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*White Paper*

# Research

## Likely Effects of Basel II Capital Standards on Competition within the 1-4 Family Residential Mortgage Industry

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*Executive Summary*

New, “Basel II” standards of capital adequacy were established by the Basel Committee on Bank Supervision in June 2004. Although the published “framework” discusses three aspects of bank safety – capital adequacy, supervision, and market disclosure – most of the innovation concerns capital adequacy. New rules are designed to align regulated banking firms’ capital cushions with the riskiness of their portfolios, in order to assure a minimum credit quality for internationally-active banks. The implementation of Basel II standards has begun in Europe and is scheduled to begin in the U.S. in 2008. At least on paper, the implications of revising capital adequacy rules appear to be substantial. The purpose of this paper is to explain the underlying issues, then to evaluate the available research that has been produced so far.

Basel II offers three alternative methods for computing adequate capital, but even the simplest method is more complex than the system we have in place today. U.S. banking regulators weighed the costs and benefits of revised capital standards, and decided to implement a bifurcated system of capital regulation for U.S. depository institutions. Most banking firms will continue to operate under existing (Basel I) capital rules. Those rules make relatively coarse distinctions about asset default risks, with correspondingly coarse implications for minimum equity ratios. At the other extreme, approximately ten large, internationally active banks will be required to employ a complex “advanced internal ratings based” (AIRB) methodology, which recognizes even small differences in default risks between similar assets. These banks will be required to compute their own portfolio risk exposures, which regulatory formulas will translate into a minimum required capital ratio. Supervisors anticipate that another ten large banks may “opt in” to the AIRB method for determining sufficient equity.

Under such a bifurcated capital standard, the AIRB adopters and non-adopters will be subject to substantially different capital requirements for similar assets. For

example, AIRB adopters can probably hold as little as 40 bps of equity against each dollar of prime mortgages, while non-adopters will continue to hold 200 bps (2 percent). Because equity capital is more expensive than debt (deposits), a higher capital ratio corresponds to a higher cost of funds and hence a lower return on equity when investing in any given asset. How large might the differences in required capital be? Shortly after the new rules were published, the Fed asked 26 large banks to compute their Basel II capital requirements. When the results of this “Quantitative Impact Study” became available in 2005, 23 of the 26 banks showed lower capital requirements under Basel II than under Basel I. For the average mortgage loan, the AIRB might reduce minimum capital by up to 75 percent.

This matters because capital affects pricing, profits and competitive ability. It seems quite likely that the introduction of Basel II will shift comparative advantage in financing high-quality mortgage assets toward larger, AIRB firms. The key question is how much the bifurcated capital system is likely to matter. The capital differentials embodied in Basel II are not unprecedented in the marketplace: Fannie Mae and Freddie Mac have long operated with substantially lower capital requirements than the banks they deal with. Accordingly, the actual competitive effects of Basel II may be more limited than they appear. Only a few technical papers have evaluated the impact of these capital differences on the U.S. residential mortgage market, and they have reached conflicting conclusions. This paper reviews the available research, to determine the likely impact of Basel II on three specific facets of the U.S. market for 1-4 family residential loans:

- ◆ Which institutions or investors will hold mortgage default risk in their portfolios?
- ◆ How will the AIRB banks’ reduced equity requirements affect their ability to compete with Fannie Mae and Freddie Mac?
- ◆ Will a bifurcated capital standard encourage mergers among depository financial institutions?

On net, the most important effects on mortgage market participants should come from the third effect: smaller institutions are more likely to be acquired by larger ones.

Federal Reserve Board economists have produced two papers examining whether a bifurcated capital standard will affect the retail mortgage business. Somewhat surprisingly, the two papers reach dissimilar conclusions. Calem and Follain [2005]

predict that AIRB banks will hold relatively more mortgage assets under Basel II, particularly loans with the lowest apparent default risks. Hancock, Lehnert, Passmore and Sherlund [2005] (hereafter, “HLPS”) argue that the effects foreseen by Calem and Follain are likely to be very small, for two reasons. First, the housing GSEs (Fannie Mae and Freddie Mac) presently operate with required capital far below the banks’, and mortgage prices (contract rates) already reflect the GSEs’ dominance in the conforming mortgage market. Second, HLPS point out that capital requirements are imposed on an entire portfolio, but there is no requirement that all loans in the same portfolio have identical risks. Uneconomically high capital requirements for a subset of a lender’s loans can be rendered irrelevant by forming a “blended” portfolio. By blending safer (prime) mortgages with riskier (Alt-A or subprime) loans, a financial institution can raise its desired capital cushion to the level of its regulatory minimum.

Both of the ideas offered by HLPS deserve serious consideration. However, they seem unlikely to offset completely the impact of required capital changes on loan pricing. It seems likely that at least some non-adopters will add riskier, non-mortgage loans into their portfolios, even though the dangers associated with entering new lines of underwriting are rather well known. Another, even more worrisome, mechanism by which non-adopters might respond to the impact of higher capital charges is by blending more interest rate risk into their operations. The formal capital rules do not explicitly recognize interest rate risk exposure, providing non-adopters with the possibility of increasing their interest rate risk exposure without attracting higher equity minima. The dangers to this approach should be obvious to anyone who experienced the 1980s’ thrift debacle.

What about the GSEs? They presently operate with less capital than the banks from which they purchase mortgages: 45 bps vs. 200 bps. However, the AIRB banks will probably turn the tables on the GSEs because their regulatory capital charges for high-quality mortgages will fall below those of the GSEs. This should create some downward pressure on the GSEs’ guarantee fees (now 15 – 20 bps). The AIRB banks may also be able to profit by writing credit guarantees for loans owned by smaller, nonadopting institutions. It thus seems clear that AIRB institutions will come to hold

more of the nation's mortgage default risk, although competition will probably limit their ability to extract large profit increases.

Finally, and perhaps most importantly, it seems likely that a bifurcated, Basel II capital standard will encourage the AIRB banks to acquire non-adopters. Mechanisms for relieving the constraints of regulatory minimum capital rules all involve costs: holding riskier mortgages, non-mortgage loans or interest rate risk. In at least some instances, a better alternative for a well-capitalized nonadopter will be to sell itself to an AIRB bank, which can lever the target's equity capital more aggressively. Hannan and Piloff [2004] find little evidence that capital differentials have encouraged mergers in the past, but the results could differ with a starkly bifurcated capital standard and nationwide branching.

All of these conclusions must be interpreted in the context of the uncertainty surrounding how capital standards will actually be revised. Late in 2005, the four federal banking agencies issued an "Advanced Notice of Proposed Rulemaking" (ANPR), seeking public responses to the idea of a "Basel I-A" capital standard that would lie roughly between the historical (Basel I) rules and the AIRB rules. The initial sketch of Basel I-A included some specific changes that would provide the AIRB's flexible treatment of mortgage loans to much smaller institutions. Future regulatory changes might therefore close much of the gap between the two forms of capital regulation currently on the table.

## **I. Introduction**

The U.S. market for 1-4 family home mortgages has always been large: such mortgage debt stood at \$9.1 trillion at yearend 2005, or nearly 70 percent of U.S. GDP. This ratio stood at 15.3 percent in 1952, and has increased almost every year since then. Over the past two decades, this large debt market has also become increasingly complex. Before the early 1980s, the vast majority of mortgage loans were originated and financed by the same organization – usually a bank or a savings institution. The risks associated with financing long-term, fixed rate mortgages with shorter-term deposits became painfully obvious with the 1980s thrift crisis. The market responded by dividing mortgage loans into their financial sub-components: origination, financing, servicing, and credit risk-bearing. Now, a mortgage originator can either keep a loan in her portfolio or sell it to another investor. Breaking the bond between originating and financing mortgages has generated an increase in competition for both components. Loan originators can sell their loan product much more easily than they could in the past. A loan sold by its originator might be held as a whole loan in someone’s portfolio. More likely, it will be combined with other loans into a pool, whose claims trade on the open market. Pools are formed and marketed by the two federal housing enterprises (Fannie Mae or Freddie Mac), and also by a variety of large mortgage lenders and investment banks. Mortgage investors can choose to accept a loans’ default risk, or buy credit insurance from someone else. Historically, in most cases, the default risk was absorbed by one of the federal housing enterprises, but alternative credit insurers have been expanding rapidly. Even the loan servicing function is generally separated from ownership: mortgage investors pay processors to handle payments, taxes and delinquencies.

