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Automatic Recapitalization Alternatives

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Abstract

The recent experiences of U.S. financial institutions highlight the shortcomings of the capital regulatory regime that has evolved over the preceding three decades. That regime focuses on capital requirements and prompt corrective action (PCA)—escalating supervisory restrictions as a financial firm's capital position deteriorates relative to established triggers. The shortcomings of that regime include that it exacerbates cycles in financial services activity and the macroeconomy and fails to protect the financial system or the economy from spillover effects related to the distress of financial firms.

Regulators are seeking ways to reduce the procyclical effect of the current capital regulatory regime and the spillovers associated with financial firm distress. This paper examines one set of proposed solutions: *ex post* mechanisms that would automatically recapitalize systemically important financial institutions during periods of distress. Such mechanisms include contingent capital notes (CCNs) and capital insurance. The Treasury Department's recent white paper, *Financial Regulatory Reform: A New Foundation*, mentions those options specifically and calls for an "analysis of the costs, benefits, and feasibility of allowing banks and BHCs [bank holding companies] to satisfy a portion of their regulatory capital requirements through the issuance of contingent capital instruments … or through the purchase of tail insurance against macroeconomic risks."

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Automatic Recapitalization Alternatives

I. Introduction

The recent experience of U.S. financial institutions highlights the shortcomings of the capital regulatory regime for U.S. financial institutions that has evolved over the preceding three decades. That regime has three basic elements: a minimum capital requirement (or leverage ratio), a risk-based capital requirement, and requirements that supervisory agencies take prompt corrective action (PCA), in the form of mandatory escalating supervisory restrictions, as a financial firm's capital position deteriorates relative to established triggers. The Federal Deposit Insurance Improvement Act of 1991 (FDICIA) mandated that capital regulatory regime for U.S. banks and thrifts, and the Federal Housing Enterprises Financial Safety and Soundness Act of 1992 applied a similar regime to Fannie Mae and Freddie Mac (the Enterprises).

Pro-Cyclical Effects of the Current Capital Regulatory Regime

One shortcoming of the current capital regulatory regime is that it exacerbates cycles in financial services activity that tend to amplify the business cycle, making economic activity more volatile than it would otherwise be. Financial firms generate accounting profits during economic expansions, which provide retained earnings and improve capital positions. The additional capital allows firms to expand their books of business and compete for market share. A dominant view of the genesis of financial crises is that during such an expansion, firms take on unrecognized, "through-the-cycle" risks as they compete for new business or market share by loosening lending standards, especially toward the peak of the expansion (see, for example, Borio *et al*, 2001). As the economy sours, poorer loan and investment performance dissipates capital and causes financial firms to retrench, often by adopting stricter credit policies and taking measures to reduce counterparty exposures. The current capital regulatory regime exacerbates cycles in financial services activity and, thus, the macroeconomy in several ways:

1. For banks and other financial firms subject to FDICIA-like regulation, the threat of PCA sanctions accelerates the retrenching process if capital threatens to fall below particular thresholds.

2. The use of credit ratings to set risk-based capital requirements for the credit risk of securitized assets, as under the revised Capital Accord developed by the Basel Committee on Banking Supervision ("Basel II"), tends to exacerbate the pro-cyclicality of the decisions of financial firms. Credit ratings tend to rise when the economy is growing and to deteriorate in economic slowdowns and recessions. Such fluctuations may contribute to economic booms and the development of asset price bubbles and worsen economic downturns (Ammann 2001; Benink *et al*, 2008; and Hofmann 2005).

3. Regulatory capital requirements or supervisory limits tied to techniques for managing market risk affect the behavior of financial institutions in ways that amplify financial market volatility and reduce liquidity. For example, under the market risk amendment to the Basel I capital accord, which since 1998 has required certain large banks to hold capital against the market risks of their trading books, a bank's total risk-based capital requirement for market risk consists of a Value-at-Risk-(VaR)-based requirement plus an add-on for specific sources of market risk not captured in the bank's model. When a VaR-based constraint binds traders whose risk aversion is constant, the constraint effectively increases their risk aversion. Because such a constraint binds mostly during periods of market turbulence, traders' increased effective risk aversion leads to sales of risky assets and serves to exacerbate market volatility and reduce market liquidity in such periods (Danielsson, Shin, and Zigrand 2004).

