NON-US ASSET-BACKED SECURITIES: SPREAD DETERMINANTS

AND OVER-RELIANCE ON CREDIT RATINGS

Dennis Vink
Nyenrode Business Universiteit

Frank J. Fabozzi
Yale School of Management

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Dennis Vink*
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Abstract. In this paper, we empirically investigate two economic issues (1) the factors that affect the primary market spread on non-U.S. asset-backed securities and (2) whether investors rely solely on credit ratings and ignore other credit-related factors. We do so by using a panel-data fixed-effects model of primary market spreads for tranches of non-mortgage-related asset-backed securities issued over the period 1999-2006. With respect to the determinants of the primary market spread, we find that spread can be explained in terms of two factors credit rating and bond market conditions. Our tests support the hypothesis that despite heavy reliance on credit ratings, investors do consider factors that the rating agencies state that they consider in assigning ratings. Hence, there is reason to suspect that the notion of pure reliance on assigned ratings that has been popularized in the market may be overstated.

Key words: asset-backed securities (ABS), credit ratings, collateral, default risk, securitization, securitisation.

JEL classification: G21, G24, G32.

*   Nyenrode Business Universiteit. E-mail: d.vink@nyenrode.nl.

**   Yale School of Management E-mail: frank.fabozzi@yale.edu.

1. Introduction

There is no shortage of empirical studies investigating credit spreads on corporate bond using cash market bonds and credit default swaps. In contrast, there is no empirical evidence that we are aware of that has examined credit spreads for securitized products, more popularly referred to as asset-backed securities (ABS). Yet, in the United States, there have been periods in which the use of securitized transactions by a few non-financial corporations via their financial subsidiaries has exceeded corporate bond issuance. Although the subprime mortgage crisis has undoubtedly reduced issuance of ABS since the summer of 2007, it would be naïve to assume that securitization as a funding mechanism and a risk management tool will lose favor. Advocating such a future role would suggest that banks would have sufficient capacity to hold the loans that they originate on their balance sheet. This view that securitization will not disappear from the arsenal of funding mechanisms is supported by government officials and economists. For example, in a speech by Robert Steel, then-Under Secretary of the U.S. Department of the Treasury, before the American Securitization forum in February 5, 2008, he stated: "Secretary Paulson and I have been very clear—we believe that the benefits of securitization are significant. It enables investors to improve their risk management, achieve better risk adjusted returns and access more liquidity." In a September 20, 2007 article in *The Economist*, "When it goes wrong…," the following comment was made "But do not expect a rush back to the ways of the 1960s. Securitisation has become far too important for that. Indeed, it has not yet fulfilled its promise."

The types of assets that have been securitized are categorized as traditional asset types (such as credit card receivables, auto loan receivables, consumer loans, and mortgage loans) to non-traditional asset types (such as aircraft leases and whole businesses). By convention, in the United States, securitized products include mortgage-backed securities (MBS) and ABS. The

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former includes the securitization of *prime* residential mortgage loans and commercial mortgage loans (i.e. loans for the purchase of income-producing properties). By convention, the ABS market includes all other asset types and residential mortgage loans of credit impaired borrowers referred to as *subprime* residential mortgages. The sector of the ABS market that includes the securitized subprime residential mortgages is referred to as the mortgage-related ABS sector. In Europe, the convention has been to refer to all securitizations as ABS regardless if they are backed by mortgage loans.[1]

In the corporate bond market, not only have the determinants of spreads been analyzed, but the role of credit ratings in pricing has been investigated. For example, Campbell and Taksler (2003) find that consistent with what one would expect from asset pricing theory, yield spreads are more closely associated with the volatility of a corporate bond issuer's stock price volatility than with its assigned rating. This would suggest that there may be factors other than a credit rating that contain credit information that is superior to credit ratings. In fact, today many asset management firms use changes in historical stock price volatility as a screening signal for the post-acquisition credit analysis for their portfolio holdings (see Esser, 1995). In the case of sovereign bond ratings, Cantor and Packer (1996) find that macroeconomic variables contain most of the information regarding an issuer's creditworthiness. They conclude that the role of a credit rating is to summarize the credit information contained in observable macroeconomic variables. Much the same conclusion regarding the role of corporate bond ratings has been reached by researchers who have examined the change in spreads following a rating change: the

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[1] A securitized product that employs the securitization technology and at one time was referred to as a form of ABS is the collateralized debt obligation (CDO). However, unlike other ABS, a CDO is an actively managed portfolio of bonds, loans, or other structured products. Thus, the performance of a CDO depends on the decision made by the collateral manager rather than the performance of unmanaged pool of receivables or loans.

market has already used prevailing market information to adjust spreads prior to the actual rating change.[2]

There is a growing concern that investors, particularly institutional investors, rely on ratings without performing their own credit analysis, and the herd behavior resulting from relying solely on ratings. A report by the U.S. Securities and Exchange Commission acknowledged the growing dependence on ratings by investors not only for public debt offerings but also in private debt arrangements and by regulators. For example, ratings are used in determining collateral requirements by counterparties for non-exchange traded derivatives and by dealers in repo transactions. Two studies, Ferri, Liu, and Stiglitz (1999) and Reisen and von Maltzan (1999), suggest that the over-reliance on the ratings of emerging market sovereign bonds was a destabilizing factor in the 1997-1998 Asian financial crisis.

The subprime mortgage crisis that began in the summer of 2007 echoed the concerns about investor over-reliance on ratings. In April 2008, for example, a report by the Financial Stability Forum ("Report on Enhancing Market and Institutional Resilience"[3]) states: "Investors should address their over-reliance on ratings. Investor associations should consider developing standards of due diligence and credit analysis for investing in structured products" (p. 37). In response, in late 2008 industry associations such as the European Fund and Asset Management Association, the European Securitization Forum, and Investment Management Association prepared industry guidelines to address the issue of over-reliance on ratings for securitized products.

In this paper, we first address the question of which factors determine the primary market spread on tranches of ABS. We do so by estimating a pooled time-series cross-sectional model for floating-rate tranches of non-mortgage-related securitization transactions. The three key

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[2] See, for example, Hand, Holthausen, and Leftwich (1992).

[3] http://www.fsforum.org/publications/FSF_Report_to_G7_11_April.pdf.

factors that we investigate are credit ratings,[4] bond market conditions, and liquidity. Our sample

consists of 831 tranches from securitizations issued between 1999 and 2006. We restrict our

sample to non-U.S. securitization transactions in order to minimize the possibility of the sample

becoming contaminated by the risk associated with subprime mortgages. Our results suggest that

(1) credit rating is a major factor accounting for primary market spreads and (2) bond market

conditions account for a substantial part of the remainder of the spreads. Contrary to observations

in corporate bond market studies, liquidity proved not to be statistically significant in explaining

primary market spreads.

