What drives issue spreads in the New Zealand commercial paper market?

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Abstract:

This paper examines how commercial paper margins are determined in New Zealand using data from data on the results of 1,340 commercial paper tenders conducted between mid-2003 and mid-2011. Initial results show that prior to the failure of Bear Stearns in March 2008, issue spreads are higher when (i) issuers have a lower credit rating, (ii) market-wide risk aversion is high, (iii) investor excess demand for the issue is low, and (iv) the term of the issue is longer. However, in the period following the failure of Bear Stearns issue spreads are higher for higher rated issuers and the market-wide risk-aversion variable is not significant! When issuers are partitioned into three classes – local authorities, utilities and financial institutions – regression analysis reveals that the period following the failure of Bear Stearns is characterised by a sharp increase in spreads on issues by financial institutions, the destruction of the traditional relationship between issue spreads and the proxies for credit risk and by a significant strengthening of the role played by the proxies for liquidity. This latter development is consistent with events documented in offshore markets where a dramatic loss of investor confidence in asset-backed commercial paper led to the flight of investors, a sharp fall in the volume of issuances of asset-backed commercial paper, a shortening of maturities and a rise in issue spreads.

Key words: Commercial paper, issue spreads, credit risk, liquidity premium, financial crisis

JEL classification: G01, G10, G15

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1. Introduction

Commercial paper yields are often quoted as a margin to the bank bill rate (BKBM) in New Zealand. According to conventional wisdom, the margin on an issue determined by factors such as the credit rating of the issuer, the supply and demand dynamics for the entire commercial paper market and for the individual issuer and the term to maturity (National Australia Bank, 2010). This paper explores this explanation of how commercial paper margins are determined using data from commercial paper tenders conducted in New Zealand.

I test this explanation of the pricing of commercial paper for several reasons. First, issuers must have a high credit rating to issue commercial paper and the paper is very short-term, typically issued with a maturity of three-months. Taken together, these two factors suggest that the credit risk to investors is minor. Most issuers will also have back-up liquidity facilities, minimising rollover risk. Thus it is debatable whether investors are sensitive to the fine differences in financial strength that give rise to the different commercial paper rating grades.

Second, and relatedly, issue spreads arising from the tender panel mechanism show considerable variation between issuers, a variation that is difficult to explain on purely credit rating grounds since most issuers have the highest Standard and Poors rating, A-1+. Moreover, the differences in yield spread have become particularly pronounced since the onset of the global financial crisis and this has occurred at a time when few issuers have experienced a ratings downgrade. In fact, across my sample of 28 issuers, there have been only three changes in rating over my eight-year sample period and two of these changes were upgrades!

Third, the behaviour of spreads on corporate debt securities during depths of the global financial crisis in 2008 has raised questions as to the relative importance of credit risk and liquidity factors

in determining these spreads. Recent research shows that although bond market illiquidity deteriorated following the onset of the global financial crisis in August 2007, illiquidity worsened sharply in March 2008 during the failure of Bear Stearns (and its absorption by JP Morgan Chase) and became dramatically worse in September/October 2008 following the default of Lehman Brothers before steadily declining in response to injections of funds by the Federal Reserve and improving market conditions (Bao et al., 2011). This research suggests the liquidity rather than credit risk factors were primarily responsible for the dramatic widening of spreads during the height of the financial crisis. One of the aims of the current paper is to investigate the extent to which this has also happened in the New Zealand commercial paper market.

Fourth, the institutional setting of the study suggests that, regardless of actual market conditions, two liquidity-related factors – the supply and demand dynamics and the term to maturity – will be the principal drivers of commercial papers spreads. The first institutional feature is the tender mechanism. Under a tender mechanism, the commercial paper spread arising from the tender will be heavily influenced by the volume of bids submitted relative to the amount of commercial offered for sale in the tender. Excess demand for an issue is likely to lead to higher prices, lower issue yields and a narrower spread to the market benchmark. The second institutional feature is the lack of an active secondary market for commercial paper in New Zealand. Most commercial paper is purchased by institutional investors and banks which typically hold the paper to maturity. The absence of an active secondary market exposes investor to considerable liquidity risk. All other things being equal, one should expect longer term issues to command a significant liquidity premium. This suggests that the term to maturity of the paper being offered in a tender will also have a significant impact on the issue spread.

The remainder of this paper is structured as follows. Section 2 discusses the characteristics of commercial paper and the main features of the commercial paper market in New Zealand, the role of credit ratings and the determinants of the yield spread on a commercial paper issue. Section 3 discusses the methodology, sample and data. Section 4 presents and discusses the empirical results/ Section 5 concludes.

2. Background

2.1 What is commercial paper?

Commercial paper is an unsecured promissory note typically issued by banks and companies to finance working capital and other short-term requirements. The most common maturities in New Zealand and three-month and six-month maturities, in sharp contrast to the US where issuances have a much shorter term.[1] They are zero coupon money market securities, issued under the borrower's own name at a discount to their face value. Commercial paper is often referred to as "one name" paper since the promissory notes only carry the name of the issuer, unlike bank bills which carry both the name of the issuer and the bank that has accepted or endorsed the bill (Potter, 1995). However, as the investor must look to the issuer alone for repayment the commercial paper market is restricted to entities with relatively high credit ratings.[2] This is the

[1] In 2008, 69% of issues (by volume) had a term to maturity of less than 5 days (Anderson and Gascon, 2009).

[2] Issuers of commercial paper, relative to non-issuers, are larger, have less volatile earnings and their levels of inventory and working capital display less sensitivity to fluctuations in cash flow. Improvements in the financial condition of the issuer are also associated with greater use of commercial paper (Calomiris et al., 1995).

major reason why the commercial paper market in New Zealand is smaller than the bank bill market.[3]

Commercial paper can be divided into corporate-issued commercial paper and asset-backed commercial paper (ABCP). Although corporate-issued commercial paper can be sub-divided into financial and non-financial issues, nearly all corporate-issued commercial paper in New Zealand is issued by non-financial entities. Asset-backed commercial paper is typically issued by a conduit that uses the proceeds to purchase various types of assets such as loans and receivables. The conduit is reliant on rolling over the commercial paper funding so that it can remain fully invested in its asset pools.[4] The conduits can be either single-seller or multiple-seller conduits. A single-seller conduit has a single originator of the conduit's assets, normally the sponsor. Under a multi-seller structure, however, the conduit buys assets from a number of different originators.

Commercial paper is issued using one of three mechanisms in New Zealand: by tender, by dealers and by private placement (Potter, 1995). Table 1 provides a summary of the activity by the 28 commercial paper issuers utilising the tender mechanism over the eight-year sample period from 1 July 2003 to 30 June 2011. The issuers are partitioned into issuers of 'commercial issues' and issuers of asset-backed commercial paper. For the issuers in the latter category, the identity of the sponsor is reported. Of the 1,340 issues in the sample (total face value of $35.1

[3] The volume of commercial paper outstanding was estimated at approximately $4 billion at the end of 2002. In contrast, the volume of outstanding bank bills and similar securities was estimated at $17 billion (Mortlock, 2003).

