Financial Intermediation Theory and the Sources of Value in Structured Finance Markets*

Janet Mitchell**
National Bank of Belgium

December, 2004

* This paper was written in conjunction with the author's participation in the CGFS Working Group on The Role of Ratings in Structured Finance Markets.

** Department of International Cooperation and Financial Stability, National Bank of Belgium. E-mail: janet.mitchell@nbb.be

1. Introduction

Structured finance instruments represent a form of securitization technology which can be defined by three key characteristics: (1) pooling of financial assets, such as loans, bonds, or credit-default swaps; (2) de-linking of the credit risk of the asset pool from the credit risk of the originating firm,[1] usually through use of a finite-lived, stand-alone special purpose vehicle (SPV); and (3) issuance by the SPV of "tranched" liabilities backed by the asset pool. Tranching accomplishes the "splitting" of cash flows from the asset pool into separate classes of liabilities with differing risk and return characteristics. For example, tranching may create securities with differing seniority; the most junior tranche, i.e., the "equity tranche", absorbs initial losses in the asset pool up to some level, followed by the mezzanine tranche, followed by more senior tranches. Payments to senior tranche holders are insulated from defaults in the asset pool to the extent that losses are absorbed by the equity and mezzanine tranches.

Tranching is the key feature that distinguishes structured finance instruments from traditional securitization products (sometimes referred to as pass-through instruments). The latter are typically composed of pools of large numbers of loans (e.g., residential mortgages or credit-card loans) which have been transferred (de-linked) from the originator's balance sheet to an SPV, which then sells shares in the pool. Another feature that distinguishes some structured finance (SF) from traditional securitization products is the nature of the underlying assets: structured finance products are often made up of pools of relatively small numbers of assets acquired through financial markets, rather than large pools of loans originated by a financial intermediary. The assets included in the SF pool may also be "unconventional", such as tranches of other structured finance instruments (e.g., a collateralized debt obligation (CDO) made up of tranches of other CDOs).

This paper makes use of finance literature relating to security design and securitization to identify economic forces underlying the creation of SF instruments. Questions addressed include: Under what conditions does the introduction of structured finance instruments create value? What explains the use of a structured finance product rather than a traditional securitization, or pass-through instrument? Although tranching of liabilities is the distinguishing characteristic of structured finance relative to traditional securitization, it is nevertheless important to identify the benefits associated with each of the three defining characteristics of SF products in order to understand the situations in which SF markets are likely to arise. Section 2 of the paper discusses briefly the benefits of de-linking. Section 3 discusses the benefits of issuing securities against pooled assets and identifies the situations in which issuing tranched liabilities against the asset pool can add value relative to a pass-through security offering a simple share in the cash flows of the pool. This section also addresses issues relating to governance of the SPV and, by definition, of the SF transaction. Section 4 offers some concluding remarks.

2. De-linking and credit risk

The de-linking of assets, which is common both to traditional securitizations and to structured finance, resembles secured borrowing, but nevertheless generates benefits for financial intermediaries and investors which go beyond those of classical secured loans. The resemblance of structured finance to secured borrowing derives from the use of

[1] The term originating firm, or originator, refers to the financial intermediary originating the assets. In the case of loans, this will be the lender. In the case of assets such as bonds, which are traded in financial markets, the originating firm will be the intermediary, e.g., an investment bank, which has purchased the assets in the market and whose balance sheet contains the assets prior to de-linking.

collateral (ie, the underlying asset pool) to back the SF securities and from the fact that the collateral will not come under court jurisdiction should the originator file for bankruptcy. Yet, despite the provision of collateral, structured finance differs from traditional secured borrowing in that payments to the secured creditors (ie, the holders of the notes issued by the SPV) are affected only by the performance of the de-linked asset pool and not by the performance of the originating firm. While defaults in the underlying asset pool will lower the payments to the SPV note holders, other factors, such as poor performance by the originator's management, should have no impact.[2]

De-linking thus allows for the issuance of claims secured by portfolios of assets with known characteristics and whose returns may be more certain or stable than the total returns of the originating firm. The greater certainty will be due either to the specific characteristics of the securitized assets, e.g., generating predictable return distributions, or to the more limited governance problems arising within the context of a finite-lived SPV as opposed to the originator as an ongoing concern.[3] Consequently, the credit risk of the de-linked assets is often lower than the credit risk of the originating firm, which facilitates access by the originator to cheaper sources of funding.

