Countercyclical Bank Equity Issuance

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Abstract

It is well established that equity issuance for non-financial firms is procyclical. This paper shows that, in contrast, equity issuance for banks is countercyclical across credit cycles after 1980, as is retained income. Thus, during credit booms, banks raise less equity, even though more equity might help banks better absorb shocks. This paper shows that government guarantees play a crucial role in driving banks' countercyclical equity issuance. Countercyclical equity issuance arises in the U.S. during the bailouts of the 1980s, mostly in banks that equity markets perceive as "too-big-to-fail" (TBTF). Across types of firms, historical time periods, and countries, equity issuance is countercyclical when government guarantees are strong and procyclical when government guarantees are weak. Furthermore, bank equity issuance becomes more countercyclical in Eurozone countries that gain increased implicit guarantees upon adopting the Euro. These findings help explain why banks may resist raising equity during credit expansions, making financial distress more likely.

A central issue in banking finance concerns the optimal capital requirements of banks and whether bank equity is expensive from both a social and private point of view. It is often argued that higher capital requirements act to reduce banks' risk-taking incentives and help banks withstand adverse shocks (see, for example, Admati et al., 2013a). As a result, higher capital requirements have been a key focus of recent financial reforms around the globe. To analyze optimal capital requirements of banks, it is important to understand why banks issue equity at some times and pay out equity at other times.

This paper investigates the drivers of bank equity over the credit cycle. A robust fact for equity issuance by non-financial firms is that they issue more equity in good times, i.e. equity issuance is procyclical.[1] This tendency makes sense because both investment opportunities for firms and their stock prices are high in good times, making equity issuance attractive for managers of non-financial companies. However, this paper demonstrates that the logic of this argument does not hold for banks: bank equity issuance is countercyclical.[2] During credit booms, banks raise less equity, even though more equity might help banks better absorb shocks. Banks instead wait until after the downturn, when it is potentially more costly to raise equity and too late to mitigate a crisis.

Why does the logic of procyclical equity issuance not hold for banks? The contribution of this paper is to demonstrate how bailout distortions and government guarantees may lead banks to choose countercyclical equity issuance. This paper shows that across types of firms, historical time periods, and countries, equity issuance is countercyclical when government guarantees are strong and procyclical when government guarantees are weak or absent. Importantly, countercyclical equity issuance arises in the U.S. during the bailouts of the 1980s and is driven by banks that equity markets perceive as "too-big-to-fail" (TBTF). In a difference-in-differences test, bank equity issuance becomes more strongly countercyclical in

[1] See, for example, Marsh (1982), Pagano, Panetta, and Zingales (1998), Baker and Wurgler (2002), and Hong, Wang, and Yu (2008).

[2] This paper analyzes cyclicality in terms of the credit cycle (i.e. aggregate lending by banks to households and non-financial firms), which is most relevant for banks. Similar patterns of equity issuance hold when defining cyclicality in terms of GDP or other variables.

Eurozone countries that gain increased implicit guarantees upon adopting the Euro, relative to Eurozone countries without increased implicit guarantees. These results suggest that implicit guarantees distort incentives of banks to raise new equity and affect the dynamics of bank capital structure over the credit cycle.

The paper proceeds as follows. First, I develop an illustrative model of moral hazard to understand why bailout distortions and government guarantees may lead banks to choose countercyclical equity issuance. The model features a conflict between bankers (working in the interests of shareholders) and creditors. Bankers would like to take advantage of the option-like payoff to shareholders by paying out rather than raising equity. Though payouts enrich shareholders, they increase the probability of firm default. Foreseeing the possibility of payouts, creditors threaten to increase the interest rate if shareholders do not raise sufficient equity, the threat of which incentivizes bankers to raise equity. This threat represents market discipline. The key friction in the model is the presence of government guarantees to creditors: by partially shielding creditors from losses in the event of default, government guarantees dull creditor market discipline. While the model is static, we can think about the cyclicality of equity issuance using comparative statics, letting downside risk vary cyclically. As a result, when government guarantees are strong and therefore creditor market discipline weak, equity issuance is countercyclical, since countercyclical issuance is privately optimal from the point of view of bankers and shareholders. In contrast, in the absence of government guarantees, creditor market discipline produces procyclical issuance.

Turning to the data, I look systematically at bank equity issuance, share repurchases, dividend payouts, and retained income across credit cycles. Bank equity issuance, measured in a variety of ways, is countercyclical over the period 1980-2012, while equity issuance by non-financial firms is procyclical. The data further indicate that countercyclical bank equity issuance is not driven by market timing or simply by time-varying cash-flows[3] or provisioning

[3]Meaning that during credit expansions, banks may earn high profits; if they lack adequate investment opportunities to employ these profits, they may simply pay out excess profits (and vice versa for negative cash flow shocks).

across the credit cycle.

I then present three key pieces of evidence showing that equity issuance is highly countercyclical when government guarantees are strongest and procyclical when government guarantees are weak or absent. First, over the time period 1980-2012, large banks have the strongest countercyclical equity issuance, followed by investment banks and then small banks, while non-financial firms have procyclical issuance, consistent with their different levels of government guarantees as reported in Gandhi and Lustig (2013).

Second, equity issuance is strongly procyclical in the U.S. before the creation of the FDIC (pre-1935), moderately procyclical from that time until the start of the Savings and Loan failures (1935-1980), and countercyclical thereafter (1980-2012). This pattern is consistent with the fact that there was little, if any, perception of government guarantees (with the exception of Fed discount window assistance) before the creation of the FDIC in 1933, along with the fact that TBTF government guarantees increased in the U.S. in the 1980s (for example, after the bailouts of Continental Illinois in 1984 and of a variety of large banks in the late 1980s and 1990s). Moreover, this shift in the 1980s is driven by banks that equity markets perceive as "too-big-to-fail." [4]

Third, among developed countries, countries with large relative banking sectors (bank assets greater than 200% of GDP, e.g., Switzerland, Hong Kong, the Netherlands) generally have procyclical bank equity issuance, while countries with small relative banking sectors (bank assets less than 200% of GDP, e.g., the U.S., Canada, Japan) have countercyclical bank equity issuance. This evidence is consistent with the idea that implicit government guarantees might be perceived to be weaker in countries with bank assets greater than 200% of GDP due to the government's limited fiscal capacity to fully protect creditors in the event of a large bank failure.[5] If investors anticipate in advance that some banks in these countries

[4]The equity market measure of TBTF that I construct is based on announcement returns subsequent to bailouts (drawing on work by O'Hara and Shaw, 1990). The measure captures increased perceptions of TBTF guarantees conferred to large banks; small banks do not see any effect. Details on constructing this measure are presented in Section 4.

[5]This perception is borne out by reality: Iceland and Cyprus had to impose deep haircuts on bondholders and foreign depositors. Ireland, in contrast, provided their large banking sector with a blanket guarantee

might be "too-big-to-save," creditor market discipline might be stronger and equity issuance might be less countercyclical or even procyclical.

While the above evidence suggests the potential importance of government guarantees and bailout distortions, these results alone are not sufficient to establish a direct link. For example, there might be other differences between large and small banks[6], over time[7], and between large and small countries.[8] Therefore, the heart of my evidence is a difference-in-differences test demonstrating that bank equity issuance becomes more strongly countercyclical in Eurozone countries that gain increased implicit guarantees upon adopting the Euro, relative to Eurozone countries that do not gain increased implicit guarantees upon adopting the Euro.

This difference-in-differences test exploits the introduction of the Euro as an exogenous shock with differential effects on the banking sectors of different countries. The idea is that bank creditors in some Eurozone countries (e.g., Italy and Ireland) gained implicit protections in adopting the Euro, perhaps from the European Central Bank (ECB) or from other Eurozone countries.[9] I exploit the variation in implicit guarantees gained by different Eurozone countries upon adopting the Euro, which may make bank equity issuance more countercyclical in some countries than in others. This identification strategy assumes that

for all creditors, which eventually forced the Irish government nearly into insolvency alongside the banks. Bailouts in many countries have grown so large that they have strained the public finances in many countries (Brown and Dinç 2011; Demirgüç-Kunt and Huizinga 2010; Acharya, Drechsler, and Schnabl, 2013). In particular, Spain, Portugal, and Ireland all had to ask the IMF and EU for emergency loans with the joint purpose of recapitalizing their largest banks and forestalling sovereign debt crises.

[6] See, for example, Hanson, Kashyap, and Stein (2011) on capital structure and competition for funding.

[7] Some events in the 1980s that might affect bank equity issuance include: deregulation (e.g., the Garn-St Germain Act of 1982, relaxation of branching and interstate bank restrictions) that gave banks more risk-taking ability and increased competition, increased regulation (Prompt Corrective Action, Basel I), which mandates recapitalization for distressed banks, and the rise of securitization and universal banking.

[8] For example, shocks to smaller countries might be larger (e.g., trade shocks, interest rate shocks, capital outflows), leading to greater market discipline. Alternatively, regulators, foreseeing both larger possible shocks and lack of fiscal capacity to backstop the largest banks, might be more vigilant in regulating the banking sector.

[9] Even if the implicit guarantees in joining the Euro are conferred mostly upon these countries' sovereign debt rather than on bank debt, implicit guarantees for sovereign debt can indirectly support banks because they provide the fiscal backing for individual governments to support their banks in the event of a crisis. The fact that the EU lent money to Ireland, Spain, and Portugal in 2011-2012 to help these governments jointly recapitalize their banks and forestall a sovereign debt crisis illustrates how implicit guarantees for sovereign debt can indirectly confer protections to a country's banking sector.

the introduction of the Euro was a political project unrelated to developments in the banking sector and also that the only differential effect the Euro had on the banking sectors of its member countries was through its impact on implicit guarantees. I discuss my identification strategy and potential caveats in Section 3.

I use interest rate convergence as a proxy for implicit guarantees — specifically, the change between 1996 and 1999 in the real short-term interest rate spread relative to Germany. The fall in interest rates in countries such as Greece, in part, reflected lower perceived default risk, as creditors believed that other Eurozone countries and the ECB would protect Greek sovereign debt and the Greek banking system in the case of financial distress, because of the possibility of spillover in a monetary union (which is exactly what did happen).

To analyze whether changes in implicit guarantees lead to changes in the cyclicality of bank equity issuance, I divide the initial group of Euro-adopting countries into two groups based on interest rate convergence. I classify countries as having low interest rate convergence if the change in the spread is less than one percentage point (e.g., Germany, the Netherlands, and Finland) or high if the change in the spread is greater than 1 percentage point (e.g., Ireland, Italy, and Portgual). Using the above classification, I estimate a difference-in-differences regression to test whether countries with high interest rate convergence have increased countercyclical issuance when joining the Euro, compared to countries with low interest rate convergence. The difference-in-differences coefficient is a statistically significant -0.102 (t = -2.332, dually clustered), meaning that, conditional on a one-standard deviation increase in credit expansion, net equity issuance decreases by 10.2 percentage points (annualized, as a fraction of book equity) in countries that gained implicit guarantees upon adopting the Euro, relative to countries that didn't gain implicit guarantees upon adopting the Euro. This result suggests that changes in implicit guarantees lead to economically-important changes in the cyclicality of bank equity issuance.

Finally, I investigate the role of market timing in bank equity issuance over the credit cycle, in light of the fact that credit variables can predict future returns, especially for bank stocks (Baron and Xiong, 2014).[10] Using credit expansion to predict future equity returns, I find that the cost of equity capital for both banks and non-financial firms is countercyclical over the credit cycle, with low cost-of-capital (i.e. high stock prices) during expansions and high cost-of-capital (i.e. low stock prices) during contractions. According to market timing theory, equity issuance should therefore increase during credit expansions alongside the lower cost of capital, and issuance should be procyclical. While procyclical issuance for non-financial firms is consistent with market timing, countercyclical issuance by banks indicates that banks do not appear to be simply timing the market.

This final result also ties into the ongoing debate on the cost of bank capital (see Admati, DeMarzo, Hellwig, and Pfleiderer, 2013b). While previous work (e.g., Baker and Wurgler, 2013; Kisin and Manela, 2014) estimates a time-averaged cost of bank capital, my result suggests that, due to the time-varying cost of capital, the cost of increased regulatory capital may be substantially lower than previously estimated, if regulators are careful to implement increased capital requirements during expansions.

The paper proceeds as follows. Section 1 discusses related literature. Section 2 presents an illustrative model. Section 3 presents my hypothesis and empirical strategy. Section 4 discusses the data and summary statistics. Section 5 presents the empirical results. Section 6 concludes.

1 Related Literature

In related papers, Acharya, Le, and Shin (2013) and Acharya, Gujral, Kulkarni, and Shin (2012) study dividend payments of selected large banks and broker-dealers in 2007-2009 and show how increased risk-shifting can take place via capital structure and dividend policies.[11]

[10] Similarly, but from a different theoretical perspective, Adrian, Etula, and Muir (2013) and Muir (2014) show how intermediary book leverage can price a variety of assets.

[11] Similarly, Scharfstein and Stein, in a New York Times Op-Ed dated Oct. 20, 2008, point out that TARP recipients planned to pay out a substantial fraction of injected capital from TARP as dividends. Scharfstein and Stein argue that these policies benefit shareholders at the expense of the debt holders, while depleting bank capital at a time when banks crucially needed more capital.

Similar to my paper, these papers highlight the conflict of interest between shareholders and bondholders of banks, leading bankers to prefer immediate payouts, even though these payouts substantially reduced banks' equity cushions in 2007-2009. I extend their work by systematically studying new equity issuance, share repurchases, and dividend payouts of all banks and large broker-dealers over credit cycles from 1925-2012. I find that banks reduce new issuance and retain less income during the peak of the credit cycle, not just when banks are on the verge of failing.

Another closely related paper concerned with agency frictions between shareholders and creditors is Admati, DeMarzo, Hellwig, Pfleiderer (2013a), which argues that shareholder-creditor conflicts can lead to leverage "ratchet effects"; shareholders may avoid reducing leverage when leverage is already high, even if leverage reduction might increase the total value of the bank. Complementing their theory, my paper provides empirical evidence demonstrating that banks raise less equity and pay out more capital during credit expansions, when their leverage is already high.

My paper is also related to the extensive literature on capital structure and capital requirements of banks.[12] Related in focus to my paper, Hanson, Kashyap, and Stein (2011) argue that the high leverage of financial firms is driven by competition on the cost of funding. They show a strong inverse relationship between bank size and capital ratios. In addition, using data on state banking deregulation, they show that when banks are faced with more competition, banks tend towards both higher and more uniform levels of leverage. In contrast, my paper argues for the role of shareholder-creditor conflicts and government guarantees in driving capital structure decisions. However, it is important to note that both competition between banks and shareholder-creditor conflicts in the presence of government guarantees may be jointly present and mutually reinforcing. Competition, by reducing the franchise value of a bank, may further encourage banks to take advantage of creditors and government guarantees by issuing less equity. Consistent with this argument, Keeley (1990)

[12] Kashyap, Rajan, Stein (2008) provide an overview of various perspectives motivating bank capital requirements.

finds that banks with more market power (and thus presumably more franchise value) tend to hold more capital and have lower default risk.

