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The Determinants of Loan Contracts to Business Firms

Empirical Evidence from a Private Bank in Vietnam

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Abstract

This paper deals with loan contracting from a private bank in Vietnam. We focus on the main loan contract features that the bank uses in lending to business firms, namely loan maturity, collateral and loan interest rate. Based upon the simultaneous equation model of Dennis et al. (2000) and the bank's loan contracting policies, we examine the possible interdependency of the three different loan contract terms. Also, we try to determine which firm characteristics and exogenous factors are relevant for loan contracts. We find strong interdependencies between these contract terms with significant bi-directional relationships between collateral and loan maturity, loan rate and loan maturity, and a uni-directional relationship between loan rate and collateral. The conflicting signs within the collateral–loan maturity relationship and the loan interest rate–loan maturity relationship can be explained by our hypothesis that the choice for a certain loan maturity is primarily determined by borrowers' behaviors, whereas the loan rate and the collateral requirements are primarily determined by banks policies. In addition, our results support the relevance of firm quality, agency costs of debt and relationship lending in loan contract design.

Keywords: contract design, collateral, interest rate, maturity

JEL classification: G14, G21, C31

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1 Introduction

This paper deals with loan contracting from a private bank in Vietnam, the Asia Commercial Bank (ACB). Loan contracting forms part of the broader financial contracting literature. The financial contracting literature has been developed starting from two influential papers by Grossman and Hart (1986) and Hart and Moore (1990). These papers discuss agency problems in situations where contracting is incomplete in the sense that some important future variables are difficult or impossible to describe initially and therefore must be left out of the contract. These variables are ex-post observable for the parties in a given contract, but are not verifiable for any third party. Financial contracting can be seen as an instrument to avoid or reduce agency problems of any kind. The financial contracting literature deals with the optimal financial structure of firms. It focuses on the entire set of characteristics of the different financial contracts that the firm is linked to.

In this paper we only deal with one aspect of financial contracting, the lender-borrower relationship that concerns banking, ignoring other issues related to the financial structure of the firm. We call this loan contracting. In general, loan contracting deals with the toolbox of contracting devices the borrower and the lender have to avoid informational problems between the two parties. A loan contract is a complex relationship between a borrower and a bank. Ideally, a loan contract should stipulate all obligations of the two parties for all possible contingencies in the future. This would imply that for each possible future state of nature, for example, the amount of repayment, the interest rate on remaining debt, possible adjustments in required collateral, and actions undertaken by the borrower should be specified (Freixas and Rochet 1997: 91). Writing a complete contingent contract, however, would be prohibitively costly. In practice, therefore, loan contracts are much less complex. In most cases, loan contracts only specify the interest rate on debt, the repayment amount, the duration of the loan, and possible collateral requirements. Sometimes covenants, fees, and default declarations are also specified.

So, a commercial bank has a toolbox of contracting devices that can be used in setting up a loan contract, such as collateral, guarantees, covenants, fees, and loan interest rate. This paper focuses on loan contracting of the ACB, the largest private bank in Vietnam. The main loan contract features that the ACB uses, namely maturity, collateral and the loan interest rate, will be analyzed. The ACB offers a range of debt contracts, with varying values for these three loan contract items. Borrowers then have the possibility to choose a preferred debt contract, by trading off different loan items. This implies that the loan contracts of the ACB are multidimensional and suggests that the contract terms are interdependent.

There is a growing theoretical literature on loan contract design that focuses on the interdependencies of the loan terms (Merton 1974; Myers 1977; Smith and Warner 1979; Bester 1985; Flannery 1986; Chan and Thakor 1987; Midle and Riley 1988; Boot et al. 1991; Diamond 1993; Pozzolo 2002). The various theories used to explain the debt contract design, however, do not give unambiguous answers as to the relationships between the different loan terms specified in a debt contract. For instance, the Bester (1985) signalling model points at a negative relationship between collateral and the interest rate, whereas Pozzolo (2002) argues that banks simultaneously require collateral

and charge higher interest rates to ex-ante riskier borrowers. Another example refers to the relationship between lending rates and maturity. According to the so-called trade-off hypothesis loans of a longer maturity bear higher interest rates to offset the higher risk premium. So, this view predicts a positive relationship between lending rates and the maturity time. On the other hand, Merton's (1974) option pricing model predicts an uncertain relationship between the lending rate and the maturity time. Empirical studies need to show under which circumstances certain theories hold or fail.

Empirical studies on loan contract design should allow for the interdependencies of the different loan contracting tools and consider that different contracting items are related to a common set of exogenous variables. However, most empirical studies on loan contracting focus on a single contract feature, ignoring the possible interdependencies between different contract terms. The standard approach is to set up an equation for one of the loan contract items and to estimate this equation by assuming that all of the explanatory variables are exogenous. If the right-hand side variables are truly exogenous, and hence do not contain proxies for one of the contracting tools, this approach will result in unbiased estimates. However, in many cases one of the right-hand side variables is related to a contracting tool. As the contracting tools are interdependent, estimates of such an equation using the ordinary least squares (OLS) technique, as is mostly done, will lead to biased estimates. The study by Dennis et al. (2000) is an exception. They account for the possible interdependencies between different contract terms by estimating a system of equations.

This paper contributes to the small empirical literature on loan contract design. The aim is to provide an empirical analysis of loan contracting determinants of the largest private bank in Vietnam, the ACB. We focus on ACB bank lending to small and medium sized enterprises (SMEs) in Vietnam. A special feature of the analysis is that, in line with Dennis et al. (2000), we focus on the possible interdependency of different loan contracting tools and hence estimate a simultaneous equation model. We also try to determine the relevant firm characteristics for the loan contracts, and how they affect the different contract features. In this way we hope to provide some additional evidence on the different, often conflicting, theories of loan contract design. Another novelty of this paper is that the empirical analysis relates to a private bank in a developing country, Vietnam, which just started a process of economic liberalization. The prior empirical work on loan contract design almost exclusively deals with developed economies (Berger and Udell 1995; Strahan 1999; Dennis et al. 2000; Degryse and Cayseele 2000; Pozzolo 2002). Given a more or less adequate infrastructure for financial contracting and financial information, the setting of a developed economy ensures that banks are profit-seeking and loans are commercially oriented. In the absence of such an adequate setting, the relevance and applicability of loan contract design for transition economies remains unclear. A reason for this gap in the literature of loan contract design seems straightforward: there is simply no data available on loan contracts in developing countries. We are in the fortunate position that the largest private bank in Vietnam, the ACB, is currently developing a database on loan contracts, and was willing to provide us with this dataset. The focus on contracts from a private bank in Vietnam is particularly interesting from the applied perspective. With the financial reform on the move, the Vietnamese (private) banking sector has considerably strengthened its position in mobilizing resources and allocating them to investments. Despite the fact that state-owned commercial banks still dominate the credit market, non-state-owned commercial banks are gaining market share due to their more customer-oriented approach and distinct profit motive.

The rest of the paper is organized as follows. Section 2 describes the financial sector of Vietnam as there is little information about the financial sector in Vietnam in international journals. For the focus of this paper, the main aim of this section is to set out the increasing importance of the private banking sector in Vietnam. Section 3 presents the specification of the theoretical model we use to examine loan contracting by the ACB. The theoretical model emphasizes the interdependencies between the three loan contract terms we focus on. Section 3 also gives a short survey of the literature on loan contract design to shed some light on the sign of the interrelations between the different contract terms we consider. Section 4 describes our dataset. The estimation technique and the estimation results are presented in section 5. Finally, section 6 concludes with a summary of the paper and some suggestions for further research.

2 The Vietnamese banking sector

The Vietnamese banking sector has experienced significant changes since the early 1990s in line with a variety of imperative financial reforms. The banking reform process began with the establishment of a two-tier banking system during 1988-89 to include the State Bank of Vietnam and a system of commercial banks. The four state-owned commercial banks (SOCBs) still account for 78 per cent of total assets of the banking system (Fitch Ratings 2002). However, they coexist with several new players including 36 joint stock banks (JSBs), 80 branches and representative offices of foreign banks, and 4 joint venture banks (JVBs) (World Bank 2002).