3. Pooling of assets and tranching of liabilities

Finance literature makes the distinction between the sale of an asset and the sale of a security backed by the asset (or a pool of assets). In the abstract, any security issued by a nonfinancial firm represents an asset-backed security, where the underlying assets include all of the firm's capital, both physical and human. However, in the case of a financial intermediary – which has financial assets on its balance sheet – the sale of a financial asset can be clearly distinguished from the sale of a security whose return is backed by the asset. A general question that arises with respect to any asset-backed security is: What is the optimal form of the security (e.g., debt or equity)? Questions arising with respect to asset-backed securities issued by financial intermediaries, who can also choose to sell the assets directly, include the following. When should assets be pooled and shares in the pool issued (i.e., a pass-through instrument), as opposed to the assets being sold individually? If asset-backed securities are issued, should two or more securities with heterogeneous characteristics (e.g., debt and equity) be issued against the assets? In other words, should the asset-backed securities be "tranched" by splitting the cash flows?

Given that debt and equity of any firm in effect represent asset-backed securities, the intuition of the Modigliani-Miller theorem can be brought to bear. In a world of perfect financial markets, with no information asymmetries and with all securities tradable in perfectly liquid markets, tranching – or the creation of multiple types of securities backed by the firm's assets – would not add value, as the structure of the firm's liabilities would be irrelevant. Market imperfections must exist in order for tranching, and structured finance instruments more generally, to be profitable. At least three types of market imperfections can be identified as giving rise to value creation via the issuance of tranched liabilities backed by a pool of assets: (1) asymmetric information; (2) market incompleteness; and (3) market segmentation. Each of these market imperfections is considered in turn in the subsections below.

---

[2] To the extent that the structured finance instruments includes loans in the underlying asset pool that were originated by the originator and the originator is designated as the servicer for the loans in the asset pool, then poor performance of the management could impact the performance of the loans.

[3] See Section 3.2.

Finally, Duffie and Garleanu (2001) point out that securitization (i.e., pooling) can improve the liquidity of many types of assets by increasing the number of potential buyers. For example, the number of buyers willing to bid for an individual loan to an unknown firm may be very small and costly to find. Independently of the existence of other types of market imperfections, transaction costs can be reduced and liquidity improved by pooling homogeneous loans and selling shares (or tranches) in the pool.

3.1 Asymmetric information

Different participants in financial markets – firms, financial intermediaries, rating agencies, and investors – typically have varying amounts of information about, or differing abilities to determine, the value of securities offered in the market. Two types of asymmetric information problems commonly arising for nonfinancial firms include: (1) a firm issuing a security has more information about the potential cash flows associated with the security than do investors; (2) some investors have more information about a security's value than other investors; i.e., some investors are "informed" whereas others are "uninformed."

The sale by financial intermediaries of financial assets on their balance sheets or securities backed by these assets gives rise to these two asymmetric information problems. For example, an intermediary originating loans will often have more information about the value of the loans than will potential investors if the loans are offered for sale. In addition, however, with financial intermediaries a third type of asymmetric information problem may appear: (3) intermediaries originating loans may be less informed about the ultimate market value of their assets than are investment banks which may serve as arrangers; i.e., who purchase the assets, repackage them by pooling them with assets originated by other intermediaries, and sell the repackaged assets or securities backed by them. Arrangers will have better information about market values of assets when their pricing models are better than those used by the originators. Also, whereas each originator may have good knowledge of the cash flows from its own assets or asset pools, it does not generally possess data on the cash flows from other originators' pools, in contrast to arrangers, who may have access to such information.

General security design

The literature on security design initially focused on the first adverse selection problem mentioned above. The classic paper by Leland and Pyle (1977) analyzes this problem and shows that when the owners of a firm or project have private information about the project, the amount of their own funds invested in the project will be interpreted as a signal of its quality. In equilibrium, the higher the quality of the project, the greater the amount of equity that will be retained by the owner, and the higher will be the market valuation of the firm.

Gorton and Pennacchi (1990) focus on the second problem of asymmetric information. They consider financial markets with informed and uninformed investors and find that in this context there is scope for "splitting" the cash flows from an asset to create multiple types of securities. In particular, these authors consider an environment with a capital good and a consumption good. Informed investors are assumed to be able to observe returns to capital, whereas uninformed investors are not. In the absence of financial intermediaries, informed investors can form coalitions and benefit from "insider" trading in financial markets (of the capital for consumption good). The trading strategy of the coalition is chosen in such a way that prices do not fully reveal to uninformed investors the state of nature, which allows the informed investors to obtain a profit from their information. One

means by which uninformed investors can protect themselves is to form financial intermediaries and to have the intermediary split its cash flows by issuing safe deposits (riskless debt) to the uninformed investors and equity to informed investors. The uninformed investors, who invest only in deposits, no longer have to trade with informed investors. This model thus offers one potential explanation for the existence of intermediaries. Note, however, that this strategy could also work by having private firms issue a riskless debt security to uninformed investors and equity to informed investors, providing that riskless debt could be issued. In the case of a financial intermediary, the government may have to provide deposit insurance in order for the intermediary's debt to be riskless.