We also study, using the same sample of tranches and same statistical model, whether

investors rely solely on ratings (after adjusting for non-credit factors) which we refer to as the

"over-reliance hypothesis". This issue of over-reliance or pure-reliance on credit ratings has been

put forth as a reason for the subprime mortgage crisis and concerns with securitization in general

by market commentators and regulatory entities. To investigate this important issue, we review

the factors that the rating agencies disclose in their writings that they rely upon in assigning

ratings to the tranches of a securitization transaction. In testing this hypothesis, we examine if

factors that are already considered in assigning ratings — which we refer to as credit-related

redundant factors — still have explanatory power after adjusting for credit rating. If the over-

reliance hypothesis is true, such factors should not be statistically significant. We find that credit-

related redundant factors are important determinants of the primary market spread, strongly

suggesting that investors do not ignore other credit-related factors beyond the assigned credit

rating.

The remainder of this paper is organized as follows. Section 2 provides a description of

the methodology used by rating agencies in assigning ratings to tranches in a securitization

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[4] Empirical evidence supporting the importance of credit ratings as a factor is provided by Elton, Gruber, Agrawal, and Mann (2001), and John, Lynch, and Puri (2003).

transaction. In Section 3, we describe our unique database. It is here that we set forth the reasons for investigating primary market spreads on new issues of non-U.S. ABS that are not backed by real estate. Section 4 examines the impact of credit ratings, bond market conditions, and liquidity on primary market spreads, and Section 5 tests the over-reliance hypothesis. Section 6 offer some concluding remarks.

2. Factors Considered by Rating Agencies

Empirically investigating credit spreads on ABS is not as simple as for corporate bonds given the complex structure associated with a securitization transaction. Various academic studies have been published identifying a wide range of factors that would be expected to influence corporate credit spreads.[5] The factors considered are those that are widely recognized in the corporate finance literature as impacting the issuer's financial well being.[6] In contrast, the key element in a securitization is to legally separate the credit risk of the corporation that originated the loans from the legal entity issuing the ABS. As a result, ABS investors can look only to the performance of the collateral for fulfillment of the terms of the debt obligation rather than the performance of the corporation that originated the loans. For example, while the ratings of the two U.S. auto manufacturers, General Motors and Ford, were downgraded to junk bond status in May 2005, the ratings on several of their securitization transactions were actually upgraded due to high subsisting levels of credit enhancement.

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[5] See, for example, Altman *et al* (2005) on default and recovery rates; Collin-Dufresne et al. (2001) and Molina (2005) on the impact of leverage ratios; Elton *et al* (2001) and Covitz *et al* (2007) on the impact of liquidity, and Chen *et al* (2008) on the relationship between credit spread and market conditions.The extent to which traditionally used credit risk models – and more specifically structural models based on the contingent claims analysis initiated by Merton (1974) – match the observed credit spreads has proven to be disappointing (see Jones, Mason and Rosenfeld 1984 and Huang and Huang 2003).

[6] See, for example, and Altman *et al* (2005) and Acharya *et al* (2007).

Hence, the factors that drive credit spreads on corporate bond issues are not applicable to the majority of ABS, with a few exceptions that will be noted below. As in the case of corporate credit spreads, a factor that drives ABS credit spreads is the assigned credit rating. Not only is the ABS general methodology used by rating agencies published and available to investors, they also publish rating criteria for the different asset types that have been securitized. Although the three rating agencies (Moody's, Standard & Poor's, and Fitch) have different approaches in assigning credit ratings, they do focus on the same areas of analysis. Moody's, for example, investigates (1) asset risks, (2) structural risks, and (3) third parties to the structure (see Silver, 1998).

Evaluating asset risks involves the analysis of the credit quality of the collateral. The rating agencies will look at the underlying borrower's ability to pay and the borrower's equity in the asset. To evaluate structural risk, the rating agencies examine the extent to which the cash flow from the collateral can satisfy all of the obligations of the tranches in the securitization transaction. The cash flow payments that must be made are interest and principal to investors, servicing fees, and any other expenses. This is described by the structure's cash flow waterfall. The rating agencies analyze the structure to test whether the collateral's cash flows match the payments that must be made to satisfy the issuer's obligations. This requires that the rating agency make assumptions about losses and delinquencies and consider various interest rate scenarios after taking into consideration credit enhancements.[7]

The third-party providers to a securitization transaction investigated by the rating agencies are credit guarantors (most commonly bond insurers), the servicer, a trustee, issuer's

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[7] In considering the structure, the rating agencies will consider (1) the loss allocation (how losses will be allocated among the bond classes in the structure), (2) the cash flow allocation (i.e., the cash flow waterfall), (3) the interest rate spread between the interest earned on the collateral and the interest paid to the bond classes plus the servicing fee, (4) the potential for a trigger event to occur that will cause the early amortization of a deal, and (5) how credit enhancement may change over time.

counsel, a guaranteed investment contract provider (this entity insures the reinvestment rate on investable funds), and accountants. In addition, rating agencies analyze the legal structure (i.e., the special purpose vehicle created for a securitization). The legal analysis is performed to reduce the likelihood that the securitization's collateral will not be declared by a bankruptcy judge as being part of the estate of the corporation that originated the loans. The key in the securitization in any country is the legal infrastructure that provides the safeguarding of the collateral on behalf of the holders of the ABS.

3. Data

The principal data source used in this study was collected from the data reported in *Structured Finance International* (SFI) magazine published by Euromoney Institutional Investor Plc. SFI is recognized by participants in the securitization market as one of the world's leading journals and news sources.[8] From SFI, we collected information on 9,041 tranches from 2,296 securitization transactions (total par value of €1.45 trillion) completed between January 1, 1999 and December 31, 2006. Because we limited the types of ABS investigated as explained below, we used a final sample (from our total population of 9,041 tranches) consisting of 831 tranches (total par value of €166 billion) from 186 securitization transactions.

We excluded transactions for the following reasons. First, we did not include collateralized debt obligations (CDOs) in our study because these structured products are managed products and the spread reflects the expected performance of the collateral manager and other factors such as the extent to which the collateral manager has taken an equity participation

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[8] In particular, SFI provides data on the volume and nature of securitization activities in the global capital markets spanning Asia, the Middle East, Europe, Africa and the Americas.

in the transaction.[9] In creating our sample we excluded all MBS and mortgage-related ABS (i.e., subprime mortgage securitizations) because of the significant role that prepayment risk has on the spread. That is, the observed spread at issuance for a tranche in a mortgage-related securitization reflects not only credit risk but also the significant prepayment risk exposure.[10] We also excluded all issues placed outside the Eurobond market in order to enhance comparability across issues.[11] Furthermore, we included only non-U.S. securitization transactions to rule out any possibility of the sample becoming contaminated by the risk associated with subprime mortgages.

