t)	t1ratio(t)	t1ratio(t)	t1ratio(t)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
debt_filter(t)	0.101	0.115	0.188	0.135	0.202*	0.281**						
	(0.78)	(1.05)	(1.64)	(0.93)	(1.77)	(2.50)						
equi_filter(t)							0.085	0.104	0.122	0.015	-0.035	0.132
							(1.07)	(1.36)	(1.30)	(0.18)	(-0.42)	(1.53)
roaa(t)	1.143***	0.863***	0.947***	0.955**	-0.069	-0.145	0.910***	0.822***	0.774***	0.777***	0.29	-0.098
	(3.81)	(4.31)	(3.42)	(2.00)	(-0.18)	(-0.26)	(4.64)	(3.51)	(4.01)	(3.19)	(1.04)	(-0.37)
size(t)	-0.677***	-3.460***	-3.421**	-0.769**	-2.493*	0.388	-0.552***	-2.809***	-1.581	-0.675***	-2.183***	-0.168
	(-2.71)	(-3.19)	(-2.39)	(-2.04)	(-1.81)	(0.67)	(-3.94)	(-3.33)	(-1.31)	(-4.15)	(-2.64)	(-0.43)
gdp(t)	0.138	0.096	0.140*	0.114	0.231*	0.054	0.202*	0.164**	0.062	0.148	0.180**	0.046
	(0.82)	(1.14)	(1.70)	(0.53)	(1.89)	(0.54)	(1.93)	(2.36)	(1.00)	(1.28)	(2.58)	(1.02)
net_loan(t)	-0.083**	-0.028	0.024	-0.134**	-0.072*	-0.02	-0.060***	-0.008	0.054	-0.120***	-0.107***	-0.094***
	(-2.43)	(-0.53)	(0.47)	(-2.49)	(-1.92)	(-0.51)	(-2.85)	(-0.21)	(1.39)	(-4.76)	(-3.32)	(-2.83)
liquidity(t)	-0.017	0.046	0.084*	-0.056	0.013	-0.018	0.016	0.015	0.123***	-0.042*	-0.088*	-0.085***
	(-0.48)	(1.08)	(1.86)	(-1.11)	(0.38)	(-0.33)	(0.71)	(0.27)	(3.50)	(-1.66)	(-1.89)	(-2.73)
neutral*gdp(t)							-0.086	-0.114	0.009	-0.102	-0.153**	-0.141**
							(-0.97)	(-1.50)	(0.17)	(-1.08)	(-2.01)	(-2.23)
past_gains(t-1)	1.250***	0.253	0.293	0.954***	-0.641***	-0.509**	0.870***	0.354	0.129	0.606***	-0.11	-0.13
	(8.60)	(1.59)	(1.26)	(9.26)	(-3.85)	(-2.28)	(3.21)	(1.39)	(0.64)	(2.87)	(-0.61)	(-0.93)
crisis								1.150***		3.385***	3.567***	
								(3.46)		(3.52)	(5.62)	
year_dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
country_dummies	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Observations	291	291	218	220	220	155	759	759	633	641	641	527
Adj_R-sqr	0.458	0.346	0.2	0.46	0.45	0.143	0.355	0.295	0.15	0.391	0.364	0.069
F_test_gdp							0.269	0.556	0.592	0.7	0.787	0.012
F_test_for_years	0	0	0.036	0	0	0.005	0	0	0.014	0	0	0.003
F_test_for_country	0			0			0			0		

(1)See notes in Table 6. kratio:risk based capital ratio;

(2) Explanatory variables are lagged one period, except for neutral, debt_filter, equi_filter and crisis.

9 Conclusions

Prudential regulators depart from some of the accounting rules to define the components of regulatory capital, setting filters for prudential purposes so as to preserve the loss absorbing capacity of capital. Currently, European jurisdictions can choose between neutralising unrealised losses and gains from fixed income instruments, so that such value changes do not affect regulatory capital or they can choose an asymmetric filter for both debt and equity instruments, by which losses are always accounted for while unrealised gains can only compute as regulatory capital with a haircut.