Notably, banking regulations have been improved in both content and form to facilitate the more distant supervision and inspection. With the main focus on recapitalization and resolving the multitude of non-performing loans, the restructuring of the commercial banks has progressed considerably. Most commercial banks have greatly increased their chartered capital and considerably reduced non-performing loans. The ratio of non-performing loans to total outstanding loans decreased from 12.7 per cent on 31 December 2000 to 5 per cent on 31 December 2002 (World Bank 2003). In addition, the autonomy of banks has been enhanced. The commercial banks have the right to decide the deposit and lending interest rate, and to select the method of loan security. Gradually, policy-oriented lending has been separated from commercial credit in SOCBs. Furthermore, banking products and services have become more diverse.

Firms in transition economies need financing for their investment and growth. Since July 2002 Vietnam has had a stock exchange, but it is still in its infancy. There are only 21 firms listed on the stock exchange. So, the Vietnamese banking sector is the main source of financial resources for firms. However, both state and non-state commercial banks are still facing great difficulties in fulfilling their role as credit providers. These difficulties can be attributed to several factors. First, the legal framework and market conditions are not yet well defined to facilitate credit operations. Second, the banking sector is insufficient both in terms of finances and operational capability (World Bank 2002). As a result, the outreach of the formal banking sector is limited to meeting only 30 per cent of credit needs (McCarty 2001). The remainder of this section examines the interactions between the banking sector and business borrowers with respect to credit access and allocation to different types of business borrowers.

State-owned commercial banks

The four main SOCBs in Vietnam are the Foreign Trade Bank of Vietnam (Vietcombank, VCB), the Industry and Commerce Bank of Vietnam (Incomebank, ICB), the Bank for Investment and Development of Vietnam (BIDV), and the Vietnam Bank for Agriculture and Rural Development (VBARD). Capturing 78 per cent of the total assets of the banking system in 2002, SOCBs dominate the credit market with 75 per cent of total lending to the economy and 76 per cent of resources mobilized through formal institutions (ADB 2003). In addition, SOCBs have advantages in providing banking services and credits for customers, given their nationwide networks, better technical conditions, more qualified staff, and better means of communication compared to the joint stock banks. SOCBs also play a major role in serving large investment projects, especially infrastructure projects financed by the government. The main customers of SOCBs are the state owned enterprises (SOEs), which contribute 75 per cent of the economic output and hold 53 per cent of the banks' loans (Vietnam Investment Review 2003). The intimate relationship between SOEs and the banking sector, which characterizes all transition economies, results in a weak banking sector in several ways. First, given the absence of profit-taking incentives, the low profitability of the SOEs reduces the profitability of the banking sector. Second, credit concentration on SOEs exposes SOCBs to high credit risk due to high volumes of bad loans. Third, assuming the government guarantees credits to SOEs, SOCBs do not exert much effort in screening and monitoring borrowers, distorting the fundamental role of commercial banks and weakening the soundness of the banking sector. Last but not least, the government-directed lending crowds out private sector access to formal credit, within which SMEs account for over 97 per cent of the total number of enterprises.

SMEs are primarily considered to be high-risk borrowers due to insufficient assets and low capitalization, vulnerability to market fluctuations, and high mortality rates. Furthermore, high administrative costs and the transaction costs of lending do not make SME financing a profitable and hence attractive business for SOCBs. Additionally, the banks in general lack skills in credit evaluation and risk management, for example, to evaluate creditworthiness and the value of collateral, while SMEs fail to provide adequate information due to deficient accounting practices and weak corporate governance. Given the failures in acquiring information for lending to SMEs, SOCBs maintain difficult borrowing procedures and a heavy requirement for collateral. As a result, the lengthy loan process and excessive documentation impose a burden on firms, reducing their incentive to apply for bank credit (Ninh 2003). Moreover, laws on property rights, collateral, and bankruptcy are not yet well defined and their enforcement is still ineffective, making it very difficult for the banks to value the pledged assets and recover loan losses in case of default. Access to SOCB credit is very challenging for private SMEs.

Joint venture banks and other foreign banking operations

There are 4 JVBs, 27 branches of foreign banks, and 53 representative offices from 20 foreign banks operating in Vietnam. Since their establishment, the market share of foreign branches has increased both in the deposit and credit market. Nevertheless, the current regulatory framework still prevents foreign banks from participating fully in the Vietnamese financial system. Operations are of small scale due to market size and operating restrictions. Foreign banks are mainly engaged in lending to foreign-owned

enterprises rather than competing to lend to domestic firms, whether state-owned or private.

Joint stock banks

JSBs are private banks established using money pooled by shareholders. The majority of the 36 JSBs were founded rapidly in mid-1990s following the initial liberalization of the financial sector and accompanied the increasing demand for credit. Many JSBs were set up out of the ailing credit cooperatives. The collapse of credit cooperatives due to unpaid deposits left these JSBs with large amounts of bad debt from the outset (Ninh 2003). Some other JSBs were established through capital supplied by a mix of SOCBs, SOEs, private businesses, and individuals. Foreign investors also have minority stakes in some of the larger JSBs.

Generally, JSBs are undercapitalized. Out of the 36 existing JSBs as of September 2002, 34 meet the minimal chartered capital requirement. Altogether, they account for only 15.4 per cent of total assets within the banking system (Fitch Ratings 2002). Despite their considerable growth in number, JSBs are exposed to intense competition and high risk due to their characteristics: low capital base, having to focus on higher risk private companies, a lack of scale economies due to the small number of branches, inadequate banking services, and concentration in two host business centers (Hanoi and Ho Chi Minh City). In addition, a lack of banking expertise and managerial skills has led many JSBs into problems. Some JSBs faced serious problems with regard to loans to real estate and troublesome companies, and were severely struck by the crash of the property market in Hanoi and Ho Chi Minh City and the collapse of many trading companies in 1996 (Soo-Nam 1999). In addition, the management of some JSBs also undertook fraudulent activities in credit evaluation and extension. For example, in the late 1990s, some JSBs defaulted on importers' Letters of Credit (LCs) with approximately US$65 million of LCs reported to be outstanding (Ninh 2003).

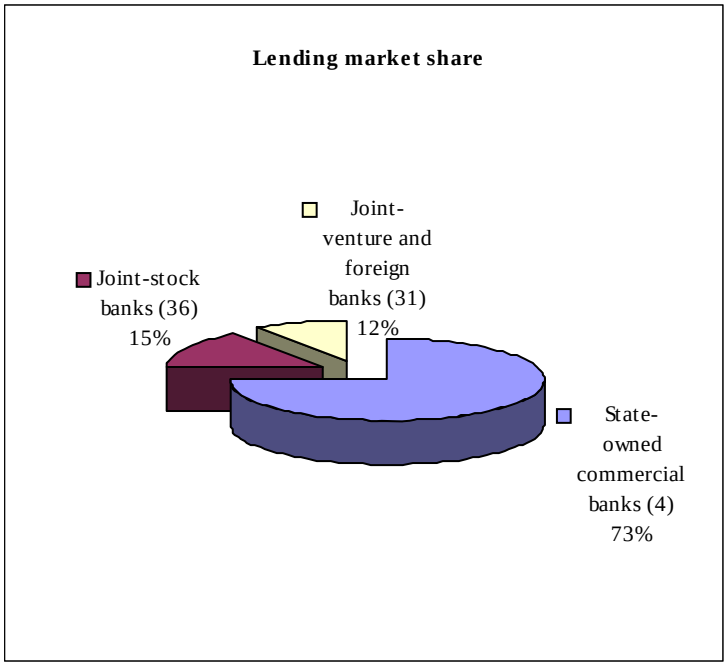
The State Bank of Vietnam (SBV) has been implementing a JSB restructuring programme by raising the minimum capital level. As a result, the consolidation of JSBs is underway with licenses of 12 JSBs revoked as of September 2002, bringing the total number of JSBs in operation to 36. Under agreement with the IMF, the SBV intended to further reduce the number of JSBs to 25 by the end of 2003.

With regards to credit allocation, JSBs primarily serve the private sector, particularly local businesses and small enterprises, making up 15 per cent of the business credit market. Whereas loans to the private sector represented 40 per cent of the SOCBs' total outstanding loans, 70 per cent of the JSBs' loan portfolio was channeled to the private sector (IMF 2002). However, loans to the private sector by SOCBs were about three times those by JSBs at the end 1998. Rapid loan growth and weak capacity to assess credit risk could result in non-performing loan problems as noted earlier, and JSBs may not have adequate access to external sources of capital. The focus on lending to the private sector requires JSBs to establish larger branch networks as distribution channels. Unlike SOCBs, JSBs are not, however, permitted to open an extensive branch network. This regulatory discrimination constrains the operations of JSBs.