4. The capital regulatory regime has generally measured capital according to Generally Accepted Accounting Principles (GAAP), which have

> increasingly reflected fair value concepts. Fair value accounting tends to increase the speed at which the earnings of financial firms rise in economic booms and fall in downturns, because fair value of equity responds more quickly to changes in asset prices than financial firm profits respond to changes in lending volume under historical-cost accounting (Shin 2006).

Spillover Effects of Financial Institution Distress

A second shortcoming of the current capital regulatory regime is that it fails to protect the financial system or the economy from spillover effects related to the distress of financial firms. Such spillover effects arise from the fact that distressed financial firms are under significant pressure to reduce risky assets, and that markets also frequently pressure healthier firms with similar assets to do the same. They can do so by liquidating assets that have become more difficult to fund with short-term liabilities, reducing other high-risk assets, or shifting new business to lower-risk products. Those options create two types of spillovers that can hurt other financial firms and overall economic activity: fire-sale spillovers and credit-crunch spillovers.

Fire-sale spillovers occur when a financial institution shrinks by selling off its assets into a distressed or illiquid market, perhaps to meet regulatory capital requirements. If such asset sales occur at depressed prices, accounting rules would force firms holding similar assets to recognize the loss in value. The fire-sale spillover occurs when those firms find their own capital asset positions under pressure and must in turn raise equity capital or liquidate some of their own higher-risk assets (Kashyap *et al*., 2008).

Credit-crunch spillovers occur if financial firms choose to shift their business activity away from higher-risk activities. A typical manifestation of such a decision is the tightening of lending standards. Such a reduction in credit availability may reduce the ability of firms to expand or conduct business as usual if they are unable to find other

sources of credit at comparable terms. Credit crunches have the potential to reduce economic activity significantly beyond the financial sector and are often associated with recessions.

FDICIA recognizes the potentially negative implications of such actions by distressed banks through a systemic risk exception. However, that exception only applies to the final stage of bank failure when it allows the Federal Deposit Insurance Corporation (FDIC) to deviate from the "least-cost resolution" requirement. The systemic risk exception requires a two-thirds vote of approval from the FDIC Board of Directors and the Board of Governors of the Federal Reserve System, followed by a recommendation of the Secretary of the Treasury in explicit consultation with the President of the United States.

Potential Modifications to the Capital Regulatory Regime

Regulators are responding to those shortcomings by seeking ways to reduce the procyclical effect of the current capital regulatory regime and the spillovers associated with financial firm distress. One set of potential solutions, increasing *ex ante* capital requirements, focuses on ways to establish larger capital buffers before financial institutions find themselves in distress. For example, a capital ratio requirement that increases with the rate of growth of the assets of a firm would result in a larger increase in capital during good times that could cushion financial firms and the overall economy as losses are realized during downturns. Increasing *ex ante* capital requirements would have costs, however (Kashyap et al., 2008). First, higher requirements would generally reduce financial intermediation by increasing the weighted average cost of funding for regulated firms. Second, higher requirements would increase incentives for capital arbitrage. The payoff to capital arbitrage depends on the size of the capital requirement and the difference in cost between equity and non-equity funding to the extent the requirement is binding. As more equity is required by regulation, funding is shifted from lower-cost sources to higher-cost sources and the potential gain from finding ways to hide risk from regulators increases. Finally, increasing *ex ante* capital requirements

would fail to address the fire-sale and credit-crunch externalities that would arise if financial firms incurred losses that depleted their capital below desired levels (regardless of its initial level) and they had either to liquidate assets, curtail new lending, or raise new capital.