[4] Conduits will normally arrange one or more committed liquidity facilities from highly-rated banks to manage the rollover risk (i.e. the risk that the conduit is unable to rollover the maturing commercial paper) and credit enhancement in the form of overcollateralization or a letter of credit to manage the default risk (i.e. the risk that the assets in the asset pool do not generate the expected cash flows).

billion), asset-backed commercial paper accounted for 569 issues with a combined face value of $18.3 billion.

[insert Table 1 about here]

Popular types of assets backing commercial paper issued by single-seller conduits include loan, hire purchase and lease receivables arising from the sales of household appliances (Fisher & Paykel Finance), motor vehicles (Speirs Group, Toyota NZ) and heavy equipment (Gough, Gough & Hamer). Bank-sponsored multi-seller conduits include Medical Mortgages (ANZ Bank), Sabre NZ (Deutsche Bank), Titan NZ Funding Trust (National Australia Bank) and Waratah Securities Australia NZ (Westpac).

The volume of asset-backed commercial paper in New Zealand grew rapidly in the early years of the last decade as many companies sought to take advantage of the cheap and flexible funding provided by the commercial paper market. However, the third quarter of 2007 witnessed a dramatic loss of confidence in securities backed by US sub-prime mortgages in global financial markets. This triggered a worldwide reassessment of the risks associated with investing in asset-backed commercial paper and a sharp fall in issuances of asset-backed commercial paper as investors became reluctant to rollover maturing commercial paper, a shortening of maturities on new issues and a rise in issue spreads (Black and Fisher, 2010).[5] Investor reluctance partly reflected the opacity of the market both in the composition of the asset pools and the lack of publicly quoted prices. The crisis in the asset-backed commercial market also triggered wider

[5] ABCP conduits that has limited back-up liquidity facilities or credit enhancement were particularly vulnerable and exposed investors to losses. These conduits were forced to liquidate their portfolios and exit the ABCP market. The liquidation of the asset pools, often at low prices, lead to losses for holders of the asset-backed commercial paper (Anderson and Gascon, 2009).

concerns about the counterparty risk associated with dealing with banks that were providing back-up liquidity facilities or credit enhancements to ABCP conduits, sparking a rise in interbank rates.

[insert Figure 1 about here]

The reluctance of investors to purchase asset-backed commercial paper in recent years is seen in the dramatic decline in securitisation-related issues depicted in Figure 1. The decline in these issues is attributed to a decline in investor appetite for this type of commercial paper rather than to a decline in issuer supply because issue spreads have risen (Kacpercyzk and Schnabl, 2010). What is also apparent is the rapid decline in the volume of commercial paper issued via tenders by local authorities in this same period. While there is no indication that local authorities were forced out of the commercial paper market by investor wariness regarding their creditworthiness, the rise in issue spreads experienced in the commercial paper market might have encouraged them to look elsewhere for more competitive funding.

2.2 Credit ratings of commercial paper

As noted above, the commercial paper market is restricted to entities with relatively high credit ratings. In assigning issuers credit ratings, the rating agencies employ much the same methodology in assigning commercial paper ratings as they do in the case of bond ratings, although they place greater emphasis on the issuer's liquidity and funding profile. This is not surprising given the short-term nature of commercial paper. All the issuers in the current sample had short-term Standard & Poors credit ratings of A-1+, A-1 and A-2, the three top rating levels. The minimum credit quality associated with the A-1+ commercial paper rating is the equivalent of a long-term A+ rating (Standard & Poors, 2004). For commercial paper to be rated A-1, the

bond rating would need to be at least A-, and for commercial paper to rated A-2, the bond rating would need to be at least BBB.

The credit rating of asset-backed commercial paper is often higher than that of either the sponsor or of the assets which back the paper because of the credit enhancements which insure investors against default risk.[6] Not surprisingly, 10 of the 11 asset-backed commercial paper programmes in New Zealand were rated A-1+ by Standard & Poors, the highest rating available, as at 30th June 2007.

2.3 Yield spreads on commercial paper

Spreads on corporate debt securities are typically measured relative to a risk free benchmark such as the treasury yield curve, or more recently, the swap curve. The resulting spread, whether measured in either the new issue market or in the secondary market, represents compensation for the default or credit risk arising from the possibility that the securities may not be repaid in full or on time (Fisher, 1959), and the illiquidity of the corporate securities relative to treasury securities (Longstaff, 2002).[7] However yields spreads on commercial paper are often quoted as a margin to a money market benchmark such as the bank bill swap rate (BBSW) in Australia and the bank bill rate (BKBM) in New Zealand. The bank bill market is a highly liquid market and bank bills are considered to pose minimal credit risk to market participants. According to

[6] In contrast, the provision of back-up liquidity facilities will not, by itself, be sufficient to raise the credit rating on asset-backed commercial paper above that of either the sponsor or of the assets backing the commercial paper.

[7] The decomposition of corporate spreads into default and non-default components arose from the recognition spreads on corporate bonds seemed to be too high for default risk to be the only contributing factor (Elton et al., 2001) and that changes in the spreads on corporate bonds are not well explained solely by changes in the factors affecting default risk (Collin-Dufresne et al., 2001). Using credit default swap premia as a proxy for default risk, Longstaff et al. (2005) show that the default risk component comprises only 49% of the spread over treasuries for AAA/AA-rated issuers in the US, rising to 68% for BBB-rated issuers and 84% for BB-rated issuers.

conventional wisdom, the margin on an issue determined by factors such as the credit rating of the issuer, the supply and demand dynamics for the entire commercial paper market and for the individual issuer and the term to maturity (National Australia Bank, 2010).

How well does this explanation accord with the extant literature on the pricing of commercial paper ratings? This is a neglected area of research in the commercial paper literature which has tended to focus on such issues as the predictive ability of the commercial paper-treasury bills spread, the role of back-up liquidity facilities and identifying the variables that help explain the credit ratings of issuers (e.g., Peavy and Edgar, 1983; Chandy and Duett, 1990).

Gatev and Strahan (2006) argue that changes in the high-grade commercial paper-treasury bill spread reflects changes in market liquidity rather than short-lived changes in default risk. However the authors are using aggregate data in their study. Covitz and Downing (2007) follow the literature that has examined the behaviour of corporate bond spreads and model the commercial paper-treasury bill issue spread as a function of proxies for credit risk and liquidity in the commercial paper market. The authors use three proxies for credit risk: the issuer's credit rating (measured on a numeric scale), expected default frequency published by Moody's KMV corporation and equity volatility. The latter two measures are computed from data on the issuer's stock price.[8] The authors also use three proxies for liquidity: the number of transactions at the maturity traded, total trading volume (turnover) at the maturity traded and the term to maturity.