Theories of bank capital structure have generally focused on the role of capital structure in disciplining bank managers (e.g., Calomiris and Kahn, 1991; Diamond and Rajan, 2000, 2001), the benefits of liquidity creation (e.g., Kashyap, Rajan, and Stein, 2002; DeAngelo and Stulz, 2013), asset substitution and monitoring of borrowers (e.g., Holmstrom and Tirole, 1997; Mehran and Thakor, 2010), and competition on the lending side (e.g., Allen, Carletti and Marquez, 2011). Macroeconomic models incorporating the role of financial sector leverage and net worth have generally avoided the role of new equity issuance (e.g., Adrian and Boyarchenko, 2012; Adrian and Shin, 2013; He and Krishnamurthy, 2013; Brunnermeier and Sannikov, 2014). My study adds to this literature on bank capital structure by demonstrating the dynamic nature of equity issuance and payouts over the credit cycle and the key importance of government guarantees.

Finally, this paper is also related to the expansive corporate finance literature on equity issuance, share repurchases, and dividend decisions of firms, though this literature mostly focuses on non-financial firms. The literature highlights the roles of adverse selection (e.g., Ross, 1977; Myers and Majluf, 1984), debt overhang (e.g., Myers, 1977), tax benefits of debt (e.g., Miller, 1977; Graham, 2000; Fama and French, 2002), market timing (Baker and Wurgler, 2002), optimism (e.g., Malmendier and Tate, 2005), and disagreement between managers and shareholders (e.g., Dittmar and Thakor, 2007; Huang and Thakor, 2013). In contrast to these papers, my paper focuses on the determinants of equity issuance and payouts over time specifically for banks. The contrast between procyclical non-financial issuance and countercyclical bank issuance suggests that theories for non-financial firms may be less applicable for banks.

2 A model of moral hazard and equity issuance

Consider the following illustrative model, which borrows from the framework of Acharya, Le, and Shin (2013) and highlights the link between moral hazard, government guarantees, and equity issuance.

There are two periods, today and tomorrow. The bank's balance sheet consists of A_0 risky assets today, which turn into $\tilde{A}$ assets tomorrow, where $\tilde{A}$ is a random variable. The bank is financed by L liabilities, with the rest of the assets financed by shareholder common equity. The bank defaults if the realization of assets plus any new cash raised (or minus any cash paid out) is less than liabilities L. Furthermore, assume that $\tilde{A}$ is uniformly distributed over the interval $[\underline{A}, \overline{A}]$, such that $\underline{A} < L < \overline{A}$. Let $\sigma = \frac{\overline{A} - \underline{A}}{A_0}$ represent total asset risk, and let $\sigma_D = \frac{A_0 - \underline{A}}{A_0}$ represent downside or tail risk. The discount rate is zero.

The model adopts the point of view of a risk-neutral bank manager working in the interest of shareholders to maximize their expected payoff. The banker chooses n, the value of new capital to raise through equity issuance (with $n < 0$ corresponding to payouts), with N the maximum amount of capital that the bank can raise or pay out. Given the option-like payoff to equity holders due to limited liability, the banker wishes to maximize shareholder value by taking advantage of creditors and government guarantees, while also trying to protect the bank's franchise value V (which can be thought of as the present value of future cash flows), which would be lost in the event of default. The creditors, anticipating that the banker is trying to exploit limited liability, thus threaten to charge a higher interest rate r in the presence of increased moral hazard to compensate themselves for a higher probability of default. This threatened higher interest rate is the key channel here for market discipline — it serves to incentivize increased equity issuance in line with the "first-best."

The key friction is the presence of government guarantees: fraction γ of all creditor losses of principal will be reimbursed by the government in the event of default. By partially shielding creditors from losses in the event of default, the government guarantees result in less market discipline.[13]

Lastly, I also include the possibility of market timing to demonstrate how moral hazard can counteract market timing. If the bank issues shares whose total market value should be n (which is inclusive of the dilution from issuing these new shares), the firm receives $(1+a)\cdot n$ in cash, where a is exogenous and reflects the premium or discount from equity markets.[14]

The model is static, but it is still useful to think about how the model's predictions might vary over the credit cycle using comparative statics. One way to do capture variation over the credit cycle is to think of perceived downside risk, σ_D, as varying countercyclically (which in turn drives countercyclical market discipline in the model). While the model assumes that downside risk σ_D is a fixed parameter known by all agents in the model, we can think of it more generally as reflecting time-varying beliefs about downside risk or as reflecting measured value-at-risk of banks (which is backward looking) or the VIX (which is forward looking) and which are countercyclical over the credit cycle (Adrian and Shin, 2013).[15]

Returning to the model, the expected payoff to shareholders is given below by Equation 1.[16]

$$\begin{aligned}\text{Expected Shareholder Value} \;=\; & E[\tilde{A} - (1+r)L + (1+a)\cdot n \,|\, \tilde{A} + (1+a)\cdot n \geq L] \\ & + Pr[\tilde{A} + (1+a)\cdot n \geq L]\cdot V \;-\; n \end{aligned} \tag{1}$$

[13]This friction reflects extensive evidence that implicit guarantees diminish the relationship between bank risk-taking and funding costs (e.g., Flannery and Sorescu, 1996; Flannery and Nikolova, 2004; Morgan and Stiroh, 2005; Balasubramanian and Cyree, 2011; Strahan, 2013; and Acharya, Anginer and Warburton, 2014) and that this diminished creditor market discipline translates into increased risk-taking by banks (e.g., Keeley, 1990; Duchin and Sosyura 2014; Demirguc-Kunt and Detragiache 2002, 2006; Panageas, 2010; Fahlenbrach, Prilmeier, and Stulz, 2012).

[14]In the model, equity payouts take the form of share repurchases rather than dividends, in order to capture market timing.

[15]Another possible driver of countercyclical equity issuance could be time-varying regulation. We can think of regulation being lax during credit expansions — perhaps reflecting institutional frictions like regulatory capture, political lobbying, and lax monitoring of regulators by the public, or behavioral frictions like forgetting about past crises — and more vigilant after the crisis, when regulators are more closely watched by the public, and stress tests, higher capital requirements, and financial reform legislation become more common.

[16]For calculational simplicity, I make the approximation that the condition of the bank's survival is that $\tilde{A} + n \geq L$, even though it is really $\tilde{A} + n \geq (1+r)L$.

The first term represents the value of assets plus new equity raised, minus liabilities, conditional on the bank's survival. The second term is the franchise value of the bank, minus the interest paid to creditors, conditional on the bank's survival. The third term is the cash that shareholders give up when they purchase new equity from the bank.

The creditors' breakeven (or participation) constraint is given in Equation 2. Anticipating that bankers may exploit limited liability and government guarantees to creditors, creditors set the interest rate to compensate themselves for expected losses.

$$\begin{aligned} 0 &= Pr[\tilde{A} + (1+a)\cdot n \geq L]\cdot rL \\ &\quad +(1-\gamma)\, E[\tilde{A} - L + (1+a)\cdot n \,|\, \tilde{A} + (1+a)\cdot n < L] \end{aligned} \tag{2}$$

The first term represents interest payments the creditors receive, conditional on the bank's survival. The second term represents expected losses of the creditors, conditional on the bank's failure.

Assume for now that equity is priced correctly ($a = 0$). The "first-best" solution, the one that takes into account the total value of the firm (shareholders and creditors together) plus the net costs to the government, is that the bank should always raise the maximum allowed equity (n = +N) in order to minimize the probability of default, which is a pure loss from a social point of view. To see this, add expected shareholder value from Equation 1 to expected creditor value from Equation 2:

$$\begin{aligned} \text{Expected Total Value} &= E[\tilde{A} - (1+r)L + n \,|\, \tilde{A} + n \geq L] + Pr[\tilde{A} + n \geq L]\cdot V \quad (3) \\ &\quad -n + Pr[\tilde{A} + n \geq L]\cdot rL + E[\tilde{A} - L + n \,|\, \tilde{A} + n < L] \\ &= E[\tilde{A} - L] + Pr[\tilde{A} + n \geq L]\cdot V \end{aligned}$$

Thus, it is clear that expected total value is increasing in n, since more equity decreases the probability of default. Since default results in forfeiting the bank's franchise value, it is a pure social loss. All other private costs and benefits of equity cancel out, merely transferring value between equity holders and creditors.

We can now solve generally for the banker's optimal choice of equity issuance or payout, taking into account the presence of government guarantees. As a result of the uniform distribution, the shareholder's expected value and the creditor's breakeven constraint are:

$$\text{Expected Shareholder Value} = \frac{\frac{1}{2}(\overline{A} - L + (1+a)\cdot n)^2}{\overline{A} - \underline{A}} + V\frac{(\overline{A} - L + (1+a)\cdot n)}{\overline{A} - \underline{A}} - n - (rL)\cdot Pr[\tilde{A} + (1+a)\cdot n \geq L] \quad (4)$$

$$0 = (rL)\cdot Pr[\tilde{A} + (1+a)\cdot n \geq L] + (1-\gamma)\frac{\frac{1}{2}(\underline{A} - L + (1+a)\cdot n)^2}{\overline{A} - \underline{A}} \quad (5)$$

Substituting the creditor's breakeven constraint (Equation 5) into the shareholders' expected value (Equation 4) results in an upward-facing quadratic equation with respect to n, and therefore no interior solution exists. Thus, a bank manager who is maximizing shareholder value will choose either n = +N (issuing the maximum amount) or n = -N (paying out the maximum amount), depending on whether equity issuance or payout is more desirable. Mathematically, the optimum n = +N or -N depends on whether the vertex of Equation 4 is greater or less than n = 0.

The result is the following proposition, a proof of which can be found in the Appendix:

Proposition 1: Let $\Psi = \frac{1}{\gamma}\left[\frac{V}{A_0} + \sigma\cdot\frac{a}{1+a}\right] + (1-\sigma_D) - \frac{L}{A_0}$.

Shareholders' optimal equity issuance or payout is a corner solution:

n = +N, if $\Psi > 0$,

n = -N, if $\Psi < 0$,

with indifference between +N and -N, if $\Psi = 0$.

Thus, issuance is more likely when: government guarantees γ are low, franchise value of the bank $\frac{V}{A_0}$ is high, perceived downside risk σ_D is high, the price of equity is high (i.e. $a > 0$), and book leverage $\frac{L}{A_0}$ is high.[17]

If, as described earlier, we think of perceived downside risk σ_D as countercyclical across the credit cycle, we can compare different types of firms and implicit guarantee regimes. For banks with a high level of government guarantees γ, net equity issuance may be countercyclical, as countercyclical variation in σ_D can drive Ψ above and below the zero threshold, generating countercyclical net issuance. However, for banks with a low level of government guarantees γ, net equity issuance may be substantially less countercyclical, perhaps nearly acyclical, because a low γ keeps Ψ positive almost all the time. After adding in market timing (i.e. letting a be procyclical), net equity issuance can be procyclical with low government guarantees γ.

3 Hypothesis and Empirical Strategy

The model suggests that government guarantees, by partially shielding creditors from losses in the event of default, may result in less creditor market discipline and thus stronger countercyclical equity issuance. This section introduces a hypothesis motivated by the model and my empirical strategy to test it.

This paper exploits the fact that government guarantees vary widely across firms, countries, and historical time periods. For example, Gandhi and Lustig (2013) find a tail-risk subsidy that is greatest for large commercial banks, less for large investment banks, and negative for small commercial banks. Non-financials are generally not perceived to have government guarantees protecting creditors. Little, if any, perception of government guarantees (with the exception of Fed discount window assistance) existed before the creation of the FDIC in 1933. Perceptions of TBTF government guarantees are generally regarded to have

[17] The fact that payouts are even more likely when leverage is already high is the "ratchet effect" analyzed in Admati et al. (2013a).

increased in the U.S. in the 1980s and 1990s — for example, after large-scale interventions, such as the bailouts of Continental Illinois in 1984 and LTCM in 1998. Similarly, perceptions of implicit guarantees may have changed when certain Euro countries (e.g., Ireland, Italy, Portugal) adopted the Euro. Across this wide variation in government guarantees, do we see differences in equity issuance associated with different levels of government guarantees?

Motivated by the model and the considerations discussed above, I put forward the following hypothesis:

Hypothesis: Equity issuance is more strongly countercyclical in the presence of higher levels of government guarantees. In contrast, equity issuance is procyclical when government guarantees are weak or absent.

At the heart of my analysis is a difference-in-differences test that exploits the introduction of the Euro as an exogenous shock that has differential effects on the banking sectors of different countries. As mentioned earlier, the identification strategy assumes that the introduction of the Euro was a political project unrelated to developments in the banking sector and that the only differential effect the Euro systematically had on the banking sectors of Eurozone countries is through implicit guarantees. One caveat of this approach, however, needs to be pointed out: to the extent that adopting the Euro also reduced various forms of risk (e.g., exchange rate and inflation risk), potentially leading to laxer market and regulatory discipline of banks, increased countercyclical issuance may stem from reduced risk rather than increased implicit guarantees. However, the ongoing Eurozone crisis illustrates quite dramatically how lower funding costs for banks in Eurozone periphery countries did not reflect lower risks (risks were quite high, as it turned out) but rather the correct perception that EU fiscal and monetary support would be used to rescue and recapitalize important banks in countries such as Greece, Spain, Portugal, Italy, and Ireland (sometimes indirectly, through supporting sovereign debt).

My regression methodology is as follows. To analyze the cyclicality of equity issuance, payouts, and retained earnings, I estimate the following regression:

$$y_t = \alpha + \delta \cdot CreditExpansion_t + \gamma' \cdot Controls_t + \epsilon_t \tag{6}$$

The standard dependent variable y is *net equity issuance* aggregated over all large banks, though I also look at other dependent variables, such as *net equity issuance minus dividends* and *retained income*. *Credit expansion*, i.e. $\Delta(bank\,credit/GDP)$, the standardized year-over-year change in aggregate bank credit to GDP, is my standard measure of the credit cycle. The time-series regression is estimated with Newey-West standard errors on quarterly data.

To test differences between two groups (e.g., small vs. large countries), I estimate the following regression, where variable i can denote either individual firms or countries:

$$\begin{aligned} Equity\,Issuance_{i,t} &= \alpha_i + CreditExpansion_{i,t} \cdot \\ &\quad (\delta_i + \delta_1 \cdot 1_{TreatmentGroup}) \cdot + \gamma' \cdot Controls_{i,t} + \epsilon_{i,t} \end{aligned} \tag{7}$$

The above estimation approach is conceptually similar using Equation 6 to estimate δ firm-by-firm or country-by-country with a time-series regression and then testing the difference in the average δ between the two groups (i.e. small vs. large countries). However, special care must be taken to test differences in countercyclical issuance across firms or countries because innovations to equity net issuance may be correlated across firms or countries (due to common global shocks) and over time (due to persistence of firm- or country-specific shocks). Therefore, I adopt a panel regression approach for Equation 7 and estimate standard errors following Thompson (2011) that are dually clustered on time and firm/country, to account both for correlations across firms/countries and over time, which is the approach recommended by Petersen (2009).