It is important to reiterate that this study is based on issuance spreads which we refer to as primary market spreads. The reason we prefer these spreads is the difficulty of obtaining reliable secondary market spreads which are typically derived from pricing matrices or dealer quotes. Consequently, issuance spreads are a more accurate measure not only of the actual cost of debt but also of the risk premium demanded by investors.

Fixed-rate or floating-rate tranches can be issued in a securitization transaction. In fact, within a securitization, there can be both fixed-rate and floating-rate tranches.[12] The problem in

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[9] When CDOs were first introduced in the market, they were lumped into the ABS sector for classification purposes. Because they are actively managed products that use the securitization technology, dealer firms eventually split off CDO group from the ABS group.

[10] We say significant prepayment risk exposure because there are ABS where the borrowers of the underlying loans may have the right to prepay but the prepayment option is not exercised when interest rates decline. A good example is auto loan-backed securities where borrowers have the right to prepay but there is typically no economic advantage to do so when interest rates decline.

[11] The Eurobond market includes bonds with the following features: (1) they are underwritten by an international syndicate, (2) at issuance, they are offered simultaneously to investors in a number of countries, and (3) they are issued outside the jurisdiction of any single country and they are unregistered (Fabozzi, 2007, Chapter 9).

[12] The collateral typically has only fixed- or floating-rate loans or receivables. When there is a mismatch between the cash flow attributes of the collateral and the tranches (e.g., the collateral may have a fixed rate but some of the tranches may be floating rate), the rating agencies require that the structure include an interest rate swap or cap to hedge the interest rate risk.

dealing with fixed-rate tranches is that the credit spread must be estimated by selecting a suitable benchmark for the country where the deal is issued. Because of the difficulty of doing so, we further restricted our sample by excluding all fixed-rate tranches. In contrast, for a floating-rate tranche the coupon reset formula is the reference rate plus a spread. That spread, referred to as the quoted margin, is the additional compensation for the risk above and beyond the risk associated with the reference rate.

In the Euromarket, the reference rate for a floating-rate tranche of an ABS is the Euro Interbank Offered Rate (EURIBOR) used for the eurozone. However, the Euromarket also contains ABS which are denominated in British pound sterling (GBP). For these securities, the London Interbank Offered Rate (LIBOR) is used exclusively. In this case LIBOR is a more appropriate measure of credit risk than EURIBOR because of GBP's association with LIBOR. Both EURIBOR and LIBOR reflect the average credit risk levels at which highly credit rated banks can borrow on an unsecured basis.

The spread above the interbank offered rate reflects the risks above this interbank market credit risk. Basically, it represents three components: (1) credit risk, (2) liquidity risk, and (3) optionality risk. Since in our study we exclude MBS and subprime mortgage deals, optionality risk in the form of prepayment risk is close to zero for the tranches in our study. We eliminated any tranches that are puttable or callable and tranches that allow the quoted margin to change over time. Consequently, the floating-rate tranches in our study are floaters with no optionality risk. Furthermore, we restricted the tranches in our sample to those that were issued at par value so that the quoted margin on the issues would reflect a spread above the interbank offered rate without being distorted by any premium or discount on the offering price. Hence, the quoted margin is the primary market spread in our study and reflects both credit risk and liquidity risk.

Next, we used credit rating data to assign numerical values to each rating for each tranche with higher numbers reflecting lower credit ratings. In our sample we did not did find tranches with a rating below Ba3 or BB-, so our rating classification scheme consists of 13 credit-rating dummy variables corresponding to *Aaa/AAA, Aa1/AA+, Aa2/AA, Aa3/AA-, A1/A+, A2/A, ..., Ba3/BB-.*[13] If an issue has a split rating ─ and thus multiple numerical values ─ we selected the lowest rating and used this value for the tranche's credit rating. Table 1 provides a breakdown of the sample by credit rating.

A single rating, however, does not capture adequately all of the risks inherent in ABS. In December 2008, for example, Credit Assessment Guidelines by the EFAMA-ESF-IMA states: "Credit ratings are incomplete descriptions of riskiness. Credit ratings may be assessments of creditworthiness, but they are not assessments of the level of liquidity, market or rating volatility risk…" (p.4).[14] Thus, our analysis must not only allow for pricing differences among credit ratings, but it must also allow for other possible risk dimensions, such as variations in bond market conditions and liquidity. For this reason, we included dummy variables that correspond to different quarters so as to capture the effect on credit spreads in the market exerted by changes in market conditions. Each of these equals one if the securitization transaction was completed during the corresponding quarter, and zero otherwise. Our sample did not contain any tranches issued in the fourth quarter of 2005 or the first quarter of 2006.

Initially, we used the natural log of the par value of the tranche amount to proxy for the expected liquidity as has been done in other empirical studies on the determinant of corporate

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[13] It is important to remember that the rating scales are inverse scales, so that spread increases as rating decreases.

[14] http://www.efama.org/index.php?option=com_docman&task=doc_download&gid=834.

bond spreads.[15] However, we did encounter a multicollinearity problem arising from a high condition index and low eigenvalues in our empirical test attributable to the natural logarithms. Consequently, we employed an alternative approach: we constructed three dummy variables for tranche amount. The first dummy variable equals one if the size of the tranche lies between €0 up to and including €500 million, and zero otherwise. The second dummy variable equals one if the tranche size corresponds to an amount between €500 million up to and including €1 billion, and zero otherwise. The last dummy variable equals one if the tranche size is larger than €1 billion, and zero otherwise. The choice of the amounts, admittedly, is arbitrary. Our results are qualitatively similar, however, when we broke down the sample using smaller amounts.

4. The Determinants of Primary Market Spread

4.1 Methodology

In an effort to simultaneously control for the multiple effects that we hypothesize determine the primary market spread, we estimated a pooled time-series cross-sectional model for floating-rate tranches of non-mortgage-rated securitization transactions. The baseline regression model contains primary market spread on dummy variables for (1) credit rating, (2) quarter, and (3) tranche size. We examined them in a multivariate framework on a sample of 831 tranche observations between 1999 and 2006. To remove systematic heterogeneity from the error term, we used a heteroskedasticity-consistent variance-covariance matrix (White, 1980).

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[15] The currency of the issue has to be analyzed carefully since a tranche's value is often stated in the foreign currency. In order to include the issues denominated in different currencies in the analysis, we converted them into euros. The exchange rate used is the average rate of the year the issue was launched. This information was obtained from the Nederlandsche Bank.

It is important to note that including time dummy variables in the empirical model is required not only because we measure bond market conditions with the help of these variables, but also because the standard errors related to time may be correlated across tranches as a result of the fact that our dataset is a pooled time-series and cross-section panel. Thus, tranches in the aggregate may be affected by the same bond market conditions. This made it necessary to include time dummies in order to control for this effect.

