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Abstract

In October 2006, Dominion Bond Rating Service (DBRS) introduced new ratings for banks that account for the potential of government support. The rating changes are not a reflection of any changes in the respective banks' credit fundamentals. We use this natural experiment to evaluate the consequences of bail out expectations for bank behavior using a difference in differences approach. The results suggest a striking difference between the effects of bail out probabilities during calm times ("ex ante") versus during crisis times ("ex post"). During calm times, higher bail-out probabilities result in higher risk taking, consistent with the moral hazard view and much of the empirical literature. However, in crisis times, we find that banks with higher bail out probabilities tend to increase their risk taking less compared to banks that were ex ante unlikely to be bailed-out. Charter values are one part of the explanation: Supported banks may have a funding advantage relative to non-supported banks during the crisis. However, we cannot rule out that other factors also may be playing a role, including tighter supervision of supported banks in crisis times.

JEL classification: G21, G28, G32
Bank classification: Financial institutions; Financial system regulation and policies; Financial stability

Résumé

En octobre 2006, l'agence DBRS a modifié la notation des banques afin de tenir compte du soutien potentiel de l'État. Les modifications apportées ne traduisaient pas des changements de la qualité fondamentale du crédit des institutions concernées. Dans leur étude, les auteurs tirent parti de cette expérience naturelle pour évaluer, par la méthode des doubles différences, l'effet des perspectives de renflouement sur le comportement des banques. D'après leurs résultats, l'incidence des probabilités d'un sauvetage diffère grandement selon qu'on est en période de calme (*ex ante*) ou en temps de crise (*ex post*). En période de calme, des probabilités plus élevées se traduisent par une prise de risque accrue, comme le veut l'hypothèse de l'aléa moral et conformément à la plupart des constats empiriques. En temps de crise, toutefois, la prise de risque des banques plus susceptibles d'être secourues a tendance à moins augmenter que celle des banques qui, *ex ante*, avaient peu de chances d'être renflouées. Les valeurs de licence y seraient pour quelque chose : pendant les crises, les banques bénéficiant d'un soutien disposent peut-être d'un avantage en matière de financement relativement aux autres banques. Mais il se peut que d'autres facteurs interviennent aussi, dont le renforcement en temps de crise de la surveillance des banques secourues par l'État.

Classification JEL : G21, G28, G32
Classification de la Banque : Institutions financières; Réglementation et politiques relatives au système financier; Stabilité financière

I. Introduction

In the wake of the financial crisis of 2007/2008 many governments extended public guarantees to individual banks or the entire banking system.[1] Public guarantees affect bank risk-taking via two opposing channels. They can exacerbate risk-taking by undermining market discipline (Flannery, 1998, Sironi, 2003, Gropp et al., 2006) while at the same time curb it by enhancing charter values (Keeley, 1990). In addition, public guarantees may affect banks with ex ante high charter values differently from those with ex ante low charter values (Gropp and Vesala, 2004). If banks have higher charter values and therefore more "skin in the game" they may not suffer from moral hazard. Hence, to extend public guarantees to those banks may not affect their risk taking. Overall, the net effect of public guarantees is ambiguous and depends on the interaction of charter value and moral hazard effects (Keeley, 1990, Cordella and Yeyati, 2003, Gropp et al., 2011).

In this study we take advantage of a unique natural experiment that allows us to identify the net effect of government support. In October 2006, Dominion Bond Rating Service (DBRS) introduced a new assessment methodology for banks that accounts for the potential of government support. According to the new rating scheme, banks are rated based on the likelihood and predictability of timely external support, which can range from an outright guarantee to a full ownership and control (nationalization). In the rating announcement, DBRS stressed that the rating changes were based on the consequence of the new methodology being applied, and were not a reflection of any changes in the respective banks' credit fundamentals. Furthermore, the new ratings were applied simultaneously to all banks and were not preceded by any news announcement.

Hence, the DBRS announcement represents a natural experiment similar to the one employed by Kliger and Sarig (2000). Kliger and Sarig used the introduction of subcategories for Moody's ratings to identify the information content of ratings. They could use this rating innovation as a clean test of the information content of ratings, as the simultaneous introduction of the subcategories across all firms was not associated with a change in underlying risk of the firms or any pre-announcement news releases.

[1] For example in the U.S.: Indy Mac, Fannie Mae, Freddy Mac; in the UK: Bradford Bingley, Northern Rock, RBS, HBOS, Lloyds; in Germany: IKB, Hypo Real Estate; in Belgium/Netherlands: Dexia, Fortis.