To test difference-in-differences (for example, countries with increased implicit guarantees versus those without, before and after adopting the Euro), I estimate the following regression, where variable i can denote either individual firm or country:

$$\begin{aligned} Equity\,Issuance_{i,t} &= \alpha_i + CreditExpansion_{i,t} \cdot \\ &\quad (\delta_i + \delta_1 \cdot 1_{Treat} + \delta_2 \cdot 1_{year>\overline{y}} + \delta_3 \cdot 1_{Treat} \cdot 1_{year>\overline{y}}) \\ &\quad + \gamma' \cdot Controls_{i,t} + \epsilon_{i,t} \end{aligned} \tag{8}$$

As before, I estimate dually-clustered standard errors following Thompson (2011). The coefficient of interest is the difference-in-differences coefficient, δ_3, which tests the change in the cyclicality of equity issuance in the treatment group (the group that received increased implicit guarantees) compared to the change in the control group (the group that did not).

4 Data and Summary Statistics

I construct several related data sets: 1) a time series data set of aggregate credit expansion, equity issuance, payouts, and other variables for different subsets of firms (large banks, small banks, investment banks, non-financials) over the sample periods 1925-2012; 2) a panel data set of U.S. banks (a de-aggregated version of the data set above); and 3) a cross-country panel data set of aggregate bank lending, equity issuance, payouts, and other variables for 26 developed countries over the sample period 1980-2012.

4.1 Firm classification

I classify firms into large commercial banks, small commercial banks, investment banks, and non-financial firms. Commercial banks (which I also take to also include savings and trust institutions) are selected by SIC codes 6020-6036, then further filtered by NAICS and GIC codes to remove erroneous firms; holding companies that are primarily banks (e.g., Citigroup) with SIC codes 6712 are also included as commercial banks. Investment banks are selected by SIC codes 6712 and 6211, further filtered by NAICS and GIC codes, and then manually filtered to include only firms whose primary line of business (based on Compustat descriptions and web searches) is investment banking. Non-financial firms are Compustat manufacturing firms (SIC codes 2000-3999). To the extent that manufacturing firms are not representative of non-financial firms, the results in this paper should be viewed accordingly.

For each quarter, I categorize large commercial banks as the largest 20 banks by assets, and small commercial banks as banks ranked between 50 and 100 by assets.[18] The data is quarterly data from 1925 to 2012 for large commercial banks and from 1980-2012 for small commercial banks, investment banks, and non-financial firms.

4.2 Key variables

The main variable analyzed in this paper is *net equity issuance* (new equity issuance minus share repurchases) in dollar values, normalized by beginning-of-quarter *book equity*. To construct *net equity issuance*, I look at the quarterly net change in *common shares outstanding* from Compustat (after adjusting for stock splits and effective dilutions) and value the equity based on the end-of-quarter price for the equity. Stephens and Weisbach (1998) and Jagannathan, Stephens, & Weisbach (2000) suggest that this method is generally accurate in measuring net issuance. They also suggest a method for separating equity issuance and share repurchases, which I follow (see Appendix). I similarly construct a measure for dividend payouts normalized by book equity. As a robustness check, I also use alternative approaches for measuring equity issuances and repurchases.

As the key variable representing the credit cycle, I define the variable *credit expansion*, also denoted Δ(bank credit / GDP), as the year-over-year change in aggregate bank credit to GDP, where bank credit is defined as credit from banks to domestic households and private non-financial corporations, constructed with data from BIS and from Schularick and Taylor (2012). See the Appendix for details.

For data post-1965, I collect financial characteristics of firms from standard sources. For

[18]The term "small" is a misnomer, since these banks are actually quite large. These banks tend to be regional banks and savings and loans. The term "small" is simply used to distinguish these banks from "large" banks.

the U.S., I use Compustat for *shares outstanding, assets, book equity*, and two measures of income (*net income before changes to loan-loss reserves* and *net income after changes to loan-loss reserves*, normalized by beginning-of-quarter book equity). For measuring the cost of capital for the banking sector, I use quarterly *stock returns* and *dividend yields* from CRSP, from which I construct quarterly excess returns (total returns minus the three-month T-bill rate) for each of the sectors (market-cap-weighted indices for large banks, small banks, investment banks, and non-financial firms).

For international data on 26 developed countries (1980-2012), I use Thompson-Reuters Datastream for bank *net equity issuance*, *payouts*, *equity returns*, *income*, *book equity*, and *market equity.* For international data on bank assets to GDP, I use OECD data when available or data from each country's central bank otherwise. For Eurozone economies, I also calculate real short-term interest rate spreads relative to Germany, using data from Eurostat, Global Financial Data, IMF, and OECD. See the Appendix for information on control variables for the regressions.

Lastly, to construct a measure of market-perceived changes in implicit TBTF guarantees for U.S. banks, I look at the one-day abnormal returns corresponding to specific announcements, following O'Hara and Shaw (1990). Those announcements are: 1) The OCC announcement related to Continental Illinois (Sept. 20, 1984); and 2) President George H.W. Bush's proposal for a Savings and Loan bailout (Feb. 7, 1989). See the Appendix and Section 5.2 for historical details of these events and their relationship to TBTF. For each bank, I average the abnormal returns over the two announcements to get the TBTF measure for each bank.

4.3 New historical data

I hand-collect new data for banks over the period 1925-1965. It is important to my study to use data going back to 1925 in order to establish that bank equity issuance was procyclical prior to 1980 and highly procyclical before the establishment of the FDIC in 1933. Hand-collected data is needed because bank stocks do not appear in CRSP before 1965, since they were traded almost exclusively OTC before around 1965. Likewise, Compustat begins in 1965 for all firms.[19] Given the challenges of hand-collecting data, I only analyze the 15 largest banks ranked by assets. The top 15 banks are selected on a yearly basis, but, interestingly, the list of top 15 banks stayed remarkably stable throughout the period 1925 – 1965.[20]

I gather hand-collected data from two sources: yearly editions of Moody's Bank and Finance Manuals (for *new equity issuance*, *dividends*, *stock splits and dilutions*, *net income* both before and after changes to loan-loss reserves, and annual bank balance sheet data, such as *cash*, *loans*, *deposits*, and *book equity*) and Wall Street Journal archives (for *bank equity prices* on a quarterly basis). I also collect from Moody's Manuals specific data on how the new capital was raised, whether through secondary offerings or subscriptions rights (which includes information on how many shares were offered and at what price). Using the above information, I calculate effective stock dilutions for each bank and year, which may result from stock dividends, rights issues, mergers, and actual splits.

4.4 Summary statistics

Table 1 presents summary statistics related to equity issuance, payouts, and other key variables for large U.S. banks. Panel A presents cross-sectional statistics for the 20 largest banks during 2005, around the peak of the most recent credit cycle. Summary statistics are reported for *bank assets*, *book equity to assets*, *annualized growth of assets*, and *annualized growth of book equity.* This panel demonstrates substantial heterogeneity across large banks, even at the peak of the credit cycle. For example, there is substantial variation in leverage across large banks, from 6.5% to 16.0% book equity to assets. There is also substantial

[19]Studies of the Great Depression using individual bank-level data have had similarly to overcome these data limitations. One prominent example is Calomiris and Mason (2004), which hand-collects Fed call reports data of over 8,000 banks between 1929-1931 to study the causes of bank failures in the Great Depression.

[20]Only a few banks declined in size and dropped out of the sample (e.g., Irving Trust), while only a few banks entered the sample (e.g., Mellon). The three largest national banks just before the Great Depression were Chase, City (now Citi), and Bank of America, which are still the largest today.

heterogeneity in individual banks' balance sheet expansion, with growth of assets ranging from 0.6% to 72.8% and growth of book equity ranging from -10% to 17.2%. Thus, even though all firms are increasing their assets (with a mean growth rate of 18.7%), some banks are decreasing their book equity.[21]

Panel A also shows substantial heterogeneity in equity issuance and payouts in the cross-section of large banks in 2005. Summary statistics are reported for *net equity issuance*, *net equity issuance minus dividends*, *issuance*, *repurchases*, *dividends*, and *retained income*, all expressed as a percentage of book equity. *Net equity issuance* ranges from -17.2% to 4.4% with a mean of -3.0%. *Net equity issuance minus dividends* has a mean of -9.4%, suggesting that banks choose to pay out high levels of capital during credit expansions. *New issuance* and *share repurchases* are 0% of book equity for about half of banks, but range as high as 4.6% (for issuance) and 17.6% (for repurchases). *Dividend payouts* range from 1.2% to 11.0%.

Panel B presents aggregated time-series statistics over the period 1980-2012. The first row looks at *credit expansion* (the year-over-year change in bank credit to GDP). *Credit expansion* is also plotted in Figure 1, Panel A, along with alternative measures of the credit cycle such as change in total credit to households and non-financials (from the BIS) and change in bank loans to GDP (from the Fed flow of funds), which are shown to be similar. As shown in Table 1, Panel B, credit expansion can range as high as 2.4% of GDP (i.e. a credit expansion) and as low as -4.3% (i.e. a credit contraction).

Looking at equity issuance and payouts over time for the 20 largest banks aggregated together, Table 1, Panel B, reports that *net equity issuance*, *net equity issuance minus dividends*, their components, and *retained income* are highly time-varying over credit cycles, ranging from annualized 6.9% to 7.0% for equity net issuance, from -12.9% to 3.2% for equity net issuance minus dividends, and from -4.4% to 14.5% for retained income. Figure 1, Panel B, plots *net equity issuance*, *dividends*, and *retained income* over time for the 20 largest

[21] This decrease in book equity observed for some banks is not due to losses, since return on equity (after changes to loan-loss reserves) is positive for all large banks (results not shown).

banks aggregated. As shown later in the paper, banks' net equity issuance and retained earnings are countercyclical over the credit cycle, with net payouts during credit expansions, followed by net recapitalization during credit contractions.

5 Empirical results

In this section, I first present the main result of this paper, that net equity issuance by large banks over the period 1980-2012 is countercyclical. Then, I present evidence related to patterns of equity issuance across types of firms, historical time periods, and countries, followed by results of the difference-in-differences tests related to the adoption of the Euro. Lastly, I discuss the time-varying cost of bank capital and show that banks do not seem to be timing the market in aggregate.

5.1 Countercyclical equity issuance for large U.S. banks

I present the main result of this paper, that equity issuance by large banks over the period 1980-2012 is countercyclical.

To analyze the cyclicality of equity issuance, payouts, and retained earnings, I estimate Equation 6 with Newey-West standard errors using the dependent variable net equity issuance aggregated over all large banks over the time period 1980-2012. Estimates are reported in Table 2, while Figure 2, Panel A, plots the corresponding scatter plot for large banks' net equity issuance over credit cycles, 1980-2012. Column 1 of Table 2 shows that a one standard deviation increase in credit expansion is associated with a statistically significant 1.5 percentage point decrease in net equity issuance ($t = -3.627$). I also estimate Equation 1 with various controls, such as return on equity (past 8-quarter smoothed), book-to-market, past stock returns (indicator variables of whether bank stocks increased more than 50% or decreased more than 25% in the last two years), term spread, and non-residential investment to capital (i/k). These controls account for other factors that might influence bank issuance: bank profitability, equity valuations, and investment opportunities. In Column 2, I find that the coefficient on credit expansion is relatively unchanged in magnitude and significance in the presence of these controls. Lastly, in Columns 3 and 4, I estimate the regression conditional on positive credit expansion (i.e. on the subsample where Δ(bank credit / GDP) > 0), with and without controls. The fact that the estimates are about twice as large in magnitude and still significant indicates that the results for the full sample are not just driven by recapitalization of banks in bad times. Banks actually issue less equity in good times.

Equity net issuance is the standard dependent variable in my analysis, but I also look at other measures of equity inflows and outflows of large commercial banks (1980-2012), such as equity net issuance minus dividends, new issuance, repurchases, dividends, and retained income. In Table 3, I repeat my analysis by estimating Equation 6 for these other dependent variables, all of which are normalized by book equity. As in Table 2, I also estimate regressions with and without controls, both on the entire sample and conditional on credit expansion being positive. The estimates in Table 3 demonstrate that all of these measures of capital inflow and outflow are consistent with countercyclical bank equity.

One potential concern might be that equity issuance and payouts may simply be driven by cash flow considerations: during credit expansions, banks might be highly profitable and generate more profit than they have investment opportunities to re-invest those profits, in which case banks might just pay out the excess profits. If this were the case, we would see payouts increase proportionately to income (or some smoothed measure of income). However, I show that, since retained income is countercyclical, banks increase their payouts faster than their income increases.[22] In particular, the countercyclicality of retained income is not driven by increased provisioning during credit expansions, because this measure of retained income is before changes to loan-loss reserves. Thus, banks are actually increasing capital payouts during expansions and funding new investment opportunities with debt rather than retained

[22] Retained income is income minus payouts, so countercyclical retained income would imply that banks increase their payouts faster than their income increases.

income or new issuance.

I perform various robustness checks (see the Online Appendix) and find that equity issuance for large banks is robustly countercyclical. For example, firm level regressions with fixed effects (without and with firm-level controls, such as log assets, leverage, return on equity, book-to-market, and past equity returns), estimated with Thompson's (2012) dually clustered standard errors, also yield significantly negative coefficients. I also repeat the analysis but normalize issuance and payouts by market value of equity rather than book value. I also show that results are robust to calculating net equity issuance using shares outstanding from other data sources (CRSP, Bankscope, Datastream). Stephens and Weisbach (1998) also suggest alternative approaches for measuring equity issuances and repurchases, for example, using Compustat's Purchase of Common and Preferred Stock and Sale of Common and Preferred Stock. Results are robust to these alternative measures of equity issuance and payouts; however, these two series only extend back to the late-1990s or early 2000s, making them unsuitable for studying longer time periods. Lastly, I show that countercyclical bank equity issuance is robust to other measures of the credit cycle, such as change in loans from commercial banks to GDP (from Fed flow of funds, 1947-2012) and change in total credit to GDP (all credit, not just from banks, to households and non-financial firms, from BIS).

5.2 Equity issuance across types of firms, historical time periods, and countries

I present evidence related to patterns of equity issuance across types of firms, historical time periods, and countries.

5.2.1 Across types of firms

I look at differences in government guarantees across types of firms. Recall that Gandhi and Lustig (2013) find a tail-risk subsidy that is greatest for large commercial banks, less for large investment banks, and negative for small commercial banks, while non-financials in the U.S. are generally not perceived to have government guarantees protecting creditors. Do we see different patterns of equity issuance corresponding to these different levels of government guarantees?

Table 4 reports estimates for Equation 6 for large banks, investment banks, small banks, and non-financial firms over the sample period 1980-2012. Figure 2, Panels B-D, plot the corresponding scatter plots. Consistent with the hypothesis, large banks have the most countercyclical equity issuance with a coefficient of -0.015 (t-stat = -3.627), followed by investment banks with a coefficient of -0.006 (t-stat = -0.600) and small banks with a coefficient of -0.005 (t-stat = -1.099); non-financials have procyclical issuance with a positive coefficient of 0.009 (t-stat = 2.696). Coefficients and their corresponding t-values are relatively unchanged in the presence of controls. Thus, we see cyclicality of issuance consistent with different levels of government guarantees.

