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Cover Page Footnote

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ABSTRACT

Quality problems that are known to the seller of an asset, but will become known to the buyer only after the purchase have the potential to frustrate voluntary exchanges. When the problem is subtle or confounded by the extent of buyer inputs, requiring risk-sharing by the contracting parties, both parties would benefit from a mechanism, such as seller financing, which not only credibly signals to the buyer the veracity of the seller's representations about the asset (s)he is trying to sell, but also offers the seller sufficient protections against the potential that the buyer may engage in post-sale opportunistic behavior about the maintenance of the asset. We analyze *one-time-only* mortgage contracts in the National Association of Realtors' Home Financing Transaction database for 1984-1996, (data not collected outside this period), and find empirical support for seller financing as an asset quality signal and, separably, as a mechanism for providing credit when conventional credit sources are tight. We also point out the broad, but not well-acknowledged, reach of seller financing, including the sub-prime loan debacle, the earnout mergers or reverse annuity mortgages, which are inherently embedded with both asymmetric information about the quality of the relevant assets and moral hazard about the asset acquirer's post-purchase maintenance.

KEYWORDS

Microeconomics Information, Knowledge, and Uncertainty, Financial Economics, General Financial Markets, Financial Institutions and Services

JEL codes: D8, G1, G2

INTRODUCTION

Ever since Akerlof's (1970) pathbreaking contribution, the literature has recognized that asymmetric information about the quality of an asset between its seller and its potential buyer, if not cured, can even lead to a breakdown of markets and voluntary trading. There exists a very rich literature, which examines several economic and financial phenomena under the asymmetric information condition. Riley (2001) provides a comprehensive review of this literature. Any solution that removes the potential buyer's asymmetric information will lead to a consensus between the seller and the potential buyer about the asset's valuation, and increase the probability of trading of the asset at its full information value.

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One such solution is for the seller to invite the potential buyer to “experience” the quality of the asset for a sufficiently long period of time, upon which a “symmetrically-informed” trade can proceed. This solution typically requires the seller to finance the potential buyer during the “experience period.” Since any leveraged asset acquisition can provide the potential buyer with a put option (Merton, 1974), seller financing is vulnerable to the potential for buyer’s opportunistic behavior with respect to maintaining the quality of the asset during this period.

The roots of seller financing arguments, as a solution for asymmetric information, are in fact hidden in Akerlof’s (1970) generic used car example for the “lemons” problem. The seller of the car, having been an owner/driver of it for some time, has asymmetrically superior information about its quality over the potential buyers, who do not have any experience of owning and driving the same car.¹ Akerlof (1970, p. 489) notes that:

“After owning a specific car, however, **for a length of time (emphasis placed by us)**, the car owner can form a good idea of the quality of this machine; i.e., the owner assigns a new probability to the event that his car is a lemon.”

The post-purchase removal of asymmetric information can occur if and when the buyer is given a *sufficiently long* period of time to *experience and learn* the quality of the asset such that the buyer’s and seller’s probability distributions of the asset quality converge at the end of this period. Bilateral negotiations between the buyer and the seller that establish the clauses of the seller’s loan contract also allow for the experience period as part of the maturity (i.e., term) of this contract. Its maximum is bounded by the length of the term of the loan. During this period, both parties exchange continuously information, learn and revise their own probability distributions and valuations, and monitor each other.

Better or full maintenance of the asset during the experience period depends critically on whether and to what degree the seller is present to monitor the potential buyer. At one extreme, seller monitoring of the buyer reduces substantially the risk of buyer opportunistic behavior in maintaining the asset. For example, though not recognized by the extant literature yet, the earnout corporate mergers are in fact seller-financed transactions where the seller may be present fully during the experience period. Kohers and Ang (KA) (2000, p.445) note that:

“Differing expectations about target value are a prominent source of disagreement between bidders and targets in merger negotiations. In addition, these valuation disagreements may be even more severe when the realizable target value depends uniquely on human capital, such as key target managers who may or may not agree to stay after the merger occurs.”

In this context, earnouts may serve as a contractual mechanism that “...allow bidder and target firms to disagree on their valuations and yet manage to reach an agreement on the transaction.”² So, KA (2000) add earnouts to the portfolio of market mechanisms and buyer/ seller behaviors that have been identified in recent years as encouraging otherwise-willing, but asymmetrically-informed buyers

¹ Information asymmetry about quality is sometimes the source of severe valuation disagreements. The buyer, facing the quality uncertainty, may ultimately decline to purchase the car if its price is above what the buyer considers a reasonable price. Akerlof (1970, p. 495) points out that “The cost of dishonesty, therefore, lies not only in the amount by which the purchaser is cheated; the cost also must include the loss incurred from driving legitimate business out of its existence.”

² The purchase of Skype at an overvalued price by EBay in 2005 provides a unique example (see John Bowker, October 9, 2007, http://biz.yahoo.com/rb/071009/skype_valuation.html?v=3). In October 2007, EBay agreed to cut as much as \$1.2 billion off the \$4.3 billion potential price it agreed to pay. Evidently, Niklas Zennstrom, co-founder of Skype, expressed his agreement that the original valuation put on the company was too high.

and sellers to transact with one another.³ At the other extreme, sellers may not be present at all to monitor the buyer's behavior. Therefore, the seller faces, ex-ante, the full risk that the buyer may not undertake the optimal maintenance regime for the asset during the experience period, causing declines in asset quality and its valuation.⁴

We argue that seller financing is a signal of asset quality and moves the asset in question from a pooling equilibrium to a separating equilibrium. Diligent and careful ex-ante contracting, which crafts a risk-sharing arrangement for the ex-post welfare of both the seller and buyer, becomes essential. Though the extant literature has taken a narrow view of seller financing as a financing technique mainly in retail markets so far, its *broad* reach has gone *unrecognized* so far. For example, the earnout mergers in corporate finance, as indicated, are fundamentally seller-financed transactions. Further, unfolding events, surrounding the ongoing country and bank bailouts, offer evidence consistent with several aspects of seller financing.

We offer both a theory and empirical evidence on seller financing when the seller *is not present to monitor* the buyer's maintenance regime and behavior during the experience period. In particular, contracting under seller financed residential property transactions provides an empirical context. Given that the asymmetric information about the quality of residential properties was within the genesis of the sub-prime loan crisis, seller financing offers valuable lessons for the future from this market on contracting in the presence of asymmetric information about asset quality. The clauses of seller-financed transactions should be more protective of the seller's interests when the seller cannot monitor the buyer than those when the seller can monitor the buyer. For example, the experience period may be longer when the seller is present to monitor the buyer. This arrangement gives further assurance to the buyer. (See footnote 4.)