Our findings suggest a striking difference between the effects of bail out probabilities during calm times ("ex ante") versus during crisis times ("ex post"). We show that during calm times, higher bail-out probabilities result in higher risk taking, consistent with the moral hazard view and much of the empirical literature. However, in crisis times, we find that non-supported banks increase their risk more than supported banks. Gropp et al. (2011) show that during normal times, non-supported banks compete more fiercely with supported banks since the latter benefit from lower refinancing costs, which pushes non-supported banks towards higher risk-taking. To the best of our knowledge, the current paper is the first to document this relationship during a crisis when funding is scarce. We show (relatively weak) evidence that supported banks maintained higher level of wholesale funding during the crisis. Furthermore, we show that the increase in risk is even smaller if the supported banks have ex-ante high charter values, consistent with the charter value view of public guarantees. In line with a charter value argument, we conjecture that supported banks may enjoy a funding advantage during the crisis and therefore exhibit lower risk compared to banks that are not supported. At the same time we cannot rule out other explanations, as our findings would also be consistent with the idea that supported banks during crisis times are subject to greater scrutiny by supervisors that is effective in reducing risk taking, as in Berger et al. (2001) and Krainer and Lopez (2009).

The paper adds to a voluminous literature on the effects of public guarantees on risk taking of banks. While the evidence is somewhat mixed, the literature generally tends to conclude that banks increase their risk-taking in the presence of government support. For example, large banks, which may be perceived to be "too big to fail" tend to follow riskier strategies than smaller banks (Boyd and Runkle, 1993; Boyd and Gertler, 1994; Gropp et al., 2011). Public banks, on the other hand, do not appear to follow riskier strategies than private banks (De Nicolo and Loukoianova, 2007). The evidence on the effect of government support on overall banking system stability is also mixed. Demirguc-Kunt and Detragiache (2002) show that more generous deposit insurance may increase the probability of banking crises. However, Barth et al. (2004) show that government ownership has no robust impact on bank fragility, once one controls for banking regulation and supervisory practices.

The interaction between charter values and public guarantees has not been extensively examined in the literature, since Keeley (1990) argued that the introduction of deposit insurance in the US did not have a large effect on bank risk taking, because banks in the US were heavily regulated and therefore enjoyed local market power. He argued that local market power creates higher charter values, which in turn mitigate the moral hazard effect. Indirect evidence is presented in Beck et al. (2006), who find that systemic banking crises are less likely in countries with more concentrated banking sectors. If charter values arise from higher market power in more concentrated banking systems, this would support the hypothesis that charter values mitigate moral hazard. Most closely related to the evidence in this paper is the evidence in Gropp and Vesala (2004), who show that the introduction of deposit insurance in some EU countries had no effect on the risk taking of banks with higher charter values.

II. The Event

On October 6th 2006, DBRS implemented a new methodology for bank credit ratings that makes references to support assessments (SA) and intrinsic assessments (IA)[2]. By using a four-notch scale for the SA ratings, DBRS aimed to provide more transparency and clarity on its analytical process. Based on the new methodology, ratings were assigned to each banking entity to reflect the possibility of external support for various debt instruments. According to DBRS

> ...An SA-1 [rating] reflects very strong to good likelihood and predictability of timely external support, ranging from an outright guarantee to ownership and control. An SA-2 reflects the expectation of some form of systemic external support, which can be either [provided for] national institutions or local and regional banks with an important local market position and which are part of well-defined sectoral associations. An SA-3 reflects that there is no expectation of any form of timely external support, which means that the most senior debt of the bank is equivalent to DBRS's intrinsic assessment. [...], an SA-4 is the opposite of support enhancement, where the rating of the entity in question is in fact pressured by an external third party.

[2] An intrinsic assessment reflects DBRS's opinion of a bank's intrinsic fundamentals – market position, franchise value, governance, ownership, management strength, strategy and its implementation, financial strength and earnings capacity as reflected in key ratios and qualitative parameters, risk profile and risk management (credit, market, liquidity, asset liability management, operational, etc.) – in terms of the strength and predictability of the operating and regulatory environment. Thus, the intrinsic assessment of a bank is the result of a comprehensive and multi-faceted analysis of its fundamentals, including both qualitative and quantitative elements.

Finally, it is important to note that the implementation of the new ratings was done simultaneously for all banks, and resulted in upgrades for some of the securities issued by the banks designated as SA-1/SA-2. In its announcement, DBRS stated that the rating changes were not a reflection of any change in the affected banks' credit fundamentals, and were purely driven by the introduction of the SA methodology. With that respect, the rating announcement represents a natural experiment, allowing us to study the moral hazard consequences of government support.

Appendix I lists the publically traded financial institutions implicated by the DBRS rating, which constitutes the sample for the empirical analysis to come. The group of banks that can potentially benefit from government support (SA1/SA2) includes 4 banks from Australia, 1 from Belgium, 6 from Canada, 2 from Ireland, and 4 from the U.K. The list of banks that received an SA-3 rating from DBRS and are less likely to receive external support is mainly made out of U.S. banks (41). It also includes 1 Canadian, 1 Irish, and 2 U.K. banks.

A legitimate concern is that the DBRS ratings do not accurately reflect market expectations, as some US banks might still be considered too-big-to-fail even if rated SA-3[3]. If true, markets may have disregarded the ratings and we should not find any significant impact of the rating on bank behavior. In addition, DBRS's SA ratings were in full agreement with Fitch's Support Ratings, indicating that as of 2006, none of the US banks was likely to be bailed out.