In assigning ratings, the rating agencies explicitly review the underlying collateral characteristics. Nevertheless, tranches may also share some unmodeled heterogeneity with respect to the collateral type that would cause serially correlated errors in our regression.[16] We account for the potential serial-correlation problem by allowing for clustering of the error term at the collateral level. Thus, by adding collateral type in our baseline regression model, we constructed a panel-data fixed-effects model that preserves the dispersion across tranches, but does not exploit any collateral variation in the observations.

To categorize our sample by collateral type, we used the classification scheme proposed by Moody's Investors Service (2002, 2005). This rating agency identifies 10 asset types for ABS: automobile loans, consumer loans, future receivables, equipment leases, credit card receivables, trade receivables, small business loans, aircraft leases, whole business, and others.[17] To account for the potential error-dependence problem, we reestimate the baseline regression model including dummy variables for Moody's collateral classifications. The dummy variable is assigned a value of one if the tranche was part of a securitization that corresponded to the

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[16] Another general form of dependence which is common in finance applications that is raised by Peterson (2009) is the so-called "firm effect" where the standard errors are clustered by firm. In our sample we cluster the standard errors by collateral type instead because there is no firm affect by the very nature of securitization.

[17] Auto loans, credit card receivables and consumer loans are considered consumer ABS, while equipment leases, aircraft leases, small business loans, future receivables and whole business loans are commercial ABS, see Fabozzi (2007, Chapter 14).

collateral classification provided by Moody's, and zero otherwise. The definition of each type of collateral is briefly revised next.

Automobile loans are loans granted to borrowers in order to finance the purchase of new or used automobiles, and are typically secured by liens on the automobiles being financed. Consumer loans are unsecured loans granted to individuals and used for different purposes (e.g., car, home, equipment, and furniture). Credit card receivables are loans granted to consumers in order to finance the purchase of goods and services, and are generally unsecured. Future receivables refer to the securitization of receivables that do not exist at the time of issuance of the security. Created as a function of future sales, they are used to finance the time lag between the start of an obligation and payment or redemption of the related debt. Small business loans are loans made available for small businesses seeking to make capital investments, and may be secured. Aircraft leases and equipment leases are both agreements between an owner (lessor) and a user (lessee), whereby the lessee makes a periodic payment to the lessor for the use of the product. Equipment leases are considered to be small or medium-sized, while aircraft leasing falls under the big-sized leases. Trade receivables are unsecured obligations generated when one business sells goods or services to another. Whole business loans or whole loan securitizations are granted to a business, and the originator intends to repay the loan out of the cash flows generated by its business. It should be noted that the collateral type that is atypical of a securitization is the whole business securitization. For an explanation as to why, see Fabozzi and Kothari (2008, pp. 195-204).[18] Other loans are issues secured by assets that do not fall into any of the categories described above.

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[18] Whole business securitization began in the United Kingdom during the mid 1990s when the cash flow of a nursing home were securitized. This led to a spate of transactions in various spheres such as pubs, hospitals, entertainment and amusement sites, airports, theaters, and ferry services.

4.2 Credit Rating, Liquidity, and Bond Market Conditions

In Table 2 we report the results of the estimated baseline regression model and panel-data fixed-effects regression model, as well as four variants of these two regression models on the entire sample (831 tranches). (Regression 4 in the table is the baseline regression model.) The first four regressions in the table are ordinary least squares (OLS) regressions on the entire pooled time-series cross-section data without collateral fixed effects. The first two regressions in the table are without quarter dummies, the second two regressions include quarter dummies in order to remove secular time effects among the independent variables. The last two regressions include collateral fixed effects. The F-statistics indicate that each of the regressions in Table 2 is significant at reasonable levels. Coefficients on quarter dummies are not reported.

Several important regularities emerge from the regression estimates in Table 2. We find almost all credit rating dummy variables (*AAA/Aaa,....,Ba3/BB-*) statistically significant at the 1% level in all regressions that include ratings, and the pattern presented by the coefficient dummies indicates that the primary market spread rises when ratings worsen (see Figure 1). Credit rating dummies appear to be the most important variables in determining the variability in the primary market spread. This is confirmed by the adjusted R^2 of 0.68 in regression 1 where only credit rating dummies were included.

Adding time and liquidity dummies in regression 4 generally leaves the credit rating coefficients unaffected, but significantly increases the adjusted R^2 from 0.68 to 0.71 (F- statistic is 3.67). The adjusted R^2 of 0.68 in regression 1 (which includes credit rating only) compared with the significantly larger R^2 of 0.71 in regression 3 (which also includes time dummies) suggests that it is primarily bond market conditions, not liquidity, that provides the added explanatory power in this regression.

Figure 2 shows a trend suggesting that in our sample ranging from 1999 to 2006 the primary market spread, on average, declines over time. The coefficients for the quarter dummy variables are all negative and most of these dummies are highly significant (the first quarter of 1999 is the omitted category). These findings correspond to the favorable bond market conditions in capital markets witnessed during most of these years.

A result that we found to be different from what has been observed in corporate bond market studies is the failure of liquidity to be a statistically significant in explaining primary market spreads. In regression 2, which also includes credit rating dummies, we found significantly lower spread for tranches with a size of more than €1 billion compared with tranches varying between €0 and €500 (t-statistic is −3.10). All other things being equal, tranche with a size of more than €1 billion decreases the primary market spread by -7.91 basis points. But, the economic significance of this factor is questionable. First, the F-statistic resulting from adding liquidity dummies in regression 2 indicates that they are not jointly different from zero (F-statistic for change is 0.25). Thus, adding liquidity does not significantly increase the R^2 of the regression model. Second, in the baseline regression model (regression 4) as well as in the panel-data fixed-effects model (regression 5), liquidity factors become insignificant when we include quarter dummies (t-statistics for liquidity factors range from -0.58 to -1.58). Thus, a mechanical association between bond market conditions and primary market spreads could generate a spurious relation between primary market spread and size.

Consistent with our expectations, collateral type is a key determinant of the primary market spread of a tranche. Adding collateral fixed effects to the baseline regression model that includes credit rating, quarter, and size dummies significantly increases adjusted R^2 in regression 5 by 0.02 to 0.73 (F-statistic of change is 5.06).

In regression 5, we found four collateral dummy variables ─ credit card receivables, trade receivables, whole-business loans, and other loans ─ that each demonstrated a highly statistically significant impact on the primary market spread (automobile loans is the omitted group). We used automobile ABS as the omitted class because it is generally recognized that this sector is the mainstay of the ABS market (see Schultz et al, 2008, p. 100). For three collateral types that are statistically significant, the coefficients for their respective dummy variables are positive, indicating the spread is higher; t-statistics range from 2.51 for trade receivables to 6.55 for whole-business. Credit card receivables is the only variable with a negative coefficient (the t-statistic is -2.30), indicating that the spread is smaller.