The *National Association of Realtors'* (NAR) data on the *first mortgage contracts* for residential property exchanges (occurring *only once* between 1984 and 1996) provide the foundation of the empirical analyses. We find that, in general, seller financing is more likely to occur on properties that suffer from greater informational asymmetry on their quality between buyers and sellers, *ceteris paribus*. Results show that the required down payment, the length of the repayment period, and the rate of interest of a seller-financed mortgage contract are all structured to minimize both seller and buyer opportunism, especially when both parties contribute inputs that influence the flow of services forthcoming from the contracted-for item.⁵ Results verify largely the predictions of the asset quality signaling theory of seller financing.

³ Bowker (October 9, 2007, http://biz.yahoo.com/rb/071009/skype_valuation.html?.v=3) notes, "the write down on the value of the deal came as EBay said Skype co-founders Niklas Zennstrom and Janus Friis had resigned as executives, and marked a tacit admission of lackluster returns from Skype since EBay acquired it two years ago. The cofounders stepped down before reaching earnout targets in 2008 and 2009, but Zennstrom would not say whether that meant he would have definitely have missed them." Further, EBay informed it had paid \$530 million to Skype shareholders, including Zennstrom, out of a possible \$1.7 billion. See Davis et al. (2011) for another study on the unique contractual characteristics of earnouts.

⁴ Sellers may be partially able to monitor the buyer during the "experience period" in seller-financed transactions of small businesses. In fact, the buyer may ask, as part of the contract, that the seller be partially present during the experience period since the seller has a network of clients, who are not familiar with the new buyer and may choose to go somewhere else for their new business transactions. Note that the mere transmission of this firm-specific human capital need not require the *continuing presence* of the seller. The seller stays on at the behest of the buyer precisely to encourage and monitor interaction between the buyer and the client base that, if not maintained, would diminish the value of the firm. The buyer's insistence of this as a contractual condition signals his intent to adhere to the value-maximizing ex-post maintenance regime.

⁵ These are consistent with the agency problems of debt and equity and their contractual solutions, such as bond covenants, to minimize the costs associated with them (Jensen and Meckling 1976).

This paper is organized as follows. Section 2 reviews the literature, which has mainly considered seller-financing in the retail exchange markets; highlights our departures from the literature; provides a formal model of seller financing in the context of residential real estate; and puts forward its empirically testable hypotheses. Section 3 discusses our empirical methodology and data. We present our empirical results in section 4. Our final thoughts in section 5 round out the paper with an examination of how seller financing relates to (i) the sub-prime loan debacle, (ii) the problems of corporate finance and (iii) other areas of finance.

AN OVERVIEW AND DEVELOPMENT OF THEORY AND HYPOTHESES

Why do retailers provide financing for buyers of their products? Surprisingly, not only is our understanding of the role of seller financing in retail exchanges limited, there is also very little empirical evidence on this topic. Yet, retailer-provided trade credit, which is a form of seller financing, survives in spite of the breathtaking pace of financial innovations in recent decades. Moreover, as indicated above and discussed further in section 5, the use of seller financing is not confined to a few products or markets. So, whatever the function(s) of seller financing are, they are of continuing and exhibiting importance.

Several explanations of retail-level seller financing have been proposed. Petersen and Rajan (PR, 1997) review comprehensively the explanations of (and the literature for) credit rationing, repossession management, price discrimination, and asset quality signaling and note that there is little systematic evidence on why sellers provide financing. This empirical lacuna notwithstanding, credit rationing has been the dominant explanation for seller financing (see Biais and Gollier, 1997, PR 1997, among others). Indeed, we could identify only six papers in which the authors explicitly offer an asset quality signaling function for seller financing (Smith 1987; Lee and Stowe (LS) 1993; Long, Malitz, and Ravid (LMR) 1993; Laband and Maloney (LM) 1994; PR 1997; Ng, Smith and Smith (NSS), 1999). All, with the exception of LM (1994), are couched in a trade credit context, and of the remaining five, only two -- LMR (1993) and NSS (1999) -- provide any empirical evidence for the asset quality signaling function.

PR (1997) search for empirical support for the above-mentioned theories, with the exception of asset quality signaling, using trade credit data on small firms, obtained from the National Survey of Small Business Finance database of the Board of Governors of the Federal Reserve System. Their evidence suggests that firms use more trade credit when credit from financial institutions is unavailable. PR (1997), however, acknowledge that their conclusions are limited since their data were available for only one year, a shortcoming that likely prevented them from testing the asset quality signaling hypothesis. They note (1997, p. 690) that “the single most important step for future research is to examine the determinants of trade credit over time. ... More detailed data will allow researchers to investigate the price discrimination and quality guarantee hypotheses more fully.”

Our analysis takes a step forward in providing evidence on the asset quality signal hypothesis and draws its motivation largely from LM's (1994) contribution. LM (1994) suggest that when the determination of quality after the sale is not cut-and-dry, is more subtle or especially *confounded by the extent of consumer inputs, requiring maintenance after the sale of the product and risk-sharing by the contracting parties*, bonding devices such as brand names and unconditional guarantees typically are not sufficient.⁶ Recognition of the influence and importance of buyer maintenance after the sale

⁶ Payment for a meal in most US restaurants often occurs after the meal is consumed. No payment before or during consumption of the meal is a form of very short-term seller financing. If the meal is not satisfactory, the customer may balk at paying the bill and the seller may, for his part, offer the meal at no charge to the customer. Meanwhile, the payment for a meal with standardized quality in a restaurant (such as a salad bar restaurant) usually occurs before the meal is consumed. See Faith and Tollison (1981).

of the product and offering an experience period to the potential buyer bring a new perspective to the seller/buyer interaction. While the potential buyer faces asymmetric information about the quality of a seller's product, the seller faces asymmetric information about the buyer's diligence in maintaining the product. We argue that both parties would benefit from a mechanism, such as seller financing, which not only credibly signals to the buyer the veracity of the seller's representations about the asset (s)he is trying to sell, as per the offer of a post-purchase experience period, but also offers the seller sufficient protections against the potential that the buyer may engage in post-sale opportunistic behavior about the maintenance of the product. The post-purchase product/asset quality is important to the seller, who is also the lender under seller financing.