This paper examines another set of proposed solutions: *ex post* mechanisms that would automatically recapitalize regulated financial institutions during periods of distress. *Ex post* mechanisms have the potential both to avoid some of the shortcomings associated with increasing *ex ante* capital requirements and to address the procyclical effect of the current capital regulatory regime. The remainder of the paper describes and analyzes two *ex post* approaches that would provide for the automatic recapitalization of distressed financial institutions and that are specifically mentioned in the Treasury Department's June 2009 white paper, *Financial Regulatory Reform: A New Foundation*. That white paper calls for an "analysis of the costs, benefits, and feasibility of allowing banks and BHCs [bank holding companies] to satisfy a portion of their regulatory capital requirements through the issuance of contingent capital instruments … or through the purchase of tail insurance against macroeconomic risks" (U.S. Department of the Treasury, 2009, p. 28). Section II discusses contingent capital notes (also known as reverse convertible debentures), and section III examines capital insurance. The paper concludes by summarizing the relative merits of each proposal and recommends further study.

II. Contingent Capital Notes

A contingent capital note (CCN) is a proposed type of subordinated bond that would automatically convert into common stock of the issuing financial firm under certain conditions.[1] Specifically, if the price of the underlying stock fell below a certain point, the bond would convert into shares, thus ending bondholders' rights to payments of

[1] Thomas H. Stanton (1991, p. 182) first proposed requiring Fannie Mae and Freddie Mac to issue subordinated debt that would automatically convert to common stock under specified circumstances.

interest and principal and substituting rights associated with the shares received, including the rights to dividend payments.

CCNs would allow a financial firm to recapitalize by automatically converting debt to common equity when pre-specified conditions were realized. Thus, CCNs could allow a firm to de-lever when losses seriously eroded book capital or the market value of equity. If CCNs were widely issued, their conversion when many financial firms incurred losses could short-circuit a cycle of bad events that might otherwise spiral out of control. Counterparties and market participants would know that if losses depressed a firm's regulatory capital or share price beyond pre-specified levels, conversion of CCNs into common equity would automatically boost the firm's capital position. Such a recapitalization would then reduce the likelihood of the firm from having to conduct a fire sale of assets into illiquid markets and would support its lending activity. Both effects would dampen any decline in aggregate economic activity.

Proponents argue that requiring financial firms to issue regularly CCNs and have outstanding a minimum amount of CCNs could enhance safety and soundness regulation in several ways (Flannery, 2005; Flannery, 2009; Squam Lake, 2009). First, when a financial firm was classified as undercapitalized, a portion of its outstanding CCNs would immediately convert to common equity, thereby recapitalizing the firm. Second, such a requirement would allow financial firms to operate at higher leverage during good times compared to a requirement that they build up a bigger equity cushion *ex ante*, while also providing a mechanism to both de-lever and recapitalize should large losses be realized.[2] Third, by effectively forcing current shareholders to bear more of the downside risk of decisions made by a firm, mandatory CCNs would enhance market discipline. Since shareholders would suffer dilution of their ownership claims in the event that financial distress triggered the conversion of CCNs to equity, shareholders would have a stronger incentive to monitor and influence firm risk-taking. The overall attractiveness of CCNs

[2] Another possible benefit of CCNs could be their use to provide ready access to capital to expand balance sheets when risks spreads are unusually wide and investments relatively attractive. Such a use would require a different set of conversion triggers than those discussed here.

to issuing firms would depend on their cost relative to other financing options and the extent to which regulators would count CCNs as regulatory capital.

The remainder of this section summarizes the structure and features of reverse convertible debentures (RCDs), a type of debt issued in the U.S. and Europe that closely resembles the proposed CCNs, and discusses how CCNs might be structured to enhance the safety and soundness of federally regulated financial institutions.

Structure and Features of Reverse Convertible Debentures

To understand RCDs, it will be useful to compare them to convertible bonds that can be changed into equity at a certain time and within certain limits.[3] Typically, a convertible bond is a subordinated debenture that can be exchanged, at the option of the holder, for a specific number of shares of a company's preferred or common stock if pre-specified conditions are met. Thus, a convertible bond is equivalent to a conventional bond plus a put option on the bond tied to a call option on the stock. That combination of features offers some of the benefits of both stocks and bonds. At issuance, the yield of a convertible bond will be lower than the yield on a similar, nonconvertible bond because the conversion option gives the bondholder additional value. Convertibles earn interest even when the stock is trading down, but if the market price of the equity underlying the conversion feature increases, convertibles tend to trade at a premium to other subordinated bonds that are not convertible. If the underlying equity decreases in price, the conversion feature loses value, but even if the convertible option is never exercised, the investor remains entitled to coupon payments and repayment of principal at maturity.