5.2.2 Across historical time periods

Next, I analyze equity issuance of large U.S. commercial banks across different historical periods with different levels of government guarantees. Few, if any, perceptions of government guarantees (with the exception of Fed discount window assistance) existed before the creation of the FDIC in 1933. Perceptions of TBTF government guarantees are generally regarded to have increased in the U.S. in the 1980s and 1990s — for example, after large-scale interventions, such as the bailouts of Continental Illinois in 1984 and LTCM in 1998. I show that, consistent with different levels of government guarantees, equity issuance is strongly procyclical before the creation of the FDIC (pre-1935), moderately procyclical until around the start of the S&L bailouts (1935-1980), and countercyclical subsequently (1980-2012).

Figure 3 plots net equity issuance minus dividends as a function of Δ(bank credit / GDP) over the sample periods 1926-1935 (Panel A) and 1935-1980 (Panel B). Figure 4 plots a rolling regression of Equation 6 with a past-15-year moving window to illustrate how the cyclicality of equity issuance changes over time: a dramatic shift occurs around 1935, as issuance changes from highly to moderately procyclical, followed by another in the 1980s, from procyclical to countercyclical issuance.

To formally test these shifts, I estimate Equation 6 over the three time subsamples using net equity issuance minus dividends (relative to book equity) as the dependent variable.[23] Results are reported in Table 5. Equity issuance is highly procyclical over the period 1926-1935: a one standard deviation in credit expansion is associated with a 3.9 percentage point increase in net equity issuance minus dividends (δ = 0.039, t-stat = 0.904, though the sample is necessarily limited to N = 9 years). Equity issuance is moderately procyclical over the period 1935-1980 (δ = 0.007, t-stat = 2.835) and countercyclical over the period 1980-2012 (δ = -0.024, t-stat = -3.148). According to Table 5, results are robust to adding the standard controls and to estimating the regression only during positive credit expansions (i.e. conditional on Δ(bank credit / GDP) $>$ 0).

5.2.3 TBTF banks subsequent to bailouts in the 1980s

I show that in the shift in the 1980s from procyclical to countercyclical equity issuance is mainly driven by banks that equity markets perceive as TBTF. I construct a measure of increased perceptions of TBTF guarantees (see Section 4.2 for details) based on the wealth effects that are conferred to the shareholders of the largest banks following the announcements of large bailouts (e.g., Continental Illinois in 1984). Using these wealth effects as proxies for changed market perceptions of TBTF guarantees, I find that for U.S. banks, greater market-perceived implicit guarantees predict increased countercyclical issuance, compared to banks that do not receive increased TBTF subsidies.

A long literature (e.g., O'Hara and Shaw, 1990; Kho, Lee, and Stulz, 2000; Gandhi and Lustig, 2013) argues that the subsequent wealth effects to shareholders of large banks subse-

[23] Given that share repurchases became widely used in the U.S. starting in the early 1980s, Table 5 and Figures 3 and 4 are generated using net equity issuance minus dividends as the dependent variable. Results in Table 6 are also robust to using net equity issuance or just equity issuance as the dependent variable.

quent to announcements of bailout and regulatory changes are due to changing perceptions by shareholders of implicit guarantees provided to TBTF banks.[24] Take, for example, the failure and bailout of Continental Illinois in 1984. The Comptroller of the Currency announced on September 20, 1984 during Senate testimony that the U.S. would not let the 11 largest banks fail. Subsequent to that announcement, the shareholders of the 11 largest banks, and only those banks, immediately received a wealth boost in the form of cumulative abnormal stock returns (O'Hara and Shaw, 1990). Taking these wealth effects as proxies for market perceptions of increased TBTF guarantees, for each bank I average the abnormal announcement returns over two S&L bailouts to get a TBTF measure for each era.

I compare large banks that gained greater TBTF subsidies to large banks that did not. I argue that magnitude of the wealth subsidy to large bank shareholders reflects the interaction of two effects: the perceived increase in probability of a future government intervention in the banking sector, along with the perceived systemic importance of each bank in the cross-section. This change over time, interacted with cross-sectional variation across banks in response to the announcement, reflects the differential effect that bailouts have on some large banks and not others.

To analyze whether the TBTF measure predicts the cyclicality of equity issuance going forward, I plot in Figure 5 the change in cyclicality of equity issuance as a function of the TBTF measure. The cyclicality of equity issuance is estimated for each firm individually from the following time-series regression:

$$Equity\,Issuance_t = \alpha + (\delta_0 + \delta^{S\&L} \cdot 1_{year>1984}) \cdot CreditExpansion_t + \epsilon_t \qquad (9)$$

Consistent with the hypothesis, it is evident from Figure 5 that there is an inverse relationship: firms that are perceived by equity markets to be conferred greater implicit guarantees are subsequently found to pay out more equity during credit expansions.

[24]Similarly, Kelly, Lustig, and Nieuwerburgh (2011) show that during the recent crisis the out-of-the-money index put options of bank stocks were relatively cheap, due to government absorbing sector-wide tail risk.

To formally test whether bailouts and the resulting increased implicit guarantees predict increased countercyclicality, the 50 largest commercial banks are divided into two categories: the treatment group is firms with increased implicit guarantees (TBTF measure > 0.01) and the control group is firms without increased implicit guarantees (TBTF measure ≤ 0.01). To analyze the change in the cyclicality of bank equity issuance post-1984, I estimate Equation 8 using Thompson's (2011) dually clustered standard errors. The estimation approach is conceptually similar to estimating $\delta^{S\&L}$ in Equation 9 firm-by-firm with a time-series regression and then testing the difference in the average $\delta^{S\&L}$ between the two groups.

Estimates corresponding to the difference-in-differences regression in Equation 8 are reported in Table 6. The treatment group is banks with market-perceived increases in implicit guarantees, and the $Post_t$ indicator denotes observations after 1984. The difference-in-differences coefficient is a statistically significant -0.011 (Column 2, which includes firm fixed effects; t = -2.589). The coefficient is relatively unchanged in magnitude and significance in the presence of various sets of controls (Columns 3 and 4). Thus, banks that are perceived by the market to have gained implicit guarantees subsequent to bailouts have even stronger countercyclical equity issuance, relative to banks that did not gain implicit guarantees.

5.2.4 Across countries

I look at differences across countries in the level of perceived implicit guarantees. Equity issuance for large banks might be less countercyclical, perhaps even procyclical, in countries with large relative banking sectors (e.g., Switzerland, Hong Kong, the Netherlands), since investors may perceive that some banks are "too-big-to-save." If governments have limited fiscal capacity to backstop their largest banks, implicit guarantees may be smaller.

To analyze whether size of a country is associated with the cyclicality of bank equity issuance, I estimate Equation 6 individually for 26 developed countries over the sample period 1980-2012. Results are plotted in Figure 6, where the coefficient of cyclicality, estimated from

Equation 6, is plotted for each country as a function of bank assets to GDP in the year 2000.[25] It appears in this plot that countries with bank assets greater than 200% of GDP (i.e. "small" countries) generally have procyclical bank equity issuance, while countries with bank assets less than 200% of GDP (i.e. "large" countries) have countercyclical bank equity issuance. Thus, I use the 200% cut-off to group countries into "large" (e.g., Canada, Japan, US) versus "small" (e.g., Switzerland, UK).[26] (I put these terms in quotation marks since I'm referring to the size of the countries relative to its banking sector.)

To formally test differences in equity issuance between "small" versus "large" countries, I estimate the panel regression in Equation 7 and report results in Table 7. For "large" countries, a one standard deviation increase in credit expansion is associated with a -0.7 (Column 2; t = -3.768) percentage point change in net equity issuance, corresponding to countercyclical equity issuance. In contrast, for "small" countries, a one standard deviation increase is associated with a 0.4 (Column 2; t = 0.713) percentage point increase in net equity issuance, corresponding to procyclical equity issuance for countries with large relative banking sectors. Column 1 reports a statistically significant difference of 1.1 percentage points (t = 5.366). The difference coefficient is relatively unchanged in magnitude and significance in the presence of various sets of controls (Columns 3 and 4). Thus, consistent with the hypothesis, equity issuance for large banks is procyclical in "small" countries where implicit guarantees to the largest banks may be perceived as weaker.

[25] Results are robust to classifying banks according to bank assets to GDP in other years: 1980, 1990, 2005, and an average across 1980-2012.

[26] A threshold approach based on 200% bank assets to GDP is preferable to a regression approach based on continuous variation in bank assets to GDP. The reason is that there might simply be a mechanical relation between bank assets to GDP and credit expansion = Δ(bank credit / GDP), in the sense that a larger banking sector leads to more variation in Δ(bank credit / GDP), which reduces the magnitude of the cyclicality coefficient. The binary approach based on the 200% threshold is better suited for my purpose, because what I really want to test is the sign of the cyclicality coefficient: whether countries with large relative banking sectors have procyclical issuance, while countries with small relative banking sectors have countercyclical issuance.

5.3 Change in bank equity issuance upon adoption of the Euro

I look at the change in countercyclical bank equity issuance in different Eurozone economies upon the introduction of the Euro. Using interest rate convergence as a proxy for change in implicit guarantees, I show that countries with high interest rate convergence have increased countercyclical issuance when joining the Euro, compared to countries with low interest rate convergence.

For countries joining the Euro, there may be a perception among creditors that banks in Eurozone periphery countries (e.g., Italy, Portugal, Spain) gained implicit protections in joining the Euro, perhaps from the European Central Bank or implicit fiscal guarantees from other Euro countries. Even if the implicit guarantees are conferred mostly upon these countries' sovereign debt rather than banks, implicit guarantees for sovereign debt can indirectly support banks, because they provide the fiscal backing for individual governments to support their banks in the event of a crisis. The fact that the EU lent money to Ireland, Spain, and Portugal in 2011-2012 to jointly help these governments recapitalize their banks and to forestall sovereign debt crises illustrates how implicit guarantees for sovereign debt can indirectly confer protections to a country's banking sector.

I divide the initial group of countries to adopt the Euro into two groups based on whether interest rate convergence is low or high. For my interest rate convergence measure, I use the change between 1996 and 1999 in the real interest rate spread relative to Germany. I classify countries as having low interest rate convergence if the change spread is less than -0.01 (e.g., Germany, the Netherlands, and Finland) or high if the change in spread is greater than -0.01 (e.g., Ireland, Italy, and Portgual).[27] Figure 7 plots the change in cyclicality of issuance, which is estimated for each country individually from the following time-series regression:

$$Equity\,Issuance_t = \alpha + (\delta_0 + \delta_1 \cdot 1_{year>1998}) \cdot CreditExpansion_t + \epsilon_t \tag{10}$$

[27] I specifically exclude Spain because Spain adopted in 2000 a stringent regulatory regime often referred to as "dynamic provisioning," which required provisioning in good times over and above standard loan loss provisions. See Jiménez et al. (2012) for details.

Using the above classification, I estimate the difference-in-differences regression corresponding to Equation 8 using Thompson's (2011) dually-clustered standard errors to test whether countries with high interest rate convergence have increased countercyclical issuance when joining the Euro, compared to countries with low interest rate convergence. Estimates are reported in Table 8. The difference-in-differences coefficient is a statistically significant -0.102 (Column 2, which includes country fixed effects; t = -2.332). The coefficient is relatively unchanged in magnitude and significance in the presence of various sets of controls (Columns 3 and 4). Thus, countries with high interest rate convergence have increased countercyclical issuance when joining the Euro, compared to countries with low interest rate convergence, consistent with my hypothesis.

5.4 Cost of bank equity capital and market timing

In this section, I find that the *cost* of equity capital is countercyclical over the credit cycle for both non-financials and banks: lower cost-of-capital (i.e. high stock prices) during expansions and higher cost-of-capital (i.e. low stock prices) during contractions. Therefore, if bank managers take advantage of low costs of equity capital, then equity issuance should increase during credit expansions alongside the lower cost of capital, and issuance should be procyclical. While procyclical issuance for non-financials is consistent with market timing, countercyclical issuance by banks indicates that banks do not appear to be simply timing the market.

I estimate the time-varying cost of capital over the credit cycle with the following time-series regression with Newey-West standard errors:

$$(r_{t+K} - r^f_{t+K}) = \alpha + \beta \cdot CreditExpansion_t + \gamma' \cdot Controls_t + \epsilon_t \quad (11)$$

which predicts K = 4- or 8-quarter ahead excess return of an equity index $(r_{t+K} - r^f_{t+K})$ using a set of predictor variables including *credit expansion*. Although I employ Newey-West standard errors, I take a deliberately conservative approach with standard errors by using non-overlapping returns. That is, in calculating 4- or 8-quarter ahead returns, I drop the intervening observations from our data set. Non-overlapping returns thus make the estimation results robust to many potential econometric issues involved in estimating standard errors of overlapping returns.

Table 9 estimates the panel regression model specified in Equation 11 for 4-, and 8-quarter-ahead excess returns, without and with controls (dividend yield, book to market, T-Bill yield, investment to capital, and the corporate spread). Panel A reports coefficients for large U.S. commercial banks over the sample period 1925-2012, while Panel B reports coefficients for various time subsets and types of firms. Panel A reports that a one standard deviation increase in credit expansion predicts 6.4 (t = -2.241) and 13.3 (t = -2.874) percentage point *decreases* in subsequent returns for large U.S. commercial banks over 4-, and 8-quarter horizons, respectively. When controls are included, the coefficients are slightly higher in magnitude and have similar statistical significance. Panel B reports similar cost-of-capital coefficients for two time subsets (1925-1980 and 1980-2012), in addition to coefficients for large U.S. investment banks, small U.S. commercial banks, and non-financial U.S. firms (all over the period 1980-2012). To save space, coefficients on control variables are not reported. In particular, for non-financial firms, a one standard deviation increase in bank credit expansion predicts 3.1 and 12.4 percentage point *decreases* for 4-, and 8-quarter-ahead excess returns, respectively.[28]

This result on time-varying cost of capital ties into the ongoing debate on the cost of bank capital (see Admati, DeMarzo, Hellwig, and Pfleiderer, 2013b). While previous work (e.g., Baker and Wurgler, 2013; Kisin and Manela, 2014) estimates an average cost of bank

[28]In estimating Equation 11, the cost of equity *relative* to debt is equity returns minus the three-month T-Bill yield. Since the goal is to understand why banks may choose equity over debt, it is important to use the correct funding cost for banks. To address concerns that the T-Bill rate might not be the appropriate funding cost, I also check that the results are robust to other measures of bank funding costs, such as deposit rates (from Fed data), interbank lending benchmark rates, repo rates, and implied firm-specific deposit or borrowing rates from Compustat or Bankscope. See the Online Appendix. The reason why the exact funding cost does not seem to matter is that the variance in alternative funding costs (relative to the T-Bill yield) is small compared to the variance in equity returns.

capital over time, this result suggests that, due to the time-varying cost of capital, the cost of increased regulatory capital may be substantially lower than previously estimated, if regulators are careful to implement new capital requirements during expansions. This result may further lend support for the use of countercyclical regulatory capital buffers.