III. Methodology

We use several risk measures that are derived from financial statements and market variables. Following the literature standard, we calculate

$$(1)\quad Z = \frac{(\mathrm{AROA} + \mathrm{ACAP})}{\sigma(ROA)}$$

[3] We also conducted the analysis with a sub-sample that excludes the U.S. banks and found in general results that are similar to those when the U.S. banks are included. The notable difference however, was that risk (z-score or σ(ROA)) was generally lower for supported banks in the Post period, especially for those non-US banks with a higher charter value.

Such that AROA is the average return on assets during the period, σ(ROA) is the standard deviation of ROA, and ACAP is the average of (Total Equity/Total Assets) during the period. A lower Z-score indicates more risk-taking by the bank. We also consider σ(ROA) by itself as another measure of risk-taking

Market-based risk indicators are calculated using weekly stock return data. We define bank *Total Risk* as the standard deviation of stock returns during the period. In addition, bank *Specific Risk* is the standard deviation of the error term from the following market model regression

$$(2) \quad R_i = \alpha_i + \beta_i(R_m) + \varepsilon_i$$

where R_i is the stock return of Bank i, and R_m is the return on the value-weighted market portfolio of each bank's respective country.

We construct a window-period around the event and calculate the banks' riskiness within this window. For banks reporting on a quarterly basis (Canadian and US), the pre-event period is Q2 2005 to Q3 2006, while the post-event period is from Q4 2006 to Q1 2008. For banks reporting on a semi-annual basis, the pre-event period is from H2 2004 to H1 2006, while the post-event period is from H2 2006 to H1 2008.

The balance sheet, income statement, and stock return data used in the analysis come from a variety of sources. Data on Canadian banks was obtained from the Tri-Agency Database System (TDS) of the Bank of Canada, Office of the Superintendant of Financial Institutions (OSFI) and the Canadian Deposit Insurance Corporate (CDIC). TDS contains the monthly balance sheet and quarterly income statements of all deposit-taking institutions in Canada, except credit unions. US bank data came from the "FR 9-Y: Consolidated Financial Statements for Bank Holding Companies" available from the Federal Reserve Bank of Chicago. Stock-return data is from CRSP. Data for all other banks were obtained from Bloomberg. We supplemented this information using annual reports and financial results obtained from the internet when necessary.

IV. Government Support and Risk Taking

We report the mean and median risk measures during the post period in Table 1. The banks are categorized according to whether or not they benefit from a government support according to DBRS. The mean

and median comparison tests show that the supported banks exhibit significantly lower risk (significant at the 1 percent level) after the DBRS announcement for all but the z-score risk measures. This result is surprising since most of the empirical literature concludes that public guarantees increase risk-taking.

In order to check risk taking developments for the banks in our sample before and after the rating change and for banks with and without support, we calculate 6-months rolling risk measures for 14 periods (i.e. period 1 - Jan 1 2005 to June 30 2005, period 2- Mar 1 2005 to Sept. 30 2005,..., period 14 – Jan 1 2008 to June 30 2008). Figure I plots these rolling risk-measures and exhibits a number of important characteristics. Before the rating introduction, the risk profiles of supported and non-supported banks are almost indistinguishable. After the introduction of the ratings, supported and non-supported banks' risk starts to increase (presumably reflecting the onset of the crisis), but the increase seems significantly more pronounced for non-supported banks compared to supported banks. This tends to contradict the moral hazard view of public guarantees and lends some support to the charter value view (Cordella and Yeyati, 2003).

The evidence in Table 1 and in Figure 1 is univariate. In particular, there may be important heterogeneity across countries that may account for some of the patterns, due to differences in regulatory regimes, business cycles, accounting standards, or institutional characteristics. Our next step is to estimate the relationship between risk taking and government support in a series of regressions. The nature of the introduction of the new rating by DBRS lends itself to a difference in differences specification. The advantage of this model is that under some conditions it permits a causal interpretation of the coefficients as in a random treatment experiment. The treatment in our case is the news that DBRS considers some banks (and not others) "too big to fail" or otherwise explicitly or implicitly insured. Hence, we estimate the following "difference-in-differences" specification:

$$(3)\quad Y_{it} = \alpha + \beta_1 Post + \beta_2 GS_i + \beta_3 Post * GS_i + \delta_k + \varepsilon_i$$

where we use each of the risk measures as the dependent variables (Y_{it}). A lower Z-score or a higher σ(ROA), *Total Risk* or *Specific Risk* reflect increased risk-taking by banks. *Post* =1 for the post-event period. *GS* = 1 for

banks that DBRS designates as SA-1/SA-2 (i.e. benefiting from a government support). Finally, δ_k represents country fixed-effects for Australia, Canada, the EU (Irish and Belgian banks), the U.K. and the U.S.