The issuer of a reverse convertible bond may convert it into stock or its cash equivalent at a specific date or at some specific triggering event. That is, the issuer has the right, but not the obligation, to convert the bond's principal into shares of equity, typically at a set date, if the shares underlying the option have fallen below a set price. Thus, a reverse convertible bond is equivalent to a conventional bond plus an option to

[3] Some convertible bonds can be converted into other types of bonds, but we ignore such securities here.

call the bond and put shares to bondholders, where the option is retained by the issuing company. The yield of this type of bond is higher than the yield of a similar bond without the reverse conversion option. Bondholders demand a higher yield on RCDs because they could wind up with low-value shares instead of the bond. To offset that risk further, bondholders may demand shorter maturities on RCDs. Reverse convertibles typically mature within six months to one year.[4] Firms that have issued RCDs in the U.S. include Wells Fargo, Dell, Wal-Mart, Exxon Mobil, Cisco, Best Buy, and Corning.

The terms and conditions of conversion of an RCD are clearly specified at issuance. Typically, the RCD issuer can only exercise the conversion of principal into stock at maturity. At maturity, there are two possible outcomes:

1. **Cash Delivery.** If the issuer's stock closed at or above the initial share price on the valuation date (generally, four days prior to maturity), regardless of whether the stock closed below the Knock-In Level[5] during the holding period, or if the stock closed below the initial share price, but has never closed (at the end of any day) below the Knock-In Level, then the bondholder receives cash when the RCD matures.

2. **Physical Delivery**. If the underlying shares closed below the Knock-In Level at any time during the holding period and did not trade back up above the initial share price on the valuation date, the bondholder receives shares when the RCD matures.

Whether or not the Knock-in Level is breached, bondholders receive coupon payments until the RCDs mature.

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[4] Some RCDs permit the issuer to convert the bonds into the shares of another company. For example, a bank may issue a bond that is convertible to the shares of, say, a blue chip company. The bond may have a stated yield of 10-20 percent, but if the shares of the blue chip company decrease substantially in value, the bank has the right, instead of making payments on the RCDs, to extinguish them and give bondholders shares of the blue chip company.

[5] The Knock-In Level, if present, is established in the issuing documents and typically is 70 to 80 percent of the initial share reference price. Knock-in options are barrier options where the payoff depends on whether the underlying asset's price reaches a certain level during a specific period. A knock-in option comes into existence only when the underlying asset price reaches a barrier.

How CCNs Could Be Structured

CCNs for financial firms would differ from RCDs typically issued in U.S. and European capital markets. Three important characteristics of the proposed CCNs are conversion triggers, conversion price, and post-conversion requirements. Proposals related to those features are discussed here.

1. Conversion Trigger**.** At least two distinct proposals have been made with respect to conversion triggers. Flannery (2005 and 2009) proposes that a financial firm's CCNs would automatically convert into common equity if the market value of the firm's outstanding shares fell below a pre-specified value, which would be calculated in terms of a ratio to the firm's assets, or if its prudential regulator were to classify it as undercapitalized. The Squam Lake Working Group on Financial Regulation (2009) would have conversion triggered only if two conditions were met. The first condition would be a government declaration of a systemic financial crisis, and the second condition would be a firm-specific trigger such as those proposed by Flannery. Wall (2009) points out that the systemic trigger may be problematic. He argues that it would be irrelevant for systemically important firms, whose potential failure would presumably trip the systemic trigger. Investors would face little uncertainty about the likelihood of conversion if such a firm faced failure. In contrast, for a firm or set of firms not regarded widely as systemically important, the dual trigger could create significant investor uncertainty about the conversion risk of their CCNs. Such uncertainty could make both the CCNs and the stock of such firms less attractive to investors and could affect market demand and pricing of those instruments. In addition, CCNs for such firms could prove ineffective in addressing systemic vulnerabilities in instances where smaller firms proved to be "systemic in a herd" and supervisory authorities did not immediately recognize the systemic risk associated with their failures.

