

## **The impact of Basel I capital requirements on bank behavior and the efficacy of monetary policy**

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### **Abstract**

*The paper attempts to investigate the influence of the 1988 Basel Accord on bank behavior and monetary policy. It is argued that the Accord was successful in that it forced commercial banks in all of G-10 countries to maintain higher capital ratios. Tentative research suggests, however, that – at least among American banks – the Accord also encouraged the widespread resort to regulatory capital arbitrage techniques, in particular securitization. The paper also reviews the literature on the transmission mechanism of monetary policy and shows that the Basel Accord has affected the bank lending channel.*

**Keywords:** Basel Accord, Capital Ratios, Bank Regulation, Monetary Policy

**JEL classification:** E51, G28

### **1. Introduction**

After the spectacular collapse of two large international banks, Long Island's Franklin National Bank in the US<sup>1</sup> and Bankhaus Herstatt in Germany in 1974, monetary authorities and policy makers throughout the world decided that the increasingly more common cross-border capital flows and the resulting integration of financial markets that had been going on for some time, required a new global regulatory framework which would help ensure the stability of the international financial system. In particular, it became obvious that even though the prudence of domestic banks might be secured via home country regulations, the international activities of these banks lacked proper

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<sup>1</sup> The fall of FNB, whose insolvency had been covered up for a few years by fraud, falsification of records, bribery, and embezzlement of its major shareholder and mafia figure Michele Seldona, constituted the greatest bank failure in the history of American banking, up to the unfolding of the current crisis. DeWan (2008)

supervision.<sup>2</sup> Thus, against the backdrop of these considerations, the Basel Committee on Banking Supervision was established under the auspices of the Bank for International Settlements in Switzerland by the central bank governors from the G-10 countries (Belgium, Canada, France, Germany, Italy, Japan, Netherlands, Sweden, the UK and USA) in cooperation with the monetary authorities of Luxembourg and Switzerland. The Committee's task was to analyze the complexities of the modern banking system and respond to them with propositions of guidelines for appropriate supervision. It should be stressed, however, that (BIS 2007, p. 1):

The Committee does not possess any formal supranational supervisory authority, and its conclusions do not, and were never intended to, have legal force. Rather, it formulates broad supervisory standards and guidelines and recommends statements of best practice in the expectation that individual authorities will take steps to implement them through detailed arrangements - statutory or otherwise - which are best suited to their own national systems.

In other words, the Committee acts as an advisory body the purpose of which is to produce recommendations of concordats and accords, rather than laws *sensu stricto*, encouraging the harmonization of member countries' regulatory standards. This is meant not only to ensure efficient supervision of the international banking sector, but also to promote competition by ensuring that banks worldwide comply with the same bylaws, and thus face similar costs. Jackson *et al.* (1999, p. 22) note, for example, that "when banks are required to maintain equity cushions exceeding what they would otherwise choose it is natural for banks to view capital standards as a form of regulatory taxation." Thus, to the extent that international regulation imposes the same standards on banks, it may be perceived as a roller leveling the global financial playing field.<sup>3</sup>

The first proposal of an accord worked out by the Committee was the 1975 Basel Concordat which attempted to resolve the nontrivial question of which supervisory authorities should have jurisdiction over branches of banks operating abroad – should the home or the host country regulations apply. The Concordat proposed that the host country supervisor be responsible both for liquidity and solvency issues of

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<sup>2</sup> Of course, it might very well be argued that these efforts were merely a natural consequence of promoting moral hazard among commercial banks in the first place. In other words, it is conceivable that had it not been for the lender of last resort, banks would have acted much more prudently even in the absence of any governmental regulations. Thus, Selgin and White (1994, p. 1744) write: "The moral hazard created by deposit insurance and last-resort lending is in turn used to rationalize regulations on bank balance sheets. The theoretical and historical research cited above on whether "inherent instability" would characterize a laissez faire regime casts doubt, however, on the idea that confidence externalities clearly provide a rationale for government intervention."

<sup>3</sup> As an aside it is worth noting that in most instances of such international leveling regulations, harmonization occurs by some sort of averaging out of particular national regulations. As a result not every country – or branch of business – ends up better off. A stark example of such averaging out was the adoption of the common external customs tariff by the European Community in 1968.

foreign bank subsidiaries, whereas the home country should supervise the liquidity of foreign branches.<sup>4</sup> The changes introduced were of rather minor character and it was not until thirteen years later that the Committee's true *raison d'être* was established with the introduction of the 1988 Basel Accord (henceforth referred to as Basel I). Heffernan (2005, p. 181) calls the Accord "a watershed", and this seems to be a very astute appellation since Basel I focused expressly on effective supervision of international<sup>5</sup> banking operations and contained proposals aimed at harmonizing various national capital adequacy regulations. Specifically, a supervisory framework was devised, resting on a common standard of risk assessment, which required all international banks to maintain a certain minimum fixed relation between their capital and assets. This fixed relation soon came to be known as Basel capital ratio and was defined in the following way:

$$\text{Basel capital ratio} = \frac{\text{capital}}{\text{risk-weighted assets}} = \frac{\text{capital (tier 1 and 2)}}{\text{assets (weighted by credit type) + credit risk equivalents}}$$