Boot and Thakor (1993) employ intuition similar to that of Gorton and Pennacchi (1990) to argue that in asset markets with asymmetrically informed investors it is optimal for firms to split their cash flows through a senior/subordinated security design. A major difference between the two models, however, is that the optimal security design in Boot and Thakor is supply-driven (i.e., modeled from the security issuer's point of view) rather than demand-driven. Boot and Thakor assume three types of investors: (1) those who are informed about the quality of the firm issuing securities; (2) those who are uninformed about issuer quality and whose demand for the security is random and exogenous; (3) and those who can choose to become informed at a cost. The latter category of investor will make the decision to become informed or not after having observed the aggregate demand for the security by the other two groups, and the decisions of the third category of investors will effectively determine the profitability to the firm of issuing different types of securities. Investors in the third category resemble somewhat a market maker, or perhaps an arranger in a securitization context.

Boot and Thakor consider the case of a firm issuing a single security (therefore, the supply of the security is fixed) and where informed investors learn the firm's type ("good" or "bad") with certainty. Once the group of potentially informed investors – the third investor category – have observed the aggregate demand by the other two categories (and without being able to distinguish the demands of each category), the potentially informed investors decide whether to become informed or not, based upon whether it is profitable to become informed.[4] In equilibrium, the proportion of potentially informed investors who have chosen to become informed will be such that profits from becoming informed have been driven to zero; the marginal potentially informed investor would earn zero profit by incurring the cost to become informed.

Boot and Thakor compare the firm's profit when it issues a single security (equity) paying out the cash flows from the assets versus two securities: one a riskless, senior security (debt) and the other a junior security (equity). In the latter case, it is assumed that some random proportion of the uninformed investors invest in the junior security.[5] The firm's profit from issuing two securities relative to a single one will be positively related to the incentive of the potentially informed investors to become informed when two securities are issued. Boot and Thakor show that it is more profitable for the firm to issue multiple securities, with "information insensitive" cash flows paid to the senior security holders and "information sensitive" cash flows paid to the subordinated security holders. The extra

[4] It will be profitable to become informed if the conditional probability that the firm is "good", given the observed aggregate demand, is high enough so that the expected return to potentially informed investors of becoming informed exceeds the cost.

[5] It is necessary to have at least some uninformed investors (liqudity traders) investing in equity, because if only informed investors invested in this security, it would be possible for the potentially informed investors to costlessly determine the firm's quality.

information sensitivity of the junior security relative to the single-security case increases the incentive of potentially informed investors to become informed and results in a higher equilibrium price for the issuer.

Boot and Thakor also provide some intial intuition as to why pooling of assets (followed by issuance of tranched securities) might be profitable for a firm. If, rather than learning the firm's quality with certainty, informed investors receive noisy signals of quality, then pooling of assets can help investors diversify against the idiosyncratic noise in the quality signal received for each firm.

Asymmetric information in securitization and structured finance

DeMarzo and Duffie (1999) analyze the first asymmetric information problem in the context of securitization by a financial intermediary which desires to raise cash – for example in order to acquire more profitable assets – via the sale of a single security backed by an asset (or portfolio of assets). At the time that the originator sells the asset-backed security, it will have private information about the expected cash flow from the portfolio; therefore, there will be an adverse selection problem similar to that analyzed by Leland and Pyle. The model of DeMarzo and Duffie, however, is more general than that of Leland and Pyle, in that the issuer chooses the optimal security design (as opposed to simply issuing equity, as assumed by Leland and Pyle). It is also more general than the model of Boot and Thakor in that the issuer chooses from among all possible security designs, rather than only two. In addition, the issuer chooses the quantity of security (i.e., cash flows) to sell, whereas Boot and Thakor assume a fixed supply of the security.

DeMarzo and Duffie analyze a situation where the security issuer is informed about the value of the assets, and all investors are uninformed. Similarly to the results of Leland and Pyle, a consequence of the adverse selection problem is that the quantity of the security that the intermediary decides to sell will serve as a signal regarding the assets' cash flows. In equilibrium, the price that investors are willing to pay for an asset-backed security will be a decreasing function of the share of the securitized portfolio that the originator wishes to sell. The originator sells a smaller proportion of a security if the quality of the underlying assets is high.