This de-construction of the mortgage process was not driven by capital requirements when it began to emerge in the 1980s, but was responding to the interest rate risk associated with the thrift crisis. With the introduction of “Basel I” capital standards in 1990, however, the equity

capital associated with various forms of mortgage finance began to affect how those loans were financed. At least since the mid-1990s, federal “capital adequacy” regulations have probably played an important part in allocating various mortgage types to specific institutions. Although capital standards are not the *sole* determinant of mortgage financing patterns, new regulations due to take effect in 2008 may further alter the mortgage-financing landscape. These “Basel II” rules may substantially reduce large banks’ effective cost of holding mortgage credit risk, while leaving most smaller institutions’ costs unchanged. Some observers speculate that such a “bifurcated” system of capital standards will bestow competitive advantages on the largest institutions. Larger lenders might underprice small lenders and/or the housing GSEs; smaller mortgage lenders might need to expand the riskiness of the loans they hold in portfolio; the GSEs might be forced to price their loan guarantees to reflect default risks more closely; and other things. At the same time, other authorities argue that the pending revisions will have little effect on mortgage lenders or on loan markets. Who’s right?

This article explains the proposed changes to regulatory capital rules and reviews the available evidence about how a bifurcated system of capital standards would affect various components of the mortgage sector. I start out by explaining why capital requirements matter to regulated firms. In short: an institution’s expected return on equity is higher when it finances its mortgage portfolio with less equity and more debt. Section II describes the impact of capital regulations on the value of mortgage loans, and Section III explains how the proposed (Basel II) standards differ from those presently in place. Section IV provides a brief overview of how mortgages are presently financed in the U.S. Sections V – VII evaluate the available literature about the implications of a bifurcated capital standard for three aspects of the U.S. mortgage market: mortgage lenders’ portfolio composition, the demand for GSE (and other) credit guarantees and merger activity involving the non-adopters. Section VIII briefly argues that the effect of Basel II on mortgage bankers will be very limited. The final two sections summarize and offer some caveats.

## II. Why Do Capital Regulations Matter?

A mortgage lender or investor evaluates several key aspects of any deal. How likely is the borrower to default? How much will the collateral be worth in default? How can funding be arranged to avoid serious interest rate risk exposure? How high can I set the mortgage rate without losing the deal to another lender? Constraints on a lender's capital ratio affect this last question quite directly. Most firms finance their operations by selling a combination of shares and bonds to investors. The bonds have a senior claim on the firm's earnings and assets, but losses might prevent the firm from honoring its bond obligations. Given a firm's asset portfolio, its default probability depends on the extent of its equity financing. The more equity, the lower the probability of default. If a firm finances 10 percent of its total assets with equity, it can survive a large loss (up to 10 percent of total assets) without bankruptcy. If the same firm held only 6 percent equity, however, losses are more likely to wipe out equity and throw the firm into bankruptcy. Because there's always a chance of loss, any firm activity needs to be supported by at least some equity. But how much equity is enough? The answer to this question varies with the riskiness of the firm's activities. For unregulated firms, the bondholders and shareholders work out for themselves an *economically appropriate* equity ratio for the firm. Shareholders do not generally wish to operate with skimpy equity cushions, because they wish to protect themselves from losses that might force them into bankruptcy. Bondholders will accept a lower coupon rate if the firm is less levered. Rating agencies (Moody's, Standard and Poor's, etc.), whose opinions largely determine debt costs, also consider a firm's equity capital ratio when evaluating a bond's credit quality.

Banking firms differ in one important aspect from most other firms in the economy: their "bonds" are primarily deposits, which are largely protected by deposit insurance. This leaves depositors relatively unconcerned about the amount of equity protection their bank provides.

Accordingly, insured banks' borrowing costs don't increase very quickly with leverage and their incentives to hold capital are weakened. Capital regulations (such as Basel II) are designed to offset the effect of deposit insurance on banking firms' muted incentives to hold equity capital. If capital requirements are binding, then supervisors are forcing banks to fund themselves with a higher proportion of equity than they would hold voluntarily. This reduces banks' profits, because equity funds are more expensive than debt funds.<sup>1</sup>

In the 1980s, regulatory capital requirements had a big effect on many banking firms. Because they had relatively little equity, some banks could not expand their loan portfolios. As financial conditions improved after the 1990-91 recession, however, most banks raised their capital ratios and today the typical banking firm holds more capital than is strictly required by regulatory authorities. Does this mean that a decline in required capital will not affect most institutions' profitability? Not necessarily, for two main reasons. First, the banks may be holding a cushion of extra capital to protect themselves from falling below the regulatory minimum. If that minimum falls, some people believe that the banks will keep the same cushion – which implies a decline in actual capital ratios. Second, if some of the larger banks are presently capital constrained, Basel II will release this constraint. These banks can then increase their loan volumes even at the same (or lower) interest rates. Since small and large banks compete to make mortgage loans, the reduction in the largest banks' required capital may affect other banks through the competitive process for obtaining new mortgage loans.<sup>2</sup>

To see how capital requirements might affect the mortgage market, consider a simple institution with one type of asset (prime mortgage loans) and one type of debt liability.<sup>3</sup> If we

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<sup>1</sup> The interest on its debt is tax deductible, while dividends are not. Further more, bondholders bear less of the firm's business risk and hence deserve a lower expected return.

<sup>2</sup> Because other factors (beyond equity ratios) affect mortgage loan pricing, firms with high required capital are unlikely to be forced out of the market entirely. However, a change in this one factor can certainly "tilt" the business toward larger, capital-advantaged institutions.

<sup>3</sup> The Appendix provides a more complete mathematical derivation of the issues discussed in the next few paragraphs.

ignore operating costs for simplicity, this institution's profits (P) are simply the difference between revenues and costs:

$$P = r_A A - r_D D \quad (1)$$

Where  $r_A$  = the return to assets, net of operating costs and default losses

A = dollar volume of interest-earning assets

$r_D$  = the cost of deposits, including related operating costs (e.g. maintaining branches for retail funds or a trading desk for obtaining wholesale funds).

D = dollar volume of "debt". For most banking firms, "debt" is primarily retail deposits, but it can also include Federal Home Loan Bank advances and purchased (wholesale) money like large CDs or federal funds.

We can ignore taxes without changing any important aspect of this example.

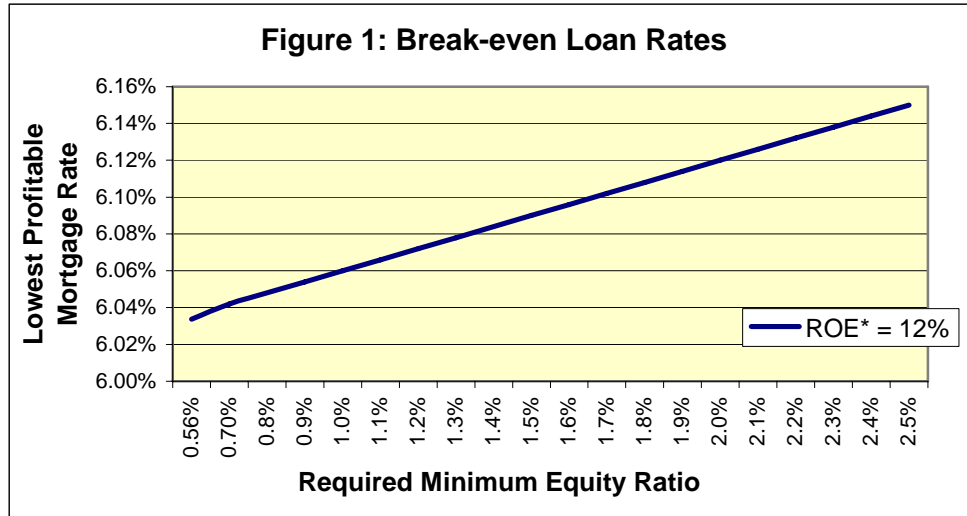
The bank's balance sheet requires that assets equal liabilities plus net worth, or  $A = D + E$ , where E = the dollar volume of contributed equity and retained earnings. This balance sheet constraint can be substituted into (1) to get an expression for the firm's return on equity:

$$ROE = \left( \frac{P}{E} \right) = r_D + (r_A - r_D) \left( \frac{A}{E} \right) \quad (2)$$

Importantly, this equation shows that the firm's return on equity (ROE) increases with leverage (A/E). Since leverage is the inverse of the capital ratio (E/A), equation (2) says that forcing a bank to hold more equity capital – lowering (A/E) – directly reduces its ROE. If a firm's equity ratio is constrained by regulatory requirements, it will increase leverage (A/E) when Basel II becomes effective, which (at least initially) increases ROE. Shareholders prefer higher ROE and will move their capital to firms that can produce it.