To the extent that bank managers do not seem to be timing the market, market timing theory (Baker and Wurgler, 2002) is only relevant when there is differential optimism between bank managers and equity markets. Previous work has indicated that bank equity investors are over-optimistic during credit booms (Baron and Xiong, 2014), as were professionals in the securitization industry during the recent housing boom (Cheng, Raina, and Xiong, 2014). To the extent that I do not detect market timing for large banks and broker-dealers in the data, the evidence is consistent with similar levels of optimism between bank managers and equity markets but no differential optimism driving equity issuance.

6 Conclusion

Bank equity issuance and retained income are countercyclical across credit cycles over the sample period 1980-2012. In contrast, equity issuance for non-financial firms is procyclical. Thus, during credit expansions, even though more capital might help banks better absorb shocks, banks raise equity the least.

I develop an illustrative model of moral hazard to understand why bailout distortions and government guarantees may lead banks to choose countercyclical equity issuance. In accordance with the model, evidence across types of firms, countries, and historical time periods strongly suggest that bank equity issuance is most countercyclical when and where government guarantees, especially implicit TBTF guarantees, are strongest. In particular, a shift from procyclical to countercyclical bank equity issuance shift in the 1980s is driven by banks that equity markets perceive as TBTF. Analyzing countries adopting the Euro and using interest-rate convergence as a proxy for increased implicit guarantees, I find that bank equity issuance becomes more strongly countercyclical in Eurozone countries that gain increased implicit guarantees upon adopting the Euro, compared to other Eurozone countries. Lastly, I find that the cost of equity capital (for both banks and non-financials) is countercyclical over the credit cycle. While procyclical issuance for non-financials is consistent with market timing, countercyclical issuance by banks indicates that banks do not appear to be simply timing the market. My results highlight the role of bailout distortions and government guarantees, which allow bankers to raise less and pay out more equity during credit expansions.

Appendix

A. Data construction

In this section, I provide addition information related to data construction.

New equity issuance and share repurchases. Following Jagannathan, Stephens, & Weisbach (2000), I separate out new equity issuance and share repurchases as *max(net equity issuance, 0)* and *min(net equity issuance, 0)*, respectively, where net equity issuance here is from monthly CRSP data, which Jagannathan, Stephens, & Weisbach (2000) show is generally accurate compared to other methods of constructing issuances and repurchases.[29]

Credit Expansion. The bank credit data comes from the BIS Long Credit Series (data are generally from 1950 onwards for a variety of countries), merged with historical bank credit data from Schularick-Taylor (2012), which extends the dataset back to 1870 for 14 developed economies. I standardized credit expansion within each country.

Control variables. The *term spread* is the difference between *long-term interest rates* (10-year government bond yields, taken mostly from Global Financial Data and OECD) and *short-term interest rates* (3-month government t-bill rates taken from Global Financial Data,

[29] They show, in general, these measures tends to slightly understate issuance and repurchases, since they are netted out on a monthly basis.

the IMF, OECD). *Investment to capital* is private non-residential fixed investment divided by the outstanding private non-residential fixed capital stock, which comes from the Kiel Institute's database on investment and capital stock. The *corporate spread* (just used for the U.S.) comes from *FRED*. For the predicted cost-of-capital regressions (U.S. data only), *dividend yield* (d/p) and *book-to-market* for the S&P 500 index come from Global Financial Data.

Announcement Returns. Announcement returns, defined as the one-day abnormal returns (relative to the S&P 500 index), are reported for each bank and each announcement in Table A1. The two announcement events are:

1. Sept. 20, 1984: The OCC announcement related to Continental Illinois. See Section 5.2 and O'Hara and Shaw (1990) for details.

2. Feb. 7, 1989: President George H. W. Bush unveils his proposal for the $166 billion Savings and Loan bailout, guaranteeing that *all* depositors of *all* banks (not just of S&Ls) would be protected, while also promising that the FDIC insurance premium would not rise (except for S&Ls). While S&L stocks rose, stocks of large money-center banks were the biggest beneficiaries, due to the blanket guarantees for all deposits. See Mansur and Elyasuani (1994) for details.

B. Proof of Proposition 1

Substituting the creditors' breakeven constraint (Equation 5) into the shareholders' expected value (Equation 4) results in:

$$\begin{aligned}\text{Expected Shareholder Value} \;=\; & \frac{\frac{1}{2}(\overline{A} - L + (1+a)\cdot n)^2}{\overline{A} - \underline{A}} \\ & + V \cdot \frac{(\overline{A} - L + (1+a)\cdot n)}{\overline{A} - \underline{A}} \\ & - n \; - (1-\gamma)\,\frac{\frac{1}{2}(\underline{A} - L + (1+a)\cdot n)^2}{\overline{A} - \underline{A}}\end{aligned} \tag{12}$$

Equation 12 is an upward-facing quadratic equation with respect to n, and therefore no interior solution exists. Thus, a bank manager who is maximizing shareholder value will choose either n = +N (issuing the maximum amount) or n = -N (paying out the maximum amount). Mathematically, the optimum n = +N or -N depends on whether the vertex of Equation 12 is greater or less than n = 0. To find the vertex n^*, I differentiate Equation 12 with respect to n and set it equal to 0:

$$\begin{aligned} 0 &= \frac{d\,E[Shareholder\ Value]}{dn} \\ &= \frac{(1+a)}{(\overline{A}-\underline{A})}\left[V + \left(\overline{A} - L + (1+a)\cdot n\right) - (1-\gamma)\left(\underline{A} - L + (1+a)\cdot n\right)\right] - 1 \end{aligned} \tag{13}$$

Solving for n yields:

$$-(1+a)n = \frac{1}{\gamma}\left[V + (\overline{A}-\underline{A})\cdot(\frac{a}{1+a})\right] + (\underline{A}-L). \tag{14}$$

Substituting in $\sigma = \frac{\overline{A}-\underline{A}}{A_0}$ and $\sigma_D = \frac{A_0-\underline{A}}{A_0}$, dividing both sides by A_0, and labeling both sides Ψ yields:

$$\Psi = -(1+a)n = \frac{1}{\gamma}\left[\frac{V}{A_0} + \sigma\cdot\frac{a}{1+a}\right] + (1-\sigma_D) - \frac{L}{A_0}. \tag{15}$$

From Equation 15, we can see that if $\Psi > 0$, then the vertex is $n^* < 0$, and therefore the bank manager will choose n = +N (issuing the maximum amount). If $\Psi < 0$, then the vertex is $n^* > 0$, and therefore the bank manager will choose n = -N (paying out the maximum amount). If $\Psi = 0$, then the vertex is $n^* = 0$, and therefore the bank manager will be indifferent between the two corner solutions.

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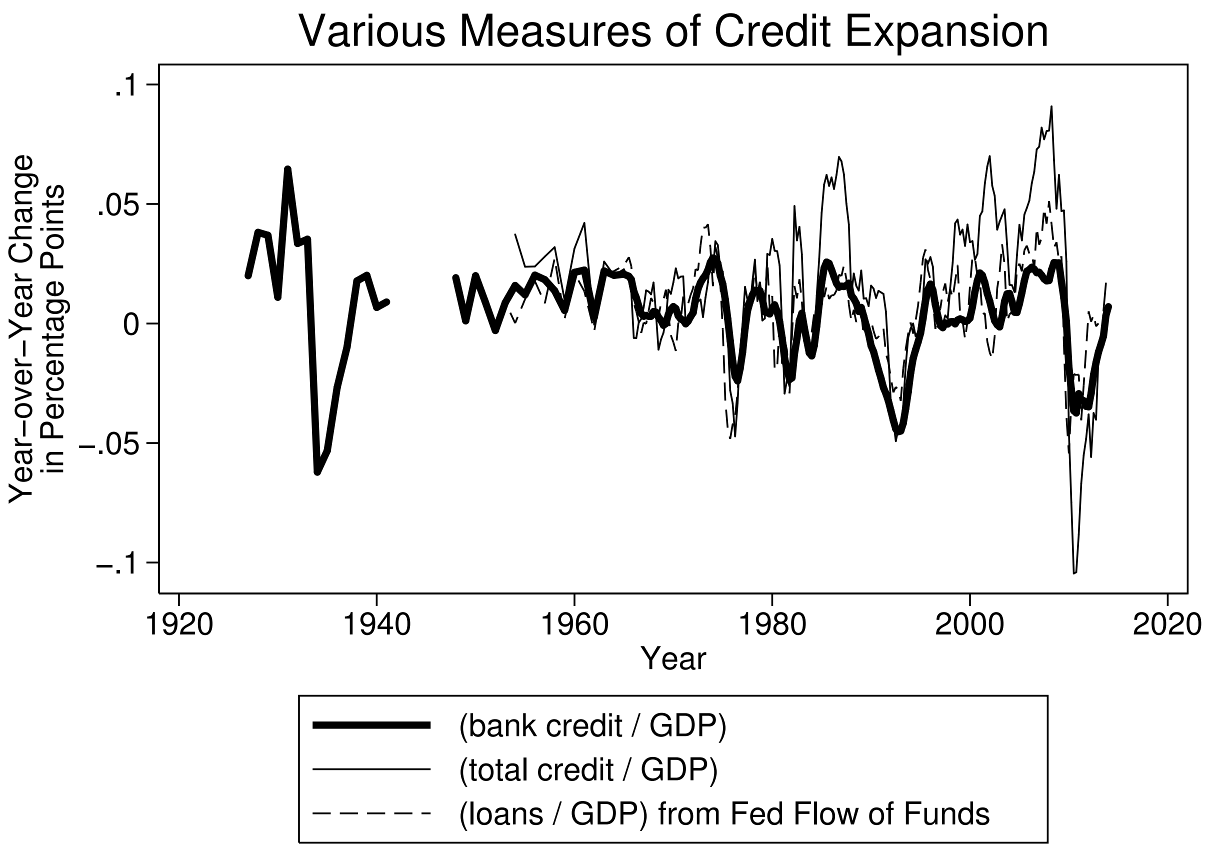
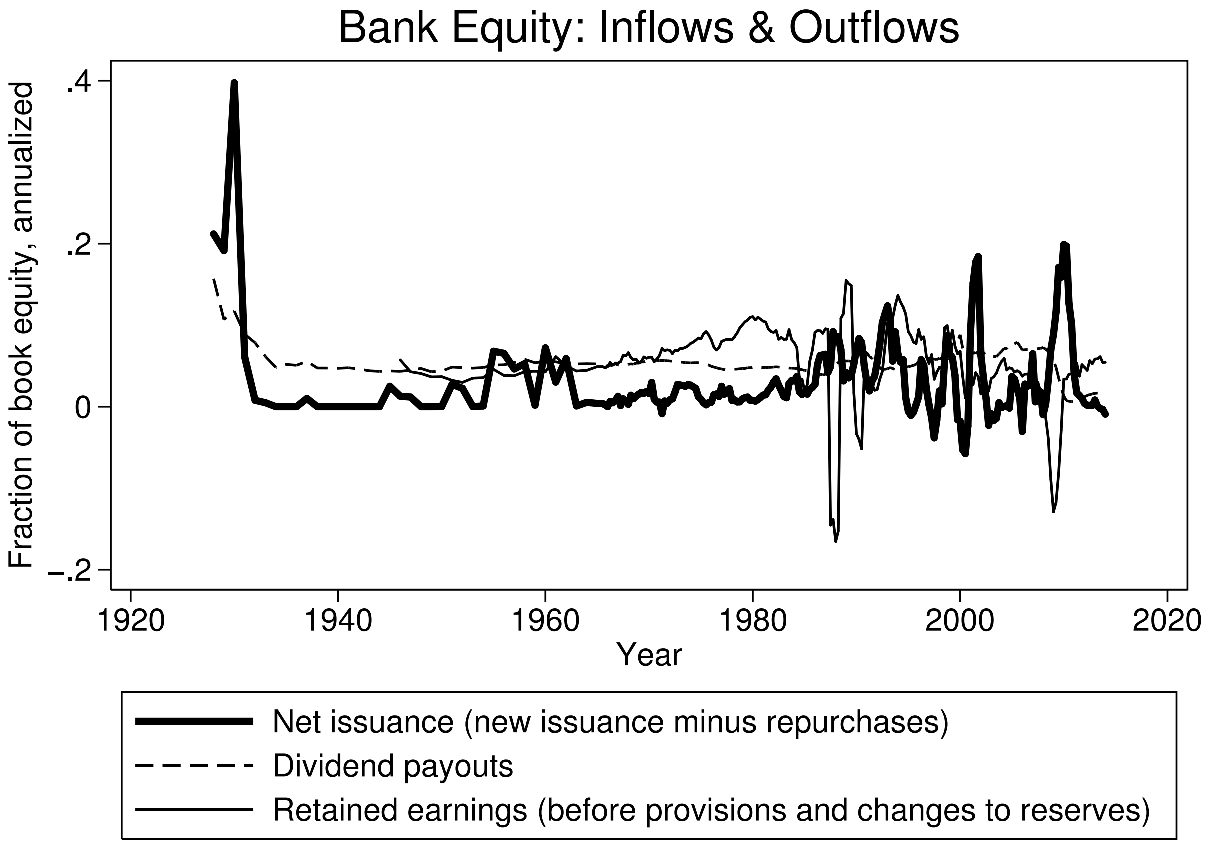
Figure 1: Credit expansion and bank equity

Panel A plots credit expansion (i.e. $\Delta(bank\, credit/GDP)$) over time, along with alternative measures of the credit cycle, such as change in total credit to GDP and change in bank loans to GDP. Panel B plots net equity issuance, dividends, and retained earnings (normalized by book equity) over time for the 20 largest U.S. commercial banks, aggregated.

Panel A



Panel B



Bank Equity: Inflows & Outflows
Fraction of book equity, annualized
.4
.2
0
−.2
1920
1940
1960
1980
2000
2020
Year
Net issuance (new issuance minus repurchases)
Dividend payouts
Retained earnings (before provisions and changes to reserves)

Figure 2: Equity issuance for different types of U.S. firms

Figure 2 plots net equity issuance (normalized by book value) as a function of $\Delta(bank\, credit/GDP)$. Net equity issuance is aggregated over all U.S. firms in each category. Panel A is for large commercial banks, Panel B is for large investment banks, Panel C is for small commercial banks, and Panel D is for non-financial firms. Observations are quarterly, 1980-2012.