The results of the first set of regressions are reported in Table 2. The *Post* dummy indicates that all banks increased risk taking. This is expected since our post window overlaps with the 2007/08 financial crisis and consistent with Figure 1. For our purposes, the most interesting finding is that the univariate result from Figure 1 seems to hold up, as supported banks increased their risk taking less during the post-event period compared to banks without a support. The *Post*GS* coefficient is negative and significant (at the 1%) in the σ(ROA), *Total Risk* and *Specific Risk* regressions. It is, however, insignificant for z-score.

This stands in sharp contrast to most of the empirical findings on the effect of government support (see for example Boyd and Runkle, 1993; Boyd and Gertler, 1994 and Gropp et al., 2010), which largely finds that public guarantees result in higher risk taking. It also contradicts theory, which maintains that public guarantees reduce market discipline because creditors anticipate their bank's bail-out and therefore have lower incentives to monitor the bank's risk-taking or to demand risk premia for higher observed risk-taking (Flannery 1998; Sironi 2003; Gropp, Vesala, and Vulpes 2006). The effect is similar to that discussed in the deposit insurance literature (Merton 1977). If depositors are protected by a guarantee, they will punish their bank less for risk-taking, reducing market discipline. However, it is consistent with theoretical literature assigning an important role for charter values in the risk decision of banks (Keeley, 1990, Cordella and Yeyati, 2003) and consistent with some evidence in Gropp and Vesala (2004) and Gropp et al. (2011). Hence, we next explicitly include charter values in the regressions.

V. The Net Effect of Government Support – The role of Charter Values

One way to reconcile the surprising results in Table 2 is to consider the interaction between government support and bank charter value. Keeley (1990) was the first to show that higher charter values decrease the incentives for excessive risk-taking, because the threat of losing future rents acts as a deterrent to risk-taking. Government support result in higher charter values for protected banks due to lower refinancing costs. This

tends to *reduce* the protected banks' risk-taking. Hence, as argued theoretically by Cordella and Yeyati (2003) and by Hakenes and Schnabel (2010), the net effect of government support on the risk-taking of protected banks is ambiguous and depends on the relative impact of the two channels, i.e. the reduction in market discipline versus the increase in charter value.

To disentangle the two channels, we follow the literature standard and use Tobin's Q as a proxy for a bank's charter value such that:

$$(4)\quad Tobin's\ Q = \frac{BVA+MVE-BVE}{BVA}$$

Each component of Tobin's Q is measured as its average over the pre-event window[4]. BVA is book value of assets, while MVE and BVE are the market and book values of equity, respectively. For Canadian and US banks, whose financial reports are quarterly, the "pre-event" window is Q2 2005 - Q3 2006. For the banks in Australia, Belgium, Ireland and the UK, all of whom report semi-annually, the window is H2 2004 - H1 2006.

We therefore next estimate the following difference-in-differences specification such that

$$(5)\quad Y_{it} = \alpha + \beta_1 Post + \beta_2 GS_i + \beta_3 Post * GS_i$$

$$+\beta_4 HighQ_i + \beta_5 Post_t * GS_i * HighQ_i + \delta_k + \varepsilon_i$$

where *Post* represents the post event period and *GS* equals one if the bank is recognized by DBRS as benefiting from a government support. *Post*GS* takes the value of one for supported banks in the post-event period, and *HighQ* is a dummy equals to one for banks that are above the median charter value for their country. The term *Post*GS*HighQ* captures the impact of the pre-event charter value on the post-event behavior of affected banks. Finally, as in equation (3), δ_k represents country fixed-effects.

The results for this specification are presented in Table 3. As before, *Post* is highly significant and positively associated with risk. The negative coefficient on *Post*GS* indicates that supported banks had lower risk based on the *Total* or *Specific* risk measures (1% significance). Finally, our variable of interest, *Post*GS*HighQ,* indicates that supported banks with a higher charter value increased their risk ex-post less

[4] An alternative measure of charter value relates a bank's market power with its ratio of demand deposits, since the ability to issue deposits at below market rates is an important factor of charter value (Keeley, 1990). However, we cannot obtain an accurate measure of demandable deposits since there is not a consistent definition of demand deposits across all of our banks.

compared to banks with low charter values, given the positive coefficient in the Z-score regression (5% significance) and the negative coefficient in the σ(ROA) regression (10% significance). However, for the market risk measures the *Post*GS*HighQ* coefficient is not significant.

VI. Normal times versus crisis times

The above analysis does not provide unambiguous evidence on the relation between charter value, government support and risk-taking. Furthermore, while the results suggest that charter values are part of the explanation, charter values do not seem to be able to fully explain why supported banks increased risk-taking ex post less than banks without support. One particularly interesting feature of our data is that the post-event window overlaps with the 2007/08 financial crisis. Hence, we can check whether the results are indeed driven by the crisis or hold irrespective of the time period. Hence, our empirical set-up permits a distinction of the effect of support during normal times, i.e. in the center of the risk distribution versus their effect during crisis times, i.e. in the tail of the distribution.

To address this issue, we define shorter pre- and post- event windows that are identical for all banks. We choose a 6-months window around the event such that *pre* is April 1, 2006 to October 5, 2006, and *post* is between October 7, 2006 and March 31, 2007 and therefore before the crisis starts in the summer of 2007. The downside of specifying a shorter window is that we cannot use the Z-score and σ(ROA), as those require a longer period to compute.