We offer an empirical analysis of seller financing based on National Association of Realtors' (NAR) data on the *first mortgage contracts* for residential property exchanges that occurred *only once* between 1984 and 1996. (See Pafenberg, 1993; the NAR ceased to produce this data after 1996.) Trade credit transactions, however, occur between a buyer and a seller mostly on a repeated and ongoing basis. This difference renders some of the seller financing explanations, such as the advantage in information acquisition, advantage in controlling the buyer, and price discrimination, as reviewed in PR (1997), irrelevant for our work. The repossession management explanation has some relevance for us, however. PR (1997, p. 689) note that (in an ongoing trade credit relationship): "suppliers are in the best position to liquidate the goods they have sold the firm, provided it has not been transformed (and provided they are secured so suppliers can seize the goods)."⁷ Transforming a residential property within a short period of time without being noticed and with legal permissions is difficult. Given the buyer's put option on a leveraged asset acquisition under seller financing during the experience period, repossession is quite viable. Thus, a seller, who does not and cannot monitor closely buyer's post-purchase behavior, is keenly concerned about the buyer's post-purchase maintenance regime.⁸

SELLER FINANCING, ASSET QUALITY AND EMPIRICAL IMPLICATIONS

Drawing from the more general model proposed by LM (1994), we model product quality in residential housing in terms of the life of the flow of housing services provided. This flow of services is a function of the quality of inputs employed when the structure was built and the maintenance engaged in by the property owner. Thus, we write:

$$(1) \quad S = S(Q, M)$$

where S is the flow of housing services to the buyer, Q represents the seller-provided quality inputs, and M refers to the buyer's maintenance regime.

We assume that a prospective buyer has an expectation regarding the flow of services prior to buying the property, but the true flow of services is known only after the sale. For simplicity, let the information be revealed to the buyer immediately following the purchase. After purchase, the buyer embarks on a maintenance regime at cost M that is optimal given the revealed quality provided by the seller. We assume that at the market equilibrium described by our model, the buyer makes a utility maximizing choice between the amount of this and all other goods. Hence, the buyer's objective in forming the contract can be stated as:

⁷ This may be why the supply of trade credit increases the extent to which inventories consist of raw materials (PR, 1997).

⁸ In earnout contracts for mergers, this is consistent with the post-merger retention of key managers of a target firm (KA, 2000). Their retention is critical for the target's post-merger value. Further, their presence should lessen the value of the embedded put option as they can monitor the buyer's post-purchase behavior.

$$(2) \quad \min_{\{M\}} C(M)/S(Q,M),$$

where C is the cost of the property. C is composed of three parts: (1) the maintenance expenditure, M , (2) the down payment, D , and (3) the scheduled payments in the mortgage contract. For simplicity, we assume the discount rate to be zero, which permits us to write the sum of the mortgage payments as:

$$(3) \quad P = \min [T, S(Q,M)] \cdot [SP(1-d)/T]$$

where P is the total of the mortgage payments, T is the term of the mortgage (i.e., the scheduled number of payments), SP is the selling price of the property, and d is the percentage of SP paid as a down payment.

The second term in equation (3) is the mortgage loan payment - the selling price of the property less the down payment divided by the scheduled number of payments. Since the discount rate is assumed to be zero, the total of the mortgage payments is the number of payments made times the payment rate. The number of payments actually made is the smaller of the scheduled number or a number equal to the life of the flow of housing services. Equation (3) says that the buyer only makes payments during the term of the mortgage provided the flow of housing service continues. That is, if there is a failure in the flow of housing services, the buyer stops making mortgage payments at that point (i.e., the buyer exercises the put option; see Geltner and Miller, 2001, Chapter 16 for details).

Rewriting the objective function, we have:

$$(4) \quad \min_{\{M\}} C/S = (M + D + P) / S(Q,M).$$

The first order condition, $C_M/C = S_M/S$, has the buyer spending on maintenance until the percentage increase in the flow of housing services is equal to the percentage increase in maintenance cost. The level of quality (flow of services) embodied in the house affects the buyer's behavior and the seller recognizes this. The seller maximizes profits that are the difference between the total payment received for the property and his/her cost, which consists of quality producing expenditures, Q , and other costs, K . Thus, the seller's objective function is:

$$(5) \quad \max_{\{Q\}} \pi = D + P - K - Q.$$

The first order condition is:

$$(6) \quad S_Q \cdot [SP(1-d)/T] = 1.$$

The seller solves (5) subject to the response function of the buyer embodied in $C_M/C = S_M/S$. T and d determine the equilibrium behavior of the buyer and seller. The market equilibrium contract adjusts until the values of T and d maximize total surplus. This occurs where:

$$(7) \quad S_Q = S_M.$$

Equation (7) indicates that the impact of seller-provided quality inputs on the flow of housing services must be equal, on the margin, to the impact of buyer-provided maintenance expenditures on the flow of housing services. While we have simplified our discussion by assuming a zero interest rate, introduction of a positive interest rate merely means that, under equilibrium contracting, the rate of

interest adjusts along with T and d to maximize total surplus.

Since, as noted previously, there are many dimensions of the ‘quality’ of a property, acquiring reliable information about the ‘true’ quality of a property, especially for a not brand-new home, prior to purchase may be very difficult for the buyer. No one is in a better position than the seller to provide this information. But, of course, the prospective buyer may be reluctant to trust the seller if (s)he suspects that the seller may be less than completely candid. Seller financing provides a mechanism whereby the seller can, in effect, provide surety with respect to his honesty.⁹ It mitigates the opportunism problem on the part of the seller because if (s)he misrepresents the quality of the property being sold, the buyer can stop making payments, but foreclosure of this low quality property is not an attractive option for the seller. Conversely, if the buyer of a high-quality home defaults anyway, foreclosure of this high quality property is a viable strategy for the seller. (See footnotes 2 and 3.)

The ‘quality’ of a home depends on the owner’s maintenance regime. The quality can erode quickly if the owner fails to fix leaky pipes, patch the roof, treat for termites, etc.¹⁰ The embedded put option under seller financing, if not contracted or priced properly ex-ante, may present the buyer with opportunity to engage in a less-than-optimal maintenance regime after the sale of the property. In other words, a high quality property, when sold under seller financing without sufficient protective contractual terms for the seller’s short put position, may become in a relatively short period of time a low or lesser quality property if the buyer fails to provide necessary maintenance. The buyer can then stop the mortgage payments for this low or lesser quality property, blame the seller by claiming that the seller did not inform the buyer about the quality problems of the property in the first place and cause the seller substantial losses.

Our model suggests that there are a number of ways that home sellers can protect themselves, ex-ante, against buyer opportunism. They can demand any one or a combination of the following contractual protections:

1. higher down payments, thereby raising the cost to buyers of acting opportunistically,
2. shorter contract periods, which reduces the likelihood that the value of the service flow from the residence will fall below the value of the periodic payment,¹¹
3. higher interest rate, which, once again, increases the cost to buyers of acting opportunistically.

By the same token, prospective home buyers, seeking the quality assurance, as signaled by seller financing, should, *ceteris paribus*, be willing to pay a premium for seller financing by offering higher down payments, shorter repayment periods and/or higher rates of interest.¹² In the presence of an experience period under asymmetric information about the quality of the asset, we stress that both

⁹ Some other mechanisms exist to alleviate the informational imbalance between sellers and prospective buyers: brand names (on the components, as well as builders as the assemblers of the components), insurance, inspections, etc. Sellers often do not require third-party inspections of the premises. This is *prima facie* evidence in support of asset quality signaling.