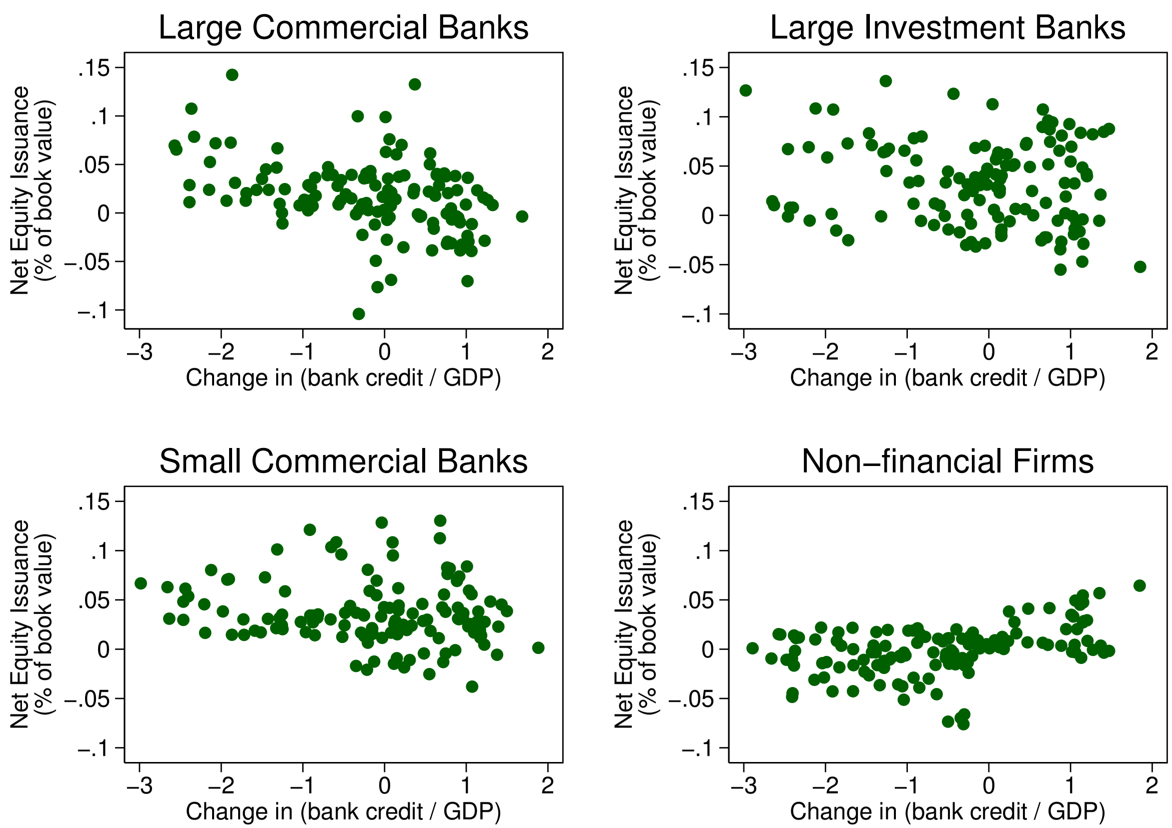
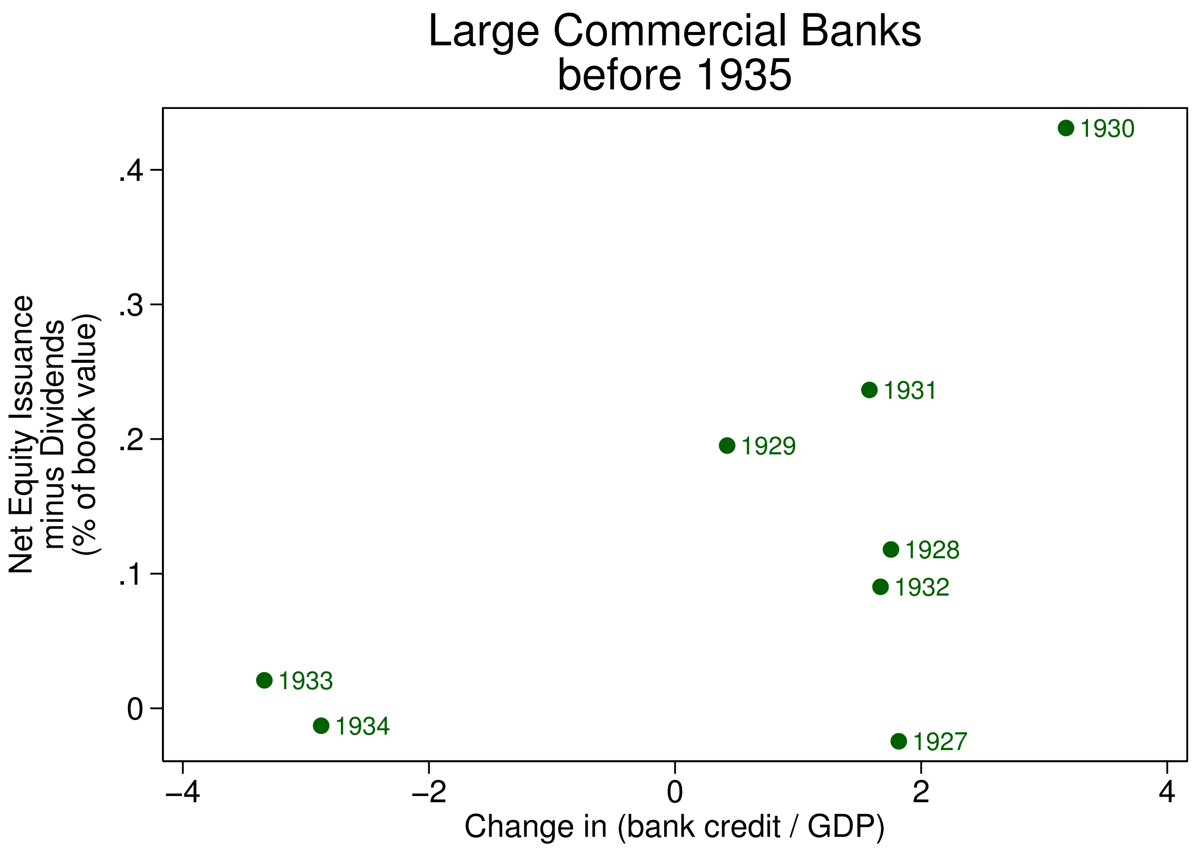


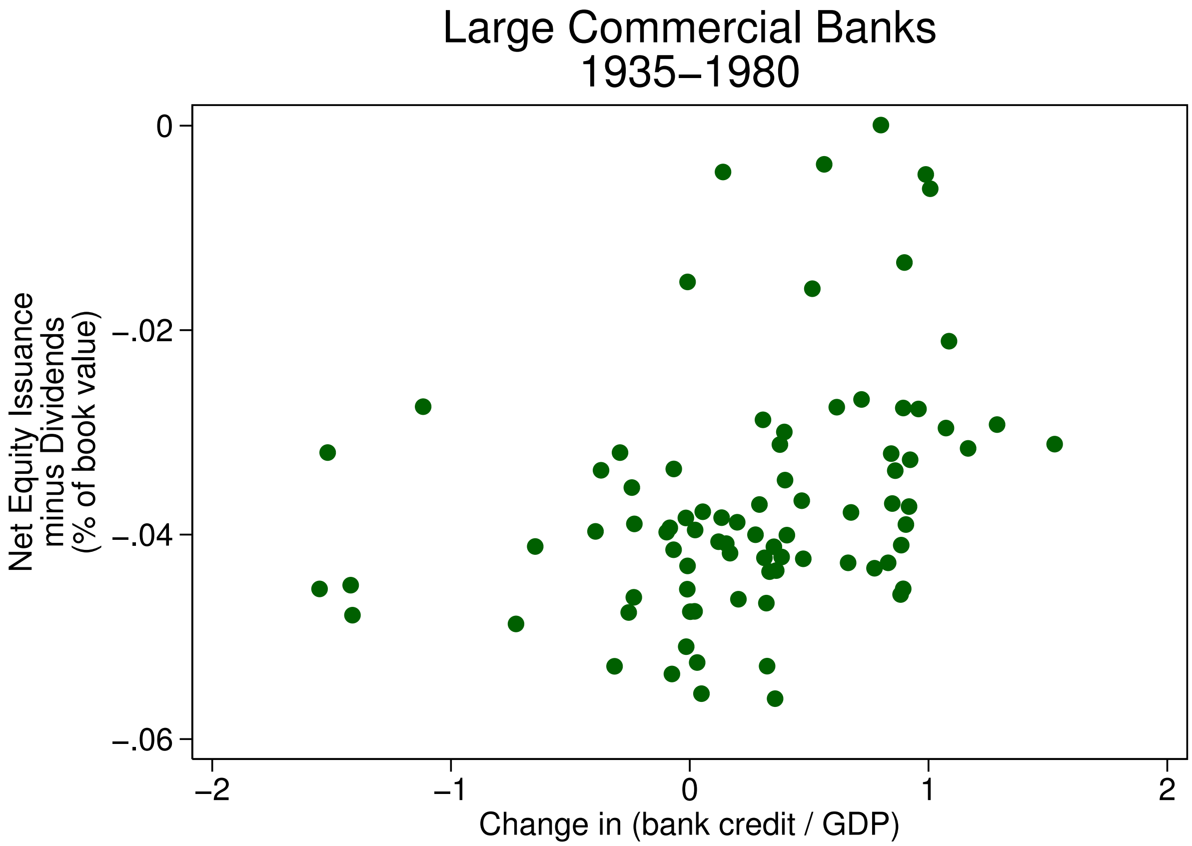
Figure 3: U.S. bank equity issuance over two historical time periods

Figure 3 plots net equity issuance (normalized by book value, aggregated over all large U.S. commercial banks) as a function of $\Delta(bank\,credit/GDP)$. Panel A is for the period 1926-1935, while Panel B is for the period 1935-1980.

Panel A



Panel B



Large Commercial Banks
1935–1980
Net Equity Issuance
minus Dividends
(% of book value)
0
−.02
−.04
−.06
−2
−1
0
1
2
Change in (bank credit / GDP)

Figure 4: Rolling regression of the cyclicality of bank equity issuance

Figure 5 plots a rolling regression of Equation 6 with a past 15-year moving window to illustrate how the cyclicality of bank equity issuance changes over time. The gray shading is the 95% confidence interval.

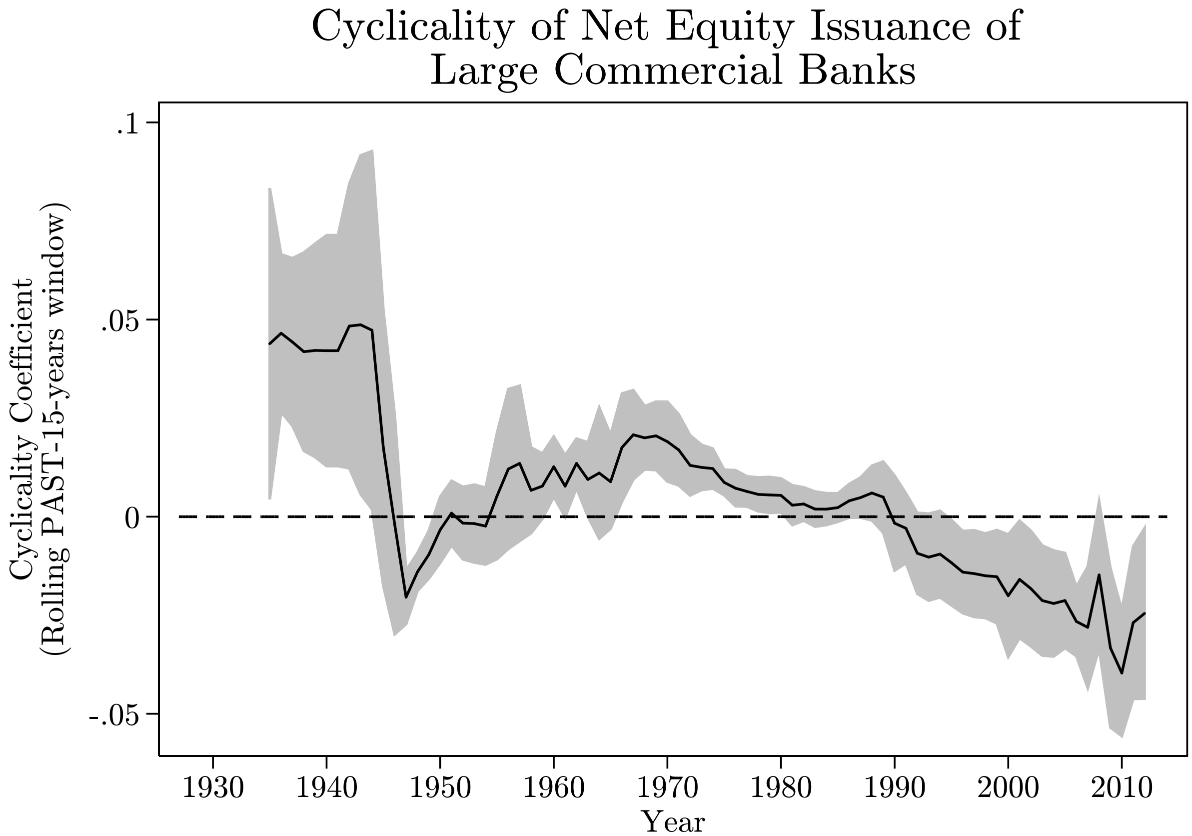


Figure 5: Change in bank equity issuance after Savings & Loan bailouts

Figure 5 plots the change in cyclicality of equity issuance as a function of the "too-big-to-fail" (TBTF) measure (a measure of implicit subsidies constructed from equity announcement returns). The cyclicality of equity issuance is estimated for each firm individually from Equation 6.

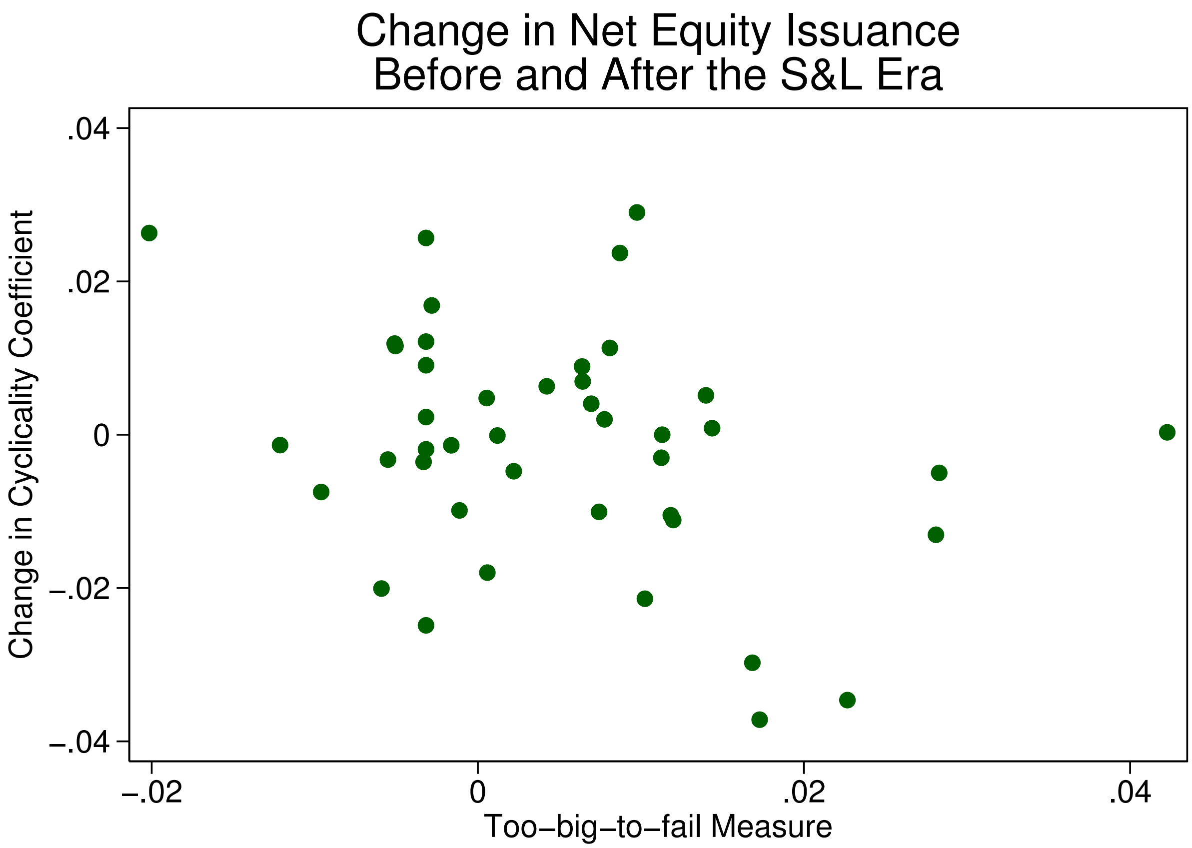


Figure 6: Bank equity issuance across countries

Figure 6 plots, for each country, the coefficient of cyclicality for bank equity issuance (estimated from Equation 6) as a function of bank assets to GDP.