[8] Prior researchers have often employed variables from a structural model of default to explain the behaviour of the credit risk component of the issue spread on corporate bonds. Two key variables often include the stock price and implied volatility on the grounds that changes in the stock price, as a proxy for leverage, will capture changes in credit quality and the perceived financial stability of the issuer. Equity volatility is employed as a proxy for asset volatility because an increase in volatility will increase the volatility of the issuer's assets, increasing the probability of default (see for example, Collin Dufresne et al., 2001).

The first two proxies are standard measures of liquidity while the latter is included to control for any clientele effects. Covitz and Downing (2007) find that yield spreads on commercial paper transactions are significantly positively related to all three credit risk proxies, consistent with prior expectations. The yields spreads are also significantly negatively related to the number of transactions and significantly positively related to the term to maturity. Surprisingly, yield spreads are also found to be significantly positively related total turnover at the maturity traded.

3. Data and Methodology

3.1 Methodology

I follow market convention and measure the issue spread on a commercial paper issue by subtracting the yield on a bank bill of equivalent term from the issue yield on the commercial paper. That is, the bank bill yield is a *de facto* proxy for the risk free rate.

Following Covitz and Downing (2007), I model the issue spread on commercial paper as a function of proxies for credit risk and liquidity in the commercial paper market. The two main proxies for credit risk are the issuer's credit rating measured on a numerical scale and the spread between the yields on three-month bank bills and three-month treasury bills. The latter variable is a measure of the market's aversion to investing in non-treasury debt instruments. Since the absence of any data from secondary market trading precludes the use of any trading volume data, the main liquidity proxy in the current paper is the excess demand for the issue in the tender. This in turn depends on the amount of commercial paper offered and the total amount of bids submitted. The "price pressure hypothesis" suggests that the larger the issue in the primary market, the higher the non-default premium required to attract enough investors to ensure the entire issue is sold. Similarly, the larger the volume of bids submitted, the more competitive the

tender and the lower the issue spread.[9] I also use the term to maturity of the issue to control for the potential effect of investor preferences on the liquidity premium. However I have no prior expectation regarding investor preferences with respect to maturities.[10]

The complete model is specified as follows:

$$ISPD_i = \beta_0 + \beta_1 RATING_i + \beta_2 RISKAV_i + \beta_3 (BIDS_i - AMOUNT_i) + \beta_4 TERM_i + u_i \qquad (1)$$

where $ISPD_i$ is the spread on issue *i*, $RATING_i$ is the credit rating of the issuer of issue *i*, $RISKAV_i$ is the spread between the three-month bank bill yield and the three-month treasury bill yield on the date of issue i, $BIDS_i$ is the volume of bids submitted in the tender for issue i, $AMOUNT_i$ is the size of the offering in issue *i*, TTM_i is the term to maturity of issue *i* and u_i is a random error term.

3.2 Data and sample

The sample employed in this study is drawn from the summary data on the results of New Zealand commercial paper tenders held in the Thomson Reuters Tick History (TRTH) database of Securities Industry Research Centre Asia-Pacific (SIRCA). TRTH provides data on the

[9] Alternatively, one could expect that smaller issues will face higher spreads because investors face greater price risk in holding smaller issues due to the fact that they trade less frequently and price discovery is hampered (Amihud and Mendelson, 1991) and that this risk will be factored into the spread at issuance. In their study of bond spreads in the secondary market Longstaff et al. (2005) consider the size of the issue as indicator of the volume available for trading in the secondary market. They conjecture a negative relationship between the size of an issue and the liquidity component of the bond's spread. I discount this argument because there is no active secondary market for commercial paper in New Zealand. Most commercial paper is purchased by institutional investors and financial institutions who typically hold the paper to maturity (Potter, 1995).

[10] Another liquidity proxy that appears in the literature is the bid/ask spread in the secondary market. The rationale behind using bid/ask spreads in the secondary is the notion that primary issues will price the likely level of liquidity currently present in the secondary market into the spread at issuance. Again, the use of such a variable precluded by the absence of an active secondary market for commercial paper in New Zealand.

settlement date of the tender, the term to maturity of the commercial paper offered, the amount offered, the total bids received and the weighted average yield. The database contained 1,340 usable observations over the eight-year period from 1 July 2003 to 30 June 2011. This data is supplemented by TRTH data on three-month treasury bill yields, three-month bank bill yields and the three-month OIS swap rate. The TRTH database also provides data on Standard and Poor's short-term credit ratings of the issuers.

I partition the sample into two sub-samples: (i) a pre-crisis period extending from 1 July 2003 to 16 March 2008, and (ii) a crisis period covering the period from 17 March 2008 to 30 June 2011. The demarcation point between the two sub-samples corresponds to the collapse of Bear Stearns and its absorption by J P Morgan Chase. This event heralded a significant change in the behaviour of spreads on commercial issues in the New Zealand market. The first sub-sample includes 1,028 observation, the latter 312 observations.

3.3 Preliminary data analysis

Table 2 reports descriptive statistics on the key variables for the two sub-samples and the full sample period. The data in Panels A and B show a mean (median) *ISPD* of 3.1 (1.0) basis points during the pre-crisis period and a much higher 67.9 (42.0) basis points during the crisis period. The data in Panels A and B also show that the crisis period is characterised by lower (i.e. better) average *RATING*, marginally lower *RISKAV*, much lower average *BIDS*, marginally lower average *AMOUNT* and similar *TERM*. The lower average *RATING* is likely a result of the decision of many issuers of asset-backed commercial paper to withdraw from the commercial paper market during the crisis period.

[insert Table 2 about here]

Table 3 reports correlations between the key variables for the full sample period and the two sub-samples. The following discussion focus on the correlation between *ISPD* and the key explanatory variables. The data in Panel A shows that during the pre-crisis period *ISPD* is positively related to *RATING*, consistent with expectations, but the correlation is not significant. *ISPD* is significant positively related to *RISKAV*, consistent with expectations. As expected, *ISPD* is significantly negatively related to *BIDS* but the positive correlation between *ISPD* and *AMOUNT* is not significant. Lastly, *ISPD* is significantly positively related to *TERM*. This suggests that investors demand a liquidity or term premium when buying longer-term commercial paper.

[insert Table 3 about here]

The data in Panel B shows that during the crisis period *ISPD* is still significantly negatively related to *RATING*, contrary to expectations. This is surprising because it suggests that issuers with better credit ratings face higher issue spreads. The correlation between *ISPD* and *RISKAV* is negative but not significant. The significant negative correlation between *ISPD* and *BIDS* remains while the positive correlation between *ISPD* and *AMOUNT* is still not significant at the 0.05 level. The positive correlation between *ISPD* and *TERM* is only significant at the 0.10 level.