¹⁰ Several authors, including Miceli and Sirmans (1994), Shiller and Weiss (2000), and Davidoff (2004a,b) recognize moral hazard with respect to maintenance.

¹¹ LMR (1993) argue this point slightly differently, by focusing on the period of time that trade credit is offered for: “It is reasonable to assume that firms purchasing high-tech products, such as computers, other electronic goods or machinery, require a longer time period to ascertain quality. Therefore, buyers of such products may require longer trade credit terms to allow for uncertainty resolution. Alternatively, buyers of perishable products where quality is readily observable, such as food and tobacco, only require a short time to resolve uncertainty, and they are therefore willing to accept shorter terms.”

¹² This is consistent with Pratt’s (1964) work on risk-aversion. Further, this is also consistent with higher yields observed for mortgages with embedded put options vis-a-vis yields for the equivalent-maturity US government bonds without default risk (Geltner and Miller, 2001, p. 399).

buyers and sellers converge naturally towards contractual terms characterized by higher down payments, shorter repayment periods, and/or higher interest rates. Further, since seller financing is a signal of higher quality for a property, a fourth implication of our model is that a seller-financed property should command a higher price than an otherwise comparable property sold under conventional financing.

So far, credit rationing appears to be the widely accepted explanation for seller financing in the residential real estate context. High interest rates characterize tight credit in an economy and may motivate seller financing of residential properties. The argument is that sellers agree to finance the sale of their properties to buyers, who do not qualify for mortgages from conventional sources, at lower interest rates and higher property prices. This is one of the so-called creative financing mechanisms in the real estate literature (see Clauretje and Sirmans 2003, among others).¹³ If credit rationing were the *only* reason of seller financing, then there would be no need for an experience period. So, the observed relation between down payment (maturity) and the incidence of seller financing should be negative (positive), respectively. That is, when conventional credit market sources do not support a prospective buyer *and* when asset quality signaling is not a factor, the seller *qua* financier can help by reducing the required down payment and/or by lengthening the repayment term relative to conventional sources of credit.

We recognize that all buyers of residential real estate, whether credit-rationed or not, have a strong interest in the quality of the property they buy.¹⁴ That is, buyer concern with quality *always* is present, regardless of credit market conditions.¹⁵ Further, the fact that seller financing occurs even when interest rates are relatively low (i.e., when credit rationing is less likely to occur) suggests that a fundamental aspect of seller financing in these markets is not being driven by credit rationing. Our view is that the asset quality signaling explanation of seller financing in residential real estate markets and the credit rationing explanation *are not mutually exclusive*. Thus, we do not argue against the possibility that credit rationing in conventional credit markets motivates seller financing to some extent. Rather, we highlight asset quality signaling as a more general explanation of seller financing, even in the presence of credit rationing, in asset markets with asymmetric information problems. When we consider the asset quality signaling role of seller financing under credit rationing conditions, the only difference from the predictions derived from our model of asset quality signaling arises for the interest rate. Credit rationing suggests a trade-off between a higher property price and a lower interest rate, while there is no such implied trade-off under asset quality signaling.¹⁶

¹⁴ Monetary contractions lead small businesses to engage in trade credit although it is expensive Nilsen (2002) Morgan (1998) examines tight credit conditions with and without loan commitments.

¹⁵ From a buyer's perspective, purchasing a house can be a very risky venture. Numerous conditions that influence the buyer's perception of "quality" may not be readily observable, rendering them less informed about characteristics of the property than is the seller. For example, the house may be infested with termites or have leaks in the roof, basement, or plumbing; the wiring may be hazardous; asbestos insulation may have been installed; the PVC pipe to bathroom fixtures may have been run so close to poorly insulated external walls that there might exist a high likelihood of the pipe freezing and splitting during cold weather, among others. We note that seller financing is not the only way to sort out the informational asymmetry issues in this market. First, both parties to the contract may agree on some sort of third-party bonding agent. However, third-party home inspections may not fully capture the subtleties of the quality of the property. For example, aspects of drainage and/or roofing quality may not be fully revealed until there has been substantial rainfall; unless the inspection occurs under just the right conditions to reveal quality shortcomings (or strengths), they will not, in fact, be identified to the inspector. Second, the buyer may rely on the representations of the seller with respect to the quality of the property being sold. This, of course, creates a moral hazard problem. Leland and Pyle (1977, p. 371) note: "Nonetheless, information on project quality may be transferred if the actions of the entrepreneurs ("which speak louder than words") can be observed.

¹⁶ Both hypotheses posit a higher selling price for a seller-financed property than an otherwise comparable conventionally financed property, but for different reasons.

We suggest one way of empirically observing these two, not-mutually-exclusive explanations. The credit-rationing hypothesis implies that the incidence of seller financing will rise and fall with the interest rate while the asset quality signaling hypothesis suggests that seller financing will persist in periods of both high and low mortgage interest rates. Thus, observing statistically significant low (high) rates of interest on seller-financed mortgage contracts at times of high (low) interest rates in an economy offers evidence in support of credit rationing (asset quality signaling) motivation of seller financing, respectively. Since quality is a concern of both buyers and sellers, even under credit rationing conditions, we should observe, *at all times*, (1) shorter mortgage terms or (2) larger down payments (as a percent of the selling price) on seller-financed mortgage contracts than on conventionally-financed mortgage contracts. Furthermore, asset quality signaling also suggests that the incidence of seller financing is greater when the extent of information asymmetry between seller and buyer is higher. Thus, a variable that proxies informational asymmetry should be positively related, *at all times*, to the likelihood of observing seller financing. Our empirical modeling and interpretation of our results follow from this perspective.

DATA AND EMPIRICAL MODEL

Our data are taken from the National Association of Realtors' (NAR) *The Home Financing Transaction* data for 1984-96. These data consist of 11,835 broker-assisted residential real estate transactions for conventional lender financed and seller-financed mortgage contracts; transactions that do not involve a broker are not included. In addition, we filter the data to focus exclusively on seller- or conventionally-financed first mortgages that are not followed by second or third mortgages.¹⁷ This filtering also excludes the possibly confounding effects of assumption financing and other sources of financing from our analyses. To control for the potential effects of the volatility of interest rates, seller-financed transactions are matched on a monthly basis with conventionally financed transactions. These data screening criteria, along with considerable missing data problems, reduce our usable sample to a total of 4,356 observations, of which 289 were seller-financed and 4,067 are conventionally financed. Sample statistics for those transactions involving seller financing versus conventional lender financing are presented in Panels A, B and C of Table 1.