In addition, DeMarzo and Duffie show that the design of the security has an impact on the severity of the adverse selection problem. It may, for example, be possible for the originator to offer riskless debt, if the cash flows from the assets are known by investors always to exceed some minimum level. This would avoid the adverse selection problem. However, issuing riskless debt would require the originator to retain a certain proportion of the assets' cash flows, and this proportion may be higher than desired. The originator thus faces a tradeoff between the desire to sell the security in order to obtain cash and the reduced liquidity of the security (lower price), due to the adverse selection problem, when high enough quantities are issued.

Interestingly, in the model of DeMarzo and Duffie the security design is chosen prior to the issuer acquiring private information about the assets' cash flows (e.g., the asset portfolio backing the security may not yet have been completely assembled). Thus, the security design itself can not be a signal of the originator's private information; rather, the design is chosen subject to the knowledge that an adverse selection problem will exist at the point where the security is sold. More precisely, DeMarzo and Duffie assume that at the point at which the security is designed, the issuer has not yet acquired private information about the cash flows from the assets; however, the issuer will have acquired the information prior to

deciding the quantity of the security to sell. These assumptions can also accommodate the case of an informed arranger, who designs the security prior to acquiring the assets from an originator and then who acquires private information about the assets, e.g., from a good pricing model, prior to selling the security.

With respect to the optimal security design, DeMarzo and Duffie find that when it is possible to contractually base the security payments on the cash flows of the underlying assets (i.e., when the cash flows of the assets are "verifiable"), then under some rather general conditions, standard debt is the optimal form of security. The standard debt security pays a given face value, unless the cash flows of the assets are less than this face value, in which case the security holders receive the entire cash flows from the assets. Standard debt turns out to be optimal because it is the least information-sensitive security design from among all other designs meeting the same general conditions.[6] In addition, the greater the desire for the issuer to obtain cash, the higher will be the face value set for the debt, and the more the security will resemble equity.[7]

As noted above, in contrast to the case of a nonfinancial firm, a financial intermediary can decide between the sale of an asset and the sale of an asset-backed security. This gives rise to the question of when a financial intermediary wishing to raise cash would prefer to sell assets individually versus issuing an asset-backed security. DeMarzo (2004) uses an extended version of the model of DeMarzo and Duffie (1999) to address this question. More precisely, DeMarzo asks when an intermediary would prefer to sell assets individually versus pooling the assets and selling a share in the pool. Then, he asks whether, in the case of an asset-backed security, the intermediary would prefer to issue differing tranches as opposed to a pass-through instrument. Finally, DeMarzo also analyzes these choices for the case when the third type of asymmetric information problem exists; i.e., where arrangers are informed but originators and investors are not, and he contrasts the results with the case corresponding to the first asymmetric information problem, where the originator is informed but investors (including the arranger) are not.

DeMarzo first considers the situation where originators are privately informed about the values of their assets, and they sell these assets (or securities backed by the assets) to uninformed investors. Then, DeMarzo analyzes the case where originators are uninformed relative to arrangers, who may purchase assets from the originators, repackage them, and sell them to uninformed investors. In both cases, the informed party (originator or arranger) is assumed to have the incentive to raise cash by selling some portion of the assets (or cash flows) on its balance sheet. As in DeMarzo and Duffie (1999), the existence of private information implies that the fraction of the security sold will serve as a signal of its quality. In equilibrium, the fraction sold by the informed originator will be a declining function of the asset's quality.

DeMarzo derives two major results relating to the case of an informed originator. The first result is that the informed originator would prefer to sell the assets individually than to pool them and sell shares in the pool (a pass-through instrument). In other words, sale of individual assets dominates pooling for the originator. The intuition underlying this result is that by selling each asset individually, the originator can choose the optimal fraction to sell of each asset, thereby maximizing the benefit of the private information. When the assets are pooled, some of the benefits of this information will be lost (an "information

[6] In other words, the expected payoffs to standard debt holders will change less if the originator's private information increases than will the expected payoffs of other security forms.

[7] The debt security would be transformed into equity if the face value were set at the maximum possible value of the assets' cash flows.

destruction" effect), since the fraction of the security that the originator sells must be based on the average quality of the pool.

The second result, however, is that the combination of pooling and tranching may be preferred by the originator to the individual sale of assets. This result implies that in certain circumstances pooling and tranching the assets will be preferred to individual sale. When pooling and tranching is the preferred method, the pooling of the assets creates a diversification benefit (arising from the idiosyncratic risk embodied in each asset), and this diversification benefit is greater than the information destruction cost mentioned above. An example of a case where pooling and tranching would be preferred to individual sale of assets would occur when the value of each asset is composed of a privately observed component and a "nonprivate" component, and when the nonprivate component contains an idiosyncratic element that is "important enough." Alternatively, if the private information on asset values is "general", in the sense that the private information is correlated across assets, then pooling and tranching would be more likely to be preferred than if the private information is specific to each asset.