4. Results

4.1 Initial regression model estimates

The OLS estimates of the regression model are reported in Table 4 for the full sample and the two sub-samples. Columns (1) – (4) present the bivariate regressions of each explanatory variable with the dependent variable *ISPD*. Column (5) presents the estimation results when all

four explanatory variables are combined in a single model. I focus on the estimation results for the pre-crisis period (Panel A) and the crisis period (Panel B).

The bivariate regression estimation results reported in Panel A of Table 4 show that *RISKAV* and *TERM* have positive and significant coefficient estimates while *BIDS-AMOUNT* has a negative and significant coefficient estimate. Although the coefficient estimate of *RATING* is also positive, it is not significant. Of the four explanatory variables, *RISKAV* appears to have the greatest explanatory power. The estimation results in column (5) show that the signs of the coefficient estimates of the four explanatory variables are unchanged when all variables are considered simultaneously but the significance levels attached to several coefficient estimates have changed. In particular, the positive coefficient estimate on *RATING* is now significant at the 0.10 level, as is the positive coefficient estimate of *TERM*. These results show that during the pre-crisis period there is weak evidence of the expected link between credit ratings and commercial paper issue spreads and weak evidence of issue spreads on longer-term commercial paper issues containing a liquidity or term premium.

[insert Table 4 about here]

The bivariate regression estimation results reported in Panel B of Table 4 for the crisis period show some important differences from those reported in Panel A for the pre-crisis period. The coefficient estimate for *RATING* is now negative and significant at the 0.001 level. The coefficient estimate for *RISKAV* is also negative but not significantly different from zero. The coefficient estimate for *BIDS-AMOUNT* is negative and significant at the 0.001 level, but larger than in Panel A. The coefficient estimate for *TERM* is positive, significant at the 0.001 level and again larger than in Panel A. The results reported in column (5) of Panel B show that the coefficient estimates of the explanatory variables have the same sign when all variables are

considered simultaneously. Compared with the results reported in column (5) of Panel A, the results for the crisis period show that commercial paper issue spreads are now higher for issuers with a better credit rating, which is completely counterintuitive, and that issue spreads in the commercial paper market are no longer sensitive to the yield spread between bank bills and treasury bills.

Do our results make sense and how do they compare with prior expectations or those reported in prior research? First for the good news. The negative and significant estimates of the *BIDS-AMOUNT* coefficient in all three panels show that spreads are decreasing in investor's excess demand for commercial paper. That is, an excess of bidder interest over issue size is associated with lower issue yields and issue spreads as investors compete for the limited supply of paper, while a deficiency of investor interest relative to the amount of paper on offer will be associated with higher issue yields and issue spreads as issuers are forced to accept less competitive bids. This result is consistent with the "price pressure" argument that investor demand for commercial paper in the primary market is not perfectly elastic and that price concessions in the form of a greater liquidity premium must be offered to sell a larger issue. The full sample coefficient estimate of -0.0046 indicates that a $10 million increase in the issue size is associated with an economically significant increase in the issue spread of 4.6 basis points.

The positive and generally significant estimates of the *TERM* coefficient show that issue spreads in the commercial paper are weakly increasing in the term to maturity of the commercial paper, consistent with the existence of a term premium in the commercial paper market. The full sample coefficient estimate of 0.0027 indicates that a 30-day increase in the term to maturity of the issue is associated with an economically significant increase of 8.1 basis points in the issue spread. This finding is consistent with research that finds evidence of a positive term premium in

markets for corporate bonds (Elton et al., 2001; Chen et al., 2007) and commercial paper (Covitz and Downing, 2007).

However the absence of significant positive estimates of the *RATING* coefficient is troubling. This results suggests that higher credit ratings (reflected in lower *RATING* scores) are not associated with lower issue spreads, after controlling for other influences on the issue spread, and indeed, are associated with higher issue spreads during the crisis period. This runs counter to intuition and is not consistent with prior research into the determinants of credit spreads in both bond markets (Elton et al., 2001; Chen et al., 2007; Bao et al., 2011) and commercial paper markets (Covitz and Downing, 2007).

One possible explanation for this result is that our measure of the issue spread in the commercial paper is flawed because the benchmark yield is the bank bill yield rather than the treasury bill yield. To test this explanation we measure the issue spread in the commercial paper market as the spread of the commercial paper yield over the three-month treasury bill yield and re-estimate the regression model. As an alternative, we also we measure the issue spread in the commercial paper market as the spread of the commercial paper yield over the three-month OIS rate. The estimation results are reported in columns (1) and (2) of Table 5. Column (1) reports the results for the treasury bill benchmark and column (2) reports the results for the OIS benchmark.

[insert Table 5 about here]

The estimation results in column (1) show that the sign, size and significance of the coefficient estimates for *RATING* in all three panels is much the same as in Table 4. That is, there is no change in the relationship between credit ratings and spreads. The coefficient estimate for *RISKAV* is much larger and closer to unity, which is not surprising given that one would expect the commercial paper-treasury bill spread to be similar to the bank bill-treasury bill spread. This

also causes a sharp rise in the explanatory power of the regression model. The estimation results in column (2) show that the coefficient estimates for *RATING* are negative in all three panels but the negative coefficient estimate is not significant in the pre-crisis period. Overall, the estimation results in columns (1) and (2) of Table 5 do not suggest that the measurement of the issue spread in the commercial market is responsible for the lack of a strong positive relationship between credit ratings and issue spreads in the commercial paper market.

The absence of consistently positive and significant estimates of the *RISKAV* coefficient in all three panels shows that issue spreads in the commercial paper are not always increasing in the bank bill-treasury bill spread which measures investor's sensitivity to credit risk concerns regarding the major commercial banks. This is particularly so during the crisis period. This could reflect the fact that the issue spread in the bank-bill market is impacted by the illiquidity of the treasury bill market. To test this explanation we measure risk aversion in short-term debt markets by the spread of the three-month bank bill yield over the three-month OIS rate. The estimation results are reported in column (3) of Table 5. These results show that the coefficient estimate of *RISKAV* is now positive in both sub-periods and the full sample period, although the coefficient estimate in the crisis period is not significant. These results suggest that the spread of the three-month bank bill yield over the three-month OIS rate is a superior proxy for investor risk aversion in short-term debt markets. With this specification the coefficient estimate of *RATING* is now positive and significant at the 0.01 level during the pre-crisis period but remains negative and significant during the crisis period and the full sample period.