Under the Accord, banks were required to hold a backing for weighted assets of no less than 8% total capital and at least 4% of tier 1, or core, capital. Core capital was defined as issued and fully paid ordinary shares/common stock plus non-cumulative perpetual preferred stock and disclosed reserves. Supplementary capital (tier 2) consisted simply of all other capital (i.e. undisclosed reserves, property where the value changes, bonds etc.). Assets were to be weighted according to their risk with:

- no risk (0% weight) being assigned to cash, gold and bonds issued by OECD government;
- 20% weight characterizing claims on agencies of OECD governments and local public sector entities;
- 50% weight attributed to mortgage loans;
- 100% weight assigned to all claims on the private sector, non-OECD governments, real estate, investments and all other assets.<sup>6</sup>

Even though the division between tier 1 and tier 2, as well as the specification of assets and weights, proposed under Basel I was hardly unambiguous,<sup>7</sup> the standards were immediately adopted by the G-10 governments and by the late 1990s the Accord has spread to over 100 countries worldwide (Jackson *et al.* 1999, p. 1).

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<sup>4</sup> For a concise treatment of the 1975 Concordat see Heffernan (2005), pp. 180-181.

<sup>5</sup> The accord was originally meant to apply only to internationally active banks leaving national authorities the freedom to set stricter standards as they might see fit (BIS 1988, p. 2), however most countries adopted the Basel I framework for both national and international credit institutions.

<sup>6</sup> For the technicalities of the regulations see BIS (1988).

<sup>7</sup> For a critical treatment see Heffernan (2008), pp. 184-185.

Clearly, the main purpose of the implemented regulations was to put a check on banks' activities as originators of credit by encouraging them to boost their capital positions. However, as the risk asset ratio might be increased by altering either the numerator or the denominator in the ratio, banks could improve their position not only by securing larger amounts of capital, but also by restructuring their balance sheets and resorting to arbitrage, in particular securitization. This would certainly be a viable option if banks were to perceive the new Basel framework as a form of undue taxation. Nevertheless, certain conditions with regard to the financial market ought to be satisfied for securitization to flourish. Hence, the popularity of this particular form of capital arbitrage seems, at least a priori, to be somewhat dependent on the institutional framework of a given country.

While it has been of some concern to regulators that the Accord might render the reported capital ratios somewhat misleading (Jackson *et al.* 1999), the present paper is more interested in its impact on monetary policy. In a stylized exposition of monetary policy, the central bank affects the economy via changes in commercial banks' reserves. For example, when the monetary authorities wish to relax economic conditions, they buy securities from commercial banks and increase their reserve holdings. This, as the theory goes, allows banks to accept more reservable liabilities (deposits) and grant more loans, thus expanding the supply of money and credit. However, this textbook account overlooks the fact that most central banks use short-term interest rates as their operational targets, and thus stand ready to supply any amount of reserves to keep their price (i.e. the short-term interest rate) at a level consistent with the monetary authorities' macroeconomic model. Hence, as Disyatat (2008) astutely observes, in modern conditions it is not the endogenous supply of reserves that constrains credit expansion but the level of capital ratios imposed by the regulators. After all, with a binding risk-based capital requirement, banks cannot simply expand credit without obtaining additional capital. Thus, if after the implementation of Basel I, banks have found their equity levels to be at or below the minimum requirement, their lending may have been less responsive to changes in the interest rate, and thus monetary policy may have had a weaker impact on general economic conditions.

The paper is structured in the following way. Section 2 provides some data supporting the view that the implementation of the Basel Accord has been successful in encouraging banks to hold higher capital adequacy ratios. It also investigates whether and to what extent the rise in capitalization may have been a result of capital arbitrage (securitization). Section 3 reviews the literature assessing the impact of the Accord on monetary policy and discusses the question whether the newly implemented Basel II framework might change that impact. Section 4 closes with some conclusions.

## **2. Basel I and securitization**

In trying to assess the successfulness of Basel I, the first question to ask is whether the new universal capital requirements introduced in 1988 led banks to hold higher capital ratios. Figure 1 uses the data collected by De Nederlandsche Bank to plot the evolution of capital ratios in a group of 29 OECD countries over the years 1990-2001. It is clear that capital-to-asset ratios increased significantly from roughly 8.5 to about 12%. This

result closely resembles that of Bondt and Prast (1999) who report an increase of about two percentage points (from 9 to 11%) in a selected group of G-10 countries (the UK, US, Italy, France, Germany, and the Netherlands) in the years 1990-1997, whereas Peura and Jokivuolle (2003) note that the average capital ratio for G-10 banks in 2001 stood at 11.2% (11.9% in the US and 10.8% in Europe). Naturally, reliance merely on descriptive statistics would render any analysis guilty of the *post hoc ergo propter hoc* fallacy. In other words, the observation that the introduction of Basel I was followed by an increase in capital ratios in and of itself does not yet prove that the increase in prudence was a direct result of the imposition of new regulations. After all, banks may have set aside more capital due to, e.g., competitive challenges, which seems all the more plausible as capital ratios have risen more than would seem necessary to comply with the new regulations.<sup>8</sup> Econometric analysis indispensable to set this matter straight is however rather challenging. The problem essentially boils down to comparing bank behavior with and without capital requirements all other factors held constant.