A further implication of equation (2) is that a firm's capital ratio determines the minimum loan rate ( $r_A$ ) that it can charge without becoming unprofitable. In other words, we can compute the lowest mortgage contract rate consistent with earning a minimum return on equity. (When this minimum acceptable return (ROE\*) is 12 percent, the Appendix derives the breakeven loan rates shown in Figure 1). The most important thing about this graph is its slope: a reduction in

required capital lowers the breakeven loan rate, but not by a huge amount. For example, a capital ratio of 200 bps (2 percent) requires a (net) loan return of at least 6.21 percent. A capital ratio of 56 bps (0.56 percent) requires at least 6.08 percent. The crucial question is whether such a 13 bp (about one-eighth of a percentage point) change will appreciably affect the mortgage market.



Assume for the moment that it will. Figure 1 then implies that low-equity lenders can underprice high-equity lenders when competing for new mortgage loans. If the low-equity lenders initially have limited resources, the mortgage rate will remain above their break-even loan rate and they will be very profitable. New capital will flow to these lenders and their ability to finance mortgage assets will expand. Competition among low-equity-ratio investors will eventually drive down mortgage contract rates toward their breakeven level, and banks with higher capital requirements will become unable to hold prime mortgages profitably in their portfolios.

How do real-world proposed reforms conform to this situation?

## II. How Will Basel II Change Capital Rules?

### *A. The Recent History of Capital Standards*

Formal U.S. capital regulation began in the 1980s with a simple leverage rule: a bank's equity had to exceed a certain proportion (initially, 5.5 percent) of its total assets. Although simple and straightforward, two serious shortcomings became apparent. It does not align a firm's equity with the risk of its assets, and it entirely ignores off-balance sheet sources of risk. In addition, financial regulators became concerned that large, internationally-active banks were exploiting international differences in capital rules.

Following the foreign exchange crisis of 1974, representatives from the Group of Ten nations began to meet as the "Basel Committee on Bank Supervision" (BCBS), seeking ways to share supervisory information and stabilize the foreign exchange market's trading processes. The BCBS set out in the early 1980s to design a mechanism by which to align each bank's capital ratio with its true risk exposure.<sup>4</sup> In 1988, they produced an Accord, which fundamentally changed how financial supervisors defined capital adequacy. Each asset category was assigned one of five "risk weights" to indicate its perceived default probability. E.g. commercial loans have a 100 percent risk weight. Mortgages are considered less prone to default and hence have a weight of 50 percent. Mortgage backed securities guaranteed by Fannie Mae or Freddie Mac have a weight of 20 percent. A bank's total "risk weighted assets" (RWA) was then calculated as the sum of each risk category's dollar amount times its risk weight. The minimum regulatory capital was set at 8 percent of RWA. The banks' off-balance sheet risks were also incorporated explicitly into capital adequacy rules. The Basel Accord of 1988 also defines "regulatory capital." Initially, regulatory capital consisted of equity (called "Primary" or "Tier I" capital) and subordinated bonds (called "Secondary" or "Tier II" capital). Loan loss reserves (up to some

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<sup>4</sup> The Basel Committee on Banking Supervision presently includes central bank and bank supervisory representatives from thirteen countries: Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States.

maximum) also counted as Tier II capital.<sup>5</sup> The banks subsequently designed new securities to provide cheaper sources of loanable funds, but for our purposes here we can ignore these. We can summarize the Basel Accord of 1988 as requiring regulatory capital to equal at least 8 percent of RWA, and up to half of that 8 percent could take the form of subordinated debentures.<sup>6</sup>

When the U.S. banking regulators implemented the Basel Accord (in two stages, at year-end 1990 and 1992), they added a simple leverage constraint. Regardless of its total *risk-weighted* assets, a bank would be considered “adequately capitalized” only if its Tier I (equity) capital was at least 4 percent of on-book assets. (5 percent was the minimum for a “well capitalized” institution.) The leverage ratio soon appeared in an important piece of financial legislation, the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991. Among other things, FDICIA mandated that regulators take specific steps to limit risk-taking if a bank’s leverage ratio falls below 4 percent. Such “Prompt Corrective Actions” are intended to forestall a bank’s decline, or at least to minimize the cost to taxpayers if a failure occurs.<sup>7</sup> These leverage restrictions are particularly relevant to institutions with large portfolios of high-quality mortgages. The mortgages’ 50 percent risk weight permits a bank to finance \$100 of mortgage loans with only \$4 of regulatory capital, or as little as \$2 of equity capital. The leverage requirement (at least \$4 of equity per \$100 of assets) thus effectively preempts risk-related rules for a bank holding primarily high-quality mortgage assets.

While Basel I included some noteworthy improvements, it also had some well-recognized shortcomings. First, the risk weights were designed to reflect only credit (default) risks.

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<sup>5</sup> Basel II differs from Basel I in this regard. Under Basel II, loan loss reserves are not recognized as capital, which is held to protect the firm against unusually high loan losses.

<sup>6</sup> Although subordinated debentures are somewhat more expensive than deposits, it is easiest to see the qualitative impact of Basel II by assuming here that all debt carries the same coupon rate. This assumption simplifies the discussion, at a cost of slightly overstating the value of leverage to a firm’s shareholders.

<sup>7</sup> Simple equity capital rates play a major role in defining whether a bank is adequately capitalized, under Section 131 of FDICIA. For example, when a bank with equity below 4% of assets is considered “undercapitalized” and must immediately prepare a plan to restore its capital position. Should undercapitalization persist, supervisors must limit growth opportunities and/or permissible deposit rates. If “tangible” equity capital falls below 2% of book assets – a simple leverage ratio – supervisors must appoint a conservator to run the bank within 90 days. Aggarwal and Jacques (1998) provide an excellent description. See particularly page 22.

Appropriate treatments for interest rate, operational, or foreign exchange risk exposures (among others) were left to supervisory judgment within each country. Second, Basel I differentiated rather coarsely among credit risks. With only five risk categories, the true credit risk of loans in the same category could vary quite a lot. Banks responded by structuring deals to take advantage of imprecise risk weights (Jones [2000]). This “regulatory capital arbitrage” struck at the heart of Basel I’s objectives. If the link between portfolio risk and leverage cannot be enforced, supervisors have little control over bank safety and soundness. As private-sector innovations loosened this linkage, the Basel I signatories began meeting to refine their minimum capital rules.

### ***B. Basel II***

After extensive deliberations and several false starts, the BCBS published a final set of new principles in June, 2004, which were updated slightly in late 2005.<sup>8</sup> The Basel II principles specify three “pillars” of financial regulation: capital standards, supervisory oversight, and market disclosure. The new rules for setting appropriate capital standards occupied roughly 54 percent of the 2005 report’s 272 pages. The Principles specify three alternative approaches to determining a bank’s minimum required capital. The “standardized approach” refines the original Basel Accord by expanding the number of risk categories and incorporating bank borrowers’ published credit ratings into the required capital calculations. The most complex method (called the ““advanced internal ratings based,” or AIRB, approach) bases each bank’s capital requirement on its own assessment of asset risks.<sup>9</sup> An AIRB bank estimates a probability of default (PD), an exposure at default (EAD), and a loss given default (LGD) for each loan or loan category. Supervisors input these assessments to a model of overall portfolio risk, which specifies the bank’s minimum capital requirement.

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<sup>8</sup> The most current description of the Basel II standard is provided in BCBS (updated, November 2005).

<sup>9</sup> Basel II also permits a middle course, called the “fundamental internal ratings based” approach. This will not be permitted in the U.S. and hence is not discussed here.

By early 2003, the Federal Reserve Board had determined that the administrative burden of Basel II exceeded its benefits for most institutions. Even the “standardized approach” requires considerably more data than many banks routinely maintain. Vice Chairman Roger Ferguson announced that only about ten large, internationally active U.S. banks would be subject to Basel II regulations, exclusively in the form of the AIRB method (Ferguson, 2003).<sup>10</sup> A few other large banks might be permitted to “opt in” to the AIRB method if their risk measurement systems are sufficiently reliable. The vast majority of U.S. banks and thrifts will continue to operate under historical (Basel I) standards or some relatively slight modification.

### ***C. How Much Might AIRB Reduce Minimum Regulatory Capital?***

How different might the capital standards be for the AIRB adopters and non-adopters? A lot of information about this question was provided by the Federal Reserve’s Quantitative Impact Study (QIS 4). Twenty-six banks applied the June 2004 *Basel II Principles* to their own portfolios. Many analysts were shocked by the results reported in the spring of 2005. Although the capital reforms had been intended to leave the average bank’s capital requirement unchanged, QIS 4 indicated that the mean (median) capital requirement under AIRB was 17 percent (26 percent) below the Basel I level. Reported capital requirements ranged from about 50 percent to 160 percent of the Basel I level, but only three of the twenty-six banks estimated that their required capital would be higher under the AIRB approach. The largest reductions in required capital occurred for Residential Mortgage and Home Equity loans, which stand about 75 percent lower under the AIRB than under Basel I (Riccobono [2005]). A bifurcated implementation of Basel II in the U.S. might therefore expose the majority of banks and thrifts to a capital requirement for mortgages nearly four times that of the largest banks’ AIRB requirement.