2. Conversion Price**.** Flannery (2005 and 2009) proposes that the conversion price would be the current share price. Unlike traditional convertible bonds (which convert to a specified number of shares), one dollar (face value) of CCNs would convert into one dollar (current market value) of common stock. Thus, the lower the market price at the time of conversion, the greater the number of shares the CCN owners would receive at conversion. Flannery (2009) argues that, if the conversion trigger were set in terms of a ratio between the market value of a firm's shares and its assets and set sufficiently high, this conversion feature would make the default risk of CCNs very low, which in turn would lower the coupon rates on CCNs, increase their liquidity, and make them easier to reissue after conversion.

   The Squam Lake Working Group (2009) argues that conversion as proposed by Flannery could invite market manipulation either by CCN holders or by management on behalf of shareholders. CCN holders might short a stock hoping to trigger conversion at a lower price and, thus, receive a greater share of equity. Equity interests may intentionally trigger conversion if the conversion price is high relative to management's assessment of current value. The Squam Lake Group also raises concerns about successive conversions triggering "death spirals" in equity prices. The group believes that the incentives for such manipulation can be minimized or averted if each dollar of CCN face value converts into a fixed quantity of equity shares, rather than a fixed value of equity.

   Flannery (2009) argues that the Squam Lake proposal creates its own opportunities for market manipulation and suggests specific design features that could minimize market manipulation under fixed-value conversion. In addition, he argues that empirical evidence of "death spirals" in equity prices related to convertible debt is not generally applicable to large financial firms that would issue CCNs.

3. Post-Conversion Requirements**.** CCNs could be written to require certain actions upon conversion. For example, conversion could require the replacement of or votes to replace management and the board of directors. Such a requirement could be based on the amount of CCNs converted or the percentage of firm ownership that CCN holders obtain in the conversion. Conversion could also trigger a requirement that the firm sell new CCNs within a specified time frame to replace the converted ones.

A number of issues have not been fully analyzed and would need more extensive consideration before amending capital regulations to allow CCNs to be counted toward fulfilling regulatory capital requirements. Such issues include:

- How quickly should a firm be required to replace converted CCNs?

- Is there likely to be significant market demand for CCNs? If not, should there be restrictions on the volume of CCNs issued?

- Would CCNs be priced to yield a cost advantage relative to raising common stock *ex ante*? How risk-sensitive would that pricing be?

- What would the accounting and tax treatment of CCNs be? How would those treatments affect the viability of CCNs as a source of contingent capital?

- Should there be restrictions on the ownership of CCNs? How would such restriction affect the demand for CCNs?

- How would the issuance of CCNs by a firm affect short selling of the firm's common stock? It would be worthwhile to evaluate the impact of CCN issuance on the dynamics of a firm's stock price, particularly as the firm's assets fall in value.

In sum, CCNs would provide a transparent and consistent means of programmed de-levering that does not require a firm to sell new shares to the public when the firm has been suffering losses and the cost of raising new capital is expensive.

III. Capital Insurance

Another possible form of contingent capital is capital insurance (Kashyap, Ragan, and Stein, 2008). Like CCNs, capital insurance would provide a mechanism to recapitalize a financial firm automatically when pre-specified conditions were realized. A financial firm would purchase insurance that would provide it additional capital at times of distress. Such injections would eliminate or reduce the need to raise capital when it would be unusually costly or unavailable. In light of the limited and costly options available to financial firms during economic downswings, capital insurance could provide both a liquidity and a solvency backstop, mitigating the risk of fire-sale and credit-crunch spillovers.

The potential for mitigating those spillover effects makes capital insurance attractive. As noted above, financial firms facing a sudden depletion of their capital must shrink their (risk-weighted) assets, reduce their risk exposures in other ways, or raise new equity. While any of those choices would improve compliance with capital requirements, the choice to shrink assets—especially to reduce risky assets—has the potential to create fire-sale and credit-crunch spillovers that can affect other financial institutions and the macroeconomy. Capital insurance would address those problems in two ways. First, the act of selling insurance would give the insurer an incentive to monitor risk taking, while the act of buying insurance at a risk-sensitive price would give the financial firm an incentive to manage risks well. Such monitoring and pricing would align the financial firm's incentives with the more general interest in the stability of the financial system. Second, in the event that a financial crisis occurred despite the better alignment of incentives, capital insurance would provide a private-sector mechanism to automatically provide liquidity and capital to insured financial firms.