As economic development in Vietnam has progressed, JSBs have considerably enhanced their role in serving the country's economy. The portion of credit provided by

private banks has increased steadily over time, as seen in Table 1. The Table also shows that the credit extension by non-SOCBs has increased by a larger degree than by SOCBs. Figure 1 shows the lending market shares of the different banks.

Figure 1: Lending market shares in Vietnam (2000)



Source: IMF (2003), ADB (2003)

Table 1: Bank credit in Vietnam

	Total bank credit		Credit extended by SOCBs		Credit extended by non-SOCBs	
Year	Amount (VND billion)	Per cent	Amount (VND billion)	Per cent	Amount (VND billion)	Per cent
1994	33,345	100	27,610	82.8	5,735	17.2
1995	42,277	100	33,647	79.6	8,630	20.4
1996	50,751	100	38,320	75.5	12,431	24.5
1997	62,201	100	48,042	77.2	14,159	22.8
1998	72,597	100	59,087	81.4	13,510	18.6
1999	112,730	100	76,559	67.9	36,171	32.1
2000	155,720	100	114,193	73.3	41,527	26.7
2001	189,103	100	143,355	75.8	45,748	24,2
2002	231,078	100	175,489	75.9	55,589	24.1

Source: IMF (2000, 2002, 2003)
VND = Vietnam Dong

In sum, the position of commercial banks in credit allocation has improved. It is characterized by the gradual growth of private banks, despite SOCBs still holding the dominant position. Whereas SOCBs are not adequately meeting the needs of the country's economy, given their lack of exposure to the rigors of competition, the country's better JSBs are gaining market share. Remarkably, the distinct motive for profit of the JSBs will ensure that they continue to grow in the future. For our study, we focus on one of the most successful joint stock banks – Asia Commercial Bank (ACB) – with the aim of empirically examining its lending practice, especially the determinants of its loan contracting.[1]

3 The specification of the model

The previous section showed that private banks in Vietnam in general, and the ACB in particular, have become increasingly important. This section focuses on the loan contracting of the ACB. In particular, we explain how we model loan contracting of the ACB. After the model specification is given in general terms, we are more specific about the signs of the relationships and the set of exogenous variables that we take into account. This is done by surveying the literature on loan contract design.

3.1 The structure of the model in general terms

In order to allow for the potential interdependencies between different contract terms, we follow Dennis et al. (2000) by specifying a system of equations that simultaneously explains a set of contract features. We focus on three contract terms: the loan maturity, collateral requirements, and the loan interest rate. Our model takes the following form:

$$(1)\quad Collat = \alpha_1 Lmat + \alpha_2 Loanr + \beta_1 X_1 + \varepsilon_2$$

$$(2)\quad Lmat = \alpha_3 Collat + \alpha_4 Loanr + \beta_2 X_2 + \varepsilon_2$$

$$(3)\quad Loanr = \alpha_5 Lmat + \alpha_6 Collat + \beta_3 X_3 + \varepsilon_3$$

where *collat* is a zero-one dummy with a one if collateral is asked, and a zero if not, *lmat* refers to the loan maturity, and *loanr* refers to the interest rate of loans denominated in Vietnamese currency, Vietnam Dong (VND). X_K for *K=1 to 3* are vectors of other explanatory variables (to be explained below). ε_K are the residuals.

The structure of the system of equations assumes that there are bidirectional relationships between the three contract terms taken into account. Note that this differs from Dennis et al. (2000), who assume that there is a bidirectional relationship between *lmat* and *collat*, but a unidirectional relationship from both *lmat* and *collat* to *loanr* (in their case the spread). We allow for a bidirectional relationship between the *loanr* and *lmat* and *collat* because there is no reason to assume why one of these relations should

[1] More general information on the ACB can be found at www.acb.com.vn.

be unidirectional. At the least, the bidirectional relationships between all of the contract terms are a testable assumption.

3.2 Interdependencies between the loan interest rate, collateral requirement, and maturity

The model emphasizes the possible interdependencies between the loan rate, the loan maturity, and the collateral requirement. An important question is whether these contract features are positively or negatively related to each other. The existing theories on loan contract design may shed some light on this. However, it should be noted that an obvious problem of a description of the interdependencies of the loan contracting tools is that the different loan contract items are endogenous, and are, therefore, equilibrium outcomes. Theories on loan contracting show that the equilibrium outcomes depend on bank policies as well as firm strategies. It may well be that for banks the contract items are positively related, whereas for firms they have a negative relationship. In that case, the ultimate positive or negative co-movement depends on the origin of the shock.[2] In addition, the existing theories, as we show below, are conflicting with respect to the interdependencies between the various loan contract terms, so it is very difficult to come up with unambiguous signs. We show that these interdependencies are theoretically indeterminate and ultimately depend on the relative strength of the one or the other theory. Empirical studies are needed to weigh the importance of the different possible theoretical outcomes.

There is also a question of normalization. Equation (1) is normalized with respect to *collat*, equation (2) is normalized with respect to *lmat* and equation (3) is normalized with respect to *loanr*. In other words, in equation (1) *collat* is the dependent variables, whereas *lmat* and *loanr* are the dependent variables in equations (2) and (3), respectively. By definition *collat*, *lmat* and *loanr* are jointly determined, so that, strictly speaking, we cannot talk about dependent variables in one or another equation. The way of normalization is important, though, because in over-identified systems the estimators are different for different normalizations.[3]

The system of normalization we have chosen is based on the loan policies of the ACB. In personal conversations with ACB managers, it has been made clear to us that the ACB primarily sets collateral requirements and the loan rate based on the maturity time of the loan that is requested by the firm. The loan maturity demanded by the firm is taken as given by the ACB. On the other hand, the loan maturity demanded by the firm is of course affected by the loan rate and the collateral requirements set by the ACB. The equilibrium values for *collat, lmat* and *loanr* are determined by the three equations together. However, based on the ACB loan policies, we see equations (1) and (3) as primarily determined by loan policies of the ACB, whereas equation (2) primarily

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2 A comparison with a simple demand-supply system may explain this. The relationship between the endogenous variables price and quantity depend on whether the shock originates from the demand or the supply side. Shifts in the supply curve lead to negative co-movements between price and quantity, whereas shifts in the demand curve imply positive co-movements.

3 This does not hold for all estimation methods, but holds for our estimation technique, which is comparable to a 2SLS method.

reflects demand policies of the firm. Below, it will become clear that this affects our choice of exogenous variables, that is, the modelling of X_1, X_2, and X_3.

Collateral or the secured status of a loan vis-à-vis the loan interest rate

Signalling theory argues that collateral can be used as a screening device to identify credit applicants (Bester 1985). Presumably, the interest rate is designed as a function of collateral, creating pairs of different credit contracts that act as a self-selection mechanism in that it reveals information about the default risk of loan applicants. The model implies that high-risk borrowers can be identified because they prefer loan contracts with lower collateral and a higher interest rate. Similarly, high quality borrowers tend to post more collateral to reveal their true type and thereby enjoy a lower loan interest rate. Therefore, a negative relationship between collateral and the loan rate is expected according to this theory.

The contrasting view by Pozzolo (2002) predicts that banks simultaneously require collateral and charge higher interest rates to ex-ante riskier borrowers. This result is derived from two major assumptions. First, collateral is more valuable to borrowers than to the banks. Second, borrowers maximize their profits by choosing the level of effort to put in the project. Probability of success is jointly determined by the level of borrower riskiness and the level of effort. The model shows that for a given probability of success, banks face a trade-off between higher interest rates and lower collateral. However, when the probability of success decreases, banks cover the higher credit risk both by augmenting the degree of loan security and by charging higher interest rates.

Most empirical studies provide evidence on a positive relationship between collateral and the loan rate. Pozollo (2002), for instance, finds that interest rates on secured loans are on average higher than those on unsecured loans. Furthermore, small firms, perceived to be high-risk, borrow on a secured basis and have to pay higher interest rate (Strahan 1999). Positive empirical relations between collateral and the loan rate are also found by Berger and Udell (1990) and Dennis et al. (2000).