The short window results are presented in Table 4. The results tend to confirm the prior empirical evidence in the literature and contradict our earlier finding. Under both market risk measures, supported banks increase risk-taking during the 6 months period following the DBRS announcement more than non-supported banks given the positive and significant *Post*GS* coefficient. This is in sharp contrast with the results in Table 2, in which *Post*GS* is negative and significant for most risk measures. Interestingly, for the shorter window charter values do not have any explanatory power for explaining bank risk taking as the coefficient on *Post*GS*HighQ* is insignificant and also economically small.

One potential explanation for the relatively reduced risk taking of supported banks during the crisis (ex post) may be better access to wholesale funding during the crisis. If the government support is truly effective, then investors would be willing to extend funding and the supported banks should maintain access to the market. We check this in Appendix 2. In a difference in differences specification similar to the one for risk, we confirm that the wholesale funding (measured as the ratio of non-retail deposits to total liabilities) is higher ex post for banks that benefitted from a government support according to DBRS. While the effect is positive, it is only weakly significant.[5]

VII. Discussion and conclusion

In October 2006, Dominion Bond Rating Service (DBRS) introduced a new rating methodology for banks that accounts for the potential of government support. According to the new rating scheme, banks were rated based on the likelihood and predictability of timely external support. In the rating announcement, DBRS stressed that the rating changes were not a reflection of any changes in the respective banks' credit fundamentals. In addition, the ratings were applied to all banks simultaneously and were not preceded by any news announcement. Hence, the announcement by DBRS represents a natural experiment to evaluate the consequences of bail out expectations for bank behavior.

The results suggest a striking difference between the effects of high bail out probabilities during calm times ("ex ante") versus during crisis times ("ex post"). Our sample is uniquely suited to distinguish between the two, as we are able to define samples that include and that exclude the 2007/08 financial crisis. It appears that during normal times, higher bail-out probabilities result in higher risk taking, consistent with the moral hazard view and much of the empirical literature. However, in crisis times, we find that banks with higher bail out probabilities tend to increase their risk taking less compared to other banks. Gropp et al. (2011) show evidence on the competitive distortions introduced by government support during calm periods, which induce

[5] The analysis excludes Northern Rock (failed in 2007) and Depfa PLC (acquired by Hypo in Sept. 2007) as those do not have valid Post observations. In this context we were concerned about survivorship bias, but found in unreported regressions that guaranteed banks were not more likely to fail ex post nor were they more likely to be bailed out.

non-supported banks to increase risk-taking. Our paper presents consistent evidence for a crisis period. We also show that the increase in risk is even smaller if the banks have ex ante high charter values and have better access to wholesale deposit funding during the crisis, although the effect is small and econometrically only weakly significant. This is consistent with the charter value view of public guarantees.

At the same time, the results also suggest that charter values are only part of the explanation and there may be other important reasons for our findings. For example, our evidence is also consistent with the idea that regulators supervise supported banks more closely than non-supported banks during a crisis. The empirical literature documents that supervisory standards change with respect to economic conditions and that banks experience tighter monitoring during crises versus boom periods. (Berger et al., 2001; Krainer and Lopez, 2009).

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TABLE 1

Mean [Median] Comparison

The sample includes 17 banks identified by DBRS on October 6th, 2006 as potentially benefiting from a government support and 45 that do not. Risk proxied by Z-score is defined as (AROA + ACAP) / σ(ROA). AROA is the average return on assets during the period, σ(ROA) is the standard deviation of ROA, and ACAP is the average of (Total Equity/Total Assets) during the period. Total Risk is the standard deviation of weekly stock returns. Specific Risk is the standard deviation of the error term from a market model regression of firm on market returns. All risk measures are obtained in the Post period. For quarterly banks the period is 12/2006 to 3/2008 and for semi-annual banks the Post period is 12/2006 to 6/2008. Median significance based on Wilcoxon test statistics.

Panel A: Mean [median] comparison

	Banks with Gov. Support (n=17)	Banks without Gov. Support (n=45)	*p-Value* difference between Groups
Post Ln.(Z)	3.26	3.11	*0.602*
	[3.27]	[3.32]	*[0.352]*
Post σ(ROA)	0.0027	0.0065	*0.002*
	[0.0022]	[0.0039]	*[0.001]*
Bank Total Risk	0.0337	0.0445	*0.001*
	[0.0300]	[0.0412]	*[0.003]*
Bank Specific Risk	0.0252	0.0415	*0.000*
	[0.0244]	[0.0383]	*[0.000]*

TABLE 2
Baseline Difference-in-Differences

The sample includes 17 banks identified by DBRS on October 6th, 2006 as potentially benefiting from a government support and 45 that do not. Risk proxied by Z-score is defined as (AROA + ACAP) / σ(ROA). AROA is the average return on assets during the period, σ(ROA) is the standard deviation of ROA, and ACAP is the average of (Total Equity/Total Assets) during the period. Total Risk is the standard deviation of weekly stock returns. Specific Risk is the standard deviation of the error term from a market model regression of firm on market returns. For quarterly banks the period is 6/2005 to 9/2006 (pre event) and 12/2006 to 3/2008 (i.e. Post=1). For semi-annual banks, the period is 12/2004 to 6/2006 and 12/2006 to 6/2008 (i.e. Post=1). GS = 1 for supported banks. Robust standard errors clustered at the bank level are reported in brackets. Regressions include unreported country fixed effects. ***, **, * Significance at the 1%, 5%, and 10% level respectively.