As we saw in Figure 1 and (in the Appendix) Figure A-1, differential binding capital requirements can influence institutions’ profitability (ROE) and their ability to raise new equity

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<sup>10</sup> Mandatory adopters were subsequently identified as all depositories with banking assets above \$250 billion and/or foreign risk exposures above \$10 billion (HLPS [2005], page 1).

capital. Observers quickly identified several areas in which the bifurcation seemed to favor the AIRB banks. The area of greatest contention has involved the mortgage market. Most analysts agree that prime mortgages have very little credit risk, and it appears that AIRB banks might be able to hold as little as 56 basis points (0.56 percent) of regulatory capital against their mortgage assets. (See Table 4 below.) In contrast, nonadopting depository firms must continue to hold 2 percent equity capital for each dollar of mortgage loans, regardless of their credit quality. Since equity funds are more expensive than debt funds, AIRB adopters might be able to underprice non-adopters, re-distributing profits and business substantially within the mortgage sector.

#### ***D. Summary: What Changes Should We Worry About?***

Despite all the recent regulatory activity, it is difficult to say how capital standards will actually change for the important actors in the U.S. mortgage market. For purposes of this article, therefore, I'll assume that

- Informed lenders generally agree about the amount of equity capital that “should” be held against the default risk of mortgage loans with specified features, such as LTV and FICO score.
- A few large “adopter” banks will be operating under Basel II’s AIRB, permitting them to hold as little as 28 bps of equity (56 bps regulatory capital) for prime mortgage loans.
- Most U.S. banking firms will be “non-adopters,” continuing to operate under the Basel I standard of 200 bps of equity (4 percent regulatory capital) against prime mortgage loans.
- The U.S. leverage standards will remain unchanged; an institution’s equity capital must equal or exceed 4 percent of its on-book assets (5 percent to be “well-capitalized”).

It is very important to re-emphasize that minimum capital requirements affect market outcomes only if they exceed the economically appropriate level. This is most likely to occur for the safest mortgage loans.

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<sup>11</sup> The actual differential capital charge for mortgages will be somewhat smaller than the 172 bps implied by these first two bullet points. Basel I includes ordinary loan loss reserves in its definition of Tier 2 capital, but Basel II does not. So the 28 bps for prime mortgages will be augmented by the expected losses held in a reserve account. These expected losses are quite small on prime mortgages, so I will proceed without paying them explicit attention.

#### **IV. The Mortgage Market Today**

The bifurcated capital requirements envisioned for U.S. depository institutions will have its most direct effects on the institutions holding mortgages and mortgage-related securities in their portfolios. AIRB adopters' capital requirements will fall relative to both those of nonadopting banks and the GSEs. Basel II reforms therefore hold the potential for very substantial effects in the mortgage market. A discussion of these effects should therefore begin with an overview of how mortgage loans are presently financed in the U.S.

Table 1 reports the type of U.S. investors holding whole mortgage loans in at the end of 1995, 2000 and 2005. Even after two decades of institutional changes in this market, depository financial institutions continue to finance roughly one-third of outstanding mortgages in their portfolios (line 4). The housing GSEs (primarily Fannie Mae and Freddie Mac) own a modest share of whole mortgages for their own accounts – 3.9 percent at the end of 2005 (line 8) – but in 2005 they guaranteed the credit on nearly 40 percent of the nation's total mortgage debt (line 9). Private pools (line 10) are less than half as large as the Agency and GSE-backed pools, but their share of mortgage finance has been growing very rapidly. In addition to organizing their traded pools, Fannie and Freddie hold claims on these pools in their own portfolios. These holdings are not reported in Table 1, but amounted to 21.96 percent of all “Agency and GSE-backed mortgage pools” (line 9) in 2005.

Table 2 provides information about mortgage holdings *within* the bank and thrift industries, which will be subject to a bifurcated capital system. Recall that the Fed anticipates only 10 – 20 AIRB adopters. The first row in this Table describes the 27 banks (or 32 bank holding companies) with assets exceeding \$50 billion. Even if all these institutions adopt Basel 2 – which is unlikely – note that the remaining banks and savings institutions presently hold \$657 billion (7.18 percent of total U.S. mortgages) in whole mortgage loans. (This number excludes credit union holdings.) Table 3 reports the 2005 mortgage holdings of the most likely AIRB adopters – the ten largest U.S. bank holding companies (by asset size). If just these ten BHC

adopted Basel II, more than 63 percent of the depositories' current mortgage holdings would initially be in non-adopters' portfolios: roughly \$1.9 trillion, or 20.7 percent of total U.S. mortgages. It thus appears that both parts of a bifurcated capital standard would, indeed, supply large amounts of mortgage credit.

Fannie and Freddie currently guarantee the timely payment of principal and interest on more than \$3.5 trillion of mortgages. Their statutory capital requirements are 0.45 percent for pools they guarantee, and 2.50 percent for mortgage-related assets owned/financed on the GSEs' books. Because there is no reason to expect any corresponding decline in the GSEs' required capital ratios, at least some AIRB banks are likely to have lower requirements than the GSEs for bearing prime mortgages' credit risk.

## **V. Portfolio Effects: Who Will Hold the Default Risk?**

The analysis of breakeven loan rates in Figure 1 seems to indicate that a bifurcated capital system could transfer a good chunk of the mortgage financing business to AIRB adopters. An AIRB lender can lever its equity more, giving it a lower cost of capital. Competition among adopters could plausibly bid down mortgage contract rates to the point that non-adopters could not afford to hold the loans. Could the impact of Basel II be this simple to discern? Probably not. Two research papers have analyzed how a bifurcated Basel II standard would affect the institutions that originate and finance mortgage loans. Although the two papers come to sharply different policy conclusions, they agree on an important underlying principle: mortgage lenders' sophisticated statistical models permit them to assess the default risk for a mortgage applicant quite accurately. Some mortgages have very little default risk, while others have a lot.

### **A. Calem - Follain: The Shift to Basel II Could Have Important Competitive Effects**

Calem and Follain [2005] assert that the required equity capital for prime mortgage loans would be substantially lower under AIRB than under Basel I. They calculate that economically

appropriate equity levels vary between 12 and 181 bps, depending on the loan's LTV and the borrower's FICO score. (See Table 4.) The last line in Table 4 indicates that an AIRB bank would hold about 40 bps of equity against a "Seasoned and Diversified Portfolio of Prime Loans," compared to 200 bps for a non-adopter. By comparison, nonadopting banks will continue to hold at least 200 bps of equity against all high-quality mortgages. The model in the Appendix (specifically equation (A-4)) relates the breakeven loan rate to required capital. If the required return on equity is 12 percent and the marginal cost of borrowing debt funds is 6 percent, every 50 bps difference in the required capital ratio corresponds to about 3 bps in the breakeven mortgage rate. The 160 bp difference between the AIRB equity ratio and the Basel I ratio thus implies a loan pricing difference of 9.6 bps, or something less than one-eighth of a percent in the mortgage's contract rate.

Calem and Follain predict that AIRB banks will underprice non-adopters for many loans. Theoretically, this effect is clear: AIRB banks should be able to expand their share of mortgage credit risk-bearing, either by holding mortgages in portfolio or by providing credit insurance to non-adopters who hold such mortgages.<sup>12</sup> But how large an effect would roughly 10 bps have on the mortgage business? Calem and Follain readily admit that estimating this effect is extremely difficult. Their educated guess is that AIRB banks will gain \$116 – 279 million in annual profits, while non-adopters will lose between \$655 and \$880 million.<sup>13</sup> These estimates are quite

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<sup>12</sup> These statements are based on the plausible assumption that large and small banks can originate all sorts of mortgage loans equally well. This situation distinguishes mortgage loans from loans to small and medium-sized enterprises (SMEs), which Berger [2006] examines. He concludes that Basel II will have little effect on the market for SME loans, because small and large banks make different *types* of SME loans. Large banks specialize in transaction loans whose credit worthiness can be justified by "hard information" such as audited accounting reports or credit histories. By contrast, smaller banks specialize in "relationship loans" for which "soft information" (such as personality, quality of the business' local reputation, etc.) plays a dominant role. Since large and small banks operate in different segments of the SME loan market, Berger concludes that a bifurcated capital standard will not disturb the historical relationship between these two groups of banks. Berger also presents one observation relevant to the mortgage market when he notes that the differential required capital may permit adopters to underprice large non-adopters for hard information, transaction loans,

<sup>13</sup> The difference between adopters' gains and non-adopters' losses reflect the impact of mortgage repricing on the mortgage market's aggregate size and differences in the extent to which adopters and non-adopters compete away any rents created by the new capital standards.

sensitive to the assumptions one must make in order to complete the calculations, and they are best viewed as very rough estimates.