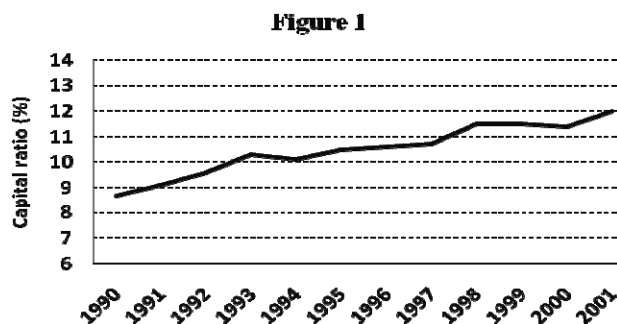


Figure 1. Average risk to assets in a group of 29 OECD countries. Source: De Nederlandsche Bank

Even though there seems to be no comprehensive statistical comparison of trends in bank behavior, a number of papers, e.g. Bondt and Prast (1999), Shrieves and Dahl (1992), and Ediz *et al.* (1998), have argued that relatively poorly capitalized banks tend boost their capital ratios to a greater extent than better capitalized ones. Rime (2001) who studied bank behavior in Switzerland reports, for example, that banks which at some point find themselves close to the minimum regulatory capital requirement tend to subsequently increase their ratio of capital to risk-weighted assets (RWA).

These observations were given a detailed explanation by Furfine (2000) who argues that in their portfolio management banks tend to take into account the considerable costs of falling below or even approaching the required level of capital adequacy. These costs include not only the official penalty imposed by the regulator and possibly intensified supervisory review, but also reputation losses. Furthermore, banks realize that if they should fall below the required capital ratio, they would have to

<sup>8</sup> Such mechanism is described in detail by Bernauer and Koubi (2002) who, having investigated the American banking sector, show that the better capitalized banks face significantly lower borrowing costs.

immediately cut back on their lending or obtain additional capital, neither of which is free. Thus, banks perceive costs of building up capital buffers exceeding the minimum requirement to be lower than possible losses, both in financial and reputational terms, incurred in the event of noncompliance. This conclusion is further substantiated by Furine's (2000) econometric analysis (based on 362 American banks) which reveals that even though many factors might conceivably have accounted for changes in banks' portfolios, only changes in capital regulation can simultaneously explain all of the observed alterations.

Additional light on the impact of the implementation of Basel I capital framework on bank behavior is shed by researches who have not been explicitly interested in regulatory issues as such, but studied instead the "credit crunch", or economic slowdown, in the early 1990s. For example, Haubrich and Wachtel (1993) note that American banks have substantially increased their holding of government securities from roughly 15% in 1989 to 22% of their total assets in 1993. The reason being, of course, that under the new regulatory standards banks were required to hold at least 8% capital backing for loans and 0% for government securities. The authors believe that to the extent that such a restructuring limited commercial lending, it might have contributed to a slowdown of the economy. Hall (1993) presents evidence that from 1990 to 1992 American banks have reduced their loans by approximately \$150 billion, and argues that it was largely due to the introduction of the new risk-based capital guidelines. He goes even so far as to say that "To the extent that a "credit crunch" has weakened economic activity since 1990, Basle-induced declines in lending may have been a major cause of this credit crunch." Hence, it is not an overstatement to say that Basel I did have an impact on bank behavior as it forced them to hold higher capital ratios than it otherwise would have been the case.<sup>9</sup>

Now that it has been established that Basel I did contribute, or even cause, an increase in capital ratios, it seems important to ask whether and to what extent this constituted a true increase in prudence. Clearly, to the extent that banks perceive compliance with capital requirements an unnecessary, or excessive, burden, it is reasonable to expect that they will develop techniques aimed at circumventing them. These techniques are usually called capital arbitrage and in principle involve such restructuring of a bank's portfolio that it has basically the same – or even greater – risk, yet a lower capital requirement. In a classic article Merton (1995) brilliantly observed that such practices are likely to continue as long as capital regulations are not based

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<sup>9</sup> Some authors stress, however, that the general compliance with the regulations regarding capital requirements would still persist even should those requirements be purely optional or even if they were not directly imposed by any government agency. In other words, even in the absence of government supervision and regulations, the market would itself still impose a certain "minimum" capital adequacy ratio binding for most banks. Bondt and Prast (1999) point out that there usually tends to be some "normal" level of capital holdings in the banking industry which banks tend to hover around since falling below it, would result in losses of credibility and higher borrowing costs. It remains an open question, however, whether this "normal level" would be smaller or greater than the 8% imposed by Basel I. See also Bernauer and Koubi (2002).

directly on the portfolio's underlying risk, but instead on a broad class of asset categories weighted by risk. To illustrate the extensive possibilities for arbitrage under Basel I, Merton offered the following example (pp. 468-469):

If a bank were managing and holding mortgages on houses, it would have to maintain a capital requirement of 4%. If, instead, it were to continue to operate in the mortgage market in terms of origination and servicing, but sells the mortgages and uses the proceeds to buy US government bonds, then under the BIS rules, US government bonds produce no capital requirement and the bank would thus have no capital maintenance. However, the bank could receive the economic equivalent of holding mortgages by entering into an amortizing swap in which the bank receives the total return on mortgages, including the amortization features and prepayments and pays the returns on US Treasury bonds to the swap counterparty. The net of that series of transactions is that the bank receives the return on mortgages as if it had invested in them directly. However, the BIS capital calculation, instead of it being 4%, appears to produce a capital requirement using the swap route of about 0.5%.