For the case where originators are uninformed and informed arrangers exist, DeMarzo's results change. Now the originator may prefer simple pooling of the assets, and the originator's incentive to pool will be greater the larger is the potential size of the pool. The intuition is that when informed investors (the arrangers) as well as uninformed investors exist, a new adverse selection problem arises. Uninformed investors know that they are competing with informed investors who can identify and purchase the highest quality assets; hence, uniformed investors will be willing to pay less for the assets available to them than if there were no informed investors. Thus, underpricing arises as a result of the adverse selection. The originator can mitigate the underpricing problem – and raise the price that the originator obtains – by pooling the assets, thereby reducing the precision with which the informed investors can make their selection.

The analyses of the two cases – informed originators and uninformed originators with informed arrangers – leads DeMarzo to specify a dynamic model of financial intermediation in which originators sell pooled assets, which are purchased either by uninformed investors in the form of pass-through instruments or by informed intermediaries who repackage the assets (by pooling with other assets) and issue tranches backed by the repackaged assets. Even if originators pool and tranche their assets, informed intermediaries may have an incentive to further pool the tranches and sell the repackaged assets to uninformed investors. Finally, the ability to pool and tranche assets relative to individual sale leads to a higher growth rate for the originator (or arranger), by increasing the quantity of assets that it is able to sell and thus increasing the quantity of more profitable assets that it may acquire.

3.2 Asymmetric information and transaction governance

The literature discussed to this point suggests that when securities are tranched, less informed investors are more likely to purchase the senior tranches and more informed investors the subordinated tranches. Suppose that the tranched security is an asset-backed security where the assets have been "de-linked" and the tranched securities issued by an SPV. How should governance, or control, of the transaction (in particular, substitution of nonperforming assets in the underlying portfolio) be determined? That is, who, if anyone, should take responsibility for restructuring the portfolio if some of the underlying assets become nonperforming? Riddough (1997) addresses this question in the context of a model of asset securitization where the junior security holder is better informed than the senior

security holder. The greater information of the junior security holder suggests that this investor is better placed than the senior security holder to undertake portfolio restructuring in the event of poor performance. However, a conflict of interest between the security holders arises in this case. Just as the equity holders of a firm have an incentive to take more risk (i.e., engage in risk shifting) than bond holders and may want to inefficiently continue the firm in operation when it is insolvent, so may the subordinated security holders of an asset-backed transaction have the incentive to take actions that delay liquidation of the portfolio even when liquidation would be the efficient option. Alternatively, when the underlying assets are securities that are tradable in financial markets, the subordinated note holder may have an incentive to replace non-performing assets with substitute securities of low credit quality but with high yields. Both of these types of actions by subordinated note holders would be opposed by the senior security holders.

The conflict of interest created by granting the informed junior security holder control rights thus leads to a governance problem. As suggested above, this conflict of interest bears some similarity with the conflict of interest arising between debt and equity holders of a long-lived firm. Yet, there are also some important differences. For the long-lived firm, as long as it is highly profitable (i.e., in "good" times), the interests of the equity holders and debt holders will be aligned. The equity holders effectively hold a call option on the firm with exercise price equal to the debt. In good times this option is in the money, and the equity holders' interest in the long-term survival of the firm argues for giving them control over the firm. However, as the firm's profit decreases and bankruptcy becomes likely (i.e., in "bad" times), the equity holders' option moves out of the money, which creates incentives for the equity holders to gamble with the firms' assets at the debtholders' expense. Consequently, equity holders generally lose control in bad times.[8]

Unlike a long-lived firm, the SPV (or equivalently, the structured finance transaction), is of limited duration. In addition, because the underlying assets are most often fixed-income, there is only a very limited "upside" that could be generated via management or control of the transaction. Management's role becomes important only when defaults occur in the portfolio or when prepayments are made on loans in the asset pool and the cash needs to be reinvested. In addition, SF equity holders have an incentive to try to capture as much return as early on as possible, in order to insure themselves of earning the "required" rate of return. Thus, the conflict of interest between the junior and senior classes of claimants is present from the beginning of the transaction.