We develop a logistic regression model to investigate various empirical relations between the incidence of seller financing and the variables associated with the hypothesis of the asset quality-signaling role of seller financing. The model also tries to address empirically the role of credit rationing at times of high interest rates and controls for buyer characteristics, such as income, first-time buyer or not, and marital status, and the price of the property:

$$(8) \quad SF_i = a_0 + \sum (a_j * X_j)$$

where SF_i is one (zero) for seller-financed (conventionally-financed) transactions, determined, in part, by a number of factors (X_j) and the log likelihood that property i was seller-financed:

HOMEAGE = age of the property when sold,
 SSP = 'standardized' selling price of the property, which is the nominal selling price divided by the dwelling square footage,

¹⁷ We omit adjustable rate mortgages (ARM). Mortgage rates on ARMs can change. Allowing for the mortgage interest rate to change over time has the potential to alter other contractual terms of a mortgage term at the time of contracting. To control for such confounding effects of ARMs would require substantial (and in most cases impossible) data tracking adjustments, complicating unnecessarily and substantially our empirical work.

DNPAY%	= the percent of the purchase price paid by the buyer as the down payment - calculated as the selling price minus mortgage amount, divided by selling price, times 100,
TERM	= the term of the mortgage in years,
REPEAT	= whether the buyer had (1) or had not (0) purchased a home previously,
UNMARRIED	= unmarried couple, single male, single female, with married couple as the omitted control group,
SSP*AGE	= interaction term between the age and the standardized selling price of the property,
DIFFYR	= the difference between the interest rate on property transaction i and the monthly average interest rate paid on all conventional mortgage contracts in our data set in that month of a given year between 1984 and 1996; that is, there are a total of 13 DIFFYR variables defined annually,
INCOME	= household annual income of buyer, entered as a series of category variables, with annual income <\$29,999 serving as the omitted control category,

To demonstrate that there is an asset quality signaling role played by seller financing, we must show that the incidence of seller financing is positively related to some measure(s) of informational asymmetry between buyers and sellers, controlling for the terms and conditions of credit imposed on buyers. One proxy for informational asymmetry is the age of a property (Spain, 1990; Reifel, 1994; Kutty, 1997). Quality problems that are known to the seller, but will become known to the buyer only after the purchase are likely an increasing function of the age of the property, HOMEAGE. Since, as argued previously, both the buyer and seller have an interest in the quality of the property, we expect the incidence of seller financing to be positively related to the age of the property being sold.

Table 1. Descriptive Statistics of the National Association of Realtors Home Financing Transactions Usable Data.**Table 1 - Panel A.** Means and standard deviations of variables by financing type.

Variable	Seller Financed Transactions		Conventional Transactions	
	Mean	Std Dev	Mean	Std Dev
Sales Price, \$	92576.17	78154.37	107827.11	74139.49
Sales Price (\$) / sq. ft	55.362	36.52	63.740	72.93
Down Payment (%)	0.2181	0.1736	0.1715	0.1585
Interest Rate (%)	0.1008	0.0116	0.1029	0.0147
Mortgage Term, yrs	15	10.2	28.197	5.039
Property Age, yrs	28.27	19.97	23.34	19.47
%Buyer's Annual Income <=29,999	0.204	0.404	0.155	0.362
% Incom 30K-39,999	0.232	0.422	0.255	0.436
% Incom 40K-49,999	0.208	0.406	0.220	0.415
% Incom 50K-69,999	0.201	0.401	0.215	0.411
% Incom >= 70,000	0.156	0.363	0.155	0.362
% Repeat Buyer	0.689	0.464	0.591	0.492
% Unmarried	0.484	0.501	0.253	0.435
% Married	0.516	0.501	0.515	0.500
No of Obs	289		4,067	

Notes: Sales price per square foot standardizes property prices by dividing nominal selling price by the dwelling square footage. Down payment is the percent of the purchase price paid by the buyer as the down payment - - calculated as the selling price minus mortgage amount, divided by selling price. The income variables represent buyers' average annual household income, entered as a series of category variables, with annual income \$29,999 serving as the omitted control category. Repeat Buyer is a dummy variable and indicates whether the buyer has (1) or has not (0) purchased a home previously. Unmarried is a dummy variable that includes unmarried couples, single males, and single females, while married is the omitted control group. The average interest rates and contract terms are for all contracts.

Table 1 - Panel B. The Year-by-Year Distribution of Data for Some Variables.

Year	Buyer Inco1	Buyer Inco2	Buyer Inco3	Buyer Inco4	Buyer Inco5
84	9	16	13	12	8
85	7	11	7	12	7
86	8	4	8	5	4
87	9	5	2	1	3
88	3	10	3	1	3
89	10	8	5	6	6
90	3	5	5	7	5
91	5	4	3	5	3
92	0	1	1	5	2
93	1	0	1	0	1
94	1	2	3	1	0
95	2	1	4	2	2
96	1	0	4	0	1
Tot	60	68	61	59	46
	Repeat	Unmarried	Avg. Int%	N, Seller Fin	N, Conv Fin
84	41	28	13.23	58	304
85	29	18	11.99	44	641
86	19	12	9.99	29	701
87	17	3	9.53	20	488
88	13	0	10.09	20	324
89	27	0	10.11	36	521
90	15	0	9.94	25	388
91	12	0	9.27	20	298
92	7	0	8.46	9	153
93	3	0	7.58	3	46
94	4	0	8.6	7	50
95	8	0	8.66	11	87
96	4	0	7.63	7	66
Tot	200	62		289	4067

Notes: An eyeballing examination of the year-by-year distribution of the seller-financed and conventionally financed transactions shows visible skewness in favor of the earlier years of 1984-1991. We consider the period of 1984-1991 (1992-1996) as a period of high (low) interest rates, respectively. Avg. Int% in Panel B-Table 1 reflects the year-by-year average interest rates on conventionally financed mortgage transactions. Buyer Income1 through Buyer Income5 denote income classes from lowest income class to the highest for seller-financed transactions; Repeat Buyer and Unmarried Buyer denote repeat buyers and unmarried buyers of seller-financed transactions, respectively.

DNPAY% and TERM also serve to help distinguish a possible asset quality signaling function for seller financing under all conditions. As indicated earlier, seller financing should be associated with larger down payment percentages and/or shorter terms, as both serve to constrain buyer opportunism, given that the flow of housing services is a function of inputs provided by the buyer after the sale, as well as inputs provided by the seller prior to sale.

Table 1 - Panel C. The Distribution of Seller Financed Data Across Buyer Incomes, 1984-1991 and 1992-1996.