## **B. Hancock, Lehnert, Passmore and Sherlund: Effects Unlikely to be “Measurable”**

Hancock *et al.* [2005] (HLPS) address the same question considered by Calem and Follain, and conclude that their estimated impacts are greatly overstated. Indeed, HLPS (page 59) are “reasonably certain that non-adopters would be largely unaffected by the implementation of Basel II capital standards.” They find it

*unlikely that there would be any measurable effect of Basel II implementation on mortgage rates and, consequently, any direct impact on the competition between adopters and non-adopters for originating or holding residential mortgages (page 5, emphasis in the original).*

Calem-Follain and HLPS present similar estimates of expected mortgage default losses, and they basically agree about the sensitivity of retail mortgage rates to capital requirements. Yet these two studies reach very different conclusions.

Their disagreement can be traced to two main differences. First, HLPS argue that the impact of differential capital requirements on contract mortgage rates is probably too small to change the rates quoted to consumers in the prime loan market. Mortgage rates are quoted to borrowers in eighth-point increments (12.5 bps) and hence the likely rate change implied by capital models will often leave the consumer’s quoted loan rate unchanged. No big change in consumers’ contract rates means no big change in anything else. Second, HLPS maintain that Calem and Follain ignored the GSE effects on market equilibrium, causing them to over-estimate the impact of a bifurcated capital standard. HLPS assert that the GSEs’ low capital charge for bearing default risk (45 bps) has lead them to reflect this charge in their guarantee fees for mortgage pools. In other words, many prime mortgages are *already* priced as if the equity capital requirement were much lower than the 2 percent mandated by Basel II for non-adopters.

Consequently, the change in AIRB requirements should not affect mortgage rates much, if at all. Let's consider these propositions separately.

### *1. Mortgage Rates Quoted in Eighths*

It seems unlikely that a 10 bp change in financing costs will not influence at least some quoted loan rate, even if retail loan rates are quoted in eighths. For example, a lender might think a borrower should pay 6.07 percent on the basis of his credit risk, but rounds this estimate up to 6 1/8 percent. If the lender's required capital falls, the relevant rate might become 6.03 percent, which rounds down to a 6.0 percent contract rate. So at least some quoted mortgage rates will change and at least some borrowers will (presumably) respond to the differential between the AIRB rate and the nonadopter's rate. Furthermore, the custom of quoting mortgage rates in eighths is a market convention that can change. With sufficiently risk-sensitive capital standards, the AIRB banks might underprice non-adopters by quoting contract rates in *sixteenths* of a percent.<sup>14</sup> How many customers would observe this difference and choose to deal with the AIRB bank is an open question. It cannot be dismissed simply by observing that current custom provides limited opportunities for risk-based pricing within the prime mortgage market.

Even if retail customers fail to react to small price differentials, however, large investors will take them into account. An AIRB adopter would still be willing to out-bid a nonadopter for mortgage loans whose economically appropriate capital lies below 200 bps. In wholesale markets, the yields at which mortgages trade are not limited to discrete eighths. Given their lower equity requirements, the AIRB banks would have lower breakeven loan yields and/or they could earn a higher ROE than non-adopters. So equity investors would have a capital-induced incentive to shift from small to larger mortgage investors, increasing the proportion of the market financed by AIRB adopters. In the new equilibrium, AIRB institutions would hold a larger proportion of

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<sup>14</sup> HLPS assert that anti-discrimination laws encourage coarse mortgage rate pricing, because they find that relatively small changes in apparent mortgage default risks are not reliably priced in the data.

mortgage credit risk.<sup>15</sup> The benefits of their reduced capital burden might be passed through to homeowners, or it might remain in the AIRB profit streams. Either way, smaller depository institutions are likely to bear less of the nation's mortgage default risk than they currently do. If bearing such risk earns a positive return, non-adopters' profits will fall.

So far, at least, the simple intuition about a bifurcated capital system seems to have some validity.

## ***2. Do Prime Mortgage Yields Reflect Current Bank Capital Standards?***

HLPS claim that the capital requirements currently imposed on banking firms are irrelevant, for two reasons:

- (1) the GSEs and other securitizers currently bear the credit risk on most U.S. mortgages and their required capital ratios for bearing that risk are generally lower than those that would apply to bank and thrift organizations; and
- (2) banks and thrifts can currently combine some low-risk and high-risk mortgages to meet Basel I-type capital standards and leverage requirements. *Thus, the financial system as a whole already holds only a small amount of capital against the credit risk posed by conforming mortgages.* (HLPS [2005], page 25, emphasis added)

Consider each of these arguments in turn.

### **a. Mortgages Currently Priced for Low Capital Requirements**

HLPS contend that high current capital standards make it unprofitable for depositories to bear the credit risk on prime (conforming) mortgages. The two federal housing GSEs (Fannie Mae and Freddie Mac) must hold equity of only 45 bps of the amounts insured through their mortgage backed securities programs. Therefore, regulated banks find it preferable to swap their qualifying mortgages for a GSE's mortgage-backed security (MBS). The GSE's guarantee fee ("g-fee") for absorbing a mortgage's credit risk reflects *its* capital requirement, not the originator's. The originating bank can either hold the MBS in its portfolio with a reduced capital charge (60 bps instead of 200 bps equity) or sell it to other investors. In either case, mortgage originators will not be thinking about their 200 bp equity requirement when quoting contract rates

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<sup>15</sup> One mechanism by which AIRB firms could bear credit risk would be expanding their portfolio holdings of mortgages. The following section points out that another mechanism would be guaranteeing the payments on loans held by others.

to prime borrowers. The attractiveness of this strategy is amply demonstrated by the fact that Fannie and Freddie currently guarantee the credit risk on 38.8 percent of all outstanding mortgages, including 35.6 percent of the one-four family mortgage loans originated in 2005.

If this argument is strictly correct, exposure to mortgage credit risk does not earn enough to compensate banks' shareholders. In the extreme, depositories should therefore hold no conforming loans in their portfolios. How does this view correspond to reality? The available data make it very difficult to answer this question, because no public data source identifies which loans conform to the GSEs' credit quality requirements. However, Table 2 indicates that depository institutions smaller than \$50 billion hold 9.53 percent of all outstanding whole mortgage loans. Of these loans, many carry adjustable interest rates. The conventional wisdom is that banks are content to hold these loans because they involve much less interest rate risk exposure than FRMs. It thus seems likely that interest rate risk considerations induce many banks to sell their fixed rate loans to the GSEs – not binding capital requirements for bearing default risk. Conversely, the fact that even small banks hold some ARM credit risk implies that the associated “capital charge” need not entirely drive the portfolio choice.

#### b. Can “Blended Portfolios” Make High Capital Ratios Irrelevant?

Individual loans (including mortgages) vary quite a lot in their credit risk exposure, and depositories will choose to hold more equity against loans with greater credit loss uncertainties. Yet regulatory capital standards apply to an overall portfolio, not to individual loans. HLPS point out that a regulated intermediary could (theoretically) neutralize a high capital requirement on safer loans by “blending” loans with different risks into a portfolio whose average risk requires economic capital equal to the regulatory minimum. HLPS have made a clever and important observation. Effective blending would obviate non-adopters' high capital requirements. It would also permit both adopters and non-adopters to meet U.S. leverage standards without holding capital in excess of their economic requirements.

What does this mean for the allocation of risky mortgages between AIRB and non-adopters' portfolios? If safer mortgage loans become priced to reflect (low) AIRB capital requirements, non-adopters will be able to hold safe loans only in combination with riskier ones. This strategy could neutralize the differential capital requirement for *some* lenders, but the aggregate supply of high-risk mortgage loans is probably insufficient for *all* non-adopters to blend their way out of a high, binding capital requirement. HLPS compute that 73 percent of outstanding mortgages are "prime", 15 percent are "near-prime" and 12 percent are "subprime." (page 10). Their "Median Estimated Prudent Capital" for each of these loan categories (20, 150 and 725 bps) (page 43, Figure 5.1) implies a prudent (voluntary) capital requirement of about 124 bps for the entire stock of U.S. mortgages – compared to 200 bps required for non-adopters.