To understand in greater detail the mechanics of capital arbitrage recall first that if a bank wanted to boost its capital-to-asset ratio, it would – from a purely arithmetic point of view – have only two ways of achieving that. It could either increase the numerator, i.e. obtain more capital, or decrease the denominator by cutting back on its loans or reducing their riskiness. While some banks really have improved their soundness by choosing one of these two options, there is ample evidence that many have simply exploited the deficiency of Basel I regulations described in Merton (1995) by inflating the measures of capital or reducing their measures of accounting (nominal) risk with no corresponding reduction in economic risk.<sup>10</sup> The problem with the former approach, i.e. with artificially inflating capital by, say, gains trading, is that it only increases capital in the short run. What seems much more attractive from the bank's point of view is the second alternative which involves reducing the measures of risk most notably through securitization.

Securitization is a broad concept, but in what follows it will be always understood simply as issue of asset backed securities (ABS), or as Heffernan (2005, p. 45) succinctly puts it “a process whereby traditional bank assets (for example mortgages) are sold by a bank to a trust or corporation, which in turn sells the assets as securities.” In other words, the bank first originates a certain class of assets, such as home mortgages or consumer loans, then pools them together and takes them off its books by selling to a separate entity (called special purpose vehicle, or SPV) which subsequently resells them as fixed-income securities to third party investors. In the final step, proceeds from the sale are transferred to the bank (see Figure 2).

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<sup>10</sup> See on this in particular Jones (2000).

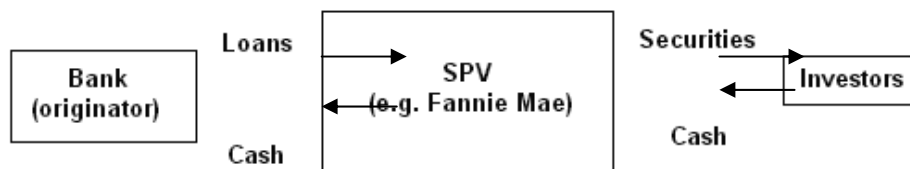


Figure 2. The process of securitization

In the US the process of securitization was sparked by the establishment of agencies that were either government owned – as in the case of the Government National Mortgage Corporation (Ginnie Mae) – or government-related – as in the case of the Federal National Mortgage Association (Fannie Mae) and the Federal Loan Mortgage Corporation (Freddie Mac) – and whose purpose was to facilitate home ownership.<sup>11</sup> Ginnie Mae started the issue of mortgage backed securities (MBS) in 1970 and Freddie Mac with Fannie Mae soon followed suit. Though it has not been stressed before, crucial for the viability of the whole securitization undertaking is the rating that credit rating agencies (such as e.g. Standard and Poor's or Moody's) assign to the issued obligations. As Heffernan (2005, p. 46) astutely observes, Ginnie Mae, Fannie Mae or Freddie Mac were perceived by the market as government-sponsored enterprises, or GSEs, whose debt was essentially guaranteed by the government (even if their respective charters did not explicitly mention that), and hence the MBS they issued had the same credit rating as those of the US government (nb. under the Basel I set up it was very profitable for banks to originate home mortgages, sell them to, say, Ginnie Mae, and then buy them back on the secondary market after the credit rating has been improved).

Even though securitization has been technically a possibility since 1948, its spectacular growth intensified only in the late 1980s. Ergungor (2003) estimated securitization of loan portfolios by private and government sponsored entities in the US to be a \$5 trillion business of which roughly \$3 trillion consisted of mortgage backed securities. Since then, according to the Flow of Funds data of the Federal Reserve, GSE-backed mortgage pools have grown to roughly 5 trillion dollars. To put this into perspective it is worth noting that in the early 1980s the extent of non-mortgage securitization was very limited and totaled less than \$4 billion. In the euro area the popularity of ABS transactions is somewhat less pronounced, but it has increased significantly after the introduction of the euro (which naturally extended the market), and the issuance of collateralized debt obligations reached €124 billion in 2006.<sup>12</sup> Although it is somewhat problematic to estimate the full scope of securitization due to

<sup>11</sup> Fannie Mae was founded in 1948, whereas Ginnie Mae and Freddie Mac were an outgrowth of a split within the New Deal's S&Ls (saving and loan banks) which occurred in 1968.

<sup>12</sup> See ECB (2008)



the fact that many banks and financial institutions do not regularly disclose sufficient information, it nevertheless should be clear that securitization has in recent years gained considerable prominence. In fact, Ergungor (2003) notes that the dynamic development of loan securitization coincided with the imposition of new capital requirements and regulations limiting asset growth.<sup>13</sup> This seems rather plausible since while banks may find securitization beneficial for a variety of reasons (it allows them, for example, to retain their function as originators of credit, and thus maintain their customer base, without having to bear the potential cost of debt default), its most important aspect consists in reducing their capital-to-asset ratio.