It should be noted that the collateral type with the largest coefficient by far is whole business securitization with a coefficient of 108.26 in regression 6 (without credit rating dummies), indicating that a tranche in a whole business securitization has a primary market spread that is 108.26 basis points higher. This is consistent with our expectations that whole business securitization is not a typical securitization and that investors would want to be compensated accordingly. Overall, our results suggest that the collateral dummies capture additional risk that is not explained by the other credit and non-credit factors.

5. Testing the Over-Reliance Hypothesis

5.1 Methodology

As noted in Section 1, a major concern of regulators is the over-reliance on ratings by investors. One reasonable approach to test this is by investigating if there are factors that are taken into account by rating agencies in assigning rating that are statistically significant even after adjusting for credit rating. That is, our null hypothesis is that any explanatory variable that

proxies for a factor that a rating agency has identified in its methodology reports that it takes into account, should not be statistically significant when ratings are considered in a regression if the over-reliance hypothesis is correct. If, instead, a factor already considered by a rating agency is statistically significant, it may suggest that there is information beyond the rating (holding aside bond market conditions and liquidity) that investors do consider.

We test the over-reliance hypothesis by a panel-data fixed-effects regression model that includes the credit rating and additional variables that are credit related: currency risk, internal credit enhancement, external credit enhancement, collateral origination, and creditor protection. As noted in Section 2, the rating agencies take each one of these factors into account in assigning a rating. A discussion of these other variables and their expected impact on primary market spreads is given below.

5.2 Credit-Related Factors

5.2.1 *Currency Risk*

Currency risk is the risk exposure faced by an investor when there is a difference between the currency in which the collateral pays and the currency in which the tranche's cash flows are paid. Rating agencies take into account currency risk by measuring the likelihood of repayment in the currency of jurisdiction in which the issuer is domiciled. Also, rating agencies are likely to require that the legal entity issuing the ABS put on a hedge against this risk. Consequently, a prior one would expect currency risk not to have an impact on the primary market spread. In our regression, currency risk is measured by a dummy variable that takes the value of one if a tranche is exposed to currency risk, and zero otherwise.

5.2.2 *External Credit Enhancement*

All securitizations have one or more forms of credit enhancement. Credit enhancements may be internal and/or external in the form of third-party guarantees. Prior to the subprime mortgage crisis, the most common form of external credit enhancement was an insurance policy issued by one of the monoline insurance companies. These providers guarantee the principal and interest payments of an issue. For each tranche, we collected information about whether or not the tranche was from a securitization transaction that is guaranteed by a third party. In our regression, external credit enhancement represents a dummy variable that takes the value of one if an issue is guaranteed by a third-party and zero otherwise.

5.2.3 *Internal Credit Enhancement*

With respect to internal credit enhancement (also referred to as structural credit enhancement), the most common form is the senior-subordinate structure as measured by a tranche's subordination level. To compute the subordination levels, we first divided the value of each tranche by the total amount of the transaction's liabilities. This was done for transactions that contain more than one tranche, since if a transaction contains only one tranche, the subordination level is 100% because no subordination exists. We then calculated the subordination level ratio according to the priority structure for each tranche in our sample.

5.2.4 *Collateral Origination*

Origination in an emerging market country is an important credit factor that a rating agency considers in assigning a rating. Although emerging countries differ in terms of risk, rating agencies believe that origination in an emerging market country carries essential consequences

concerning the extent to which the tranches are expected to be repaid from the collateral's cash flows. Emerging countries tend to have weaker legal and political frameworks to support securitization and the efficiency of their financial market is less developed than is the case for developed countries.

Using the Morgan Stanley Country Index (2006), we identified emerging and developed countries. We constructed a dummy variable taking the value of one if the securitization transaction for which a tranche is included has collateral originated in an emerging market, and zero if the collateral originated in a developed market.

5.2.5 *Creditor Protection*

The analysis of creditor protection is an important factor considered by the rating agencies because it takes into account the control and cash flow rights different classes of lenders have in a bankruptcy proceeding. The key in a securitization transaction is to isolate the holders of the tranches from the credit risk of the originator of the collateral. This is done via a legal structure known as a special purpose bankruptcy-remote vehicle (SPV). The collateral is sold to this entity by the originator in a true sale at fair market value.

In order to test the over-reliance hypothesis, we had to obtain a suitable proxy for creditor protection that could be included in the regression model. To do so, we gathered data on the creditor protection in the countries where the underlying collateral of the tranches are originated

using the creditor rights index created by La Porta *et al* (2000). The authors used four legal rights variables that they employed in their analysis to measure creditor protection by country.[19]

Of these four variables, we found one to be relevant to the pricing of ABS, namely *no automatic stay on the assets*. This variable measures the risk of preventing secured creditors from gaining possession of their security when the firm is filling the reorganization petition. The prevailing legal view for the structuring of an ABS entails that in a bankruptcy of the originator, the collateral sold to the SPV cannot be recovered by the creditors of the originator. Therefore, we expect that tranches issued in countries where secured creditors are prevented from gaining possession of the originator's collateral will have a higher primary market spread.

We measured creditor protection for each tranche in our sample by including a dummy taking the value of one if the underlying collateral was originated in a country where creditor protection forms part of the law, and zero otherwise.

5.3 Results and Analysis

In Section 5.2 we explained factors that rating agencies consider in assigning ratings and which should be redundant when included in a regression that already takes into account credit rating. We refer to these factors as "credit-related redundant factors" since, based on the rating agencies stated methodologies, they were already considered in assigning a credit rating.

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[19] The first variable is *no automatic stay on the assets*, automatic stay prevents secured creditors from getting possession of their security in a reorganization of the firm. In contrast, secured creditors can pull collateral from firms being reorganized, a right that is of value to them. The second variable is *secured creditors paid first*, in other words the assurance that the secured creditors have absolute priority over the collateral in a reorganization process. Third, there is a *restriction for going into reorganization*, and here creditor consent is needed to file for reorganization. Hence, managers cannot so easily escape creditor demands. Fourth, we have *management does not stay in reorganizations*, as is the case in the United Kingdom, where the creditors have the power to replace management

In Table 3, we test the effect of the credit-related redundant factors on primary market spreads in regression 5 that excludes credit rating, but includes instead the other factors tested in Section 4 (quarter, liquidity, and collateral dummies). The credit-related redundant factors are important determinants of the primary market spread. Including these factors increases the adjusted R^2 from 0.13 in regression 6 (without the credit-related redundant factors) reported in Table 2 to 0.26 in regression 4 as reported in Table 3.

To examine the credit-related redundant factors, we re-estimated the panel-data fixed-effects model. Regression 3 of Table 3 reports the results using the credit-related redundant factors with the inclusion of credit rating, liquidity, quarter and collateral dummies. The F-statistic for the credit-related redundant factors indicates that they are jointly different from zero (F-statistic is 5.67). However, the adjusted R^2 in this regression increases from 0.73 in the panel-data fixed-effects model to a mere 0.74 with these factors. Although the credit-related redundant factors have a rather limited explanatory power, several of the regression results nevertheless provide interesting insights into the factors that investors take into account beyond the credit rating of a tranche.[20] We summarize these below.