A number of potential solutions to the SF governance problem exist. First, as suggested above, the junior security holder could be granted control rights; however, in this case, senior noteholders would require additional ex ante subordination, which could be quite costly. Second, the junior security holder could be granted control, but with limitations imposed ex ante on its actions. Next, a third party can be designated to manage the portfolio. However, if this manager must hold one or more of the tranches in order to signal a commitment to properly managing the portfolio, then the conflict of interest may reappear at the asset manager level. The final possibility is to have an unmanaged, or static, transaction in which no modifications of the original portfolio are allowed. This alternative, however, can also prove costly since the lack of asset substitutability would limit the ability for all note holders to benefit from early identification and substitution of non-performing assets. In practice, the structural provisions of managed structured finance

[8] A common feature of bankruptcy laws in most countries is to transfer control of the firm from shareholders to either the debtors or a court-appointed administrator. Chapter 11 of the U.S. bankruptcy law constitutes an exception to this rule.

instruments impose strict contractual limitations on the actions that note holders and/or third-party managers can take. Indeed, much of the contractual structure of SF transactions is devoted to specifying the rights and responsibilities of the noteholders, asset managers, and other third parties involved in the transaction. These provisions take the place of the discretionary control rights granted to equity holders in long-lived firms.

3.3 Market completion

In an "Arrow-Debreu world" with perfect and complete markets, financial innovation via the issuance of new types of securities cannot be profitable for firms or add value for investors, since the cash flows from any new security can be replicated by a combination of existing securities. Indeed, when markets are complete, the price of any new security can be uniquely determined by computing the price corresponding to the combination of existing securities which replicates the new security's cash flows. When markets are incomplete, however, adding new types of securities can be beneficial if the securities help to complete markets.

Ross (1976) was the first to demonstrate that contingent claims written on existing assets can improve efficiency by completing markets. Ross also notes, however, that many of the "states of nature" for which markets are incomplete are idiosyncratic to individual investors. If SF arrangers are able to identify the sources of market incompleteness for certain groups of investors, then issuing SF instruments may be profitable, provided that the investors can obtain diversification benefits by adding the SF tranches to their portfolios.[9]

One difficulty faced by issuers of SF securities, however is that it is not possible to determine a unique price for new securities whose cash flows cannot be spanned by existing securities. The SF issuer must find a price that makes the costly structuring profitable and that precludes arbitrage in the market. In addition, the issuer would like to find the most profitable structure, or design, for the new security.

Gaur et al (2003) build on these ideas to devise an algorithm to show how an originator or an arranger can take advantage of incomplete financial markets by "packaging" assets via pooling or via pooling and tranching. If the packaged assets help to complete markets, then the market will place a premium on them, and the originator can profit from pooling and possibly tranching the assets. Gaur et al show that the optimal strategy for maximizing the value of the assets is to "strip away" the portion of cash flows which can be spanned by existing assets – and, therefore, for which a unique price can be determined – and to sell the remaining portion to investors at a price which earns a profit to the seller and precludes arbitrage. Whether to create tranches backed by the pooled assets and how many tranches to create are decision variables in the issuer's optimization problem. The profitability of tranching relative to pooling alone will be determined by the price bounds within which the tranched securities can be sold and which prevent arbitrage.

---

[9] Interestingly, JPMorgan (See, Meli and Rappoport, 2002) has found that equity tranches of small size have very low correlations with either bonds or equities. As equity tranche size increases, the correlations with stocks and bonds increase. Yet, because smaller equity tranches have more variable returns (a smaller tranche can be completely depleted with fewer defaults), equity tranche investors must trade off high variance in returns for low correlations with conventional assets.

The model of Gaur et al follows a body of literature that attempts to place bounds on arbitrage-free prices in incomplete markets. In Gaur et al the "monopoly" seller acts as a price taker, in the sense that it must operate within the bounds dictated by the prices of existing securities, as well as the demands of buyers in "thin" markets. As Gaur et al note, "thus, even though the market is incomplete, there is demand from individuals who are willing to buy unspanned claims at arbitrage-free prices." This suggests that knowledge of specific investors' demands may be quite important for SF issuers, a topic which is discussed in more detail in the following section.

3.4 Market segmentation

Segmentation in financial markets gives rise to arbitrage opportunities which may be exploited by originators or arrangers in creating SF products (i.e., in undertaking pooling of assets and tranching of liabilities as opposed to pooling alone). In fact, market segmentation can create two different types of arbitrage opportunities. First, restrictions imposed by preferences, investment mandates, or regulation may limit access by particular groups of investors to certain securities or cash flows that might otherwise be desirable.[10] Access to private information about individual investors' demands may allow an arranger to design tranches of SF instruments to fit the individual investors' needs; i.e., to achieve the desired cash flows without violating the constraints faced by investors. The arranger takes advantage of knowledge of an investor's demand by practicing price discrimination and to capture part of the premium that the investor is willing to pay for the tailored product.