How Capital Insurance Could Work

Kashyap, Ragan, and Stein (2008, p. 27-28) give the following example of how capital insurance might work. "[T]he insurer (… a pension fund, or a sovereign wealth fund) would at inception put $10 billion in Treasuries into a custodial account, i.e., a 'lock box.' If there is no event over the life of the policy, the $10 billion would be returned to the insurer, who would also receive the insurance premium from the bank as well as the interest paid by the Treasuries. If there is an event, the $10 billion would transfer to the balance sheet of the insured bank. Thus, from the perspective of the insurer, the policy would resemble an investment in a defaultable 'catastrophe' bond." To mitigate moral hazard associated with insurance coverage, among other things, Kashyap, *et al* suggest that the trigger for a payout be tied to financial sector losses, rather than individual firm performance.

More insight into how such capital insurance might work can be gleaned from examining catastrophe ('cat') bonds. Catastrophe bonds are securities that transfer specific risks through the capital market. The buyers of such bonds receive periodic premium payments in exchange for insurance coverage of losses, within specified limits, arising from specified events that occur within a specified period. Such bonds have been used to transfer catastrophic (low probability, high payout) risks such as those associated with earthquakes and hurricanes. The basic structure of cat bonds is as follows. An insurance company issues the bonds through a special entity called a special-purpose reinsurer. Losses arising from the predefined events determine interest payments and/or the repayment of principal. Typically, the issuer does not have to pay interest if losses exceed a certain amount. Some cat bond structures include tranches that are not protected from principal losses. Repayment of principal to those tranches may be deferred or eliminated if losses exceed a threshold amount.

As in the capital insurance example above, investor returns on cat bonds arise from both a pass-through of premiums from the insurer and investment proceeds on invested principal held in a trust account. At maturity, principal is repaid to investors

unless an insured event triggers a reduced payout. In that case, investors may not receive principal or interest payments in a timely manner, if at all.

To some extent, cat bonds have succeeded in creating new risk-bearing capacity for catastrophic insurance losses and in lowering the risk profiles of some insurance companies. For example, in 2004, some 100 to 150 institutional investors, including major asset managers and hedge funds, bought cat bonds. In addition, some mutual funds had begun to offer insurance-linked securities to small investors (Banks, 2005, p. 117). The total market for cat bonds grew from $1-2 billion per year at the turn of the century to roughly $7 billion in 2007 (Guy Carpenter, 2008). Despite that rapid growth, the market is small compared to the International Monetary Fund's estimate of $2.7 trillion for potential U.S. financial sector writedowns in 2007 through 2010 or to the $391 billion of new capital raised by U.S. banks in 2008 (International Monetary Fund, 2009). However, Froot (2001) notes that the market for cat bonds is limited and prices are far above fair value. Froot finds evidence of capital market imperfections, barriers to capital entering reinsurance, and market power exerted by traditional reinsurers all of which limit cat reinsurance and exert upward pressure on pricing.

Cat bonds offer benefits both to the primary insurers that lay off risk through the sale of those bonds and to the investors who buy them. The gains to the primary insurers are in the form of better risk management and reduced credit exposure to individual reinsurers. In some circumstances, cat bonds can also offer cost savings over reinsurance. Investors gain from the opportunity to add an investment that is uncorrelated to the rest of their portfolio. In addition, investors have received good risk-adjusted returns, including 'novelty premiums' of as much as 100 basis points over similarly rated corporate bonds. However, there are significant costs and other impediments that have limited the market for cat bonds. Those include the costs of establishing issuance vehicles and programs and of assessing, rating, pricing, and issuing the securities. In addition, the secondary market for cat bonds is undeveloped, in part because intermediaries who might otherwise make markets or add liquidity are unable to

hedge the risks associated with carrying cat bonds in inventory. Capital insurance would have similar benefits and costs and, at least initially, face similar impediments.