	Ln.Z	σ(ROA)	Total Risk	Specific
Post (=1)	-1.0221***	0.0038***	0.0175***	0.0156***
	[0.192]	[0.001]	[0.002]	[0.002]
GS (=1)	0.5483	0.0008	-0.0049	-0.0067
	[0.493]	[0.002]	[0.005]	[0.004]
Post*GS	0.3285	-0.0034***	-0.0070***	-0.0089***
	[0.365]	[0.001]	[0.002]	[0.002]
Constant	3.3602***	0.0023	0.0175***	0.0195***
	[0.561]	[0.002]	[0.004]	[0.005]
Observations	124	124	124	124
F	6.70	3.98	30.84	28.18
Adjusted R^2	0.21	0.092	0.50	0.51

TABLE 3

Difference-in-Differences: Controlling for Charter Value

The sample includes 17 banks identified by DBRS on October 6th, 2006 as potentially benefiting from a government support and 45 that do not. Risk proxied by Z-score is defined as (AROA + ACAP) / σ(ROA). AROA is the average return on assets during the period, σ(ROA) is the standard deviation of ROA, and ACAP is the average of (Total Equity/Total Assets) during the period. Total Risk is the standard deviation of weekly stock returns. Specific Risk is the standard deviation of the error term from a market model regression of firm on market returns. For quarterly banks the period is 6/2005 to 9/2006 (pre event) and 12/2006 to 3/2008 (i.e. Post=1). For semi-annual banks, the period is 12/2004 to 6/2006 and 12/2006 to 6/2008 (i.e. Post=1). Charter value proxied by Tobins' q = (book value assets + market value equity – book value equity) / (book value assets). Tobin's q is the average of its components prior to the DBRS announcement. For quarterly banks, it is calculated between 6/2005 and 9/2006. For semi-annual banks, it is calculated between 12/2004 and 6/2006. GS = 1 for supported banks. High Q = 1 for banks above their country's median Q. Robust standard errors clustered at the bank level are reported in brackets. Regressions include unreported country fixed effects. ***, **, * Significance at the 1%, 5%, and 10% level respectively.

	Ln.Z	σ(ROA)	Total Risk	Specific
Post (=1)	-1.0221***	0.0038***	0.0175***	0.0156***
	[0.194]	[0.001]	[0.002]	[0.002]
GS (=1)	0.5416	0.0008	-0.0047	-0.0066
	[0.560]	[0.002]	[0.005]	[0.005]
Post*GS	-0.1217	-0.0020	-0.0089***	-0.0098***
	[0.396]	[0.002]	[0.003]	[0.003]
High Q (=1)	0.1500	-0.0001	-0.0008	-0.0007
	[0.221]	[0.001]	[0.002]	[0.002]
Post*GS* High Q	0.7654**	-0.0025*	0.0034	0.0016
	[0.366]	[0.001]	[0.003]	[0.003]
Constant	3.2544***	0.0024	0.0177***	0.0198***
	[0.631]	[0.002]	[0.004]	[0.005]
Observations	124	124	124	124
F	5.50	3.96	23.12	21.46
Adjusted R^2	0.22	0.08	0.50	0.50