[insert Figure 2 about here]

To gain greater insight into the relationship between issue spreads and credit ratings, I plot the mean issue spread of issuers in each of the three rating categories for both the pre-crisis and

crisis periods. The results are displayed in Figure 2. Figure 2 does not show any evidence that issue spreads are lower for issuers with a higher credit rating. Indeed, in the pre-crisis period the mean issue spreads on issues by A-1 rated issuers are lower than the mean issue spreads on issues by A-1+ rated issuers. In the crisis period, the mean issue spread on issues by A-1+ rated issuers is well above above the mean spread on issues by A-1 rated issuers

An alternative partitioning of issue spreads is based on the 'industry' of the issuer. The rationale for this approach is that an 'industry effect' is apparent in spreads on corporate bond.[11] For example, within a given ratings class, spreads on bonds issued by utilities are usually lower than spreads on bonds issued by industrial firms, which in turn are lower than spreads on bonds issued by financial institutions. I partition issuers into three categories – local authorities, utilities and financial institutions.[12] The first two categories make 'commercial issues' while the last category makes issues of asset-backed commercial paper. The mean issue spreads of these three types of issuers in both the pre-crisis and crisis periods are depicted in Figure 3.

[insert Figure 3 about here]

Figure 3 does not show any evidence that issue spreads differ across the three categories of issuers during the pre-crisis period. However there is strong evidence of an 'industry effect' in the crisis period: the mean issue spread of local authorities is below the mean issue spread of utilities, which in turn is well below the issue spread of financial institutions. This is despite the fact that many utilities in the sample have an A-2 rating while nearly all financial institution in

[11] Elton et al. (2001) report credit spreads on five-year AA rated issued by financial institutions of 63.7 basis points versus 49.3 basis points for industrial issuers over the period 1987-1996. The authors argue that this difference is not surprising given that these bonds have different levels of sensitivity to systematic influences and to idiosyncratic shocks that occurred over the sample period.

[12] The 'local authorities' and 'utilities' categories are overlapping since some utilities are partly- or wholly-owned by either local or central government.

the sample have a A-1+ rating! This suggests that the 'industry' of the issuer played a more important role in determining the issue spread in the crisis period than credit ratings.

4.2 Alternative regression model estimates

In light of the results reported and discussed above, I replace the *RATING* variable with the *TYPE* variable, where *TYPE* takes the value 1 if the issuer is a local authority, the value 2 if the issuer is a utility and the value 3 if the issue is an asset-backed commercial paper issue by a securitisation conduit.[13] An alternative approach is to define three dummy variables: *LA* which takes the value 1 if the issuer is a local authority and zero otherwise; *UTI* which takes the value 1 if the issuer is a utility and zero otherwise, and; *SEC* which takes the value 1 if the issue is an asset-backed commercial paper issue.

The OLS estimates of two alternative regression models are reported in Table 6 for the two sub-samples and the full sample period. Columns (1), (3) and (5) report the results for the model which replaces *RATING* with *TYPE* while columns (2), (4) and (6) report the results for the model which replaces *RATING* with the *UTI* and *SEC* dummy variables.

[insert Table 6 about here]

The estimation results reported in columns (1), (3) and (5) show that the coefficient estimates of *RISKAV*, *BIDS-AMOUNT* and *TERM* have broadly similar signs and levels of significance to those reported in Table 4, although the significance of the coefficient estimate of *RISKAV* has declined. More importantly, however, the coefficient estimate of *TYPE* has a positive sign

[13] Local authorities are assigned to the lowest credit risk score owing to the local government institutional framework in New Zealand which promotes a 'strong management culture and fiscal discipline' (Standard and Poor's, 2010). Utilities are assigned a lower credit risk score than financial institutions because they operate in highly concentrated markets, are often regulated and thus permitted to make a 'fair return' on their long-term capital.

although it is not significantly different from zero during the pre-crisis period. The estimate of 0.4399 during the crisis period suggests that, all other things being equal, the issue spreads of utilities were 44 basis point higher than the issue spreads of local authorities, while the issue spreads faced by issuers of asset-backed commercial paper were 44 basis point higher again.

The estimation results reported in Columns (2), (4) and (6) again show that the coefficient estimates of *RISKAV*, *BIDS-AMOUNT* and *TERM* have similar signs and levels of significance to those reported in Table 4, although the significance of the coefficient estimate of *RISKAV* has disappeared during the crisis period. This particular specification allows us to separate out the incremental issue spread faced by utilities and issuers of asset-backed commercial paper. During the pre-crisis period the coefficient estimates of both UTI and SEC are small and not significantly different from each other. The coefficient estimates show that utilities and issuers of asset-backed commercial paper face issue spreads approximately 3 basis points higher than faced by local authorities. However, during the crisis period, the coefficient estimates of UTI and SEC are larger and significantly different from each other. The coefficient estimates show that during the crisis period, utilities faced issue spreads 18 basis points higher than those faced by local authorities, while issuers of asset backed paper faced issue spreads approximately 88 basis points higher than those faced by local authorities, after controlling for other influences on issue spreads.

[insert Table 7 about here]

Table 7 reports estimation results for the full sample using a crisis dummy variable, BEAR, and interaction terms to illustrate the impact of the global financial crisis on the determination of issue spreads. The dummy variable BEAR takes the value 0 prior to 16 March 2008 when Bear Stearns failed and 1 afterwards. Column (1) report the results for the model which replaces

RATING with *TYPE* while column (2) reports the results for the model which replaces *RATING* with the *UTI* and *SEC* dummy variables.

The estimation results reported in column (1) show that the failure of Bear Stearns was associated with a significant 41 basis point increase in issue spreads. Moreover, the positive relationships between *ISPD* and *RATING* and between *ISPD* and *RISKAV* were obliterated during this period. On the other hand, this second period witnessed a significant increase in the strength of the negative relationship between *IPSD* and (*BIDS-AMOUNT*) and a significant strengthening of the positive relationship between *ISPD* and *TERM*. In short, the period following the failure of Bear Stearns was following by the destruction of traditional relationship between the proxies for credit risk and issue spreads and by a significant strengthening of the role played by the proxies for liquidity.

The estimation results reported in column (2) are broadly similar to the results in column (1). The estimation results confirm that while there was no essential difference between the issue spreads on 'commercial issues' by local authorities and utilities and issues of asset-backed paper by financial institutions prior to the failure of Bear Stearns in mid-March 2008, the period following this event was characterised by a significant rise in issue spread on asset-backed paper issues. Relative to issues by local authorities, the issue spreads on issues by the securitisation-related conduits rose by approximately 85 basis points. The estimation results also confirm that the period following the failure of Bear Stearns was characterised by the destruction of the traditional relationship between the proxies for credit risk and issue spreads and by a significant strengthening of the role played by the proxies for liquidity.