The dummy variable for tranches with external credit enhancement is significantly negative (t-statistic is -5.22). All other things being equal, external credit enhancement decreases the primary market spread by -28 basis points despite the fact that this credit support is considered in assigning a tranche's rating. This means that the market seemed to be assigning

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[20] We examined the sensitivity of our results to when there are split ratings. In regression 3 of Table 3 we included a dummy variable to indicate whether the tranche has a split rating. This variable takes the value of one if the tranche has a split rating, and zero otherwise. As expected, the coefficient for the split-rating dummy is significantly negative. However, the inclusion of split ratings does not affect the size or the statistical significance of the other coefficients. As such, split ratings do not appear to be driving our results.

more value to external credit support than the rating agencies. (Unfortunately, as we know from the subprime mortgage crisis, the market view was wrong.)

The coefficient for the internal credit enhancement is negative and insignificant. It should be noted that without the inclusion of credit ratings in regression 5, the economic significance of this variable is clearly dramatic. This coefficient indicates that, on average, tranches with more subordination have significantly lower spreads. Of course, this supports the reason why rating agencies require credit enhancement.

Tranches with collateral originated in emerging countries tend to have higher spreads. This effect is statistically and economically significant and is consistent with the argument that collateral originated in emerging markets carries more risk; however, this result may reflect collinearity with our measure for currency risk. The Pearson correlation between emerging markets and currency risk is 0.43, leading us to investigate regression 4 which excludes currency risk. The emerging market dummy changes only marginally and remains highly significant (*t*-statistic changes from 2.43 to 3.05).

We also find that investors, on average, require a larger spread when tranches are concerned in which the SPV runs higher risks of failing to obtain possession of loan collateral in bankruptcy of the originator. The rationale for this is that investor enjoy less protection in a case of default of the sponsor because in such cases the risk increases that the collateral ─ irrespective of its bankruptcy remoteness ─ is considered part of the originating corporation's bankruptcy estate. This, in turn, restricts the lenders' collection rights.

Overall, these tests support the hypothesis that despite heavy reliance on credit ratings, investors do consider factors that the rating agencies state that they consider in assigning ratings. Hence, there is reason to suspect that the notion of pure reliance on assigned ratings that has been popularized in the market is incorrect.

6. Conclusions

While the literature abounds with empirical studies examining spreads on corporate bonds, there is no empirical evidence that we are aware of that has examined spreads for ABS. In this paper, we presented a first–time investigation into the size and causes of differences in primary market spreads on tranches of securitization transactions issued over the period 1999 to 2006. We employ a panel-data fixed-effects model in our investigation. The nature of the securitized products requires care in designing empirical tests of spreads because one cannot draw upon certain variables used in the studies of corporate spreads. After reviewing the factors considered by rating agencies in assigning ratings, we examined three factors that would be expected to impact primary market spreads: credit ratings, bond market conditions, and liquidity.

We found that credit rating is a major factor in accounting for the overall primary market spread and that a substantial part of the remainder of the spread is due to bond market conditions. In contrast with findings reported in corporate bond market studies, we did not find liquidity to be statistically significant in explaining primary market spreads.

Finally, we tested the over-reliance hypothesis by formulating an empirical framework to analyze if any explanatory variables that proxies for a factor identified by rating agencies in their methodology reports (and taken into account in assigning ratings) is statistically significant when ratings are considered in a regression. In the regression models we estimated, we included credit rating and other credit-related variables that are of importance to the rating assessment of ABS. These include currency risk, credit enhancement, emerging market issuance, and creditor protection. Our results suggest that although ABS investors do rely heavily rely on credit ratings, they do not ignore other credit-related factors that are already considered in assigning ratings.

Hence, this may suggest the over-reliance hypothesis that is of major concern to regulators may be an overstatement of the behavior of ABS investors.

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Table 1

Sample Breakdown by Credit Rating

Credit rating	# ABS	Mean	Std. Dev.	Min.	Max.
AAA/Aaa	337	40.9%	0.5	0	1
AA+/Aa1	14	1.7%	0.1	0	1
AA/Aa2	68	8.1%	0.3	0	1
AA-/Aa3	14	1.7%	0.1	0	1
A+/A1	37	4.4%	0.2	0	1
A/A2	152	18.3%	0.4	0	1
A-/A3	24	2.9%	0.2	0	1
BBB+/Baa1	7	0.8%	0.1	0	1
BBB/Baa2	118	14.1%	0.3	0	1
BBB-/Baa3	24	3.0%	0.2	0	1
BB+/Ba1	6	0.7%	0.1	0	1
BB/Ba2	22	2.6%	0.2	0	1
BB-/Ba3	8	1.0%	0.1	0	1
Total	831	100%			

Breakdown of the 1999-2006 sample into credit rating categories. The numerical classification and the number of tranches (#ABS) are reported by credit rating.
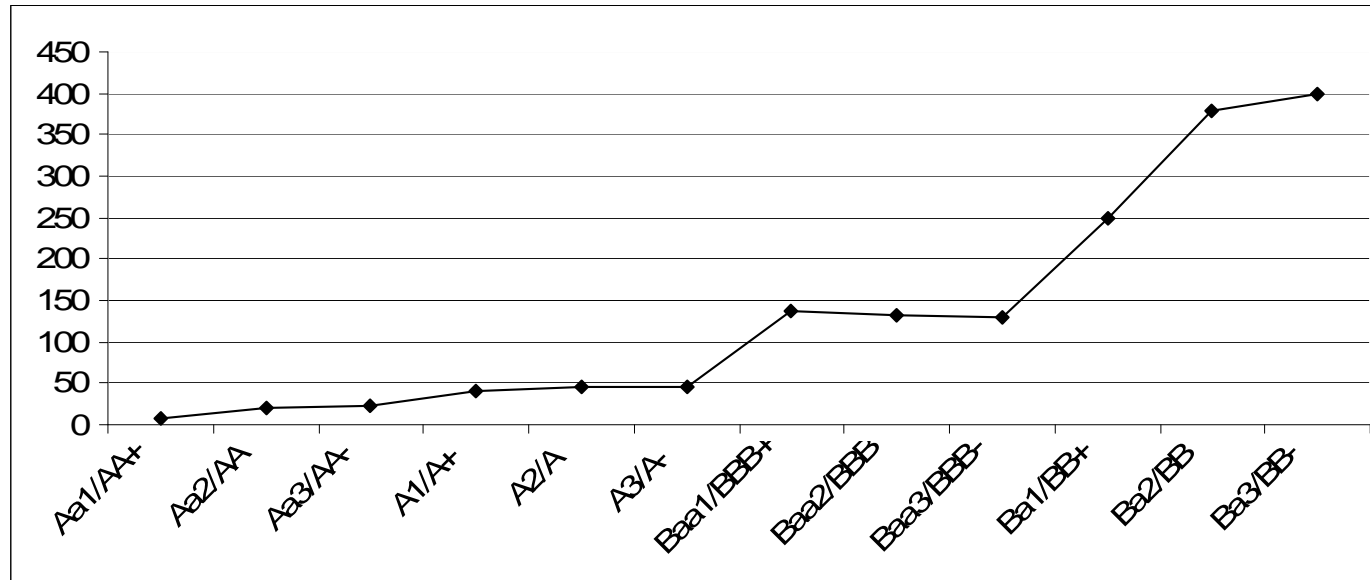
Table 2