Collateral or the secured status of a loan vis-à-vis the loan maturity

The agency cost of debt theory (Myers 1977; Smith and Warner 1979; Chan and Thakor 1987) predicts that collateral and loan maturity are positively related. The reason being that both collateral and loan maturity are tools for coping with asset substitution and underinvestment problems. These problems refer to the situation where a firm with risky debt has an incentive to undertake relatively more risky projects and/or to under-invest in low risk, positive NPV projects. These incentives may be reduced by shortening the debt maturity or requiring collateral. As substitutes, loan maturity and collateral are positively related. According to trade-off theory, this positive relationship is also expected if the loan contracting choice is primarily determined by borrowers' actions. An increase in loan maturity positively affects a borrower's utility, whereas collateral requirements have a negative effect. If borrowers try to trade-off the decrease in utility due to the collateral requirements by trying to increase the maturity, a positive relationship is expected.

On the other hand, Boot et al. (1991) derive a theoretical model in which collateral and maturity are negatively related. Assuming that banks incur a dissipative cost in taking

possession of and liquidating collateral, they argue that the dissipative costs of collateral are lower for longer maturity loans. The reason being that for a longer maturity loan a bank has more timing flexibility in terms of when to force default on the loan and take possession of collateral. In such a situation the bank can make use of its flexibility and then cut its collateral costs by lowering collateral for longer maturity loans.

The empirical literature is also not conclusive with regards to the sign of the collateral-loan maturity relationship. Harhoff and Korting (1998) and Dennis et al. (2000) provide empirical evidence for a positive relationship between collateral and loan maturity. However, Boot et al. (1991) find evidence for a negative relationship between collateral and maturity in their empirical estimates.

Loan maturity vis-à-vis the loan rate

The relationship between the interest rate and loan maturity is also ambiguous. Some authors rely on the trade-off hypothesis. According to this view, loans of a longer maturity bear higher interest rates to offset the higher risk premium that results from longer maturity loans. So, the loan maturity and the loan rate are positively related.

Other authors, however, argue that there may be a negative relationship. High risk borrowers may be forced to accept higher interest rates and low maturity if credit risk is very high. Also Merton's (1974) option pricing model predicts a negative relationship conditional on a certain range of the debt-to-firm value ratios with debt valued at the riskless rate.

Empirical studies provide evidence for both possibilities. Gottesman and Roberts (2002) find a positive relationship between loan maturity and the loan interest rate. Alternatively, the empirical analyses of Strahan (1999) and Dennis et al. (2000) suggest a negative relationship.

3.3 Effects of exogenous variables on the endogenous loan contract items

The model specified above shows that the three loan contract terms are also affected by different sets of exogenous variables. The literature on loan contracting points to a long list of theories that affect the pricing of the loan, and consequently the explanatory variables that may influence the different contract features. Very often authors refer to, for example, the importance of tax rates, firm quality, growth opportunities, agency costs, the relationship between the bank and the borrower, and the impact of the signalling hypothesis. Based on the existing theories, and the variables that are available in our data set, we come up with the following set of exogenous variables that may affect the different contract terms, and consequently would appear in a reduced form specification of our system:

$$X = \begin{bmatrix} liquidr, debta, inventc, profitbt, areceive, turno, taxa, \\ amat, fsize, lsize, numberlc, loanc, debte, dummyus, c \end{bmatrix}$$

Where: *liquidr* = current assets/ current liabilities; *debta* = debt/ total assets; *inventc* = inventories/ cost of goods sold; *profitbt* = profit before tax/ total assets; *areceive* = accounts receivable/ net sales; *turno* = net sales/ total assets; *taxa* = taxes/ total assets; *amat* = (fixed assets/ total assets)*(fixed assets/ depreciation); *fsize* = ln(total assets);

lsize = ln(loan size); *numberlc* = number of loan contracts a firm has with the ACB bank on July 2003; *loanc* = cumulative loan outstanding of a firm/ the sum of total debt of the firm plus the cumulative loan outstanding; *dummyus* = dummy with a one if the loan contract originally refers to a loan denominated in US dollars (USD), and a zero if the loan contract was originally denominated in VND; *debte* = debt/ equity and *c* = constant.

In the following paragraphs, we categorize these exogenous factors in light of several hypotheses so as to capture the impact of firm quality, agency cost of debt, taxes, and relationship lending on the endogenous contract terms. In our estimation, firm quality is assumed to be proxied by *fsize, turno, areceive*, and *inventc*. In addition, firm credit quality is proxied by *debta*, *debte*, and *liquidr*. The effect of agency cost of debts is examined through the growth potential of firm, as proxied by *profitbt*, firm asset maturity (*amat*) and firm leverage (*debta* and *debte*). Taxes/total asset ratio (*taxa*) is for the taxes considerations. Lastly, the number of loan contracts a firm has with ACB (*numberlc*) and the degree of loan concentration (*loanc*) aim to measure the relationship lending effect. These hypotheses will be analyzed below.

Firm quality hypothesis

According to conventional wisdom, firms that are as perceived as high risk have to face higher lending rates and collateral requirements. However, in certain circumstances, due to lender policies that may result in decisions not to lend to risky firms, the effects are different. From a theoretical viewpoint, the effect of firm quality is also complex. The signalling theory predicts that firm quality influences the loan contract terms – for example, collateral and loan interest rates – through the self-selection mechanism. Under this mechanism, high quality firms are inclined to post more collateral to reveal their true type and thereby enjoy the lower loan interest rate (Bester 1985), implying that firm quality has a positive effect on collateral and a negative effect on the loan interest rate. Alternatively, the Merton (1974) option-pricing model suggests a positive relationship between loan interest rate and firm credit quality, as proxied by firm leverage. In addition, another theory predicts an inverse relationship between collateral and firm quality. Particularly, a high level of collateral is associated with low-quality projects due to difficulties in project valuation (Chan and Kanatas 1985). Besides, a high level of collateral causes default to be more costly and hence failure avoidance to be more attractive (Chan and Thakor 1987), suggesting a positive relation between collateral and firm risk and credit quality. These implications find strong empirical support (Berger and Udell 1990; Pozzolo 2002; Gonas et al. 2002).

The choice of maturity is also affected by firm quality and firm credit risk. Diamond (1993) predicts that loan maturity directly relates to firm size and firm quality, and inversely relates to credit risk given that small firms with high informational opacity are significantly limited in their access to long-term debt. By contrast, Flannery (1986) and Diamond (1991a) expect a negative relationship between loan maturity and firm quality as viable firms choose and repay shorter maturity loans, thereby separating themselves from low-quality firms.

In our estimation, firm quality is represented by *fsize, turno, areceive*, and *inventc* with the following justifications. First, measured by the book value of total assets, because the market value is lacking, size of firm (*fsize*) may influence contract terms through risk diversification and reputation effects (Diamond 1989, 1991b). A larger firm is

considered to be well-established and hence less risky than its smaller counterparts. Second, a high asset turnover (*turno*) indicates that the firm is efficient in generating revenues, which are a source of debt service. Third, a low inventory period *(inventc)* and a low accounts receivable period *(areceive)* reflect the firm's efficiency in asset management. Given that credit quality is considered as one aspect of firm quality, in our analysis we proxy firm credit quality by firm leverage and firm liquidity. First, firm leverage is measured by the debt-to-total-assets ratio (*debta*) and the debt-to-equity ratio (*debte*). Reasonably, a high-levered firm may face a higher likelihood of a future insolvency. Second, firm liquidity (*liquidr*) measures the extent to which a firm can liquidate assets and cover short-term debts, implying that a highly liquid firm is less prone to default risk.

Agency cost hypothesis

Agency costs of debt may influence the design of loan contract terms (Myers 1977; Smith and Warner 1979; Chan and Thakor 1987). These costs may be potentially high for risky firms and firms with growth options. We pick up the effect of agency costs by four variables. First, firm profitability (*profitbt*) suggests that a profitable firm is strong and therefore more likely to expand. Second, asset maturity (*amat*) reflects the time pattern of cash flows generated from a firm's fixed assets. The last term in this variable aims to support the idea that longer maturity assets will be depreciated at a slower rate (Guedes and Opler 1996). Firms match the maturity of debt payments with the maturity of assets. Firms with longer-lived assets in place are able to have longer maturity debt without increasing the agency costs of debt (Myers 1977). Agency costs may be mitigated by matching debt maturity with asset maturity, suggesting a direct relationship between asset maturity *amat* and loan maturity. Third, firm leverage is admittedly relevant based on the argument that agency costs may be limited by reducing leverage as well as shortening maturity or requiring collateral. Accordingly, the debt-to-total-assets ratio *(debta)* and the debt-to-total-equity ratio *(debte)* are also taken into account to reflect an inverse relationship between firm leverage and loan maturity and a positive relationship between firm leverage and collateral.