A second arbitrage opportunity arises when market segmentation leads to pricing differentials among assets which may be included in the underlying collateral pool of SF products. One such arbitrage opportunity derives from differences in corporate bond spreads across rating categories, which may result at least in part from market segmentation. It is indeed a well known stylized fact that average corporate bond spreads are typically higher than the spreads that would be predicted based on default risk alone. Moreover, the magnitudes of the differences appear to vary across ratings categories. Along these lines, a sizeable empirical literature has been devoted to understanding the determinants of bond spreads. (See, for example, Elton et al (2001) and the references cited therein.)

JPMorgan has developed a technique for estimating the minimum spread on a class of bonds that would be necessary to compensate investors for the default risk (taking into account both expected loss and variance of loss).[11] This spread is labeled the "rock-bottom spread". Comparison of the differences between average market spreads and the rock-bottom spreads across rating categories reveals that as one moves down the ratings spectrum from AAA to BB bonds, the difference between the market spread and the rock-bottom spread increases. However, this difference turns negative for bonds rated B and below. That is, market spreads do not appear to compensate investors for the risk associated with B-rated bonds. Although market spreads on B and lower-rated bonds have exhibited considerable variation over time, the negative difference between the market and rock-bottom spread appears to be robust.

---

[10] For example, some institutions are required to confine their investments to only very highly rated securities. Others are allowed only to hold investment-grade assets, with the obligation to sell assets which have been downgraded to noninvestment grade levels. Still other institutions, such as certain high-yield mutual funds, are required to focus their investment in noninvestment-grade securities.

[11] See Rappoport (2001) and Meli and Rappoport (2003).

The explanation put forward by JPMorgan for lower market spreads than rock-bottom spreads for very low-rated bonds is a narrow focus by high-yield bond fund investors on yields alone.[12] According to JPMorgan, the demand for noninvestment-grade bonds is so high relative to the supply that prices are driven to a level such that the spread does not fully compensate for the default risk. JPMorgan also cites market segmentation as an explantion for variations in the difference between market and rock-bottom spreads across other rating categories. For example, institutions which are not allowed to hold noninvestment-grade debt know that if a BBB-rated bond in their portfolio is downgraded, they will have to sell the bond at just the moment when many others will have to sell it, implying a sharp drop in price. Consequently, in order to be willing to hold BBB bonds, these institutions require a premium.

What do structural differences in demand across bond rating categories – and resulting differences in bond spreads relative to default risk – imply for SF instruments? Depending upon the spreads prevailing in any given period, arrangers may be able to assemble portfolios of cheap, lower-rated bonds (e.g., BB), create a tranched CDO, and earn a sufficient spread to pay themselves fee income, to pay the highly rated tranches the market spreads that are consistent with observed spreads for bonds of equivalent risk, and to distribute an acceptable return (the "excess spread" minus fees) to the equity tranche.[13]

According to this logic, and given the observation of market spreads below the spreads necessary to compensate for default risk for B-rated bonds, one might conjecture that equity tranches of CDOs based on portfolios of B-rated bonds would not earn high returns. This is indeed what JPMorgan concluded from a recent study of the returns that representative CDO equity tranches would have earned on portfolios of bonds of different ratings during the period from 1984-2002.[14] During this period equity tranches based on BBB and BB bonds would have earned high returns given their risk, whereas equity tranches based on B bonds would have underperformed.

It should be noted that in order for either of the two types of arbitrage opportunities related to market segmentation to be effective – that is, to provide an arranger the incentive to undertake the costs of structuring a transaction – it must be impossible for other "arbitrageurs" to enter the market and drive the profit from tranching to zero. As Oldfield (2000) points out for the case of structured mortgage securities, an arranger can profit from tranching only if it possesses some sort of comparative advantage; for example, with respect to acquisition of the assets included in the collateral pool, the costs of structuring, or privileged access to information about clients' preferences. To the extent that other intermediaries can acquire identical assets and have equal access to the same clients, any potential profit from tranching may be quickly driven to zero. These arguments suggest that "unconventional" assets may lend themselves more easily to SF transactions than do assets that are more "standardized" and trade in thick markets. Indeed, as noted earlier,

---

[12] Interestingly, several academic studies have found that lower-rated bonds pay higher yields without having a higher standard deviation of returns. However, these studies do not include bonds rated below BBB. (See Elton et al (2001) for references.)