If credit risk blending within a mortgage portfolio cannot render Basel I capital ratios non-binding, non-adopters could alternatively expand their exposures to other sorts of risks with higher voluntary capital allocations. For example, non-adopters might expand their holdings of riskier, non-mortgage loans, as one concentrated mortgage investor (WAMU) did by acquiring a credit card company (Providian) in mid-2005. This route will be easier for lenders who already underwrite a variety of loan types, which is why Calem and Follain express particular concern about the implications of Basel II for "mortgage specialists." Alternatively, an institution can make required capital ratios non-binding by absorbing some interest rate risk along with the loan's credit risk.<sup>16</sup> Although regulatory standards pay no formal attention to interest rate risk, banks do wish to hold positive equity against such exposures.<sup>17</sup> An institution could therefore raise its desired capital to the regulatory requirement by accepting some interest rate risk in financing their prime mortgage portfolios. This development might bring back bad memories to those who witnessed the 1980s' thrift crisis.

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<sup>16</sup> The most obvious example would be a depository financing fixed rate mortgages with short-term, non-optioned liabilities.

<sup>17</sup> Under Basel II, supervisors are explicitly charged with identifying substantial interest rate risk exposures in an institution's banking book, but there is no formal link to capital requirements.

c. Summary: Basel II and Portfolio Allocations

An investor required to hold a binding equity requirement against its mortgage assets will be less competitive in pricing and holding mortgage credit risks. This implies a clear tendency for the AIRB banks to own a larger share of home mortgages or (as we shall see in the next section) at least to bear the credit risk on such loans. Non-adopters will be able to earn a fair ROE on prime mortgage investments only if they are blended with higher-risk loans. To the extent that depositories earn profits on their loan portfolios, therefore, the AIRB adopters will benefit at the expense of the non-adopters.

Note that this statement applies directly to mortgages held in portfolio, but has little to do with originations. Non-adopters will still be able to originate (underwrite) prime loans efficiently; the question is who will hold the default risk on these loans.

**IV. Credit Guarantees by the GSEs and AIRB Banks**

The housing GSEs guarantee the credit quality on 38.8 percent of the current stock of \$9.1 trillion 1-4 family mortgages via their various MBS programs. The GSEs directly finance on their own balance sheets 15.7 percent of the economy's 1-4 family mortgages, primarily by investing in their own MBS. Frame and White [forthcoming] contend that the AIRB banks' enhanced ability to compete with the GSEs is likely to lower the value of the GSEs' charters. Why do they say this?

The housing GSEs stand ready to swap a portfolio of mortgage loans for an MBS claim on the same portfolio. The MBS carries a GSE guarantee against default losses, for which the GSE receives an average "g-fee" of 15-20 bps. Let's say the g-fee is 17 bps. A portfolio of 7 percent conforming mortgages can therefore be swapped for a guaranteed MBS.<sup>18</sup> The g-fee's

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<sup>18</sup> The MBS coupon will be 6.5%, lower than the loan coupon by a charge (normally 25 bps, in this case 33 bps) for servicing and the guarantee fee (in this case 17 bps). However, I will omit the servicing fee in the

attractiveness depends largely on the originator's required capital ratio. A 2 percent equity ratio, combined with a 12 percent cost of equity capital, requires an institution to earn 24 basis points on its credit risk exposure to break even. Rather than hold an extra 2 percent equity, a regulated firm often chooses to shed its mortgages' credit risk by paying 17 bps to a GSE. In addition to being safer from a credit risk perspective, the MBS is more liquid than the mortgage loans themselves.

Non-adopters will continue to face the same incentives to sell a mortgage loan after Basel II is adopted, but the situation may be quite different for the AIRB banks. Table 4 indicates that prime mortgages may require as little as 20 basis points of equity capital. With a 12 percent cost of equity, this amounts to a required return of only 2.4 bps for an AIRB bank to hold mortgage credit risk exposure. Even after accounting for the other costs of bearing credit risk,<sup>19</sup> this situation will probably put downward pressure on GSE g-fees. First, the GSEs must charge less to attract mortgages from AIRB banks, because AIRB banks will be less willing to pay 17 bps under Basel II. Furthermore, the AIRB banks can probably absorb default risk on non-adopters' mortgage loans at less than the current fee of 15 – 20 bps, either by purchasing the loans outright or by writing a credit guarantee contract.

For the first time, a bank may be able to guarantee credit more cheaply than the GSEs can (with their 45 bps equity requirement), at least for the highest-quality mortgages. This could be a source of new profits for AIRB banks. Non-adopters will be better off if AIRB banks guarantee mortgage default credit for less than today's 17 bp g-fee, or if they force down the GSEs' g-fees.

The second impact of Basel II on GSE business arises through the regulatory treatment for banks holding the GSEs' guaranteed MBS. Current (Basel I) capital regulations assign a 20

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interests of simplicity, since someone must bear the expenses of loan servicing regardless of whether the mortgage is sold to a GSE or retained by the originator.

<sup>19</sup> This comparison ignores two costs for the AIRB bank. First, it must also hold capital equal to the loan's expected credit losses. Second, and more important, the bank must bear the costs of processing defaulted loans, which can be quite large compared to the losses against which a guarantor must hold equity capital. The main point is that an AIRB bank will have a lower equity cost of retaining credit risk exposure under Basel II.

percent risk weight to the GSEs' MBS, implying a minimum capital charge of 160 bps. (Once again, equity can account for as little as half of the regulatory capital.) Basel I thus encourages banks to hold GSEs' MBS instead of whole mortgages. Table 5 shows that the senior tranches of private securitizations also qualify for a 20 percent risk weight under Basel I, if they are rated AA or AAA. But even at this reduced risk weight, the equity charge exceeds the economic amount required to bear most mortgages' default risk. This has served to limit private securitizations to date, although required capital for these high-rated, private tranches will decline under Basel II. Table 5 indicates that a AAA senior claim on a diversified loan portfolio will have a risk weight of 7 percent under Basel II, which translates into 56 bps of regulatory capital, or a minimum of 28 bps equity.<sup>20</sup> Adopters and non-adopters alike will be able to hold senior tranches of private MBS without holding equity above the economically appropriate level. And for private underwriters of tranced MBS, the *total* amount of equity covered institutions must hold against their mortgage pools may be lower under Basel II. This reduces the relative cost of private (vs. GSE) securitization, placing further downward pressure on g-fees and expanding non-adopters' alternatives for selling loans they may originate.

The AIRB's low equity charges for prime mortgages will pressure the housing GSEs to lower their g-fees, and may shift credit risk from GSEs to AIRB banks. Once again, the effect on originators should be small (or nil). The question is who will finance mortgages and absorb credit risk exposure. It seems likely that the largest AIRB banks will be able to take some securitization or credit insurance market share away from the GSEs for very low-risk mortgages. The AIRB institutions will gain profits from their new guarantee and underwriting businesses. Competition among the AIRB institutions should pass through to non-adopters some of the benefits from their lower equity charges, but it is impossible to predict how much.

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<sup>20</sup> If the loans in the pool would qualify for a risk weight lower than 7 percent, the pool's risk might be even lower.

## **VII. Would a Bifurcated Capital Standard Encourage Mergers?**

Hannan and Piloff [2004] try to assess whether differential capital requirements have substantially motivated mergers in the past. They point out that AIRB banks “could acquire ... [non-adopters] ... and increase the return on equity associated with the acquired assets by either increasing income-earning assets without adding capital or holding less capital against the newly acquired assets.” (page 4) After reviewing the literature on bank mergers, Hannan and Piloff conclude that capital considerations have probably had little influence on past merger decisions:

Interestingly, capital is rarely cited as an important issue in the question of why banks merge. Indeed, few studies have sought to investigate the role of capital, especially that of the acquirer’s capitalization relative to regulatory requirements. The scarcity of such studies likely reflects the belief that such considerations play a minor role at best in explaining mergers in the banking industry. (page 9)

They then evaluate two historical episodes in detail. First, they investigate whether banks with excess capital (relative to a “well capitalized” standard) were more likely to acquire other banks during 1993 - 2002. Their results are inconclusive (page 34). Second, Hannan and Piloff’s examine merger activities around the time that FDICIA (1991) imposed tighter leverage standards via mandatory Prompt Corrective Action. They find that holding companies constrained by the new, higher capital standards subsequently acquired fewer banks than the unconstrained BHC did. The difference is consistent with a connection between capitalization and merger activity, but it is not statistically significant.

Hannan and Piloff recognize that their data do not contain a situation very similar to the Basel II’s bifurcated system’s stark differences in required capital for the same risk. Nationwide banking today provides more potential targets to an AIRB bank than existed in much of Hannan and Piloff’s historical sample period. In forecasting the impact of Basel II on mergers, therefore, we must start with the observation that equity capital is expensive. Market forces therefore seek mechanisms for using equity most effectively. At the same time, mergers are costly and there are other ways for non-adopters to avoid uneconomic capital constraints – e.g. holding “blended”

portfolios or selling their safer loans to AIRB banks. But if these approaches are themselves costly, we should see AIRB banks acquiring non-adopters with large prime mortgage portfolios. As noted by Calem and Follain [2005, page 23], specialized mortgage lenders will be particularly likely targets for acquisition, because they have little expertise in making higher-risk, non-mortgage loans.