Tax hypothesis

We also include tax considerations in our analysis, measured by *taxa*. Several hypotheses exist with respect to the relation between loan maturity and the marginal tax rate. Dennis et al. (2000) hypothesize a negative relationship between the marginal effective tax rate and borrowing duration. However, Guedes and Opler (1996) argue that duration is positively related to the marginal tax rate. Borrowers try to accelerate interest payments to maximize the present value of interest tax shields. A maturity structure that accelerates tax payments is more costly to borrowers than a maturity structure that lowers tax payments because an additional premium has to be paid to the lender (see Guedes and Opler 1996: 1814).

Relationship lending hypothesis

For the effect of relationship lending, we proxy relationship strength by two variables: the number of loan contracts a firm has with the ACB (*numberlc)* and the cumulative value of loans outstanding over the sum of total debt and the cumulative value of loan outstanding (*loanc*). In most relationship lending studies, relationship strength is

measured by the duration of the relationship (the number of years a firm stays with the bank) or the scope of the relationship (the number of services a firm purchases from the bank). Firms that have a stronger relationship with a bank may obtain better contract terms, for instance, less collateral (Boot and Thakor 1994; Berger and Udell 1995; Harhoff and Korting 1998; Degryse and Van Cayseeke 2000) and lower loan interest rates (Diamond 1989; Boot and Thakor 1994; Petersen and Rajan 1995; Berger and Udell 1995; Repetto et al. 2002). However, firms with a close relationship with a bank may also face a lock-in situation and rarely switch to other banks. This results in worse loan contract terms; for instance, loan interest rates increase over the course of the relationship (Greenbaum et al. 1989; Sharpe 1990; Degryse and Van Cayseele 2000). In our analysis, we use two relationship proxies, frequency of the relationship (*numberlc*) and loan concentration (*loanc*). Interestingly, Bodenhorn (2003) proves that the frequency of the relationship is valuable in that it lowers loan interest rates. For loan concentration, Dennis et al. (2000) provide empirical support for a positive association with loan interest rates. In short, we hypothesize that *numberlc* and *loanc* both have a negative relationship with collateral and the sign of the relationship with loan interest rate is uncertain.

The loan size is also taken into our considerations because many studies stress the importance of the loan size in explaining the other contract terms of the deal. Here it should be noted that the loan size may also be considered as an endogenous variable in line with the theoretical implication by Midle and Riley (1988). In their model, loan size can play a signalling role and banks screen by offering larger loans at higher interest rates. However, we follow Berger and Udell (1990), Boot et al. (1991), Harhoff and Korting (1998), Elsas and Kranen (2000), and Gonas et al. (2002) by considering loan size *(lsize)* as an exogenous variable in the system. We could have considered *lsize* as an endogenous variable, but that would have complicated the identification of the system considerably. Relating collateral to loan size, Harhoff and Korting (1998) and Elsas and Kranen (2000) find a higher incidence of securitization on larger loans, but Boot et al. (1991) and Gonas et al. (2002) discover that loan size is inversely related to the probability that a loan is secured. Concerning the loan size-loan interest rate relationship, it is commonly argued that loans of a larger size carry lower interest rates, given that larger loans incur lower transaction costs in lending. In contrast, Midle and Riley (1988) predict a positive relationship between loan size and loan interest rates.

The final exogenous variable we have to explain is *dummyus.* This variable is added because some of the contracts were originally denominated in USD. We wanted to take these contracts into account because the sample could then be considerably increased. In order to make these contracts comparable with the contracts denominated in VND, we have to convert the loan contracts denominated in USD into loan contracts denominated in VND. The conversion of the loan size is simple. We could do that by using the actual US Dollar-Vietnam Dong exchange rate. However, the conversion of the lending rate is more complicated because we need a proxy for the expected depreciation of the VND vis-à-vis the dollar. As the expected depreciation is an unobservable variable, we have to use a proxy for this. We used the following approach. We searched for two loan contracts in our dataset that had similar loan sizes, the same loan maturity, and where both had collateral requirements and were provided to the same firm. These contracts therefore differ only in that one of them is denominated in USD (and consequently have a dollar lending rate) and one of them is denominated in VND (and has a Dong lending rate). The difference between the two lending rates of these two contracts is used as a proxy for the expected depreciation (this comparison gave an expected depreciation of

7.4 per cent). To pick up remaining differences, we added a binary zero-one dummy variable with a one if the loan contract was originally denominated in USD.

As explained above, existing empirical studies point to a list of variables that may affect the contract terms. However they do not give much guidance with respect to the variables that are most important for the one or the other contract term. In other words, it is not clear whether, for instance, variables that are meant to proxy for firm quality have a direct relationship with the loan maturity, collateral requirements or with the loan rate, or whether these variables directly affect the three contract features simultaneously. In fact, it seems that the same set of explanatory variables appear in studies on collateral requirements, the loan rate, and the loan maturity. Therefore, it could be argued that most of the variables mentioned above may have a direct relationship with the endogenous variables identified. However, the identification of the system does not allow this. In order to identify the three equations we need to make some assumptions regarding the variables that directly, or only indirectly, affect the different contract features. In other words, the X_K vectors cannot contain the same set of exogenous variables. We base our choice on our assumption (see above) that the collateral and loan rate equations are primarily reflecting bank policies, whereas the maturity equation primarily reflects policies of the firm. However, we admit that this choice is still somewhat ad hoc. We specified the X_K vectors of the relationship between the exogenous variables and the endogenous variables as follows:

$$(4)\quad X_1 = \begin{bmatrix} liquidr, debta, inventc, profitbt, areceive, turno, numberlc, loanc, \\ debte, fsize, lsize, c \end{bmatrix}$$

$$(5)\quad X_2 = \begin{bmatrix} liquidr, debta, inventc, profitbt, areceive, turno, taxa, \\ amat, fsize, lsize, c \end{bmatrix}$$

$$(6)\quad X_3 = \begin{bmatrix} liquidr, debta, inventc, profitbt, areceive, turno, numberlc, loanc, \\ dummyus, fsize, lsize, c \end{bmatrix}$$

Regarding the exogenous variables that do not appear in all equations, some explanation is needed. The two proxies for relationship lending are included in the Collateral equation (X_1, see equation (4)) and in the Loan Interest Rate equation (X_3, see equation (6)) and excluded from the Loan Maturity equation (X_2, see equation (5)) because the relationship lending literature provides little evidence on the effect of relationship banking on loan maturity. The choice is also based on our assumption that the collateral and the loan rate equations are primarily reflecting bank behavior, whereas the maturity equation reflects firm behavior. This also explains why asset maturity only appears in the loan maturity equation. Asset maturity is brought only into the X_2 equation because of the unique association between asset maturity and loan maturity in mitigating agency costs of debt. It is obvious why the dummy for loans originally denominated in USD only appears in the loan rate equation (X_3).

By using the rank condition, it can be seen that all equations are now identified.[4] The order condition shows that the three equations are over-identified.[5]

4 The data set

We use information on 277 ACB loan contracts as of July 2003. This dataset was retrieved from the bank's database system. This is an ongoing process. Accordingly, many relevant types of data are unavailable, for example, value of collateral, the purpose of loan, and the deposit rate. In addition, some contracts lack information on one or more contract terms. After leaving out all contracts with missing data on any contract terms, we end up with a smaller data set of 152 contracts with complete information on all variables we use in our equations.

It should be noted that some firms have several loan contracts with the ACB at the same time. The 152 contracts refer to 47 ACB relationships with different firms in different industries and regions in Vietnam. This also implies that some variables are on a contract level, and others are on a firm level. More specifically, the three contract features: *lmat, collat* and *loanr* as well as the loan size, *lsize*, and the dummy indicating whether the contract was originally in VND or in USD are measured on a loan contract level, whereas all other variables are measured on a firm level. Table 2 gives descriptive statistics for the three contract items.

As can be seen from Table 2, most of the ACB loans – nearly 90 per cent – are provided on a secured basis. Loan maturity varies considerably from one contract to another, ranging from one month to ten years with a mean (median) of 15.7 (six) months. Unlike loan maturity, loan interest rates remain rather smooth across the sample with a mean (median) of 10 per cent/year (10.2 per cent/year). It should be noted that the loan contract variables are far from normally distributed, as can be seen from the Jarque-Bera statistic. This is not unusual in these types of studies, but obviously may affect our results.