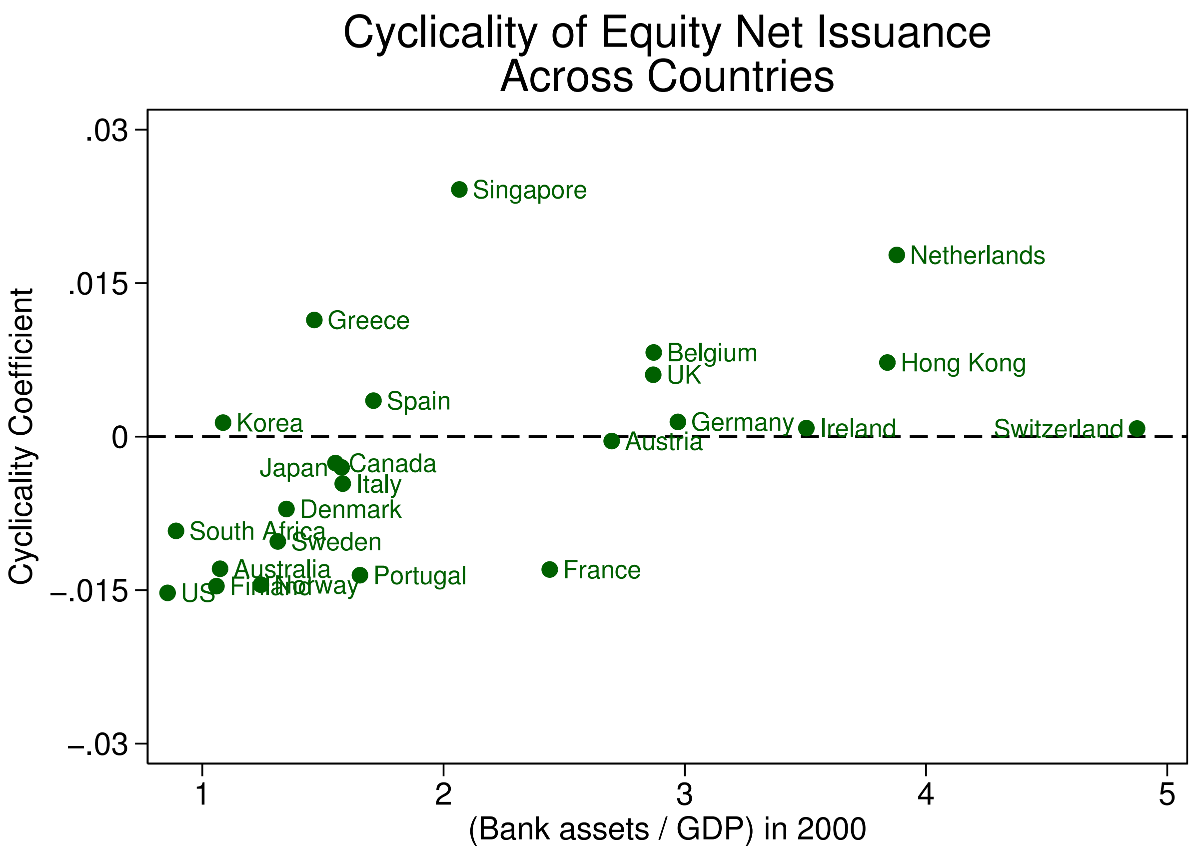


Figure 7: Change in bank equity issuance upon adoption of the Euro

Figure 7 plots the change in cyclicality of bank equity issuance (estimated for each country individually from Equation 6) as a function of the real interest rate convergence (change in real interest rate spread from 1995 to 1999, relative to Germany). Luxembourg, which has interest rate convegence of -0.015, is off the graph with a positive coefficient change of 0.1. Spain is omitted, as discussed in Section 5.3, due to its strict bank regulatory regime of "dynamic provisioning'.'

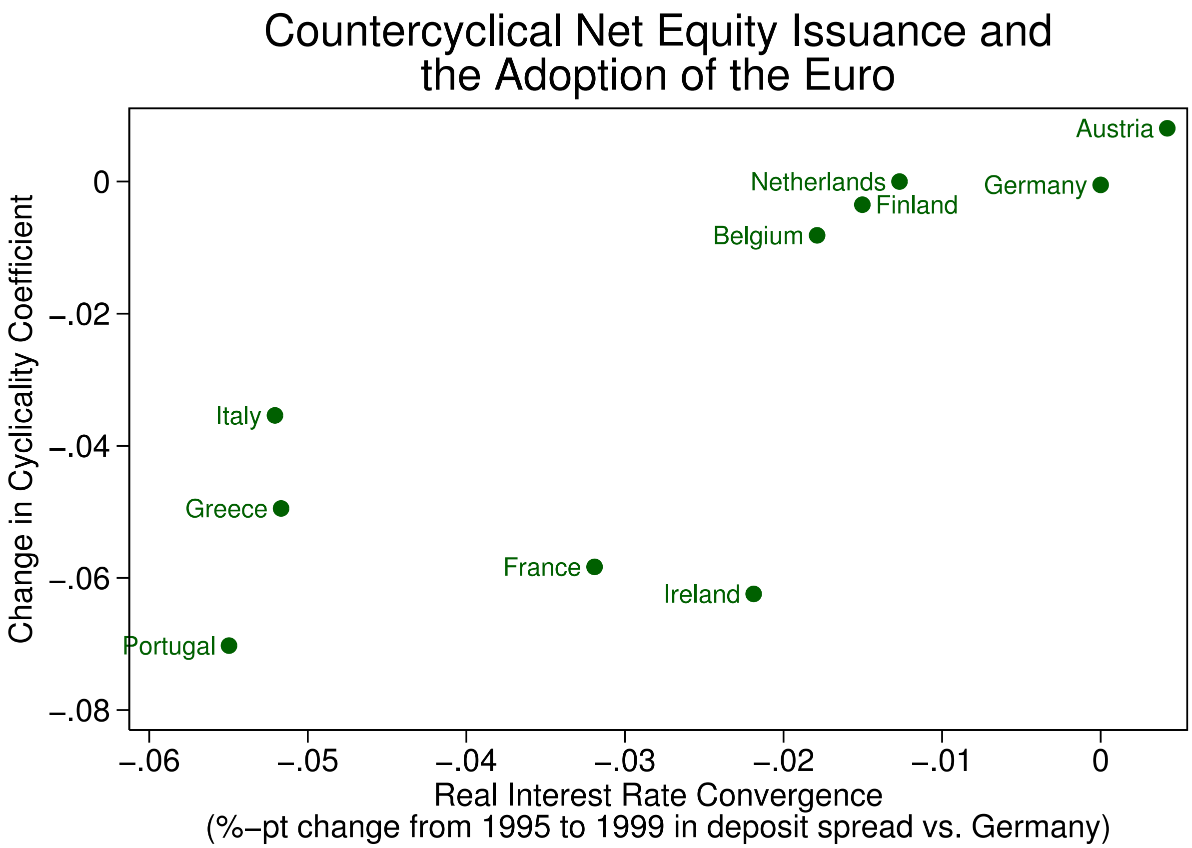


Table 1: Summary Statistics

Table 1 presents summary statistics for equity issuance, payouts, and other key variables for large U.S. banks. Panel A presents cross-sectional statistics for the 20 largest banks during 2005, around the peak of the most recent credit cycle. Panel B presents aggregated time series statistics over the period 1980-2012.

Panel A: Cross-sectional statistics, 20 largest banks in 2005

	Mean	Stdev.	5%	10%	25%	50%	75%	90%	95%
Bank balance sheet statistics									
Assets ($ millions)	336,449	437,320	54,841	60,386	91,015	109,170	434,981	1,212,239	1,472,793
Book equity / Assets	9.6%	3.0%	6.5%	6.8%	8.1%	9.0%	9.8%	12.6%	16.0%
Growth of assets (annualized)	18.7%	28.4%	0.6%	2.2%	4.9%	9.4%	21.0%	43.2%	72.8%
Growth of book equity (annualized)	3.4%	8.6%	-10.0%	-7.2%	-1.2%	3.2%	8.2%	14.4%	17.2%
Equity issuance and payouts (as percent of book equity, annualized)									
Net equity issuance	-3.0%	6.3%	-17.2%	-12.5%	-6.4%	-1.6%	1.0%	2.6%	4.4%
Net equity issuance minus dividends	-9.4%	6.9%	-24.1%	-19.5%	-13.8%	-7.9%	-5.5%	-2.6%	0.9%
Equity Issuance	1.1%	2.6%	0.0%	0.0%	0.0%	0.0%	1.1%	2.6%	4.6%
Repurchases	3.6%	4.6%	0.0%	0.0%	0.0%	2.0%	6.0%	10.5%	17.6%
Dividends	6.5%	2.3%	1.2%	3.7%	4.8%	7.0%	7.6%	8.8%	11.0%
Retained income	5.1%	5.7%	-5.5%	-0.7%	2.1%	6.0%	7.9%	10.3%	15.4%

Panel B: Time series statistics, quarterly observations (annualized) over 1980-2012

	Mean	Stdev.	5%	10%	25%	50%	75%	90%	95%
Credit expansion									
Δ (bank credit / GDP)	-0.1%	2.0%	-4.3%	-3.3%	-1.4%	0.3%	1.5%	2.2%	2.4%
Equity issuance and payouts of large banks (aggregated, as percent of book equity)									
Net equity issuance	0.7%	3.8%	-6.9%	-3.8%	-0.9%	0.8%	3.0%	5.3%	7.0%
Net equity issuance minus dividends	-4.4%	4.7%	-12.9%	-10.9%	-7.2%	-3.8%	-1.8%	1.4%	3.2%
Equity issuance	2.9%	2.6%	0.2%	0.2%	0.9%	2.0%	3.9%	7.3%	8.6%
Repurchases	2.1%	3.1%	0.0%	0.0%	0.0%	0.9%	3.2%	5.2%	7.7%
Dividends	5.1%	2.1%	0.9%	1.7%	4.4%	5.2%	6.3%	7.3%	7.9%
Retained income	4.8%	10.5%	-4.4%	-2.1%	2.8%	6.0%	9.7%	12.3%	14.5%
Change in book equity	3.6%	12.0%	-8.8%	-6.1%	0.2%	4.7%	8.9%	13.3%	15.7%

Table 2: Net Equity Issuance over the Credit Cycle

Table 2 demonstrates that equity issuance for large U.S. commercial banks is countercyclical over credit cycles over the period 1980-2012. The table reports estimates from Equation 6 with the dependent variable *net equity issuance*. The regression is estimated for the full sample in Columns 1 and 2 and conditional on positive *credit expansion* in Columns 3 and 4. Newey-West t-statistics are in parentheses. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

Large U.S. Commercial Banks, 1980-2012

	Net equity issuance			
	Full sample		Conditional on Δ (bank credit/GDP) > 0	
	(1)	(2)	(3)	(4)
Δ (bank credit / GDP)$_t$	-0.015***	-0.009*	-0.031*	-0.033**
	(-3.627)	(-2.182)	(-2.333)	(-3.038)
(Income / book equity)$_t$		-0.060		-0.121*
		(-1.699)		(-2.059)
Log(book / market)$_t$		-0.010		0.021
		(-0.978)		(1.830)
(Bank stock prices increased)$_t$		-0.008		0.004
		(-0.527)		(0.211)
(Bank stock prices decreased)$_t$		0.056**		0.127***
		(2.657)		(11.262)
(Term spread)$_t$		0.425		0.280
		(1.422)		(0.670)
Log(i / k)$_t$		-0.059		0.008
		(-1.279)		(0.180)
Constant	0.014**	-0.104	0.028**	0.040
	(2.881)	(-1.072)	(2.876)	(0.394)
Adj. R^2	0.16	0.30	0.10	0.40
N	131	131	66	66

Table 3: Various measures of issuance, payouts, and retained earnings over the credit cycle

Table 3 repeats the analysis from Table 2 but for other dependent variables, such as equity net issuance minus dividends, new issuance, repurchases, dividends, and retained income. The table only reports estimates for coefficients on Δ(bank credit / GDP); coefficient estimates for control variables are omitted to save space. The regression is estimated for the full sample in Columns 1 and 2 and conditional on positive *credit expansion* in Columns 3 and 4. Newey-West t-statistics are in parentheses. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

Large U.S. Commercial Banks

	Full sample		Conditional on Δ (bank credit/GDP) > 0	
	No controls	Controls	No controls	Controls
	(1)	(2)	(3)	(4)
Net equity issuance	-0.015***	-0.009*	-0.031*	-0.033**
	(-3.627)	(-2.182)	(-2.333)	(-3.038)
Net equity issuance	-0.023*	-0.013	-0.023	-0.029
(controlling for firm level characteristics)	(-2.022)	(-1.162)	(-0.687)	(-1.861)
Net equity issuance minus dividends	-0.024**	-0.020**	-0.024	-0.037*
	(-3.148)	(-3.294)	(-1.708)	(-2.485)
Net equity issuance minus dividends	-0.027*	-0.014	-0.020	-0.029
(controlling for firm level characteristics)	(-2.568)	(-1.499)	(-0.632)	(-1.731)
Equity issuance	-0.008*	-0.008**	-0.012	-0.015*
	(-1.994)	(-3.017)	(-1.248)	(-2.036)
(negative) Repurchases	-0.009**	-0.005*	-0.001	-0.005
	(-3.299)	(-2.242)	(-0.117)	(-0.795)
(negative) Dividends	-0.009*	-0.006	-0.003	-0.004
	(-2.158)	(-1.880)	(-0.525)	(-1.030)
Retained earnings	-0.009	-0.011**	-0.041**	-0.013
(before changes to reserves)	(-1.368)	(-3.188)	(-3.126)	(-1.219)