<b>Bank's balance sheet: benchmark scenario</b>				<b>Bank's balance sheet: securitization</b>			
Loans	\$100	Deposits	\$87	Loans	\$80	Deposits	\$67
Reserves	\$1	Equity	\$12	Reserves	\$1	Equity	\$12
Total	\$99			Total	\$79		
				Loans	\$20	ABSs	\$20

Figure 3. Securitization from an accounting point of view.

Figure 3 presents the process of securitization from an accounting point of view. In the benchmark scenario, on the left hand side of the picture, the bank holds all the loans on its balance sheet, whereas on right hand side the bank decides to securitize a \$20 package of its loans.<sup>14</sup> In the former case its total risk-weighted assets equal \$100 (assume a 100% weight) and its total capital is \$13, hence the Basel capital ratio equals 13%. When \$20 of its loans are securitized, total risk-weighted assets decline to \$80 and the capital ratio increases to 16.25%.<sup>15</sup> It is clear, then, that the transfer of loans has increased the bank's potential to originate further loans. It might be argued that in the case where a full transfer of risk occurs – such as the one described above – the bank's situation really does significantly improve as is indicated by the increase in the capital ratio. Note however, that even though all loans were assumed to have a 100% weight (as is the case under Basel I with commercial loans), it hardly ever means they are necessarily of uniform quality, since borrowers' ratings may vary from as high as triple A to as low as single B. Thus, a bank might very well select a pool of high-quality loans

<sup>13</sup> This was the case of the Competitive Equality Banking Act of 1987 which was meant to limit the asset growth of credit card banks to 7% a year.

<sup>14</sup> For the sake of clarity, tax deductions and possible servicing fees, which do not substantially change the overall picture, were omitted.

<sup>15</sup> Proceeds from the sale of loans are usually used to repay the bank's obligations vis-à-vis its creditors (either on the interbank or otherwise) or to buy back the issued share capital, hence the corresponding drop in liabilities.

in order to bolster the rating of the ABS, which – as has been demonstrated – would decrease its risk-based capital requirement in proportion to the reduction in total loans, though due to the relatively poorer quality of the remaining assets its true risk exposition would actually increase. This becomes even more evident once a much more popular case of retained risk securitization is concerned.

Assume, as before, that a bank holds \$100 worth of loans of which it decides to securitize \$20. Nevertheless, the situation changes in that the SPV requires that in order to enhance the credit rating of the ABSs the bank should offer it a \$1 loan that would function as a collateral for the issuance. Obviously, in this case the transfer of risk is only partial, yet as the maximum potential credit loss is concentrated in a \$1 loan instead of the \$20 pool, the capital ratio also increases from the base scenario to 15%.<sup>16</sup>

Thus far, it has been argued that the introduction of the Basel Accord has contributed to the general rise of capital adequacy ratios in OECD countries. It has also been suggested that capital regulations might be an incentive for banks to resort to capital arbitrage, the most prominent technique of which is asset securitization. Now it is time to put the two together and pose the question whether indeed it can be argued that Basel I regulations have facilitated the growth of securitization. The issue can be approached from a more general angle, as proposed most notably by Obay (2000), who tried to find out to what extent banks that resort to asset securitization are different from non-securitizing ones, expecting that the possible differences may manifest themselves in such characteristics as size, capitalization, profitability, funding costs, liquidity, competitive advantages, level of international banking, level of wholesale business etc. The study was based on a set of 200 American banks, of which 95 securitized assets whereas 105 did not, and used multivariate analysis of variance (MANOVA) to assess group differences across multiple metric dependent variables. The results of the analysis are reproduced in Table 1 below.

<b>Dependent variable</b>	<b>Mean (securitizers)</b>	<b>Mean (non- securitizers)</b>	<b>Significance level (Bonferroni t-test)</b>
<b>Assets (\$bn)</b>	19.792	9.917	0.0075
<b>Foreign asset ratio</b>	0.0152	0.0069	0.0570

<sup>16</sup> Credit enhancement adds some confusion to the calculations of total risk-weighted assets. Usually, provided that the amount of enhancement is less than 8% of the securitized pool, the RWA consists of the loans kept on the balance sheet (weighted accordingly) and an add-on amount corresponding to the enhancement, which is calculated in the following way  $EA/(C-E)$ , where  $E$  stands for the amount of the enhancement,  $C$  for capital, and  $A$  for the risk-weighted assets excluding the enhancement (see Jackson 1999). Thus, in the case discussed above,  $E=1$ ,  $C=13$ ,  $A=80$ , the total RWA= $80+6.67=86.67$ , and the Basel capital ratio equals 15%.