Table A1 in Appendix A presents descriptive statistics of all exogenous variables used in the analysis. Table A2 in Appendix A gives a correlation matrix of these variables.

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4 The rank condition states that an equation is identified if it is possible to construct at least one (M-1) X (M-1) matrix with a non-zero determinant from the coefficients of those variables excluded from that equation but included in other equations of the model, where M is the number of endogenous variables in the system. The rank condition is necessary and sufficient for identification.

5 The order condition is as follows: if K-k<m-1 the equation is under-identified; if K-k=m-1, the equation is just identified; if K-k>m-1 the equation is over-identified. Here K refers to the total amount of exogenous variables (including the constant), k the number of exogenous variables in the equation under consideration and m the number of endogenous variables in the equation under consideration.

Table 2: Descriptive statistics of three key contract features

	Loan Maturity (months)	Loan Interest Rate (% per year)	Collateral (dummy 0,1)
Mean	15.71	10.00	0.88
Median	6.00	10.20	1.00
Max.	120.00	11.40	1.00
Min.	1.00	6.00	0
Std Dev.	20.45	0.53	0.32
Jarque-Bera	349.66	2831.71	222.44
Observations	152	152	152

5 The estimation results

Our model contains three simultaneous equations of contract terms. The variables *lmat* and *loanr* are continuous variables, whereas *collat* is a discrete choice variable. This requires a specific estimation technique that allows for estimating a simultaneous equation model including continuous and discrete choice variables. We use Nelson and Olson's (1978) two-stage estimation procedure of a simultaneous equation model with limited dependent variables. This approach consists of first regressing the endogenous regressors from the structural equations on their reduced forms. Then we estimate the structural equations in which we replace the endogenous regressors by the fitted values of the first stage. So, the method is essentially comparable to a two-stage least squares regression. The difference is that one of the equations is estimated by logit and not by OLS because one of the dependent variables is a dichotomous variable. The reduced form equations are specified as:

$$(7)\ Collat = \Pi_1 X + \varepsilon_4$$

$$(8)\ Lmat = \Pi_2 X + \varepsilon_5$$

$$(9)\ Loanr = \Pi_3 X + \varepsilon_6$$

where X is the set of exogenous variables in the X_K vectors and $\varepsilon_4, \varepsilon_5, \varepsilon_6$ are reduced form residuals. Equations (8) and (9) are estimated with OLS and equation (7) with logit. These estimates are presented in Table B1 in Appendix B.

Note that the significance of the reduced form estimates does not necessarily imply that the structural coefficients in the second step are significant. Moreover, the reduced form parameters cannot be used to estimate the structural parameters because all equations are over-identified. The goodness of fit of the reduced form estimates, however, can give some useful information on the results. Table B1 shows that the adjusted R^2 of the *lmat* and the *loanr* equations are acceptable. The same holds for the McFadden R^2 of the *collat* equation. For *collat* we also present a cross-tabulation of actual and predicted

results (see Table B2 in Appendix B). Here we have generated predictions of *collat* (*collatf*) on the basis of the estimated logit probabilities by predicting a one if the estimated probability is above 0.5 and a zero otherwise. The off-diagonal elements in this table indicate the number of observations for which the model's prediction is incorrect. It appears that the number of correct predictions is very high. All in all, the reduced form regressions suggest that the endogenous regressors are reasonably well explained by the variables in their reduced form. Thus the fitted values from the first-stage regression seem to be reasonable proxies for the actual values. This provides some confidence in the appropriateness of our set of exogenous variables, that is, the set of instruments.

The reduced form results are used to obtain fitted values for all endogenous variables:

$$(10)\ Collat^f = \Pi_1^f X$$

$$(11)\ Lmat^f = \Pi_2^f X$$

$$(12)\ Loanr^f = \Pi_3^f X$$

where the superscript *f* denotes fitted value.

The second step consists of substituting the fitted values in the underlying structural models:

$$(13)\ Collat = \alpha_1 Lmat^f + \alpha_2 Loanr^f + \beta_1 X_1 + \varepsilon_1$$

$$(14)\ Lmat = \alpha_3 Collat^f + \alpha_4 Loanr^f + \beta_2 X_2 + \varepsilon_2$$

$$(15)\ Loanr = \alpha_5 Lmat^f + \alpha_6 Collat^f + \beta_3 X_3 + \varepsilon_3$$

These equations are estimated with logit, OLS, and OLS, respectively. Note that the standard errors reported in the second stage are not correct, but can be used as approximations (Nelson and Olson 1978: 702), and that is what we do.

Table 3 gives the second stage results. In Table B3 in Appendix B we present estimates of our structural model in which we ignore the endogeneity of *lmat, collat* and *loanr*. A comparison between Table 3 and Table B3 shows the degrees at which the assumption of endogeneity affects the results. In the last three columns of Table 3 we present regressions in which we have ignored the highly insignificant exogenous variables.[6] In Table 4 we present a cross-tabulation of actual and predicted results of *collat* (based on a cut–off value of 0.5). This table shows that in almost all cases our model predicts collateral requirements correctly. However, in seven of the 18 cases the model predicts

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6 In order to still have the same set of exogenous variables in our structural equations as in our reduced form equations (step 1), we decided to keep *turno* and *areceive* in one of the equations, although they are insignificant.

collateral requirements whereas collateral was not asked. Of the seven – wrongly – predicted cases, three cases entail the predicted probabilities in excess of 0.6. Generally speaking, the resulting collateral equation seems appropriate in explaining whether a loan is securitized or not.

5.1 Interdependencies between the endogenous contract terms

The coefficients of the contract term interdependence are of great interest as can be seen from Table 3. Specifically, we find significant bidirectional relationships between collateral (*collat*) and loan maturity (*lmat*), and between loan rate (*loanr*) and loan maturity (*lmat*), and a unidirectional relationship between loan rate (*loanr*) and collateral (*collat*). These results provide support for the underlying premise of our study that these three key contract terms are interrelated and simultaneously determined in the loan contract design process.

Turning to the specific interdependence effects, we find the bidirectional relationships between collateral and loan maturity. The collateral equation suggests that longer maturity loans lead to less collateral requirements. This corresponds to the findings of Boot et al. (1991), who argue that the costs for banks of seizing collateral are smaller for longer maturity loans. At the same time, the loan maturity equation shows a positive relationship between the two contract terms. This is in line with the agency costs theory, in which shortening maturity and requiring collateral are substitutes. The conflicting signs between collateral and loan maturity in the two equations seem to suggest that the collateral equation primarily represents bank behavior and the loan maturity equation represents borrower behavior. This provides some evidence for our assumption with respect to the normalization of the equations (see above).

As for the interrelation between loan rate and loan maturity, there is evidence of a bidirectional relationship between these two terms, although this only appears in the set of equations where we ignore the insignificant exogenous variables. Again the signs of the relationships are conflicting. In the loan maturity equation the loan rate and the loan maturity are negatively related, whereas these variables are positively related in the loan rate equation. The negative relationship can be explained by the option pricing approach of Merton (1974). The positive sign is in line with the tradeoff theory. Again these results suggest that the loan maturity equation does not reflect bank behavior and is more in line with borrower behavior.

Finally, the relationship between the loan rate and collateral appears to be unidirectional. The loan rate has a negative effect on collateral requirements in the collateral equation, whereas in the loan rate equation collateral is insignificant. The negative significant sign of the loan rate in the collateral equation is in line with the Bester (1985) signalling model, and with trade-off theory, in which high quality firms are inclined to enjoy lower loan rates by pledging more security.