[13] This strategy should be differentiated from another potential strategy, that of "rating agency arbitrage" which some observers have accused SF arrangers of undertaking in the past. In particular, because bonds within any given rating category trade at differing spreads, it is possible for an arranger to assemble a pool of bonds trading at the highest spreads within a rating category and to take advantage of the "extra" spread earned relative to the average spread for that category. The problem is that the credit risk of such an asset pool will generally be higher than the credit risk of the average bond in that rating category; consequently, defaults in the CDO portfolio may be significantly higher than investors had expected.

[14] See Meli and Rappoport (2002).

CDOs often contain nonstandard assets such as SME loans, tranches of other SF instruments, or leveraged loans. Alternatively, when standardized assets such as corporate bonds are included in a SF product, close client relationships and private information about clients' demands likely represent the main source of profit to the arranger from tranching.

4. Concluding remarks

This paper has reviewed finance literature, with the aim of identifying the sources of value creation in the structured finance market. It argues that asymmetric information problems between an originator and investors can lead to pooling of assets and tranching of associated liabilities, as opposed to individual sale of assets or to pooling alone. The more acute the problem of adverse selection, the more likely is value to be created through issuance of tranched asset-backed securities. Asymmetries of information between differing groups of investors can also lead to the issuance of tranched securities; less informed investors purchase the senior tranches, which will be insulated to a greater or lesser extent from default, and informed investors purchase the subordinated tranches.

Structured finance products can also create value for originators, arrangers, and investors when these products help to complete markets by offering investors securities with cash flows that are specifically tailored to their individual needs. A necessary condition for arrangers to have an incentive to design such tailored securities, however, is that the arrangers can practice price discrimination due to market segmentation or that they possess some other type of comparative advantage relative to competing arrangers, such as a cost advantage in acquiring the underlying assets. Market segmentation likely plays an important role in determining the profits that arrangers can earn from structuring.

Finally, the spreads on the assets included in the collateral pool must be high enough relative to the spreads paid to the tranche holders to permit arrangers (and other third parties) to earn fees to cover the structuring costs. This suggests that the composition of asset pools of newly issued structured finance instruments is likely to vary over time, with movements in the spreads on different classes of assets. Widening spreads for a particular asset class will increase the incentive for arrangers to create SF instruments with this class included in the collateral pool.

References

Ackerlof, G. "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism," *Quarterly Journal of Economics*, Vol. 89 (Aug., 1970): 488-500.

Allen, F. and Gale, D. "Arbitrage, Short Sales, and Financial Innovation," *Econometrica*, Vol. 59, No. 4 (July, 1991): 1041-1068.

Boot, A. and Thakor, A. "Security Design," *Journal of Finance*, Vol. 48, 1993: 1349-1378.

DeMarzo, P. "The Pooling and Tranching of Securities: A Model of Informed Intermediation, " *Review of Financial Studies*, 2004.

DeMarzo, P and Duffie, D. "A Liquidity-Based Model of Security Design," *Econometrica*, Vol. 67, No. 1 (Jan., 1999):65-99.

Duffie, D. and Garleanu, N. "Risk and Valuation of Collateralized Debt Obligations," *Financial Analysts' Journal*, Jan.-Feb., 2001: 41-59.

Elton, E., M. Gruber, D. Agrawal, and C. Mann. "Explaining the Rate Spread on Corporate Bonds," *Journal of Finance*, Vol. 45, No. 1 (Feb., 2001): 247-277.

Gaur, V, S Seshadri and M Subrahmanyam (2003): "Market Incompleteness and Super Value Additivity: Implications for Securitization", *mimeo*, New York University.

Gorton, G. and Pennacchi, G. "Financial Intermediaries and Liquidity Creation," *Journal of Finance*, Vol. 45, No. 1 (March, 1990):49-71.

Leland, H. and Pyle, H. "Informational Asymmetries, Financial Structure, and Financial Intermediation," *Journal of Finance*, Vol. 32, No.2 (May, 1977):371-387.

Meli, J and P Rappoport (2002): "CDO Equity as an Alternative Investment", *JP Morgan Fixed Income Quantitative Strategy*, October.

Meli, J and P Rappoport (2003): "Tranched Credit Relative Value", *JP Morgan Fixed Income Quantitative Strategy*, December.

Oldfield, George. "Making Markets for Structured Mortgage Derivatives," *Journal of Financial Economics*, Vol. 57 (2000): 445-471.

Rappoport, P (2001): "Rock Bottom Spread Mechanics", *JPMorgan Fixed Income Quantitative Strategy*, August.

Riddough, T. "Optimal Design and Governance of Asset-Backed Securities," *Journal of Financial Intermediation*, Vol. 6 (1997): 121-152.

Ross, S. A. "Options and Efficiency," *Quarterly Journal of Economics*, Vol. 90, No. 1 (1976):75-89.