<b>Wholesale ratio</b>	0.3218	0.3748	0.0210
<b>Risk-based capital ratio</b>	0.1554	0.1785	0.0001
<b>Diversification index</b>	0.2198	0.1915	0.2796
<b>Net charge-off ratio</b>	0.0061	0.0045	0.1995
<b>Fee income ratio</b>	1.1901	1.6647	0.5650
<b>ROA</b>	0.0129	0.0121	0.4168
<b>Deposit to loan ratio</b>	1.0412	1.1901	0.0293
<b>Volatile deposit ratio</b>	0.2415	0.2162	0.3181
<b>Securitizable loan ratio</b>	2.3922	1.0949	0.0086
<b>Loan growth ratio</b>	74.800	89.150	0.4080
<b>Funding cost ratio</b>	0.6533	0.6930	0.1856
<b>Funding efficiency ratio</b>	0.4808	0.4160	0.0811
<b>Securitization in 1994</b>	0.1037	0.0007	0.0007

Table 1. MANOVA results. Source: Obay (2000)

Multivariate tests of significance indicate that the overall financial characteristics of the two groups are significantly different at the 0.01% level. The univariate statistics based on the Bonferroni t-test show that 6 out of 15 variables differentiated between the securitizing and non-securitizing banks. Importantly, one such distinguishing feature was the level of risk-based capital ratio, which appears to be significantly higher for non-securitizers. Obay (2000) draws from this the conclusion that “compliance with regulatory requirements (...) has been an important motive behind banks’ adoption of financial innovation in general and asset securitization in particular” (p. 145). It should be emphasized, however, that even though Obay’s (2000) research focused on the period in question (i.e. the early 1990s, shortly after the adoption of Basel I) and thus might be treated as an important evidence that Basel regulations did facilitate the growth of securitization, it nevertheless covered only American banks. Hence, it still remains to be validated to what extent this conclusion might be extended to other G-10 countries.

Unfortunately, securitization seemed to be a phenomenon of rather minor importance outside the U.S. prior to the year 2000. There are several possible explanations for that. First of all, as Coles and Hardt (2000) observe, securitization outside the U.S. remained costly and capital intensive during the 1990s. For example, the 98/32/EC directive allows only for a 50% weighting of MBSs, which is clearly less

favorable than the 20% prevalent in America where the securities are guaranteed by government-related enterprises (e.g. Fannie Mae, Ginnie Mae). Second, and related to the latter argument, Article 87 of the EC Treaty expressly states that “any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the common market.” Thus, the EU member states are not allowed to create enterprises similar to Freddie Mac and Fannie Mae, and in this way promote securitization. Third, in the decade of 1990s, there existed no common, harmonized financial market in Europe. This has changed significantly with the adoption of the common currency, and, unsurprisingly as ECB (2008) notes, it is the introduction of the euro along with the resulting financial integration – and not the Basel regulations as such – which gave impetus to the rapid growth of securitization in Europe. Finally, as might perhaps be intuitively clear, the extent to which banks resort to capital arbitrage should correspond to the degree to which they find the regulations excessive or burdensome. For example, Wagster (1999) reports that due to the implementation of the Basel framework, American banks increased their ratio of tier 1 capital-to-risk-weighted-assets in the period 1990-1992 by over 38% – a change three times bigger than the one that occurred in Japan.

Banks in the United Kingdom, on the other hand, increased their tier 1 capital-to-risk-weighted-assets ratio by only 0.89%.<sup>17</sup>

Hence, American banks may have been under greater pressure than their European counterparts and – taking advantage both of the prevalent institutional framework and certain loopholes in the Basel setup – have to a greater extent resorted to capital arbitrage techniques.

The observation that capital requirements fostered the development of securitization, and thus the transformation of banking model from “originate-and-hold” to “originate-and distribute,” seems especially relevant in trying to assess the impact of various regulations on the current crisis. Securitization has been blamed for reducing banks’ incentives to monitor credit risk and for the erosion of lending standards which seems to be at the heart of the current crisis (e.g. Demyanyk and van Hemert 2007). Nevertheless, the extent to which the financial sector has been hit by the burst of the real estate bubble, suggests that securitization is not the only culprit. After all, the whole idea of securitizing assets is to spread risk more evenly across the economy by putting on the balance sheets of those able and willing to bear it. Interestingly, however, a recent study

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<sup>17</sup> The reason behind that is that the framework of the Accord was modeled after a system that had been used in the United Kingdom since around 1980. In fact, the end result of the negotiations at the BIS forum in 1988 resembled the U.K. risk-based capital model to such an extent, that the United Kingdom implemented the Accord almost immediately, completely forgoing a four-year implementation period allowed by the Basel Committee. Thus, as far as Britain was concerned, Basel I meant essentially nothing new.

by Greenlaw et al. (2008) persuasively argues that roughly 49% of the subprime-securitization exposure rests in the U.S. leveraged sector – commercial banks, investment banks, hedge funds – and adding foreign investment banks and hedge funds increases the extent of potential subprime-related losses concentrated in the leveraged sector to over two thirds. Apparently, therefore, something must have gone seriously wrong with the risk-dispersion process supposedly inherent in the securitization process.

One way to understand where and why possible frictions might have occurred is to consider an idealized securitization transaction whereby the originator, bound by capital adequacy rules, sells a pool of assets to an off-balance-sheet entity. What is of critical importance, however, is the issue exactly what kind of an off-balance sheet entity takes control over the assets. It may be a special purpose vehicle (SPV), i.e. what Gorton and Souleles (2005) call a bankruptcy remote, “robot firm,” with no employees, no physical existence, and no capacity to make substantial economic decisions. SPVs typically carry out predefined tasks of tranching pools of receivables obtained from the originator into asset-backed securities which are then sold on the market in much the same way as described above. Alternatively, the originating bank could set up an off-balance-sheet conduit called structured investment vehicle (SIV), a physically existing, managed and leveraged financial company whose purpose will be to undertake arbitrage by buying long-term fixed-income assets from its sponsors to fund them with short-term liabilities such as asset-backed commercial paper (ABCP).