The choice of trigger mechanism is a central feature of cat bonds. Common mechanisms include indemnity, index, and parametric triggers. An indemnity trigger suspends interest or loss of principal payments if a predefined level of loss has occurred by the primary insurer for the covered risk. About one-third of cat bonds use indemnity triggers. However, many investors are averse to such bonds since the primary insurer can directly affect the level of payouts through its own claims settlement practices. Thus, indemnity triggers are associated with a moral hazard between investors and primary insurers. To control that hazard, other triggers are further removed from the practices of the issuing company. Index triggers are tied to the overall experience of the industry rather than just one firm. Parametric triggers are tied to the magnitude of a catastrophe on some objective scale such as the Richter scale of an earthquake or the category of a hurricane (1 to 5). Although those latter triggers reduce moral hazard, they increase the basis risk for the issuing firm. That is, the issuing firm's exposure is less than perfectly correlated with the non-indemnity triggers.

There is typically some trade-off in pricing among the triggers as well. Cat bonds with indemnity triggers yield somewhat more than bonds with other triggers. The higher yield on bonds with indemnity triggers can be viewed as compensation for the greater moral hazard (to investors) or the cost of lower basis risk (for issuing firms). Thus, issuing firms and investors must balance their concerns about moral hazard, basis risk, cost, and yield in choosing among the types of triggers.

Analogous concerns would arise with capital insurance for financial firms. In their discussion of capital insurance, Kashyap, *et al* suggest a trigger tied to financial-sector-wide losses over a specified number of reporting periods (quarters). For any specific financial firm, they suggest the trigger should be based on losses for all other covered institutions (excluding the one in question). While providing a reasonable mechanism to control manipulation and moral hazard, such a trigger level would leave

considerable risk that any given firm could run into difficulty and not receive a capital insurance payout—a form of basis risk. Thus, in setting capital insurance standards, regulators would have to balance basis risk for insured institutions with moral hazard issues faced by insurers.

Issues with Capital Insurance

As with CCNs, capital insurance would automatically address involuntary increases in leverage during a financial crisis while mitigating balance sheet contractions that are associated with significant negative spillover effects. However, as with CCNs, a number of issues would need more extensive consideration and analysis before capital regulations could allow capital insurance to substitute for stockholders equity or otherwise count toward regulatory capital requirements. Such issues include:

- The size of the capital insurance market relative to the amount that would be necessary to address a systemic event. Given the relatively small size of the cat bond market, investor willingness to issue sufficient capital insurance at attractive premiums is unclear. Some evidence indicates that prior attempts by reinsurers to develop similar products have been unsuccessful (Rochet, 2008). One significant difference between cat bonds and capital insurance from the investor's perspective is that the returns on capital insurance will be highly correlated with other equity investments, whereas the returns from cat bonds are uncorrelated with other investments. Investments whose returns are uncorrelated with the returns from other investments offer diversification benefits to investors, which make such investments more attractive.

- The implications for financial firm competitiveness of allowing or requiring some firms to purchase capital insurance but not others. For example, market participants may view a requirement that only certain firms obtain capital insurance as a veiled designation of "too-big-to-fail." Such an interpretation could improve the competitiveness of such institutions and undermine the

presumed benefit from increased market discipline. However, if firms that are required to obtain capital insurance face high premiums, they may respond by shrinking in an orderly manner and improve the competitiveness of other firms.

- How to set trigger levels and tailor prices for capital insurance. As noted above, setting a trigger tied to aggregate financial sector performance could prove difficult. To achieve the desired results, pricing would have to be sensitive to the individual circumstances of each institution, including such factors as its level of basis risk and the quality of its internal risk management. The more concentrated the sector, the fewer moral hazard problems are solved by moving from an indemnity trigger to a sectoral-index trigger. Further, the proposed trigger mechanism would not result in a payout and therefore would not protect against externalities generated by the isolated failure of a systemically important firm—a point that is particularly relevant with respect to the Enterprises (Kashyap, *et al*, 2008). Other possible trigger mechanisms could be developed by adapting other approaches developed by insurers to mitigate moral hazard. For example, Directors and Officers or Errors and Omissions policies limit moral hazard by making the trigger both very specific and dependent upon certain controls being in place and functioning. Moral hazard could also be addressed through mechanisms not tied to the trigger. For example, pricing of the capital insurance policy could be linked to external audit findings or supervisory ratings for certain controls and governance indicators that would be publically available. Very high deductibles on capital insurance would also reduce moral hazard.