### **VIII. Direct Effects on Mortgage Bankers are Likely to be Small**

Mortgage bankers' and depositories' underwriting/origination businesses should find little economic effect of Basel II's implications for bearing mortgage credit risk. It is possible that mortgage rates may fall and hence the demand for loans will not be stifled by the new capital standards. Some depositories' enhanced interest in blending higher-risk mortgages into their portfolios may increase the demand for underwriters who can reliably deliver such loans. And these same firms will enjoy a somewhat enhanced market into which they can sell their loans and/or purchase credit guarantees. These developments will likely make the origination process more complex, but they will also create (limited) new opportunities.

### **IX. Summary**

The Basel II capital requirements appear to be smaller for AIRB banks than for non-adopters. This will permit adopting banks to pay more than non-adopters for prime mortgages. Consequently, adopters will end up financing or guaranteeing the credit risk on more mortgages than they do today. In the process, AIRB banks may earn higher profits, although competitive forces will pass along a good part of those profits to other banks (by bidding down GSE g-fees) or to homeowners.

However, flexibility in mortgage market arrangements will limit the effect of these statutory differences. For non-adopters, the key to holding mortgages in portfolio will be to hold

a blend of mortgage risks, so that regulatory equity standards do not exceed the amount of economic capital required for the overall portfolio. This will require nonadopting mortgage lenders to shift their portfolios toward riskier mortgages, although the present distribution of mortgage risks probably does not permit all non-adopters to make this shift. Non-adopters will need to innovate newer, higher-credit-risk loans to blend into their portfolios, to introduce (or expand) their holdings of riskier, non-mortgage credits, or to bundle interest rate risk exposure with credit risk exposure. Each of those avenues poses dangers, as well as benefits.

Considering the costs of engineering properly blended portfolios, it seems likely that many non-adopters will end up with a binding 2 percent equity capital requirement on their mortgage portfolios. Large, AIRB banks are more diversified, and should therefore have less trouble in this dimension. At least some non-adopters will become attractive acquisition targets for AIRB banks, which can lever the non-adopters' equity more aggressively. Confronted with the need to manage credit risk more aggressively in order to prosper in the new regulatory environment, selling may become a more attractive option for some smaller, more specialized lenders.

It also appears that the GSEs may be net losers under Basel II. The AIRB will permit banks to hold prime mortgages with lower equity capital requirements than the GSEs. This removes the GSEs' comparative advantage under Basel I, and should reduce the supply of GSE MBS. The GSEs will also likely be forced to lower their guarantee fees, because they will lose their absolute capital advantage over banking firms in holding credit risk worth more than 45 bps of economic capital.

The origination components of the mortgage market are unlikely to be substantially affected by the introduction of Basel II. Capital regulation is aimed primarily at mortgage credit risk and will therefore affect loan pricing and the allocation of mortgage investments. Mortgage originators (mortgage bankers or depositories that sell most of their production) must price new

credits appropriately and will need to learn about new market outlets for their loans, but they should be able to adapt readily.

The existing evidence suggests the following qualitative effects of Basel II on U.S. mortgage markets:

- The origination business – the production and underwriting of mortgage loans – should see no significant changes.
- Nonadopting banks and thrifts will need to increase their portfolio risk to offset the potential pricing advantages of AIRB banks for prime mortgages. This risk increase could mean holding more default-prone loans, or holding the interest rate risk exposure that has recently been eschewed by smaller intermediaries.
- AIRB banks will retain more of their safest loans. Loans sold to the GSEs should shift toward higher default risks.
- Non-adopters, particular mortgage specialists, will become slightly more attractive takeover targets for AIRB, who can deploy the non-adopters' capital more profitably.
- The housing GSEs seem likely to lose some guarantee business.

Providing numerical estimates of these effects is extremely difficult.

## **X. Caveats**

Predicting economic effects is always difficult. In this case, that difficulty is exacerbated by the fact that the final U.S. implementation of Basel II remains unspecified. The fourth Quantitative Impact Study's (QIS-4) findings set off alarm bells around the U.S. regulatory agencies, with three major results. First, the federal regulators decided to "retain both the existing Prompt Corrective Action and leverage capital requirements in the proposed domestic implementation of Basel II." (Federal Banking Agencies [September 30, 2005]). The leverage constraint is designed to protect the banking system against inappropriate AIRB formulae, but it may also effectively limit some AIRB banks' ability to reduce their required capital level to the extent permitted by the *Basel II Principles*. Second, the implementation period for large,

internationally-active banks' adoption of Basel II was delayed a year, until 2008.<sup>21</sup> Third, the U.S. banking agencies requested public comments on a so-called "Basel I-A" capital standard, whose risk sensitivity would lie between that of Basel I and the AIRB (Federal Banking Agencies [October 2005]).

To reduce the potential for regulatory capital arbitrage, the proposed Basel I-A capital rules would increase the number of risk-weight categories from five to nine. The risk weight for prime mortgage loans is proposed to be 35 percent. More importantly, banks wishing to accept additional reporting requirements could vary their capital holdings with a mortgage loan's LTV and FICO. Such an intermediate capital standard, available to banks on an opt-in basis, could substantially reduce the distributional effects of Basel II. Calem and Follain [2005] observe that

Something like the risk-weights associated with the Standardized approach (35 percent versus the current 50 percent) would move a long way toward reducing the potential for competitive inequities. (pp. 24-5)

Another factor that could invalidate the conclusions offered here would be the removal of the U.S. leverage restrictions, although this seems unlikely to occur.

Finally, some observers point out that large banks have recently held capital in excess of regulatory minima. Perhaps capital regulations are not binding, and Basel II will not affect the mortgage market at all! Perhaps, but not necessarily. This would be true if banks' economic capital exceeded their regulatory minima. But it is also possible that banks might be holding an equity cushion to protect themselves from falling below the required minimum. Change the minimum and banks are likely to change their total capital in the same direction, still leaving a cushion in place. While some research suggests that the observed excess equity is not simply a

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<sup>21</sup> A multi-year transition to the AIRB standard is envisioned. The latest schedule announced by the U.S. federal regulators would require parallel reporting (under Basel I and AIRB rules) in 2008 followed by a limited transition to AIRB in 2009. However, in 2009 (2010, 2011) the minimum capital requirement would be 95 percent (90 percent, 85 percent) of the Basel I level. After 2011, each AIRB institution's primary federal regulator would determine whether to eliminate such floors. (September 30, 2005 Joint Press Release) This schedule is about three years behind the one contemplated in BCBS (updated November 2005).

protective cushion (Flannery and Rangan [2004]), the evidence on this question remains ambiguous.

## Appendix: How a Capital Requirement Affects Profitability

Start with equation (1) from the text, which specifies a simplified banking firm's profits:

$$P = r_A A - r_D D \quad (\text{A-1})$$

Where  $r_A$  = the return to assets, net of operating costs and default losses

A = dollar volume of interest-earning assets

$r_D$  = the cost of deposits, including related operating costs (e.g. maintaining branches for retail funds or a trading desk for obtaining wholesale funds).

D = dollar volume of "debt". For most banking firms, "debt" is primarily retail deposits, but it can also include Federal Home Loan Bank advances and purchased (wholesale) money like large CDs or federal funds.

E = the dollar volume of contributed equity and retained earnings.

We ignore operating costs and taxes in (1) because they don't change the main effects of a required capital ratio.