Period	Income1	Income2	Income3	Income4	Income5	Seller Fin
84-91	54	63	46	50	39	252
92-96	5	4	14	8	6	37

Both the asset quality signaling and the credit rationing hypotheses for seller financing posit a higher standardized selling price for a seller-financed property than an otherwise comparable conventionally financed property, but for different reasons. The product quality hypothesis views the price differential as a premium paid for higher quality. The credit rationing hypothesis views it as a move by the seller to exploit the advantageous capital gains tax rate on higher property prices relative to the income tax rate, which is earned on interest income on the mortgage loan.¹⁸ The credit-rationing hypothesis suggests a trade-off between a higher property price and a lower interest rate while there is no such relation under the asset quality-signaling hypothesis. Thus, we expect a statistically significant positive coefficient estimate for the standardized selling price of the property and note that this estimate should be interpreted in relation to the empirical results for the mortgage interest rates over time.¹⁹

DIFFYR variables are designed with the flexibility to unearth insights into the possibility that seller financing is motivated by credit rationing on the part of conventional (market) sources of credit. Each DIFFYR is an annually defined variable with a control, via matching the interest rates on seller financed transactions in a given month by their counterparts in the same month, for the potential effects of the volatility of interest rates. A negative sign on the estimated coefficient of a DIFFYR variable would mean that the interest rate charged by seller-financiers was below the monthly average rates for other transactions that occurred in that month of that year. This would be consistent with the notion that sellers are a substitute source of credit because, in tight credit markets, sellers should offer more attractive (i.e., lower) rates than conventional lenders in efforts to move their properties, not less attractive rates. On the other hand, a positive sign on the coefficient estimate means that seller-financiers charge interest rates higher than the monthly average rates for other transactions that occurred in that month of that year. This clearly would be inconsistent with credit rationing, while providing evidence in support of asset quality signaling hypothesis. The signs and significance levels of DIFFYR variables will shed light on the complementary changing role(s) of seller financing in capital markets over time.

Repeat homebuyers, REPEAT, buyer's marital status, UNMARRIED, buyer's income, INCOME, and the interaction term, SSP*AGE, are control variables in equation (8). Repeat homebuyers have first-hand experience (thus first-hand knowledge) about housing markets and home ownership that first-time homebuyers do not have. They know, for example, that many aspects of quality only become

¹⁸ Signaling property quality vis-à-vis seller financing at times of tight credit may mean a price premium with one component for higher quality and another for the capitalization of below-market-rate financing. See Berger et al. (2000) for empirical evidence on the capitalization of below-market-rate financing arrangements.

¹⁹ 'Over time' does not mean time-series data.

apparent over time and that sellers may not tell the truth about the condition of the property being sold. Consequently, we expect repeat buyers to be more likely than first-time buyers to appreciate the value of mechanisms that help ensure the validity of the claims made by the seller. It is reasonable, then, to expect that repeat homebuyers will demand seller financing (or accept it if offered) more readily than first-time homebuyers.²⁰

It also seems reasonable to expect that seller financiers prefer to extend credit to married couples over singles or other groupings of unmarried individuals, for the same reasons that married couples are preferred by conventional sources of credit – stability and reduced volatility of income. Moreover, married couples may be more risk-averse than unmarried individuals and therefore place a higher value on the implicit honesty bond signaled by seller financing. For both reasons, we expect the incidence of seller financing to be positively associated with buyers being married.

In general, we expect credit rationing to affect low-income buyers more than high-income buyers. To the extent that sellers are a substitute source of credit, low-income buyers will demand more seller-provided credit than high-income buyers, *ceteris paribus*. If sellers serve as a supply of credit to borrowers shunned by conventional lenders, we should observe greater incidence of seller financing to lower-income buyers than to higher-income buyers.

The interaction term between the standardized selling price and the property age is introduced into the empirical model to help control for the potential implicit quality signaling effects of higher property prices (Chan and Leland, 1982; Cooper and Ross, 1985; Milgrom and Roberts, 1986; Wolinsky, 1983). This helps us separate empirically the role of the variable of property age as a proxy of informational asymmetry and its quality signals. Following PR (1997), this also helps control for potential non-linearities in the data. We expect the sign on this interaction term to be negative. That is, if the relatively high price tag on an older property is perceived by prospective buyers to imply high quality, it should reduce their demand for seller financing as a signal of asset quality.

EMPIRICAL RESULTS

Our LOGIT estimation results for the likelihood of seller financing of first mortgages are presented in Table 2. Of direct bearing on our claim that seller financing may serve a signal of asset quality is the estimated coefficient on the HOMEAGE variable, which is our proxy for the informational asymmetry between sellers and buyers. Controlling for buyer income, marital status, interest rate, and how much money the buyer provides as the down payment – factors that might influence the extension of credit by conventional lenders – we find that incidence of seller financing is strongly related to the age of the property being sold, in the expected positive direction. That is, sales of older properties are more likely to be financed by owner/sellers than sales of younger properties. Our finding in this regard is consistent with the notion that seller-financing serves as a signal of asset quality, with or without credit rationing.

Further evidence in support of the asset quality signaling role of seller financing, once again with or without credit rationing, comes from the coefficient estimate for the term of the mortgage contract, TERM. As expected, this estimate is negative and very highly significant. Also, the means of standardized selling price of the property, SSP, for seller- and conventionally-financed transactions are \$55.362 and \$63.74 in Table 1, suggesting that a negative coefficient estimate for SSP is likely in Table 2. The corresponding standard deviations of \$36.52 and \$72.93 reveal, however, that quality is more in

²⁰ We suspect that repeat buyers appreciate the value of all types of a quality signaling mechanisms more than first-time buyers. Repeat buyers should be more likely than first-time buyers to seek third-party appraisals in cases where appraisals are not required by an external source of credit.

the minds of the buyers of seller-financed transactions than those of conventionally financed transactions. Indeed, after controlling for other variables in equation (8), the coefficient estimate for SSP is positive but not significant in Table 2. On the other hand, the insignificant percent down payment, DNPAY%, is mute about asset quality signal under this sample. We examine further DNPAY% in section 4.1.

The coefficient estimates for DIFFYR variables are negative and very highly significant in 1984, 1985 and 1989 and is negative and significant at 10% in 1987. We note that conventional market mortgage rates in these years were relatively high, suggesting that in order to move their properties in the presence of tight credit, sellers provided attractive (below market) interest rates to prospective buyers. Given evidence in support of the asset quality signaling in HOMEAGE and TERM, coefficient estimates for DIFFYR in 1984, 1985, 1987 and 1989 provide evidence that asset quality signaling and credit rationing were co-factors motivating seller financing incidents in these years.