These two results are most interesting. The positive and significant estimates of the *BEAR *SEC* variable in combination with the negative and significant estimates for the *BEAR*RATING* and

*BEAR*RISKAV* variables suggest that domestic commercial paper investors arbitrarily increased the yield they required on asset-backed commercial paper despite the absence of any evidence that credit ratings had deteriorated or market-wide risk-aversion had increased. In addition, the negative and significant estimate for the *BEAR**(*BIDS-AMOUNTS*) variable and the positive and significant estimate for the *BEAR*TERM* variable suggest that investor appetite for commercial paper and the term of the issue became the primary determinants of the issue spread. This is consistent with developments in the US commercial paper market which witnessed a dramatic decline in investor interest in commercial paper, a sharp rise in issue yields and a shortening of maturities (Black and Fisher, 2010).

5. Summary and conclusions

This paper examines commercial paper margins are determined in New Zealand using data from data on the results of 1,340 commercial paper tenders conducted between mid-2003 and mid-2011. I partition the sample around the date of the collapse of Bear Stearns in March 2008 since this was a seminal event in global financial markets. Following Covitz and Downing (2007), I model the issue spread on commercial paper as a function of proxies for credit risk and liquidity.

Initial results show that prior to the collapse of Bear Stearns issue spreads are higher when (i) issuers have a lower credit rating, (ii) market-wide risk aversion is high, (iii) investor excess demand for the issue is low, and (iv) the term of the issue is longer. However the results for the credit risk variables change sharply in the following period. Most notably, issue spreads are higher for higher rated issuers and the market-wide risk-aversion variable becomes insignificant. The key credit rating relationship does not change when we employ alternatives to the three-month bank bill rates as the market benchmark such as the three-month treasury bill rate or the three-month OIS rate.

Closer analysis of the data shows that there is an "industry effect' at work in the period following the collapse of Bear Stearns. Issuers are partitioned into three classes – local authorities, utilities and financial institutions. While there is no major difference between the issue spreads of the three classes of issuers in the period prior to the collapse of Bear Stearns, the subsequent period is characterised by a sharp increase in spreads on issues made by financial institutions, with a lesser increase registered by issues made by utilities. Regression estimates show that utilities faced issue spreads 18 basis points higher than those faced by local authorities, while financial institutions faced issue spreads approximately 70 basis points higher than those faced by utilities, after controlling for other influences on issue spreads.

Additional regression analysis employing a 'crisis' dummy variable confirm that the period following the failure of Bear Stearns was characterised by the destruction of the traditional relationship between the proxies for credit risk and issue spreads and by a significant strengthening of the role played by the proxies for liquidity. The behaviour of issue spreads in the New Zealand commercial paper market during this second period, in particular the "tiering" of issue spreads among issuers with essentially the same credit rating and the increase in the relative importance of liquidity factors, is consistent with events documented in offshore markets where a dramatic loss of investor confidence in asset-backed commercial paper led to the flight of investors, a sharp fall in the volume of issuances of asset-backed commercial paper, a shortening of maturities and a rise in issue spreads.

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Figure 1
Issue volumes – by category of issuer