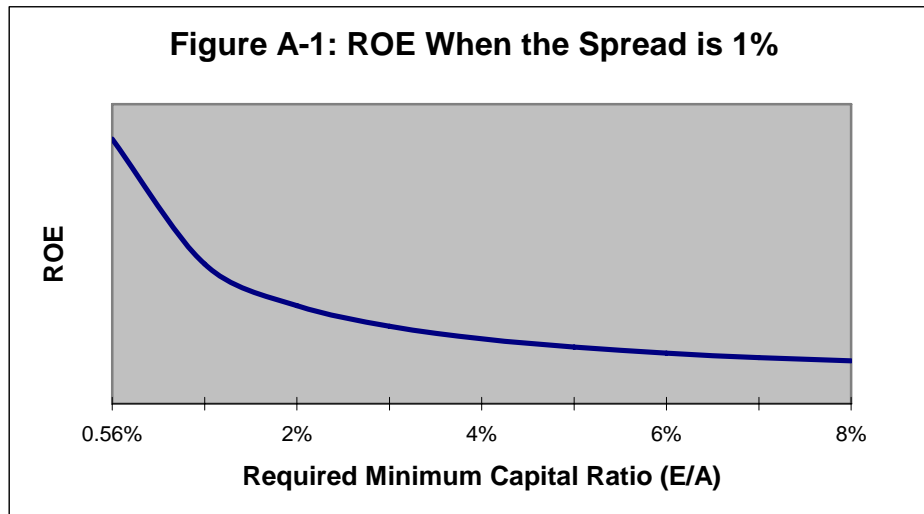
Shareholders are keenly interested in the return on their funds, which can be defined for this firm as the ratio of profits to the amount invested:

$$ROE = \left( \frac{P}{E} \right) = \left( \frac{r_A A - r_D D}{E} \right) \quad (\text{A-2})$$

A little bit of algebra transforms (2) into

$$ROE = r_D + (r_A - r_D) \left( \frac{A}{E} \right) = r_D + \left( \frac{r_A - r_D}{E/A} \right) \quad (\text{A-3})$$

This equation has a straightforward interpretation. ROE will equal the return an investor could earn on debt ( $r_D$ ) plus compensation for his exposure to default (and other) risks. That compensation comes as the profit margin on mortgages ( $r_A - r_D$ ) times the extent to which the firm levers its equity ( $A/E$ ). Figure A-1 graphs the ROE function (A-3) for a fixed spread between deposits and loan rates. Clearly, higher capitalization reduces ROE.



What does this mean for equity investors? Assume  $r_A - r_D = 1.0\%$ . Consider an investor planning to purchase \$1 million of new shares in a bank that holds mortgage assets. If that bank must hold only 2 percent equity, his shares will support \$50 million of mortgage loans. A 1 percent spread generates a (pre-tax) return of \$500,000 per year, for a 50 percent return on invested equity. By contrast, if the investor purchases new shares issued by a bank required to hold less equity – say 0.56 percent -- his contribution will support a \$178.6 million mortgage portfolio. Annual profits will be \$1,785,714, and the investor nearly doubles her invested equity in a single year. Clearly, the investor prefers the higher return afforded by the less capitalized bank's shares. The high-capital-ratio bank will be unable to attract new equity investments, and hence cannot expand. Moreover, investors will move their equity out of the institution with the higher capital requirement, for example by investing their dividends elsewhere. The constrained firm will therefore see its share of the mortgage market actually decline.

But that's not all. Competition can force down the spread between deposit and loan rates. Suppose equity holders require a minimum return (call it  $ROE^*$ ), which exceeds the return required by depositors. A firm's average cost of funds therefore increases with required

capitalization. We can re-arrange equation (A-3) to compute the lowest mortgage yield (net of expenses and losses) an institution can afford to charge:

$$r_A^* = (ROE^* - r_D) \left( \frac{E}{A} \right) + r_D \quad (A-4)$$

Figure 1 (in the text) graphs this breakeven mortgage rate when  $r_D = 6\%$  and  $ROE^* = 12\%$ .

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**Table 1: Portfolio Holdings of 1-4 Family Whole Mortgage Loans**

	<b>1995</b>	<b>2000</b>	<b>2005</b>
Total 1-4 family residences (\$B)	\$ 3,510.40	\$5,075.10	\$9,149.10
1 Commercial banks	18.4%	19.0%	19.4%
2 Savings institutions	13.7%	11.7%	10.4%
3 Credit unions	1.9%	2.5%	2.7%
4 Depository institutions Total	34.1%	33.2%	32.5%
5 Life insurance companies	0.3%	0.1%	0.1%
6 Private pension funds	0.1%	0.2%	0.0%
7 State and local gov't. retirement funds	0.1%	0.1%	0.1%
8 Government-sponsored enterprises	5.8%	4.0%	3.9%
9 Agency- and GSE-backed mortgage pools	44.0%	47.8%	38.8%
10 ABS issuers of mortgage pools	6.4%	7.4%	17.4%
		0.0%	0.0%
11 Finance companies	2.1%	2.6%	2.5%
12 Mortgage companies	0.7%	0.4%	0.2%
13 REITs	0.2%	0.2%	1.6%
	0.0%	0.0%	0.0%
14 Household sector	2.6%	1.7%	1.5%
15 Nonfinancial corporate business	1.0%	0.4%	0.3%
16 Nonfarm noncorporate business	0.3%	0.2%	0.1%
	0.0%	0.0%	0.0%
17 State and local governments	1.7%	1.3%	0.8%
18 Federal government	0.7%	0.3%	0.2%

Source: Federal Reserve Board Z.1 statistical Release

**Table 2: Portfolio Holdings of 1-4 Family Mortgage Loans (as of 12/31/05)**

**Panel A: in \$billion**

Asset Size	Commercial Banks		Savings Institutions		Bank Holding Companies	
	Number	\$bill	Number	\$bill	Number	\$bill
Greater than \$50 billion	27	1,045	-	-	32	1,511
\$25 billion to \$50 billion	22	150	1	17	12	84
\$5 billion to \$25 billion	97	172	7	20	82	140
\$300 million to \$5 billion	1,571	224	69	20	1,231	173
Less than \$300 million	6,037	111	138	6	910	35
Total	7,754	1,702	215	63	2,267	1,944

**Panel B: Percent of Total Outstanding**

Asset Size	Commercial Banks		Savings Institutions		Bank Holding Companies	
	Number	%	Number	\$	Number	\$
Greater than \$50 billion	27	11.42%	0	0.00%	32	16.52%
\$25 billion to \$50 billion	22	1.64%	1	0.01%	12	0.92%
\$5 billion to \$25 billion	97	1.88%	7	0.08%	82	1.53%
\$300 million to \$5 billion	1571	2.45%	69	0.75%	1231	1.90%
Less than \$300 million	6037	1.22%	138	1.51%	910	0.38%
Total	7754	18.60%	215	2.35%	2267	21.25%

Sources: Call Reports, with "banks" and "savings institutions" identified according to charter type.  
BHC Consolidated Reports of Income and Condition (FR-Y9C)

**Table 3: The Ten Largest Bank Holding Companies' 1-4 Family Mortgage Holdings, 12/31/2005 (Source: FR Y-9C) \***

<b>Bank Holding Company</b>	<b>Total Assets (\$ Bill.)</b>	<b>Mortgage Assets (\$ Bill.)</b>	<b>% of U.S. total</b>	<b>% of "Depositories" total</b>
Citigroup Inc.	1,494.0	\$182.70	2.00%	6.14%
Bank of America Corporation	1,294.3	\$250.40	2.74%	8.41%
JPMorgan Chase & Co.	1,198.9	\$147.16	1.61%	4.94%
Wachovia Corporation	520.8	\$ 98.8	1.08%	3.32%
Wells Fargo & Company	481.7	\$177.21	1.94%	5.95%
HSBC North America Holdings Inc.	404.3	\$125.42	1.37%	4.21%
Taunus Corporation	364.7	\$ 9.86	0.11%	0.33%
U.S. Bancorp	209.5	\$37.40	0.41%	1.26%
Barclays Group US Inc.	206.7	\$ -	0.00%	0.00%
Suntrust Banks, Inc.	179.7	\$54.90	0.60%	1.84%
<b>Total:</b>	<b>6,354.6</b>	<b>\$ 1,083.86</b>	<b>11.85%</b>	<b>36.41%</b>

\* Table 4 reports the sums of first and second liens; U.S. total from Table 1 includes only first liens.

**Table 4: Economically Justified Equity Capital Requirements for Mortgages of varying Risk**

LTV / FICO Score	Marginal Tier 1 Capital Requirement (Basis points)
70 / 620	34
70 / 660	23
70 / 700	16
70 / 740	12
80 / 620	67
80 / 660	48
80 / 700	35
80 / 740	29
90 / 620	136
90 / 660	100
90 / 700	76
90 / 740	61
95 / 620	181
95 / 660	135
95 / 700	104
95 / 740	84
Jumbo Prime Pool	53
Alt-A Pool	77
Seasoned & Diversified Portfolio of Prime Loans	40

Source: Calem and Follain [2005], Table II-1, taken from Calem and Follain [2003].

**Table 5: Basel Risk-Weights (In Percent) For Externally Rated Long-Term Positions**

Rating Designation	Basel I	Basel II	
		Senior Position	Junior Position
AAA	20	7	12
AA	20	8	15
A	50	10 – 20	18 – 35
BBB	100	35 - 100	Same As Senior
BB	200	250 - 650	Same As Senior
Below BB- and Unrated		Deduction*	

Source: Author's Condensation of Basel Committee on Banking Supervision (2004, Pp. 128-129), as reported In HLPS [2005], Table 3.1.

\*Deductions of investments will be 50 percent from tier 1 and 50 percent from Tier 2 capital.



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