As Shin (2008) astutely observes, the critical difference between SPVs and SIVs stems from the fact that selling a loan is entirely different from issuing liabilities against it. While the former – to the extent that loans are indeed passed down the chain – contributes to spreading credit risk around the whole economic system, the latter keeps it concentrated around the very bank that originates the loans and only hides it from the regulators. As recognized by the IMF (2008, p. 69) in one of its latest reports on global financial stability:

...SIVs and commercial paper conduits, are entities that allow financial institutions to transfer risk off their balance sheet and permit exposures to remain mostly undisclosed to regulators and investors; to improve the liquidity of loans through securitization; to generate fee income; and to achieve relief from regulatory capital requirements.

For our present purposes, the issue of why exactly the SIVs were so eager to hold securitized assets in their balance sheets is of minor importance (see on this Jablecki and Machaj 2009). It is sufficient to note that Basel capital rules – based on fixed risk measurement and designed to protect from excessive credit expansion – could be circumvented and that risks could be conveniently hidden from the sight of supervisors and investors alike. Unfortunately, the necessity to obey regulatory rules is just that and nothing more. In particular, it does not entail the necessity to avoid too risky investments, but rather the necessity to satisfy governmental rules and minimize the risk on paper, not in reality. This turns out to be especially important when it is implied by the institutional setup of the financial system and incorporated into the expectations of market agents that fiscal and monetary policy tools – whether in the form of buying

stocks and junk bonds with taxpayers' money, or in the form of special liquidity operations undertaken by the central bank – will most likely be used to such an extent as is necessary to guarantee the stability of the financial system.

### **3. Capital requirements and monetary policy**

Having investigated the impact of capital rules on securitization, we can move on to their impact on monetary policy. The investigation of the possible effects of capital regulations on monetary policy starts with the recognition that monetary policy influences the economy not only via the conventional interest rate channel (which concentrates on the fact that the lowering of short-term interest rates, due to sticky prices, affects also the short-term real interest rates which stimulates spending and raises aggregate demand),<sup>18</sup> but also via the so-called bank lending channel, central to which is the idea that changes in the policy rate translate into changes in the supply of loans which in turn dampens or stimulates economic activity more than would be the case solely on the basis of changing interest rates (Kashyap and Stein, 1997). For example, the theory would have it that when the central bank conducts open market operations and lowers banks' reserves, it reduces in the same time the extent to which banks can collect deposits. The problem with such an explanation is that in the current circumstances, when central banks tend to control the short-term interest rate, reserves are endogenous, supplied by the monetary authority in an amount sufficient to accommodate the demand of the banking sector. This does not imply that banks do not alter their supply of loans in response to changes in the interest rate, but rather that they do so for reasons other than the shortfall in reserves.<sup>19</sup> Indeed, as explained by Disyatat:

Given that central banks supply reserves endogenously, the existence of a bank lending channel [avenue via which central banks can directly affect the amount of loans and deposits in the economy – JJ] in practice depends on whether changes in money market interest rates can have an independent effect on banks' loan supply. For example, an increase in interest rates may affect the economic outlook of banks and increase the perceived riskiness of loans leading to an inward shift in banks' loan supply function... To the extent that monetary policy has an independent impact on loan supply, it is likely to take place through the balance sheets effects and revisions of risk perceptions rather than through any mechanical link between stance of policy and quantity of deposits (Disyatat, 2008, pp. 16-17).

Hence, one factor that may account for the fall in the loan supply following an interest rate hike is the fall in borrowers' perceived creditworthiness (as a result of a fall in collateral values). Another – and one of more importance for our present purpose – is the bank's capital adequacy.

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<sup>18</sup> See e.g. Mishkin (1996).

<sup>19</sup> After all, it would be most unusual to hear – having approached a bank for a loan – that even though the bank would like to extend it, it has not enough reserves to do so.

Consider, for example, what would happen should a bank find itself below or at the very level of the mandatory capital requirement of 8%. Clearly, in such a case the bank could not expand its loan supply without obtaining additional capital. If it were additionally for some reason impossible to issue equity, any increase in reserves would lead to a corresponding increase in reservable deposits, but – for the purpose of improving the capital ratio – the new funds would have to be invested in government securities, not commercial loans, and thus the bank lending channel would be completely inoperative.