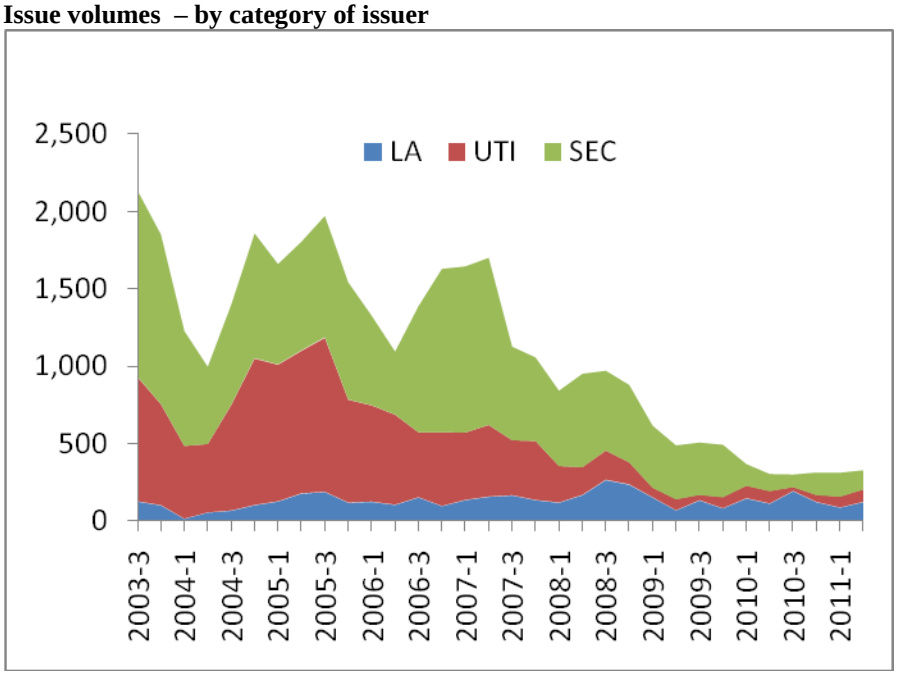

Figure 2
Issue spread – by credit rating

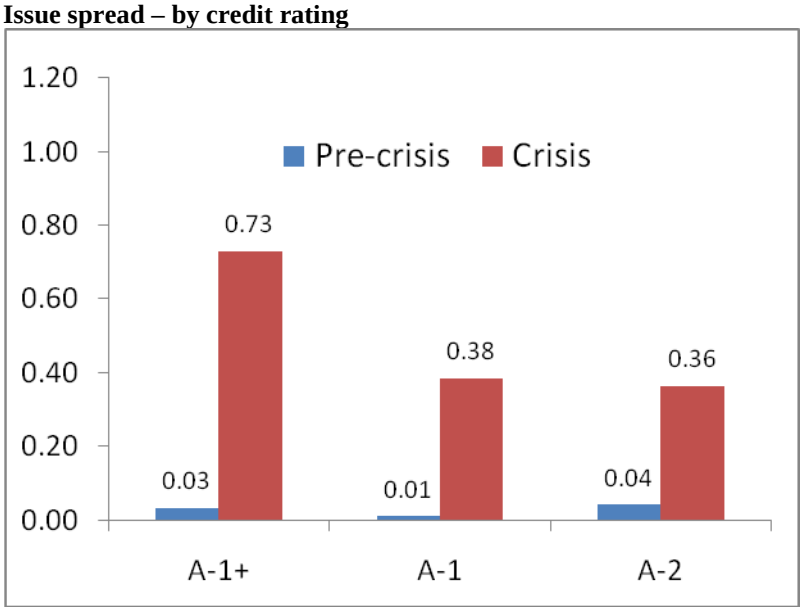

Figure 3
Issue spread – by category of issuer

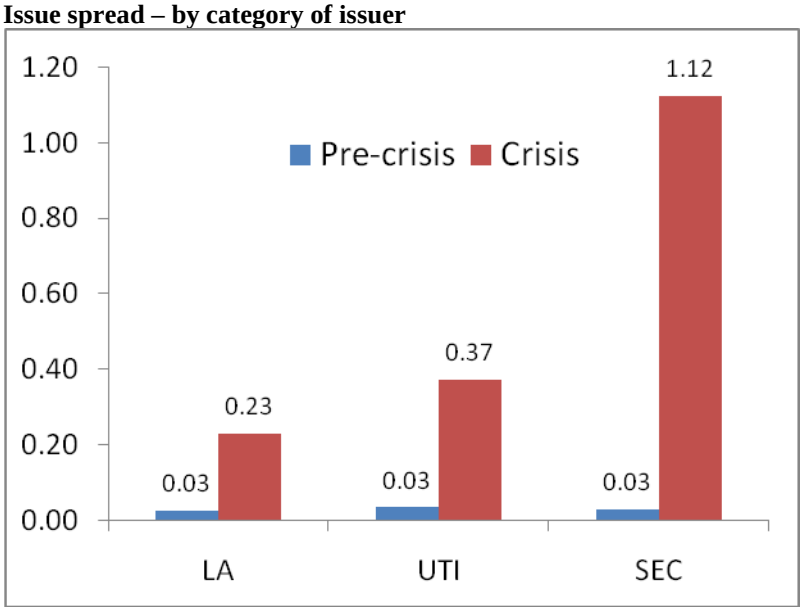

Table 1
Commercial paper issues

Panel A: Commercial issues				
Issuer	**Classification**	**S&P rating**	**No.**	**$m**
Auckland City Council	Local authority	A-1+	29	698
Auckland International Airport	Utility	A-1/A-2	118	4,270
Christchurch City Holdings	Local authority	A-1+	6	170
Christchurch International Airport	Utility	A-2	45	949
Contact Energy	Utility	A-2	4	107
Dunedin City Treasury	Local authority	A-1+	156	2,346
Hutt City Council	Local authority	A-1+	68	994
Meridian Energy	Utility	A-2	14	330
Mighty River Power	Utility	A-2	46	700
Natural Gas Corporation	Utility	A-2	20	589
Port of Tauranga	Utility	A-2	128	2,314
Ports of Auckland	Utility	A-1	48	1,094
Powerco	Utility	A-2	29	875
WaterCare Services	Utility	A-1/A-1+	1	35
Wellington International Airport	Utility	A-2	59	1,341
Total			**771**	**16,812**
Paper B: Asset-backed paper issues				
Issuer	**Sponsor**	**S&P rating**	**No.**	**$m**
Gough Securities	Gough Finance	A-1+	13	521
Housing NZ	Housing NZ	A-1+	19	420
Infinity NZ Funding	??	A-1+	8	817
Medical Mortgages	ANZ Bank	A-1+	89	2,432
RFS Trust 2006-1	Fisher & Paykel Finance	A-1+	225	6,110
Sabre NZ	Deutsche Bank	A-1	39	1,099
Securitised Equipment Receivables	Gough Securities	A-1+	41	2,208
Speirs Securities	Speirs Group	A-1+	49	1,283
Titan NZ Funding Trust	National Australia Bank	A-1+	49	2,626
Toyota Finance NZ	Toyota NZ	A-1+	11	195
Waratah Securities Australia NZ	Westpac	A-1/A-1+	26	572
Total			**569**	**18,282**

Table 2
Descriptive statistics

	ISPD	*RATING*	*RISKAV*	*BIDS*	*AMOUNT*	*TERM*
Panel A: Pre-crisis period (n = 1,028)						
Mean	0.031	1.848	0.509	75.5	27.4	85.2
Median	0.010	2.000	0.500	70.0	24.0	91.0
Maximum	2.245	3.000	1.790	326.5	148.5	185.0
Minimum	-0.707	1.000	0.180	1.0	1.0	16.0
Std. Dev.	0.102	0.888	0.227	40.4	16.6	19.7
Panel B: Crisis period (n = 312)						
Mean	0.679	1.221	0.472	36.9	22.3	86.2
Median	0.420	1.000	0.300	28.3	20.0	91.0
Maximum	7.345	3.000	1.550	145.5	140.0	116.0
Minimum	-0.646	1.000	0.040	1.0	1.0	8.0
Std. Dev.	0.679	0.583	0.385	29.5	14.0	16.3
Panel C: Full period (n = 1,340)						
Mean	0.182	1.702	0.501	66.6	26.2	85.5
Median	0.028	1.000	0.430	62.0	22.1	91.0
Maximum	7.345	3.000	1.790	326.5	148.5	185.0
Minimum	-0.707	1.000	0.040	1.0	1.0	8.0
Std. Dev.	0.436	0.869	0.306	41.5	16.2	19.0

Table 3
Correlations

	ISPD	*RATING*	*RISKAV*	*BIDS*	*AMOUNT*
Panel A: Pre-crisis period (n = 1,028)					
RATING	0.031				
RISKAV	0.418***	-0.064*			
BIDS	-0.196***	-0.133***	-0.294***		
AMOUNT	0.039	-0.246***	0.015	0.627***	
TERM	0.060+	0.063*	0.095**	0.086**	0.011
Panel B: Crisis period (n = 312)					
RATING	-0.175**				
RISKAV	-0.029	-0.018			
BIDS	-0.138*	0.363***	-0.169**		
AMOUNT	0.057	0.110+	0.141*	0.424***	
TERM	0.135*	0.110+	-0.049	-0.026	-0.359***
Panel C: Full period (n = 1,340)					
RATING	-0.228***				
RISKAV	0.023	-0.034			
BIDS	-0.317***	0.059*	-0.214***		
AMOUNT	-0.057*	-0.143***	0.053+	0.593***	
TERM	0.067*	0.059*	0.055*	0.054*	-0.056*