Table 2. Logistic Regression Results on Incidences of Seller Financing

Variables	Estimate	Std. Error	Variable	Estimate	Std. Error
Intercept	1.05	0.389***	DIFFYR-84	-130.9	15.21***
HOMEAGE	0.017	0.006***	DIFFYR-85	-103.3	18.63***
SSP	0.005	0.004	DIFFYR-86	1.1538	32.17
SSP*HOAGE	-0.000	0.000**	DIFFYR-87	-57.73	34.57*
DNPAY%	-0.085	0.49	DIFFYR-88	4.36	46.57
TERM	-0.174	0.009***	DIFFYR-89	-120.4	21.82***
REPEAT	0.103	0.19	DIFFYR-90	-33.39	51.33
UNMARRIED	-0.37	0.16**	DIFFYR-91	18.20	38.74
INC 30K-39,999	-0.32	0.24	DIFFYR-92	154.0	72.13**
INCO40K-49,999	-0.35	0.26	DIFFYR-93	150.5	83.54*
INCO50K-69,999	-0.47	0.27*	DIFFYR-94	-18.17	80.50
INCO>=70K	-0.493	0.31	DIFFYR-95	-21.94	71.60
			DIFFYR-96	11.20	31.87
N - All	4,356		-2 log likely	1280.14	
N - Seller-Fin	289				

Notes: This table reports the estimation results for the first mortgage samples. ***, **, and * indicate that the Chi-square statistic is significant at the 1%, 5% and 10% levels, respectively. We employed the following logistic regression model: $\log [P_i(\text{Seller}) / (1 - P_i(\text{Seller}))] = a_0 + \sum (a_j * X_j)$, where $P_i(\text{Seller})$ is the probability that property i will be seller-financed and that is determined, in part, by a number of factors (X_j): HOMEAGE is age of the property when sold, SSP is the 'standardized' selling price of the property, which is the nominal selling price divided by the dwelling square footage, DIFFYR are a series of variables and are constructed to be the difference between the interest rate on property transaction i and the monthly average interest rate paid on all conventional mortgage contracts in our data set in that month of that year, TERM is the term of the mortgage in years, DNPAY% is the percent of the purchase price paid by the buyer as the down payment -- calculated as the selling price minus mortgage amount, divided by selling price, times 100, INCOME are household annual incomes of buyer, entered as a series of category variables, with annual income \$29,999 serving as the omitted control category, REPEAT is whether the buyer has (1) or has not (0) purchased a home previously, UNMARRIED is unmarried couple, single male, single female, with married couple as the omitted control group. FINANCING, used in defining the dependent variable, takes a value of 1 (0) for seller- (conventionally-) financed first mortgages, which have not been followed by a second or a third mortgage. This allows us to exclude the effects of assumption financing and other sources of financing from our research, leaving behind a clean data set.

Over the course of our sample period, we observe that *seller-financing transactions occur not only during periods of high interest rates, but also during periods of relatively low interest rates*. Within our sample, we take 1992-1996 as a period of low interest rates and credit availability. This period followed very tight credit conditions, initiated with the stock market crash of 1987 and followed by a large number of bank failures in the late 1980s and early 1990s. Between 1992 and 1996 interest rates started falling, the stock market showed signs of a long-term boom, and the tight credit conditions of the late 1980s and early 1990s disappeared within a short period of time.

Panel B of Table 1 shows that seller financing was at least as likely to occur between 1992 and 1996 ($37/(37+402)=8.43\%$) as between 1984 and 1991 ($252/(252+3665)=6.43\%$). An examination of Panel C of Table 1 shows that about 13% ($37/289$) of 289 seller-financed transactions in our sample belong to the 1992-1996 period. We note that slightly less than 10% ($402/4067$) of 4,067 conventionally financed transactions belong to the same time period (in our data). Thus, the ratio of the seller-financed transactions that occurred during the easy credit period in our data as compared to the tight credit time period is actually *higher* than the ratio of conventionally financed mortgages issued during the easy credit period compared to the tight credit period.

At a minimum, this means that credit restraint is much less likely to be a co-factor for seller financed transactions between 1992 and 1996. As we argued earlier, seller financing that is motivated by signaling asset quality and that occurs in the absence of tight credit markets should command higher interest rates than we observe for otherwise similar, conventionally-financed mortgage contracts. The coefficient estimates for the DIFFYR variables for 1992 and 1993 are positive and significant – a finding that provides further evidence in support of the asset quality-signaling hypothesis. More generally, the changes in the signs and significance levels of the DIFFYR variables provide evidence on the role of seller financing over time. To the best of our knowledge, this is the first evidence over time brought to bear on the issue of seller financing in residential real estate markets or others.

The coefficient estimate for REPEAT is positive, but statistically insignificant. We had expected a positive coefficient estimate, based on the argument that repeat buyers likely would place a higher value than first-time buyers on the asset quality signal provided implicitly by seller financing. Panel B of Table 1 shows further dynamics of REPEAT. While REPEAT does not attain statistical significance in Table 2, it is worthwhile to point out that 199 out of 289 seller financed-transactions are by repeat homebuyers during our sample period. Furthermore, of 252 (37) seller-financed transactions between 1984 and 1991 (between 1992 and 1996), 68.7% (70.3%) are by repeat buyers, respectively. These figures suggest informally that repeat buyers have a preference for seller-financed transactions. Furthermore, this preference is evenly divided at times of tight credit and at times of credit availability.

The coefficient estimate for UNMARRIED is negative and significant at 5%. This is consistent with our expectation that seller financiers prefer to extend credit to married couples over singles or other groupings of unmarried individuals, for the same reasons that married couples are preferred by conventional sources of credit – stability and reduced volatility of income. Panel B of Table 1 reveals an interesting fact: there was not a single seller-financed transaction to an unmarried buyer between 1988 and 1996, in this dataset.

The coefficient estimates for the buyers' income levels are all negative and not statistically significant with the exception of that for the \$50,000 to \$69,999 range, which is significant at the 10% level. The negative signs are not consistent with our expectations. Given that we observe visible pattern differences in our data between the 1984-1991 and 1992-1996 periods, we examine separately the distribution of seller-financed income variables for each of these two periods, as reported in Panels B and C of Table 1. Once again, we observe some interesting patterns that bear on seller financing as an asset quality-signaling hypothesis. Panel C of Table 1 shows a visible increase in the seller-financed transaction numbers in the higher income groups of Income3 and Income4 in comparison to those in

the lower income groups of Income1 and Income2 during the 1992-1996 period. Meanwhile, there is virtually no difference in the seller-financed transaction numbers between Income1 and Income2 groups during the same period. Of the 37 seller financed transactions between 1992 and 1996 period, 24 come from higher income levels. On the other hand, in Panel C of Table 1, the distribution of seller-financed transactions across income groups between 1984 and 1991 shows higher numbers for the lower income groups of Income1 and Income2. Again, this suggests that seller financing serves some more fundamental purpose than merely resolving a credit-rationing problem.

We observe a negative relation between seller financing and the interaction term, constructed to account for potential non-linearities in the data, between selling price and home age. One explanation for this finding is that the selling price itself might serve potentially as a quality signal, with higher prices sending stronger quality signals, *ceteris paribus*. In this case, the quality signal provided by selling price may 'crowd out' that provided by seller financing.

Clearly, regardless of whom they sell to, sellers are more inclined to offer financing when the term of the mortgage is relatively short. This is consistent with the desire of sellers to have buyers build an equity stake in the property relatively quickly, to induce the buyers to engage in a conscientious maintenance regime on the property that prevents erosion of value.