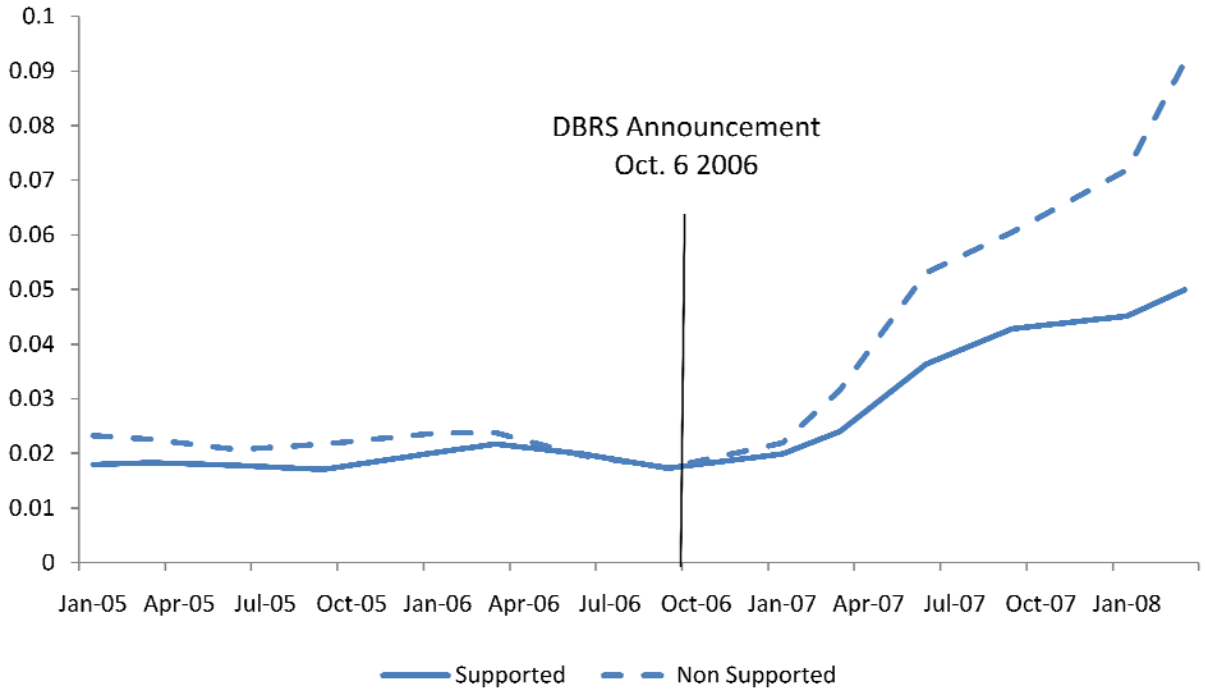
TABLE 4

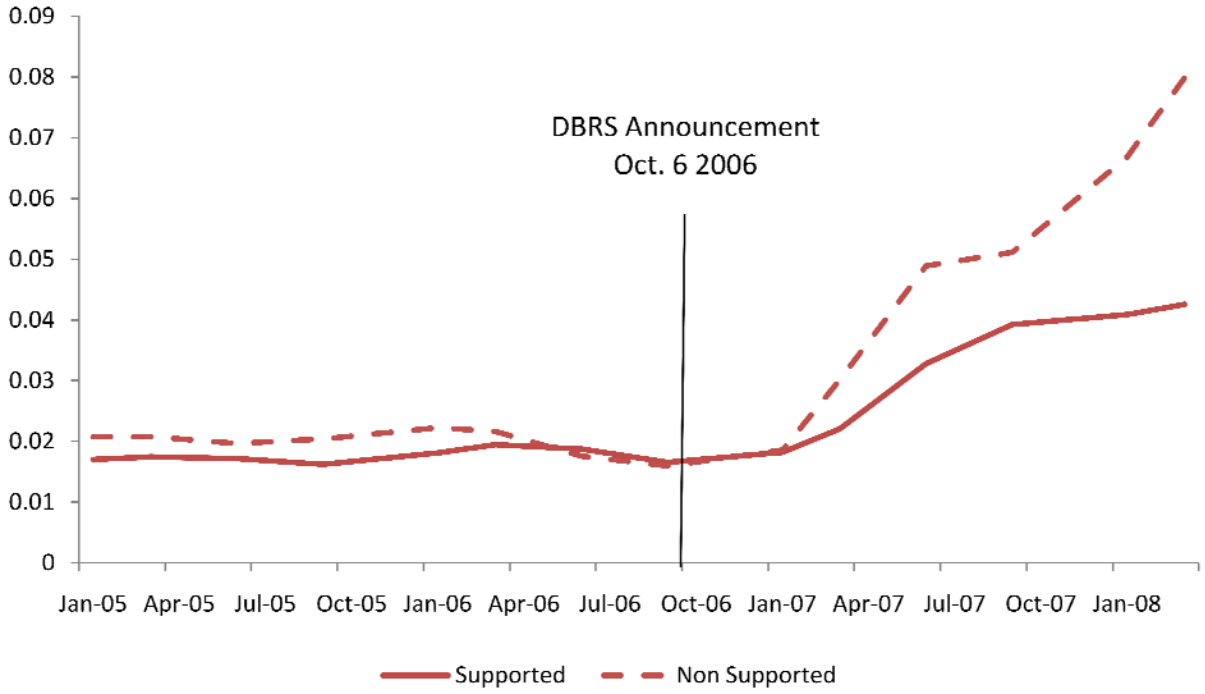
Difference-in-Differences: Shorter Pre and Post Windows

The sample includes 17 banks identified by DBRS on October 6th, 2006 as potentially benefiting from a government support and 45 that do not. Bank Total Risk is the standard deviation of weekly stock returns. Bank Specific Risk is the standard deviation of the error term from a market model regression of firm on market returns. Risk measures are obtained for *all* banks during the same pre (April 1, 2006 – October 5, 2006) and post periods (October 7, 2006 – March 31, 2007). Charter value proxied by Tobins' q = (book value assets + market value equity – book value equity) / (book value assets). Tobin's q is the average of its components prior to the DBRS announcement. For quarterly banks, it is calculated between 6/2005 and 9/2006. For semi-annual banks, it is calculated between 12/2004 and 6/2006. GS = 1 for supported banks. High Q = 1 for banks above their country's median Q. Robust standard errors clustered at the bank level are reported in brackets. Regressions include unreported country fixed effects. ***, **, * Significance at the 1%, 5%, and 10% level respectively.