The proposal contained in Basel III to remove all prudential filters of unrealised gains and losses of instruments at fair value arises as a result from the debate on whether they have been an obstacle to the early identification of problems during the crisis. On the other hand, banks have raised concerns about the effects of the increased volatility of capital ratios that such change would imply, as, with the objective of minimising such volatility in the face of increased regulatory risk banks may be induced to hold larger buffers and to reduce their demand for fixed term securities.

This study provides empirical evidence for European banks of a) the possible impact on capital volatility of introducing in its computation unrealised gains and losses arising from Available For Sale securities; b) the effect of these prudential filters on the demand for assets to be held as AFS and c) the impact of such filters on regulatory capital.

We find that adjusting past observed banks' capital ratios with observed unrealised gains and losses results in more capital volatility, *ceteris paribus.* We can thus expect that the removal of all filters could be accompanied by higher volatility in capital ratios. As far as banks are concerned with regulatory risk, such increased volatility could result in changes in investment and capital strategy. In fact, our findings suggest that the regulatory treatment of unrealised gains and losses affects banks' behaviour.

In particular, we gather evidence that if unrealised gains and losses from fixed income securities are neutralised, and thus not recognised in regulatory capital, banks tend to hold a higher proportion of these assets in relation to securities valued at fair value than if losses are recognised and gains are not or only partially accepted. We could therefore expect that if the possibility of neutralisation is removed, we will observe a decline in AFS holdings of debt instruments, most of which are sovereign bonds. Given that banks provide a large part of the demand of long-term government securities, we could expect a contraction of trading in these markets. We could also expect costly changes in liquidity management as the decline in the incentive to devote excess liquidity to fixed income securities would require redefining investment strategies. In particular, the removal of filters could result in more assets being classified as held to maturity, impairing liquidity by the classification of assets in that portfolio. It could even affect banks' ability to lend.

We have gathered evidence that the impact of the asymmetric filter for debt instruments, where losses are fully recognised while gains are only partially included in regulatory capital, on banks' decisions is channelled both through capital ratios and through investment composition. In particular, we have found that the size of the filter for gains on debt instruments negatively affects the proportion of AFS debt that banks hold in relation to

these assets held at fair value. Therefore, the removal of the current asymmetric filter for debt instruments would reduce the weight of AFS debt over total debt at fair value, reinforcing the effect of the change from neutralisation to full recognition of gains and losses.

We also gathered evidence that under an asymmetric framework the size of the filter for debt instruments positively affects the amount of Tier 1 regulatory capital that banks hold. Removing such asymmetric filter will thus result in larger capital ratios.

On the other hand, we could not gather robust evidence that the regulatory treatment of unrealized gains and losses from equity impacts either the distribution of equity between the AFS and the Held for Trading portfolio or the standard capital ratio. However, our findings suggest that the equity portfolio could be marginally affected when the removal takes place, resulting in lower AFS equity holdings.

In fact, the results obtained for capital and portfolio composition are aligned with the hypothesis that banks' main concern is capital volatility, which will certainly increase with the proposed removal of prudential filters, and the higher probability of breaching regulatory ratios associated to such volatility.

The accompanying higher risk sensitivity and higher transparency that the removal of these filters will generate need to be analysed if the benefits are also to be considered. In fact, these effects would be especially welcomed during a crisis, when unrealised losses tend to accumulate, so that the presence of filters would mask the actual solvency position of banks. In particular, without filters, losses would be fully transferred to capital and there will be no incentives to accumulate assets that become illiquid as banks try to delay the recognition of losses in income until very late. The analysis of such improvements in corporate governance and in the provision of early warnings of possible problems is not addressed in this article. On the other hand, such recognition would intensify procyclicality in capital ratios, thus generating financial stability concerns.

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APPENDIX

Table A.1 Observations by jurisdiction

country	maximum number of banks	maximum number of observations
Austria	12	91
Belgium	5	41
Cyprus	4	27
Finland	5	40
France	6	45
Germany	21	143
Ireland	3	20
Italy	32	261
Luxembourg	4	27
Malta	2	14
Netherland	10	79
Norway	10	58
Portugal	7	54
Slovakia	4	22
Slovenia	3	23
Spain	20	117
United Kingdom	11	80
TOTAL	159	1142

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