Table 2

Determinants of Primary Market Spread

	1	2	3	4	5	6
Intercept	25.08 [a]	26.15 [a]	77.12 [a]	71.51 [a]	71.89 [a]	111.13 [a]
	(8.03)	(23.75)	(4.38)	(3.95)	(3.99)	(3.72)
Aa1/AA+	5.81	4.73	6.09	8.51	7.16	-
	(0.30)	(0.52)	(0.32)	(0.46)	(0.39)	-
Aa2/AA	26.22 [a]	25.26 [a]	25.03 [a]	23.49 [a]	21.32 [a]	-
	(3.45)	(7.58)	(3.39)	(6.18)	(2.70)	-
Aa3/AA	21.98 [b]	21.09 [b]	31.02 [b]	29.60 [b]	25.79 [a]	-
	(1.48)	(2.29)	(2.16)	(3.85)	(3.26)	-
A1/A+	39.09 [a]	38.01 [a]	46.56 [a]	45.65 [a]	50.87 [a]	-
	(2.79)	(2.85)	(3.41)	(3.94)	(3.63)	-
A2/A	53.68 [a]	52.03 [a]	49.62 [a]	54.28 [a]	45.31 [a]	-
	(9.88)	(16.39)	(9.42)	(8.24)	(6.89)	-
A3/A-	69.14 [a]	68.17 [a]	70.08 [a]	73.73 [a]	60.67 [a]	-
	(5.97)	(6.99)	(6.27)	(6.44)	(6.75)	-
Baa1/BBB+	147.52 [a]	146.44 [b]	142.25 [c]	140.69 [c]	137.87 [c]	-
	(5.65)	(1.97)	(1.89)	(1.87)	(1.80)	-
Baa2/BBB	144.35 [a]	143.18 [a]	143.86 [a]	142.58 [a]	138.47 [a]	-
	(23.12)	(18.91)	(23.87)	(20.63)	(19.25)	-
Baa3/BBB-	130.92 [a]	129.85 [a]	135.38 [a]	139.46 [a]	129.38 [a]	-
	(11.50)	(7.60)	(12.28)	(12.00)	(10.18)	-
Ba1/BB+	196.03 [a]	175.72 [a]	191.34 [a]	190.11 [a]	198.43 [a]	-
	(10.02)	(6.63)	(6.18)	(6.13)	(6.09)	-
Ba2/BB	386.83 [a]	385.75 [a]	388.96 [a]	387.34 [a]	382.88 [a]	-
	(29.69)	(11.83)	(30.51)	(12.22)	(12.58)	-
Ba3/BB-	409.42 [a]	408.35 [a]	412.59 [a]	418.32 [a]	402.06 [a]	-
	(22.02)	(5.04)	(22.87)	(22.44)	(21.93)	-
Amount €500 ≤ €1,000 million	-	-2.87	-	-4.47	-5.52	-65.67 [a]
	-	(-1.15)	-	(-1.33)	(-1.58)	(-10.44)
Amount > €1,000 million	-	-7.91 [a]	-	-3.73	-4.30	-62.62 [a]
	-	(-3.10)	-	(-0.59)	(-0.58)	(-6.42)

Table 2

Determinants of Primary Market Spread (*continued*)

|	1	2	3	4	5	6
Consumer loans	-	-	-	-	0.63	13.69
	-	-	-	-	(0.14)	(1.51)
Credit card receivables	-	-	-	-	-11.75 [b]	33.59 [a]
	-	-	-	-	(-2.30)	(2.71)
Future receivables	-	-	-	-	18.28	31.48
	-	-	-	-	(1.27)	(1.51)
Aircraft leases	-	-	-	-	15.67	20.43
	-	-	-	-	(1.24)	(1.07)
Equipment leases	-	-	-	-	8.02	15.16
	-	-	-	-	(1.38)	(1.83)
Other loans	-	-	-	-	31.78 [a]	51.83 [a]
	-	-	-	-	(4.96)	(4.31)
Small business loans	-	-	-	-	4.13	34.11 [a]
	-	-	-	-	(0.82)	(3.38)
Trade receivables	-	-	-	-	16.25 [b]	-24.13
	-	-	-	-	(2.51)	(-1.33)
Whole business loans	-	-	-	-	44.24 [a]	108.26 [a]
	-	-	-	-	(6.55)	(6.14)
QUARTER DUMMIES	N	N	Y	Y	Y	Y
adjusted R^2	0.68	0.68	0.71	0.71	0.73	0.13
F	149.11	125.43	50.94	47.52	44.89	6.51
p	0.00	0.00	0.00	0.00	0.00	0.00
Number of observations	831	831	831	831	831	831
R^2 change	-	0.00	0.04	0.04	0.07	-
F change	-	0.25	3.95	3.67	5.06	-
p change	-	0.78	0.00	0.00	0.00	-

The sign "-" means for not included. The table shows the coefficient and *t*-statistic, corrected for heteroscedasticity, in parentheses. The letters a, b, c denote parameter estimates for which zero falls outside the 99%, 95%, and 90% posterior confidence intervals, respectively. The three rows at the bottom of the table list R^2 change, and *F*-statistics and *p*-values to test if the corresponding model explains a significantly higher portion of the spread variability compared to regression model 1. The omitted categories are: *AAA/Aaa* rating class for credit ratings, *automobile loans* for collateral characteristics, *the first quarter of 1999* for bond market conditions, and *amount €0 ≤ €500 million* for liquidity features.

Figure 1

Estimated Plot of OLS Credit Rating Coefficients

Plot of credit rating coefficients obtained from Regression 1 in Table 2. Includes 831 ABS issued between 1999 and 2006.