	Bank Total Risk		Bank Specific Risk	
	(1)	(2)	(3)	(4)
Post (=1)	-0.0032***	-0.0046***	-0.0046***	-0.0066***
	[0.001]	[0.001]	[0.001]	[0.001]
GS (=1)	-0.0038	-0.0054	-0.0051**	-0.0073**
	[0.002]	[0.003]	[0.002]	[0.003]
Post*GS	0.0024*	0.0022	0.0038***	0.0069**
	[0.001]	[0.002]	[0.001]	[0.002]
High Q (=1)		0.0002		-0.0002
		[0.002]		[0.002]
Post*GS* High Q		0.0021		-0.0025
		[0.003]		[0.002]
Constant	0.0209***	0.0294***	0.0214***	0.0307***
	[0.002]	[0.003]	[0.002]	[0.004]
Observations	124	124	124	124
F	18.55	15.01	8.66	6.90
Adjusted R^2	0.21	0.20	0.17	0.16

Figure I: 6-Months Rolling Risk Measures by Category
Upper Graph – Bank Total Risk; Lower Graph – Bank Specific Risk





Appendix I

Listed Banks Implicated by the DBRS Introduction of the SA Methodology on October 6, 2006

Banks with Government Support	Banks without Government Support
Australian Banks	*Canadian Banks*
Australia and New Zealand Banking Group	Laurentian Bank
Commonwealth Bank of Australia	
National Australia Bank Limited	*Irish Banks*
Westpac Banking Corporation	DEPFA Bank plc
Canadian Banks	*U.K. Banks*
Bank of Montreal	Bradford & Bingley plc
Bank of Nova Scotia	Northern Rock plc
Canadian Bank of Imperial Commerce	
National Bank of Canada	*U.S. Banks*
Royal Bank of Canada	Bank of America Corporation
Toronto-Dominion Bank	Bank of Hawaii Corporation
	Bank of New York Company, Inc., The
Irish Banks	BB&T Corporation
Allied Irish Banks p.l.c	Capital Once Financial Corporation
Governor and Company of the Bank of Ireland	Chittenden Corporation
	Citigroup Inc.
U.K. Banks	Citizens Banking Corporation
HBOS plc	City National Corporation
HSBC Holdings plc	Colonial Bancgroup, Inc., The
Lloyds TSB Bank plc	Comerica Incorporated
Royal Bank of Scotland plc	Compass Bancshares, Inc.
	Fifth Third Bancorp
Belgium Banks	FirstMerit Corporation
Fortis Bank	Fulton Financial Corporation
	Greater Bay Bancorp
	Hancock Holding Company
	Huntington Bancshares Incorporated
	IndyMac Bank, F.S.B.
	JPMorgan Chase & Co.
	Keycorp
	M&T Bank Corporation
	Marshall & Ilsley Corporation
	Mellon Financial Corporation
	National City Corporation
	Old National Bancorp
	Pacific Capital Bancorp
	PNC Financial Services Group, Inc., The
	Regions Financial Corporation
	Sky Financial Group, Inc.
	South Financial Group, The
	State Street Corporation
	Suntrust Banks, Inc.
	Susquehanna Bancshares, Inc.
	SVB Financial Group
	U.S. Bancorp
	Wachovia Corporation
	Webster Financial Corporation
	Wells Fargo & Company
	Whitney Holding Corporation
	Zions Bancorporation

Appendix II
Difference-in-Differences: Wholesale Funding Market Access

The sample includes 17 banks identified by DBRS on October 6th, 2006 as potentially benefiting from a government support and 45 that do not. Wholesale Funding is the year-end ratio of non-retail deposits to total liabilities. The Pre period is from 12/2004-12/2006, while the Post period is from 12/2007-12/2009. Charter value proxied by Tobins' q = (book value assets + market value equity – book value equity) / (book value assets). Tobin's q is the average of its components prior to the DBRS announcement. For quarterly banks, it is calculated between 6/2005 and 9/2006. For semi-annual banks, it is calculated between 12/2004 and 6/2006. GS = 1 for supported banks. High Q = 1 for banks above their country's median Q. Robust standard errors clustered at the bank level are reported in brackets. Regressions include unreported country fixed effects. ***, **, * Significance at the 1%, 5%, and 10% level respectively.

	Wholesale funding to total liabilities	
Post (=1)	0.0016	0.0016
	[0.015]	[0.015]
GS (=1)	0.0461	0.0464
	[0.094]	[0.095]
Post*GS	0.0416*	0.0383
	[0.024]	[0.036]
High Q (=1)		-0.0015
		[0.045]
Post*GS* High Q		0.0057
		[0.047]
Constant	0.2891***	0.2895***
	[0.095]	[0.099]
Observations	120	120
F	6.53	4.99
Adjusted R^2	0.09	0.07