Table 3: Structural equation results

	collat	lmat	loanr	collat	lmat	loanr
collat[f]		16.99697	0.02746		16.56602	0.04854
		(0.018)	(0.8879)		(0.0245)	(0.7805)
lmat[f]	-021212		0.01181	-0.103011		0.011209
	(0.0324)		(0.1749)	(0.0172)		(0.0414)
loanr[f]	-9.82386	-13.3016		-4.914005	-14.73545	
	(0.0179)	(0.0085)		(0.0003)	(0.0039)	
C	175.4094	22.12017	15.25876	125.8468	44.31400	15.2418
	(0.0269)	(0.7161)	(0)	(0)	(0.4332)	(0)
liquidr	1.447864	-0.07102	0.000862		-0.069087	0.001114
	(0.2891)	(0.0137)	(0.1124)		(0.0147)	(0.0282)
debta	-47.6954	2.884085	-1.53134	-72.82207		-1.610594
	(0.0123)	(0.7584)	(0.0032)	(0.0299)		(0.0003)
inventc	-1.71867	23.40218	0.143124		23.735	
	(0.7464)	(0.0387)	(0.5502)		(0.012)	
profbt	106.4617	-29.2934	-0.15156	83.57097	-31.18835	
	(0.0083)	(0.0323)	(0.6354)	(0.0082)	(0.0058)	
areceive	-3.46357	7.543622	-0.07013	1.560710		
	(0.4769)	(0.5493)	(0.7898)	(0.4997)		
turno	-0.28098	0.170446	-0.01084			-0.01164
	(0.5309)	(0.7157)	(0.3498)			(0.2676)
taxa		338.4387			331.4889	
		(0.1221)			(0.1103)	
amat		1.215238			1.10871	
		(0.0019)			(0.0013)	
fsize	-3.28246	1.7729	-0.23794	-2.630631	1.334046	-0.257795
	(0.0952)	(0.1304)	(0.0009)	(0.001)	(0.0454)	(0.0002)
lsize	0.122768	4.944255	-0.03242	0.555345	5.206386	
	(0.8592)	(0.0237)	(0.5528)	(0.0113)	(0.0083)	
numberlc	0.728943		0.028413			0.032996
	(0)		(0.0052)			(0.0007)
loanc	-35.3062		-2.33478	-30.38032		-2.541453
	(0.0236)		(0.0011)	(0.0008)		(0)
debte	6.796181			9.866333		
	(0.0435)			(0.0730)		
dummyus			0.696508			0.692249
			(0)			(0)
R-squared		0.334786	0.397488		0.332477	0.392604
Adjusted R-squared		0.277358	0.34073		0.290170	0.354107
McFadden R-squared	0.569652			0.496667		
S.E. of regression	0.222143	17.38711	0.430117	0.220819	17.23230	0.425731
Sum squared resid	6.809966	42021.33	25.53007	6.924088	42167.19	25.73503
Log likelihood	-23.7951	-642.955	-80.0929	-27.83060	-643.2180	-80.70647
Mean dependent var	0.881579	15.70395	10.00638	0.881579	15.70395	10.00638
S.D. Dependent var	0.324174	20.45342	0.52973	0.324174	20.45342	0.529730
Restr. Log likelihood	-55.2926			-55.29261		
LR statistic (13 df)	62.99512			54.92402		
Probability(LR stat)	1.52E-08			1.26E-08		

Note: The number of observations in all equations is 152. The figures in parentheses are P-values.

Table 4: Cross-tabulation of actual and predicted outcomes for the logit model
(based on estimates where insignificant variables are ignored)

		collat (predicted)		
		0	1	Total
collat (actual)	0	11	7	18
	1	2	132	134
	Total	13	139	152

5.2 Effects of exogenous variables

Also from Table 3, we find evidence of the effects of exogenous variables on the three endogenous contract terms as formulated in Section 3. The collateral equation shows significant positive direct effects of *lsize, debte* and *profitbt* and significant negative effects of *debta, loanc, fsize.* The loan maturity equation proves that *inventc, amat, fsize,* and *lsize* have a positive impact while *liquidr* and *profitbt* have a negative impact on loan maturity. Finally, the loan rate equation brings us a positive effect of *liquidr, numberlc* and *dummyus* and a negative effect of *debta, fsize* and *loanc* on loan interest rate.

The agency cost theory receives support both from the collateral and loan maturity equations. Firms with substantial growth opportunities, as proxied by *profitbt*, mitigate agency problems by borrowing from banks short-term and on a secured basis. This corresponds with the positive sign of *profitbt* in the collateral equation and its negative sign in the loan maturity equation. Another support for the agency cost theory is provided by the positive sign of the asset maturity (*amat*) – loan maturity relationship. However, concerning the effect of firm leverage, as proxied by the debt-total asset ratio (*debta*) and the debt-equity ratio (*debte*), the result remained mixed in the collateral equation due to the conflicting signs of impact on collateral.

The hypotheses on the impact of firm quality are strongly supported by our result. All three equations confirm the effect of firm size (*fsize*) as a proxy for firm quality on contract terms. In line with empirical studies of Berger and Udell (1990), Strahan (1999), Dennis et al. (2000), Gonas et al. (2002), Pozzolo (2002), we find that larger firms borrow longer-term, at lower interest rates and provide less collateral, given the negative effect of *fsize* on collateral and loan rate but the positive effect on loan maturity. Turning to the significant effects of other proxies for firm quality, which are firm liquidity (*liquidr*) and firm inventory period (*inventc*), it appears in the loan rate equation that highly liquid firms should obtain loans at lower cost and in the loan maturity equation that efficiently operating firms prefer shorter-term loans. Additionally, a positive effect of *inventc* and a negative effect of *liquidr* on loan maturity are also consistent with the signalling hypothesis, which implies that viable firms choose shorter-term loans so as to distinguish themselves from risky firms. All in all, these results support the theoretical implications on the effects of firm quality on debt contract terms (Chan and Kanatas 1985; Flannery 1986; Chan and Thakor 1987; Diamond 1991a, 1991b; Diamond 1993).

The impact of relationship lending looks interesting from our results. In the loan rate equation, the positive sign for number of loan contracts (*numberlc)* contrasts with the relationship lending literature. This finding may be explained by the fact that this variable is a very poor proxy for relationship lending. It could be argued that a firm with many contracts with ACB also has the potential to have close relations with other banks and could borrow under many contracts. Whereas *numberlc* cannot capture relationship lending effects, loan concentration (*loanc*) negatively affects both collateral and loan rate, suggesting benefits of relationship banking as predicted by Boot and Thakor (1994), Berger and Udell (1995), Harhoff and Korting (1998), Degryse and Van Cayseeke (2000), Diamond (1989), Petersen and Rajan (1995), Repetto et al. (2002).

The effect of loan size is observed in the loan maturity equation with its positive sign, which reflects our expectation that large investments may require loans of a larger size and of longer maturity. Concerning the effect on collateral, we find a similar result as the studies of Harhoff and Korting (1998) and Elsas and Kranen (2000): loan size imposes a positive influence on collateral.

Finally, the indicator variable *dummyus* shows a strong significance in the loan rate equation. As we expected, this variable is closely related to the loan rate.

It should be noted that our results support most of above-mentioned hypotheses on the loan contract design (agency cost and relationship lending, and firm quality). However, there is little support for the tax hypothesis. This differs from the study of Dennis et al. (2000), which finds no evidence for the relationship lending hypothesis, but strong evidence of the influence of tax considerations.

6 Conclusions

By investigating the loan contract design of the Vietnamese private bank ACB, our study addresses a gap in the empirical literature of loan contract design with regards to developing economies. Based on the loan contracting policies of the ACB we specify a three-equation system to determine collateral requirements, loan maturity, and the loan interest rates. Following Dennis et al. (2000) we explicitly consider the endogeneity of three loan contract terms: collateral, loan maturity, and the loan interest rate. We hypothesize that the ACB bank determines collateral requirements and the loan rate, given the loan maturity, which is primarily determined by the borrowing firms. The loan maturity, on the other hand, is chosen by firms, given the collateral requirements and the loan rate set by banks. The equilibrium values for loan maturity, collateral requirements, and the loan interest rate are determined by the three equations together.

Our results provide additional support for interdependencies between the three contract terms identified. More specifically, we find significant bidirectional relationships between collateral and loan maturity, loan rate and loan maturity, and a unidirectional relationship between loan rate and collateral. Each relationship is consistent with certain well-known theories of financial contracting (Merton 1974; Bester 1985; Boot et al. 1991; Diamond 1991a). We find conflicting signs between loan maturity and collateral in the loan maturity and collateral equations, respectively. The same holds for loan maturity and the loan interest rate in the loan maturity and the loan rate equations, respectively. These results can be explained by our hypothesis that the choice for certain

loan maturities is primarily determined by borrower behaviour, whereas the loan rate and the collateral requirements are primarily determined by bank policies. However, more studies are needed to provide additional evidence for this hypothesis. Future studies of loan contract design should be conducted using a theoretical framework that simultaneously takes into account the behavior of banks and borrowers. We expect further research to focus on the theoretical aspect of this preliminary proposition to examine under which conditions, and to what extent, bank behavior and borrower behavior determine final outcomes.