Table 4: Net Equity Issuance for Various Types of Firms

Table 4 reports estimates for Equation 3 for large banks, investment banks, small banks, and non-financial firms in the U.S. over the sample period 1980-2012. The dependent variable is *net equity issuance*. The regression is estimated for the full sample in Panel A and conditional on positive *credit expansion* in Panel B. Newey-West t-statistics are in parentheses. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

Panel A: Full sample period, 1980-2012

	Large Commercial Banks		Large Investment Banks		Small Commercial Banks		Non-financials	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ (bank credit / GDP)$_t$	-0.015***	-0.013**	-0.006	-0.004	-0.005	-0.005	0.009**	0.011**
	(-3.627)	(-2.672)	(-0.600)	(-0.446)	(-1.099)	(-1.352)	(2.696)	(3.175)
(Income / book equity)$_t$		-0.074*		0.046		0.103		-0.115*
		(-1.980)		(0.921)		(1.165)		(-2.148)
Log(book / market)$_t$		0.003		-0.013		0.008		-0.000
		(0.343)		(-0.502)		(0.472)		(-0.012)
(Bank stock prices increased)$_t$		-0.005		-0.024*		0.030*		0.020*
		(-0.384)		(-2.199)		(2.053)		(2.431)
(Bank stock prices decreased)$_t$		0.054**		0.055***		0.029		-0.001
		(2.659)		(3.682)		(1.819)		(-0.300)
Constant	0.014**	0.025***	0.031**	0.034	0.036***	0.011	0.005	0.024
	(2.881)	(4.009)	(3.257)	(1.276)	(5.430)	(0.769)	(1.580)	(1.956)
Adj. R^2	0.16	0.27	0.01	0.12	0.02	0.17	0.16	0.23
N	131	131	131	131	131	131	131	131

Panel B: Conditional on Δ(bank credit / GDP) > 0

	Large Commercial Banks		Large Investment Banks		Small Commercial Banks		Non-financials	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ (bank credit / GDP)$_t$	-0.031*	-0.035**	-0.011	-0.013	-0.003	0.001	0.012	0.013
	(-2.333)	(-3.326)	(-0.552)	(-0.704)	(-0.235)	(0.081)	(1.119)	(1.244)
(Income / book equity)$_t$		-0.128*		0.054		0.186		-0.040
		(-2.132)		(0.945)		(1.616)		(-0.528)
Log(book / market)$_t$		0.019		-0.019		0.022		-0.031
		(1.671)		(-0.664)		(1.156)		(-1.768)
(Bank stock prices increased)$_t$		0.002		-0.020		0.023		0.017***
		(0.142)		(-1.527)		(1.181)		(3.602)
(Bank stock prices decreased)$_t$		0.132***		0.033**		-0.030*		-0.006
		(15.213)		(3.350)		(-2.546)		(-1.231)
Constant	0.028**	0.053***	0.037***	0.044	0.034**	-0.010	0.009	0.032*
	(2.876)	(5.228)	(3.451)	(1.948)	(2.896)	(-0.495)	(1.312)	(2.210)
Adj. R^2	0.10	0.42	-0.00	0.01	-0.01	0.08	0.07	0.20
N	66	66	66	66	66	66	66	66

Table 5: Cyclicality of bank equity issuance over several time periods

Table 5 reports estimates for Equation 6 for large U.S. commercial banks over three historical sample periods: 1926-1935, 1935-1980, and 1980-2012. The dependent variable is slightly different here: *net equity issuance minus dividends*, since share repurchases were generally not used before the 1980s. The regression is estimated for the full sample in Columns 1 and 2 and conditional on positive *credit expansion* in Columns 3 and 4. Newey-West t-statistics are in parentheses. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

Large U.S. Commercial Banks

		Full sample		Conditional on Δ(bank credit / GDP) > 0	
		No controls	Controls	No controls	Controls
		(1)	(2)	(3)	(4)
1926-1935	Δ (bank credit / GDP)	0.039	-	0.101	-
		(0.904)	-	(1.215)	-
	N	9	-	6	-
1935-1980	Δ (bank credit / GDP)	0.007**	0.007*	0.016***	0.014**
		(2.835)	(2.345)	(5.706)	(3.428)
	N	83	83	58	58
1980-2012	Δ (bank credit / GDP)	-0.024**	-0.020**	-0.024	-0.037*
		(-3.148)	(-3.294)	(-1.708)	(-2.485)
	N	131	131	66	66

Table 6: Change in cyclicality of bank equity issuance after S&L bailouts

Table 6 reports estimates from Equation 8 on changes in cyclicality of bank equity issuance after the S&L crisis. The regression is estimated on a panel of the 50 largest commercial banks. The treatment group is banks with increased implicit guarantees (TBTF measure > 0.01), versus the control group without increased implicit guarantees (TBTF measure ≤ 0.01). The $Post_t$ indicator denotes observations after 1984. Thompson (2011) dually-clustered t-statistics are in parentheses. Observations are quarterly over the sample period 1980-2012. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

	(1)	(2)	(3)	(4)
Δ (bank credit / GDP)$_t$	-0.003*	-0.009***	-0.002	0.001
	(-2.329)	(-6.296)	(-1.354)	(0.807)
Δ (bank credit / GDP)$_t$ · Post$_t$	0.000	0.001	-0.001	-0.001
	(0.030)	(0.241)	(-0.528)	(-0.683)
Δ (bank credit / GDP)$_t$ · Treat$_i$	0.004	0.015***	0.011***	0.009***
	(1.634)	(6.040)	(4.767)	(3.885)
Δ (bank credit / GDP)$_t$ · Post$_t$ · Treat$_i$	-0.009*	-0.011*	-0.011*	-0.011*
	(-2.200)	(-2.589)	(-2.529)	(-2.345)
(Income / book equity)$_{i,t}$			-0.018	-0.017
			(-0.989)	(-0.935)
Log(book / market)$_{i,t}$			-0.015***	-0.006*
			(-5.317)	(-2.036)
(Stock price increased)$_{i,t}$			0.012**	0.012**
			(3.009)	(3.034)
(Stock price decreased)$_{i,t}$			-0.005*	-0.003
			(-2.326)	(-1.247)
(Term spread)$_t$				-0.110
				(-1.524)
(Corporate spread)$_t$				-1.113***
				(-3.844)
Log(i / k)$_t$				-0.060***
				(-4.823)
Constant	-0.040***	-0.039***	-0.042***	-0.189***
	(-400.0)	(-441.2)	(-16.01)	(-6.436)
Firm FE$_i$	NO	YES	YES	YES
Δ (bank credit / GDP)$_t$ · FE$_i$	YES	YES	YES	YES
Adj. R^2	0.07	0.08	0.11	0.12
N	4985	4985	4093	4093

Table 7: Cyclicality of bank equity issuance across developed economies

Table 7 reports estimates from Equation 7. The table tests the difference in the cyclicality of equity issuance between "small" versus "large" countries (these terms refer to the size of the countries *relative* to its banking sector). Thompson (2011) dually-clustered t-statistics are in parentheses. Observations are quarterly over the sample period 1980-2012. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

	(1)	(2)	(3)	(4)
Δ (bank credit / GDP)$_{i,t}$	-0.007***		-0.015*	-0.012
	(-3.768)		(-2.329)	(-2.039)
Δ (bank credit / GDP)$_{i,t} \cdot$ Large$_i$		-0.007***		
		(-3.768)		
Δ (bank credit / GDP)$_{i,t} \cdot$ Small$_i$	0.011***	0.004*	0.022**	0.018*
	(5.366)	(2.640)	(3.027)	(2.645)
(Income / book equity)$_{i,t}$			-0.013	0.005
			(-0.893)	(0.413)
Log(book / market)$_{i,t}$			0.003***	0.002***
			(5.435)	(5.394)
(Bank stock prices increased)$_{i,t}$			0.001	-0.000
			(0.131)	(-0.049)
(Bank stock prices decrease)$_{i,t}$			-0.001	-0.007
			(-0.242)	(-1.937)
(Term spread)$_{i,t}$				-0.149
				(-1.567)
Log(i / k)$_{i,t}$				-0.439***
				(-4.592)
Constant	-0.035***	-0.035***	-0.037***	0.008
	(-19.708)	(-19.708)	(-15.599)	(0.817)
Country FE$_i$	YES	YES	YES	YES
Δ (bank credit / GDP)$_{i,t} \cdot$ FE$_i$	YES	YES	YES	YES
Adj. R^2	0.27	0.27	0.32	0.34
N	1744	1744	1682	1294

Table 8: Cyclicality of bank equity issuance upon adoption of the Euro

Table 8 reports estimates from Equation 8 on changes in cyclicality of bank equity issuance upon the adoption of the Euro. The treatment group is high interest rate convergence countries (change in real interest rate spread greater than -0.01), versus the control group of low interest rate convergence countries (change in real interest rate spread less than -0.01). The $Post_t$ indicator denotes observations after 1998. Thompson (2011) dually-clustered t-statistics are in parentheses. Observations are quarterly across countries over the sample period 1980-2012. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

	(1)	(2)	(3)	(4)
Δ (bank credit / GDP)$_{i,t}$	-0.058	-0.069	-0.072	-0.019
	(-1.776)	(-1.458)	(-1.211)	(-0.728)
Δ (bank credit / GDP)$_{i,t}$ · Post$_t$	0.066	0.079	0.100	0.030
	(1.380)	(1.573)	(1.579)	(0.120)
Δ (bank credit / GDP)$_{i,t}$ · Treat$_i$	0.081	0.049	0.066	0.035
	(1.912)	(0.755)	(0.885)	(0.651)
Δ (bank credit / GDP)$_{i,t}$ · Post$_t$ · Treat$_i$	-0.102	-0.134*	-0.138*	-0.131
	(-1.945)	(-2.332)	(-1.980)	(-1.708)
(Income / book equity)$_{i,t}$			-0.031	-0.020
			(-1.567)	(-1.973)
Log(book / market)$_{i,t}$			-0.012**	-0.004**
			(-3.039)	(-2.807)
(Bank stock prices increased)$_{i,t}$			0.002	0.001
			(0.907)	(0.284)
(Bank stock prices decrease)$_{i,t}$			-0.001	-0.003*
			(-0.371)	(-2.352)
(Term spread)$_{i,t}$				-0.008
				(-0.350)
Log(i / k)$_{i,t}$				-0.026
				(-0.741)
Constant	-0.011***	-0.010***	-0.026***	-0.012***
	(-13.555)	(-14.585)	(-4.055)	(-4.595)
Country FE$_i$	NO	YES	YES	YES
Δ (bank credit / GDP)$_{i,t}$ · FE$_i$	YES	YES	YES	YES
Adj. R^2	0.21	0.24	0.26	0.38
N	803	803	747	585

Table 9: Predicted Cost of Equity Capital

Table 9 reports estimates from Equation 12 and demonstrates that the cost of equity capital is countercyclical over the credit cycle for both non-financials and banks. The table estimates 4- and 8-quarter ahead (non-overlapping) excess return of an equity index using a set of predictor variables including credit expansion (which is standardized). Panel A is for large U.S. commercial banks over the sample period 1925-2012, and Panel B is for various time subsets and types of firms. Newey-West t-statistics are in parentheses. *, **, and *** denote statistical significance at 5%, 1%, and 0.1% levels, respectively.

Panel A: Large U.S. commercial banks, 1925-2012

	4 quarters ahead			8 quarters ahead		
	(1)	(2)	(3)	(4)	(5)	(6)
Δ (bank credit / GDP)	-0.064*	-0.072*	-0.065*	-0.133**	-0.153**	-0.161*
	(-2.241)	(-2.607)	(-2.200)	(-2.874)	(-2.859)	(-2.607)
Log(d / p)		0.043	0.027		0.139	0.134
		(0.746)	(0.425)		(1.452)	(1.280)
Log(book / market)		0.027	0.018		0.089	0.064
		(0.471)	(0.294)		(0.919)	(0.645)
T-bill yield			-0.009			-0.055
			(-0.428)			(-0.971)
Log(i / k)			-0.020			0.023
			(-1.058)			(0.539)
Corporate spread			-0.010			0.021
			(-0.519)			(0.407)
Constant	0.018	0.024	0.026	0.046	0.071	0.069
	(0.713)	(0.856)	(0.916)	(1.086)	(1.454)	(1.249)
R^2	0.069	0.081	0.096	0.127	0.181	0.214
N	82	82	82	41	41	41

Panel B: Various time subsets and types of firms

	4 quarters ahead			8 quarters ahead		
	(1)	(2)	(3)	(4)	(5)	(6)
Large commercial banks, 1925-2012	-0.064*	-0.072*	-0.065*	-0.133**	-0.153**	-0.161*
	(-2.241)	(-2.607)	(-2.200)	(-2.874)	(-2.859)	(-2.607)
Large commercial banks, 1925-1980	-0.087*	-0.090*	-0.098*	-0.175**	-0.174*	-0.188*
	(-2.315)	(-2.150)	(-2.444)	(-3.065)	(-2.361)	(-2.693)
Large commercial banks, 1980-2012	-0.045	-0.055	-0.053	-0.095	-0.119	-0.131
	(-1.292)	(-1.714)	(-1.050)	(-1.286)	(-1.506)	(-0.869)
Large investment banks, 1980-2012	-0.082	-0.074	-0.140	-0.233*	-0.210*	-0.356*
	(-1.130)	(-1.165)	(-1.733)	(-2.560)	(-2.548)	(-2.209)
Small commercial banks, 1980-2012	-0.042	-0.039	-0.074	-0.141	-0.138	-0.213
	(-1.170)	(-1.080)	(-1.686)	(-1.776)	(-1.563)	(-1.728)
Non-financials, 1980-2012	-0.031	-0.036	-0.028	-0.124*	-0.137*	-0.145*
	(-1.165)	(-1.427)	(-1.024)	(-2.347)	(-2.410)	(-2.282)

Table A1: "Too-big-to-fail" measure

This table reports one-day abnormal returns (relative to the S&P 500 index) for each bank and each announcement.

	Bailout of Continental Illinois 1984:3	S&L Bailout (FIRREA) 1989:1	*AVERAGE* S&L Era
Averages			
Top 20 Banks	1.3%	1.2%	1.3%
Small Banks (rank 50-500)	-0.2%	-0.9%	-0.5%
Largest Commercial Banks			
CHEMICAL BANKING CORP	5.3%	0.3%	2.8%
MANUFACTURERS HANOVER CORP	2.6%	3.1%	2.8%
CITICORP / CITIGROUP	3.0%	1.5%	2.3%
SUNTRUST BANKS INC	-	1.7%	1.7%
NATIONSBANK	-0.7%	4.1%	1.7%
J P MORGAN & CO INC	1.9%	0.9%	1.4%
BANC ONE CORP	-	1.2%	1.2%
CHASE MANHATTAN	0.8%	1.6%	1.2%
BANK OF AMERICA CORP	1.0%	1.2%	1.1%
BANKERS TRUST CORP	0.9%	1.0%	1.0%
FIRST CHICAGO CORP	0.2%	1.3%	0.7%
WELLS FARGO & CO	0.0%	0.5%	0.2%
BANK OF NEW YORK	-0.3%	0.4%	0.1%
BANKBOSTON / FIRST NATL BOSTON	-1.4%	0.8%	-0.3%