The simplistic and static argument presented above has been significantly extended and developed by Van den Heuvel (2007) who assumes that: (i) there exists a market for capital, but it is imperfect, i.e. there are frictions – such as, e.g., costs and taxes – which impair the issuance of equity; (ii) banks are subject to interest rate risk due to the mismatch between the maturity of their assets (which tend to be long-term) and liabilities (which are mainly short-term). Van den Heuvel designed a highly sophisticated model, but the stylized exposition of the way it operates runs as follows. If the central bank pushes the market interest rates up, banks seek to renegotiate their loans and deposits. Nevertheless, since it is harder to raise the interest rates on long-term loans, than on short-term deposits (the phenomenon is of course exacerbated by the presence of competition), banks are likely to exhibit lower profits, which over time will translate into lower capital. Given that there are costs of issuing equity, as described in (i), banks will reduce lending in order to comply with the capital requirements. Importantly, Van den Heuvel's model predicts that while this effect is strongest for the poorly capitalized banks, it holds even if banks are well above the Basel adequacy ratio, since they might optimally reduce lending now – in response to a monetary policy tightening – in order to mitigate the probability of falling below the capital requirement in the future. Of course, this result is particularly interesting, since, as shown in Figure 1, for the most part of the 1990s banks tended to be significantly above the minimum capital ratio of 8%. Gambacorta and Mistrulli (2004) provide some empirical evidence on the strength of such a “capital channel,” assuming that banks hold capital levels above the 8% required by the Basel I framework. They show that an increase of one basis point in the ratio between the maturity transformation cost (depends on the maturity mismatch between assets and liabilities and reflects the loss per unit of assets that the bank suffers when the policy rate increases) and total assets is followed by a 1 percent reduction in the growth rate of bank lending.

There is also one other conceivable way in which bank equity might be related to the strength of monetary policy signals (Van den Heuvel, 2002). To see it, consider two banks which have similar quality assets, but different composition of liabilities. Let the first bank have less equity and more deposits, and the second have relatively more equity and less deposits. If after a monetary policy tightening both banks face an outflow of deposits, they will both seek to replace them with non-insurable debt, say certificates of deposits, to keep their lending unchanged. Even though – as has been assumed – assets of the two banks are essentially of the same quality, the first one will find it more expensive to issue CDs, since due to its lower capitalization they will be

perceived as more risky than the CDs of the second bank. In other words – borrowing the term from George Akerlof – the first bank has to pay its investors a “lemon’s premium,” and thus it is likely to reduce its lending to a greater extent than the second, well-capitalized bank. Hence – somewhat paradoxically – to the extent that capital regulations force banks to maintain higher capital ratios and boost their equity, they may also weaken the bank lending channel. Indeed, Gambacorta and Mistrulli (2004) estimate that well-capitalized banks are completely insulated from the effect of a monetary tightening (i.e. the effect is statistically not different from zero).<sup>20</sup>

It follows from the discussion above that the investigation into the effects of Basel I on bank lending, and thus monetary policy, is perhaps not conclusive, but allows for at least one generalization. It seems that the lower the capital-to-risk-weighted-assets ratio, the stronger the response of lending to monetary policy signals (both because of the adverse selection problems and the maturity mismatch and interest rate risk). A question could be raised, however, to what extent these effects are likely to change under the new, improved Basel Accord of 2006/07. While a detailed description of Basel II is beside the scope of this paper, largely due to the complexity of the new system (a detailed treatment might be found e.g. in Heffernan, 2005, pp. 192-210), a few casual remarks can perhaps be made. Most importantly, Basel II imposes a much more sensitive set of risk weights which are meant not only to eliminate capital arbitrage techniques, such as securitization, prevalent most notably in the U.S., but also ensure that riskier banks hold more equity. One interesting novelty is that under the new framework, banks’ capital requirements are based on their internal estimates of the probabilities of default (PDs) and losses given default (LGDs) of their loans. Clearly, PDs and LGDs are highly pro-cyclical, i.e. the creditworthiness of borrowers moves with the economic cycle, and thus more capital will have to be set aside during a depression and less during an economic boom. In other words, when interest rates increase due to a monetary policy tightening, PDs and LGDs are likely to rise as well, and hence lead to higher capital requirements, which in turn, on both accounts mentioned before, might reduce bank lending. Thus, the tentative conclusion regarding Basel II is that it strengthens the bank lending channel.

The efficacy of monetary policy, however, is influenced by many other factors, some of which, e.g. securitization (see footnote 21), seem to work in the opposite direction, and thus it is hard to make any predictions regarding the overall effect of changes in the financial market setup.

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<sup>20</sup> There might be yet another way for capital regulations to alter the efficacy of monetary policy. To the extent that the implementation of the Basel I framework has facilitated the growth of securitization, which – as has been argued above – seems to be the case at least in the U.S., it may have additionally insulated banks’ loans portfolios from monetary policy shocks and impaired the measurement of money and credit aggregates. On the impact of securitization on loan supply see e.g. Estrella (2002), Loutskina (2005), and Altunbas *et al.* (2007). On the distortion of money and credit statistics see Collins *et al.* (1999).



#### 4. Conclusions

The paper attempted to analyze the effects of the implementation of Basel I capital requirements on bank behavior and monetary policy. It has been argued that the new regulations generally led banks to set aside higher amounts of capital, nevertheless, at least in the U.S., part of the increase seemed to be attributable to capital arbitrage (securitization). The paper has also reviewed some tentative research regarding the effects of Basel I on the efficacy of monetary policy. Due to adverse selection problems and possible capital depletion resulting from the maturity mismatch, banks mindful of the capital requirements, will reduce lending in response to a monetary policy tightening, amplifying the bank lending channel. This result being the stronger, the lower their capital-to-risk-weighted-assets ratio is. Finally, it has been argued that the new Basel II framework is likely to strengthen monetary policy even further, yet conclusive empirical research to support this hunch is still needed.

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