IV. Conclusion

The current capital regulatory regime focuses financial regulators on leverage, risk-based capital, and PCA. However, the procyclicality of the current regulatory regime exacerbates the business cycle, increasing boom-bust tendencies and overwhelming the

ability of those mechanisms to contribute either to firm-level safety and soundness or to financial system stability. As a consequence of that regime, distressed financial firms have incentives to shrink their asset base or sharply curtail lending to shore up their capital positions. When a firm is systemically significant, such responses have spillover effects in the form of "fire sales" and "credit crunch" externalities. The net impact is a cycle of credit losses that result in the distress and shrinking of other financial and nonfinancial firms. In addition, regulators of systemically significant institutions face difficult decisions regarding forbearance or closure when one or more of those institutions experience serious financial difficulties.

This paper has examined two proposals to provide mechanisms to automatically inject capital into financial firms during periods of distress, CCNs and capital insurance. Each of those mechanisms would combat spillover effects and reduce the likelihood of regulators facing difficult forbearance or closure decisions when large, systemically important financial firms experienced serious financial difficulties.

Each mechanism has attractive features. CCNs would appear on the issuing firm's balance sheet, so counterparties and taxpayers could readily observe the role of CCNs in the firm's capital structure. For a well-managed and well-capitalized firm, the cost of the conversion feature would be low on newly issued CCNs, especially if the conversion trigger were based on the market value of a firm's shares. However, shareholders would suffer dilution of their ownership claims in the event that financial distress triggered the conversion of CCN debt to equity. By creating the potential for shareholders to bear significant losses, CCNs would increase shareholder incentives to monitor and limit the firm's risk taking. Similarly, capital insurance would have attractive features. By creating an otherwise missing market, capital insurance would price and internalize the costs of fire-sale and credit-crunch externalities.

Each mechanism also offers potential advantages over the other. Capital insurance would offer several advantages over CCNs. For example, it would be less likely to create incentives for market manipulation or "death spirals" in equity prices than

CCNs. In contrast, CCNs that had conversion triggers tied to firm-specific performance would more reliably mitigate the negative spillovers associated with financial distress at systemically significant institutions. In addition, bonds that are similar to CCNs in many respects have already been successfully marketed, whereas capital insurance would be a new product.

The challenges are significant for incorporating either or both mechanisms into the capital regulatory regime for financial institutions. Those challenges include issues related to market size, pricing, and product details, as well as how best to incorporate such mechanisms into capital requirements. Currently, CCNs appear to hold more immediate promise than capital insurance, for several reasons. First, as Froot (2001) points out, the market for catastrophic risk capital appears to be constrained and prices are high. Second, the quantities of capital insurance needed to support the stability of the financial sector is several orders of magnitude larger than has been achieved in the cat bond market, whereas the risk characteristics of capital insurance would be less attractive to investors. Finally, Flannery's proposed trigger and conversion mechanism appear to have the potential to lower the coupon cost of CCNs by reducing their default risk to investors and to magnify the incentive of shareholders of issuing firms to limit risk-taking. Therefore, while both mechanisms merit further investigation, CCNs appear to offer more immediate hope of achieving a viable market.

Finally, CCNs or capital insurance, if successfully incorporated into regulatory capital regime, hold the promise of reducing the incidence and severity of financial institution failures. Neither mechanism could, however, completely forestall all systemic crises, nor could either substitute for sound prudential supervision. Moreover, decisions related to the amount of CCNs or capital insurance to require, conversion or payout triggers, and other implementation issues could interact with other supervisory tools aimed at limiting risk taking of financial firms, such as examinations, supervisory ratings, and various regulatory risk limits. Thus, the implementation of an automatic recapitalization requirement should take into account those interactions and their implications for the effectiveness of existing and new supervisory policies.

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