Like Dennis et al. (2000), who argue that the interrelated nature of loan contract features has econometric implications for testing hypotheses related to their underlying determinants, we also find that some exogenous factors are relevant determinants of the three contract terms. Our results are in line with the agency cost theory that predicts that firms with high growth opportunities (measured by firm profitability) are more likely to borrow shorter-term and on a secured basis and firms with higher asset maturity take longer maturity loans. In addition, our findings on the effects of firm quality, as proxied by firm size, inventory period, and firm liquidity are consistent with related theories (Chan and Kanatas 1985; Flannery 1986; Chan and Thakor 1987; Diamond 1991a, 1993). Finally, the benefits of relationship lending are reflected in our study by the inverse influence of loan concentration on collateral and loan interest rates.

A final remark refers to the limits of our study. As mentioned before, our final dataset only comprises 152 loan contracts covering 47 different firms that borrowed from the ACB as of July 2003. This may induce small sample problems that bias our interpretations. These issues suggest the need for future empirical studies based on a more comprehensive database.

Appendix A

Table A1: Descriptive statistics of the exogenous variables

	liquidr	debta	inventc	profbt	areceive	turno	taxa	amat	fsize	lsize	numberlc	loanc	debte	dummyus
Mean	11.142	0.565	0.308	0.054	0.141	2.507	0.005	4.365	16.880	13.511	8.875	0.308	1.771	0.454
Median	1.421	0.564	0.337	0.023	0.076	1.431	0.003	2.341	16.879	13.373	7.000	0.231	1.291	0.000
Maximum	235.341	0.930	1.541	0.436	1.345	15.522	0.038	34.816	24.823	19.050	28.000	0.999	13.324	1.000
Minimum	0.572	0.014	0.025	-0.053	0.000	0.274	0.000	0.001	9.499	9.979	1.000	0.004	0.014	0.000
Std. Dev.	45.671	0.173	0.183	0.087	0.200	3.184	0.007	5.422	2.182	1.148	6.845	0.225	1.534	0.500
Jarque-Bera	3153.184	11.141	970.348	1242.259	1182.408	971.133	430.015	456.080	180.492	107.270	35.051	103.173	3197.177	25.341
Observations	152	152	152	152	152	152	152	152	152	152	152	152	152	152

Table A2: Correlation matrix of the exogenous variables

	liquidr	debta	inventc	profbt	areceive	turno	taxa	amat	fsize	lsize	numberlc	loanc	debte	dummyus
liquidr	1.00													
debta	-0.33	1.00												
inventc	0.21	0.06	1.00											
profbt	-0.08	-0.34	0.02	1.00										
areceive	-0.05	0.02	0.13	0.15	1.00									
turno	-0.12	-0.11	-0.53	-0.07	-0.25	1.00								
taxa	-0.14	-0.04	-0.12	0.05	0.09	0.05	1.00							
amat	0.47	-0.23	0.01	-0.26	-0.21	-0.21	-0.16	1.00						
fsize	-0.03	0.05	-0.01	-0.06	-0.54	-0.11	-0.11	0.07	1.00					
lsize	-0.02	-0.06	0.05	0.06	0.11	-0.21	-0.05	0.08	0.43	1.00				
numberlc	-0.10	0.17	0.18	-0.13	-0.17	-0.14	-0.30	0.07	0.26	-0.07	1.00			
loanc	0.16	-0.48	0.05	0.22	0.51	0.04	-0.05	0.19	-0.71	-0.12	0.07	1.00		
debte	-0.19	0.78	0.11	-0.25	0,01	-0.10	-0.07	-0.06	-0.02	-0.08	-0.02	-0.35	1,00	
dummyus	0.22	-0.10	0.03	0.24	-0.26	-0.11	-0.13	0.03	0.25	0.01	0.12	-0.08	-0,15	1.00

Appendix B: First step estimation results

Table B1: First step reduced form estimates

	collat	lmat	loanr
C	112.048	-137.306	14.120
	0.042	0.029	0.000
liquidr	2.252	-0.017	0.001
	0.102	0.519	0.441
debta	-46.079	18.833	-2.163
	0.006	0.403	0.003
inventc	-12.641	15.485	0.232
	0.172	0.105	0.218
profbt	168.469	-8.056	-0.355
	0.032	0.608	0.255
areceive	-9.787	-0.759	-0.043
	0.144	0.957	0.902
turno	-0.959	0.105	-0.012
	0.099	0.821	0.395
taxa	480.635	450.458	4.754
	0.052	0.032	0.299
amat	-0.738	0.649	0.003
	0.018	0.091	0.793
fsize	-3.824	3.691	-0.212
	0.147	0.263	0.002
lsize	-1.356	4.646	0.037
	0.014	0.053	0.330
numberlc	0.490	0.326	0.039
	0.005	0.584	0.001
loanc	-31.453	31.971	-2.143
	0.068	0.259	0.005
debte	7.009	0.609	0.105
	0.002	0.573	0.005

dummyus	-6.634	-13.069	0.566
	0.015	0.000	0.000
R-squared		0.373	0.423
Adjusted R-squared		0.309	0.365
McFadden R-squared	0.630		
S.E. of regression	0.205	17.006	0.422
Sum squared resid	5.759	39621.610	24.429
Log likelihood	-20.447	-638.486	-76.741
Mean dependent var	0.882	15.704	10.006
S.D. Dependent var	0.324	20.453	0.530
Restr. log likelihood	-55.293		
LR statistic (14 df)	69.690		
Probability(LR stat)	0.000		

Note: figures below the coefficients are p=values The McFadden R-Squared is defined as $R^2 = 1 - Logl_{UR}/logl_R$, where $Logl_{UR}$ is the unrestricted_ Log likelihood and $Logl_R$ is the restricted Log likelihood (it is the maximum of the likelihood function when maximized with the restriction that all slope coefficients are zero). The number of observations in all regressions is 152. The first equation is estimated with logit, the other two with OLS.

Table B2: Cross-tabulation of actual and predicted outcomes for the logit model (reduced form estimates)

		collatf		
		0	1	Total
collat	0	14	4	18
	1	16	128	134
	Total	20	132	152

Table B3: Structural equation results without endogeneity effects

	collat	lmat	loanr
collat		14.69927	0.042616
		(0.0004)	(0.6982)
lmat	0.16723		0.007703
	(0.0746)		(0.0051)
loanr	-0.80602	4.432324	
	(0.4229)	(0.16)	
C	101.9003	-179.995	14.63845
	(0.0613)	(0.0028)	(0)
liquidr	0.385248	-0.11445	0.000848
	(0.5093)	(0.0001)	(0.1162)
debta	-52.559	5.287651	-1.41811
	(0.0033)	(0.582)	(0.0061)
inventc	-1.03562	21.95047	0.181012
	(0.8274)	(0.0452)	(0.2854)
profbt	116.3808	-29.7695	-0.24389
	(0.0064)	(0.0269)	(0.3705)
areceive	-2.34279	22.99581	-0.11013
	(0.7406)	(0.0753)	(0.6649)
turno	-0.02336	0.965765	-0.01293
	(0.9323)	(0.058)	(0.2223)
taxa		352.8301	
		0.115	
amat		1.477678	
		0.0004	
fsize	-3.36099	2.063679	-0.2179
	(0.1059)	0.083	(0.0004)
lsize	-0.8682	6.127414	-0.01474
	0.0731	0.0075	(0.7115)

numberlc	0.32269		0.028288
	(0.0356)		(0.0014)
loanc	-35.593		-2.13126
	(0.0522)		(0.0009)
debte	6.750035		
	(0.0098)		
			0
	0.334786	0.323042	
	0.277358	0.264599	
McFadden R-squared	0.587444		
S.E. of regression	0.214043	17.53993	0.410342
Sum squared resid	6.322374	42763.24	23.23648
Log likelihood	-22.8113	-644.285	-72.9387
Mean dependent var	0.881579	15.70395	10.00638
S.D. Dependent var	0.324174	20.45342	0.52973
Restr. log likelihood	-55.2926		
LR statistic (13 df)	64.96259		
Probability(LR stat)	6.70E-09		

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