Figure 2

Estimated Plot of Significant OLS Quarter Dummy Variables
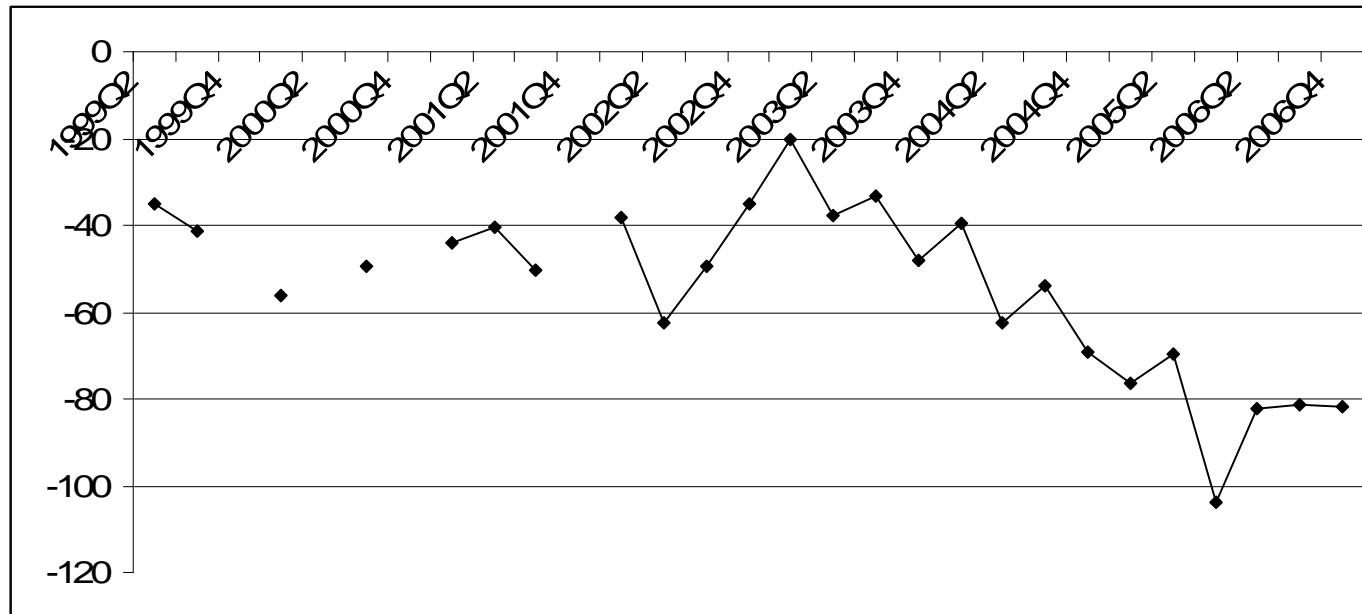
Plot of significant quarter dummy coefficients obtained from regression 6 in Table 2. It includes 831 ABS issues between 1999 and 2006. We found the following quarter dummy variables not significant: fourth quarter of 1999, fourth quarter of 2000, fourth quarter of 2004, and second quarter of 2002. These variables are excluded from the table. The sample does not contain tranches issued in the fourth quarter of 2005 and in the first quarter of 2006. Quarter dummy variables correspond to different quarters and capture the effect on credit spread exerted by variation changes in macroeconomic conditions.

Table 3
Credit-Related Redundant Factors

	1	2	3	4	5
Intercept	25.08 [a]	71.89 [a]	58.05 [a]	61.50 [a]	-
	(8.03)	(3.99)	(3.42)	(3.79)	-
Aa1/AA+	5.81	7.16	10.45 [b]	11.57 [b]	-
	(0.30)	(0.39)	(0.58)	(2.00)	-
Aa2/AA	26.22 [a]	21.32 [a]	24.36 [a]	14.96 [a]	-
	(3.45)	(2.70)	(3.41)	(3.53)	-
Aa3/AA	21.98	25.79 [c]	21.46 [b]	16.33 [b]	-
	(1.48)	(1.80)	(1.55)	(1.89)	-
A1/A+	39.09 [a]	50.87 [a]	50.95 [a]	49.52 [a]	-
	(2.79)	(3.63)	(3.86)	(4.88)	-
A2/A	53.68 [a]	45.31 [a]	48.35 [a]	40.15 [a]	-
	(9.88)	(6.89)	(9.55)	(10.70)	-
A3/A-	69.14 [a]	59.89 [a]	52.13 [a]	47.37 [a]	-
	(5.97)	(5.21)	(4.77)	(5.15)	-
Baa1/BBB+	147.52 [a]	137.87 [a]	136.56 [a]	135.13 [c]	-
	(5.65)	(5.33)	(5.45)	(1.82)	-
Baa2/BBB	144.35 [a]	138.47 [a]	137.98 [a]	131.95 [a]	-
	(23.12)	(19.25)	(23.56)	(17.59)	-
Baa3/BBB-	130.92 [a]	125.49 [a]	124.25 [a]	123.36 [a]	-
	(11.50)	(11.02)	(11.69)	(9.53)	-
Ba1/BB+	196.03 [a]	215.29 [a]	213.33 [a]	190.07 [a]	-
	(10.02)	(11.38)	(11.68)	(5.78)	-
Ba2/BB	386.83 [a]	318.27 [a]	379.51 [a]	375.52 [a]	-
	(29.69)	(28.92)	(30.84)	(12.41)	-
Ba3/BB-	409.42 [a]	402.06 [a]	400.84 [a]	385.61 [a]	-
	(22.02)	(21.93)	(22.60)	(4.58)	-
Currency risk	-	-	8.23	-	12.09
	-	-	(1.07)	-	(0.88)

Table 3
Credit-Related Redundant Factors (*continued*)

	1	2	3	4	5
Internal credit enhancement	-	-	-6.59	-6.08	-127.11 [a]
	-	-	(-0.67)	(-0.62)	(-7.09)
External credit enhancement	-	-	-28.00 [a]	-27.83 [a]	-83.99 [a]
	-	-	(-5.22)	(-5.23)	(-11.39)
Emerging market	-	-	39.25 [b]	46.83 [a]	61.92 [b]
	-	-	(2.43)	(3.05)	(2.42)
Creditor protection	-	-	-16.86 [a]	-17.77 [a]	-18.42
	-	-	(-2.63)	(-2.79)	(-1.63)
QUARTER-DUMMIES	N	Y	Y	Y	Y
LIQUIDITY-DUMMIES	N	Y	Y	Y	Y
COLLATERAL-DUMMIES	N	Y	Y	Y	Y
adjusted R^2	0.68	0.73	0.74	0.74	0.26
F	149.11	44.89	40.95	40.95	6.08
p	0.00	0.00	0.00	0.00	0.00
Number of observations	831	831	831	831	831
R^2 change	-	-	0.01	0.01	-
F change	-	-	5.67	5.67	-
p change	-	-	0.00	0.00	-

The sign "-" means for not included. The table shows the coefficient and *t*-statistic, corrected for heteroscedasticity, in parentheses. The letters a, b, c denote parameter estimates for which zero falls outside the 99%, 95% and 90% posterior confidence intervals, respectively. The omitted category for credit ratings is the *AAA/Aaa* rating class.