Table 4
Estimation results

	(1)	(2)	(3)	(4)	(5)
Panel A: Pre-crisis period (n = 1,028)					
Constant	0.0241	-0.0476	0.0705	0.0043	-0.0451
	(2.16)*	(-3.84)***	(6.08)***	(0.48)***	(-2.99)**
RATING	0.0036				0.0055
	(0.93)				(1.85)$^{+}$
RISKAV		0.1539			0.1365
		(5.23)***			(4.50)***
BIDS-AMOUNT			-0.0008		-0.0004
			(-5.45)***		(-4.43)***
TERM				0.0003	0.0002
				(2.95)**	(1.87)$^{+}$
Adjusted R^2	0.000	0.174	0.068	0.003	0.188
Panel B: Crisis period (n = 312)					
Constant	0.9274	0.7029	0.7461	0.1957	0.3652
	(14.20)***	(14.40)***	(16.42)***	(1.45)	(2.71)**
RATING	-0.2033				-0.1544
	(-7.89)***				(-4.13)***
RISKAV		-0.0505			-0.1234
		(-0.50)			(-1.16)
BIDS-AMOUNT			-0.0046		-0.0046
			(-3.30)**		(-2.81)**
TERM				0.0056	0.0073
				(3.44)***	(4.40)***
Adjusted R^2	0.027	0.000	0.030	0.015	0.070
Panel C: Full period (n = 1,340)					
Constant	0.3770	0.1656	0.3634	0.0499	0.3667
	(7.79)***	(3.31)**	(9.47)***	(1.30)	(6.78)***
RATING	-0.1147				-0.0944
	(-6.98)***				(-8.19)***
RISKAV		0.0322			-0.1337
		(0.39)			(-2.02)*
BIDS-AMOUNT			-0.0045		-0.0046
			(-8.07)***		(-8.56)***
TERM				0.0015	0.0027
				(3.15)***	(4.92)***
Adjusted R^2	0.051	0.000	0.126	0.004	0.177

*** Significant at the 0.001 level ** Significant at the 0.01 level * Significant at the 0.05 level $^{+}$ Significant at the 0.10 level.

Table 5
Estimation results

	(1)	(2)	(3)
Panel A: Pre-crisis period (n = 1,028)			
Constant	-0.1593	-0.0431	-0.0925
	(-7.69)***	(-2.05)*	(-4.03)***
RATING	0.0058	-0.0003	0.0081
	(1.89)+	(-0.08)	(2.78)**
RISKAV	1.1348	0.3623	0.5076
	(37.43)***	(9.64)***	(4.83)***
BIDS-AMOUNT	-0.0004	-0.0006	-0.0003
	(-3.66)***	(-4.77)***	(-4.65)***
TERM	0.0014	0.0014	0.0002
	(8.38)***	(7.80)***	(2.05)*
Adjusted R^2	0.920	0.515	0.207
Panel B: Crisis period (n = 312)			
Constant	0.5682	0.8105	0.2987
	(3.12)**	(3.96)***	(2.05)*
RATING	-0.1504	-0.1341	-0.1615
	(-3.92)***	(-3.23)**	(-4.27)***
RISKAV	0.8839	0.2377	0.0143
	(8.09)***	(1.84)+	(0.07)
BIDS-AMOUNT	-0.0049	-0.0066	-0.0041
	(-2.89)**	(-3.54)***	(-2.26)*
TERM	0.0050	0.0046	0.0073
	(2.29)*	(1.91)+	(4.54)***
Adjusted R^2	0.274	0.107	0.065
Panel C: Full period (n = 1,340)			
Constant	0.3146	0.5175	0.0594
	(4.54)***	(5.85)***	(1.04)
RATING	-0.0968	-0.1207	-0.0765
	(-8.25)***	(-8.82)***	(-6.02)***
RISKAV	0.8682	0.1090	0.7524
	(12.92)***	(0.09)	(4.56)***
BIDS-AMOUNT	-0.0048	-0.0060	-0.0029
	(-8.45)***	(-8.40)***	(-6.14)***
TERM	0.0033	0.0035	0.0021
	(5.24)***	(4.82)***	(4.39)***
Adjusted R^2	0.459	0.246	0.211

*** Significant at the 0.001 level ** Significant at the 0.01 level * Significant at the 0.05 level + Significant at the 0.10 level.

Table 6
Estimation results

	Pre-crisis period		Crisis period		Full period	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.0639	-0.0602	-0.5846	-0.1691	-0.1895	-0.0157
	(-4.38)***	(-5.30)***	(-6.63)**	(-2.04)*	(-3.03)**	(-0.31)
TYPE	0.0102		0.4399		0.1588	
	(1.47)		(8.66)***		(5.82)***	
UTI		0.0258		0.1809		0.0599
		(1.72)+		(1.92)+		(1.48)
SEC		0.0267		0.8790		0.2902
		(1.62)		(8.65)***		(5.07)***
RISKAV	0.1353	0.1356	-0.1768	-0.1429	-0.1357	-0.1254
	(4.47)***	(4.50)***	(-1.93)+	(-1.42)	(-1.91)	(-1.80)+
BIDS-AMOUNT	-0.0004	-0.0004	-0.0039	-0.0026	-0.0053	-0.0051
	(-4.26)***	(-4.11)***	(-5.54)***	(-3.43)***	(-8.87)***	(-8.80)***
TERM	0.0003	0.0003	0.0056	0.0059	0.0035	0.0037
	(2.33)*	(2.20)*	(4.89)***	(4.94)***	(5.62)***	(5.71)***
Adjusted R^2	0.190	0.193	0.411	0.424	0.214	0.222

*** Significant at the 0.001 level ** Significant at the 0.01 level * Significant at the 0.05 level + Significant at the 0.10 level.

Table 7
Estimation results

	(1)	(2)
Constant	-0.0451 (-3.00)**	-0.0602 (-5.22)***
RATING	0.0055 (1.83)$^{+}$	
UTI		0.0258 (1.75)$^{+}$
SEC		0.0267 (1.63)
RISKAV	0.1365 (4.46)***	0.1356 (4.46)***
BIDS-AMOUNT	-0.0004 (-4.34)***	-0.0005 (-4.07)***
TERM	0.0002 (1.86)$^{+}$	0.0003 (2.17)*
BEAR	0.4103 (2.97)**	-0.1089 (-1.28)
*BEAR*RATING*	-0.1599 (-4.19)***	
*BEAR*UTI*		0.1551 (1.59)
*BEAR*SEC*		0.8522 (7.78)***
*BEAR*RISKAV*	-0.2599 (-2.32)*	-0.2785 (-2.67)**
BEAR(BIDS-AMOUNT)*	-0.0042 (-2.36)*	-0.0021 (-2.68)**
*BEAR*TERM*	0.0071 (4.15)***	0.0056 (4.67)***
Adjusted R^2	0.445	0.644
Wald tests:		
H_0: *RATING* + *BEAR*DRATING* =0	16.19***	
H_0: *UT* + *BEAR*UTI* = 0		3.55^{+}
H_0: *SEC* + *BEAR*SEC* =0		67.40***
H_0: *RISKAV* + *BEAR*RISKAV* = 0	1.28	1.99
H_0: *(BIDS-AMOUNT)* + *BEAR*(BIDS-AMOUNT)* = 0	6.71**	10.85***
H_0: *TERM* + *BEAR*TERM* = 0	18.13***	23.69***

*** Significant at the 0.001 level ** Significant at the 0.01 level * Significant at the 0.05 level $^{+}$ Significant at the 0.10 level.