A FURTHER EXAMINATION OF DOWN PAYMENT

Under the asset quality-signaling hypothesis, we expected DNPAY% to be positively associated with seller-financed transactions; yet, the coefficient estimate reported in Table 2 was statistically flat. Relatively less well-off prospective buyers may face a barrier to purchase not only by virtue of having low income, but also by virtue of having insufficient funds for a down payment.²¹ A seller can cure this potential impediment to selling his home by being willing to accept a relatively low down payment (as a percent of the selling price). This indeed motivates some portion of seller financed home sales.

So, we further examine our data by splitting our sample by its median percent down payment of 14.063% and re-estimating separate LOGIT models for the above and below median percent down payment samples. Panels A and B of Table 3 provide these results.

Panel A of Table3 reports results for the transactions that occurred at below-the-median down payment percent. Just under 38 percent (109/289) of the seller financed transactions involved below-median down payments. For these transactions, as a group, HOMEAGE was not a significant influence on the incidence of seller financing. Note, however, that sellers are evidently very sensitive to percent down payment -- more likely to provide financing as the percent down payment increases -- and also more likely to provide financing as the term of the mortgage gets shorter. We also observe that married buyers are still preferred by sellers who offer financing, and that seller financing tends to differentially support buyers in the lowest income category, as the incidence of seller financing is significantly lower for buyers in all of the higher income categories except above \$70,000. Finally, for this sub-sample, the DIFFYR variables for 1984, 1985, and 1989 are negative and significant, indicating further the role of credit rationing in seller-financed transactions. So there is, indeed, evidence in support of the proposition that seller financing serves in part to cure a limited market for credit among the least wealthy segment of prospective home buyers. But even in so doing, sellers clearly try to protect themselves through marginally higher down payments and shorter mortgage periods.

²¹ This is consistent with Barakova et al. (2003), who argue that wealth constraints have the largest impact on potential buyers.

Panel B of Table 3 reports results for the transactions that occurred at above-the-median down payment percent. For this group, the impact of HOMEAGE and SSP on the incidence of seller financing is positive and significant. This is the first time SSP attains statistical significance while the relation between TERM and incidence of seller financing is negative and highly significant. The coefficient estimates for the DIFFYR variables for 1984, 1985, and 1989 are, once again, negative and significant, whereas unlike the previous subsample, the coefficients on the DIFFYR variables for 1992 and 1993 are positive and significant. Not unexpectedly, the coefficient estimate for DNPAY% does not attain statistical significance in this subsample. While it plays a key (positive) role in signaling the quality of the property when the percent down payment is less than the median down payment percent, its role diminishes when the percent down payment is more than the median down payment percent.²²

Table 3. Logistic Regression Results on Incidences of Seller Financing

Table 3 - Panel A. All Transactions, where Buyer's Down Payment Percent was Less Than the Median Down Payment Percent.

Variables	Estimate	Std. Error	Variables	Estimate	Std. Error
Intercept	0.56	0.71	DIFFYR-84	-107.5	19.58***
HOMEAGE	0.015	0.013	DIFFYR-85	-62.36	28.55**
SSP	0.008	0.01	DIFFYR-86	22.15	62.89
SSP* HOAGE	-0.000	0.000	DIFFYR-87	-87.73	54.47
DNPAY%	11.51	3.52***	DIFFYR-88	-30.17	56.19
TERM	-0.17	0.014***	DIFFYR-89	-101.9	29.96***
REPEAT	0.33	0.30	DIFFYR-90	16.64	98.26
UNMARRIED	-0.639	0.27**	DIFFYR-91	-5.34	65.14
INC 30K-39,999	-0.75	0.35**	DIFFYR-92	110.7	109.5
INC 40K-49,999	-0.86	0.41**	DIFFYR-93	69.82	146.2
INC 50K-69,999	-1.33	0.48***	DIFFYR-94	-39.93	86.08
INC >=70,000	-0.272	0.52	DIFFYR-95	27.21	81.25
			DIFFYR-96	15.58	36.97
N, All	2,178		-2 log likeli	515.33	
N, Seller	109				

Notes: ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. 14.063% is the median down payment percent. Variables are defined under Table 2.

A reasonable interpretation of our findings is that, because the flow of housing services is dependent on buyer-provided maintenance after the sale, sellers require a threshold level of buyer exposure (equity position) in the property to induce buyers to provide needed maintenance.²³ This threshold apparently is satisfied above the 14.063% DNPAY% median in our sample, since seller financing in the above-median sample is not linked to DNPAY%. Below the median, the incidence of seller financing is positively related to DNPAY%. Seller financing that is motivated strictly by credit rationing does not imply this result, because in that case sellers should be willing to accept lower down

²² We split our sample into those transactions falling below the lowest quartile of down payment percent and highest three quartiles, and those transactions falling below (above) a 10% down payment. In all cases, incidence of seller financing was not statistically related to HOMEAGE for the lower down payment percent transactions and statistically related to HOMEAGE for the higher down payment percent transactions. These results are available upon request.

²³ This is consistent with the requirement imposed by commercial lending institutions that homebuyers pay mortgage insurance if their equity position is less than 20%.

payments, not demanding higher down payments. So this finding again supports asset quality signaling as a co-factor motivating seller financing.

Table 3 - Panel B. All Transactions, where Buyer's Down Payment Percent was Greater Than the Median Down Payment Percent.

Variables	Estimate	Std. Error	Variables	Estimate	Std. Error
Intercept	0.941	0.546*	DIFFYR-84	-193.2	33.24***
HOMEAGE	0.024	0.008***	DIFFYR -85	-137.7	27.65***
SSP	0.008	0.005*	DIFFYR -86	-25.15	38.23
SSP* HOAGE	-0.000	0.000**	DIFFYR -87	-30.54	49.78
DNPAY%	-1.062	0.72	DIFFYR -88	63.25	88.95
TERM	-0.17	0.01***	DIFFYR-89	-166.6	35.44***
REPEAT	0.19	0.26	DIFFYR-90	-51.58	61.79
UNMARRIED	-0.20	0.21	DIFFYR-91	8.77	51.12
INC 30K-39,999	-0.013	0.35	DIFFYR-92	169.5	104.1*
INC 40K-49,999	-0.121	0.36	DIFFYR-93	219.1	129.6*
INC 50K-69,999	-0.23	0.36	DIFFYR -94	-33.27	186.9
INC >=70,000	-0.75	0.421*	DIFFYR-95	-224.0	120.0
			DIFFYR-96	5.88	80.89
N, All	2,178		-2 log likeli	712.11	
N, Seller	180				

Notes: ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively. 14.063% is the median down payment percent. Variables are defined under Table 2.

Sellers may be more likely to provide financing when they are financially secure. There is no specific information on seller characteristics in the NAR database. However, if HOMEAGE can be regarded as a reasonable proxy for the wealth of the seller, and such a wealth effect is a critical factor, motivating seller financing, then we should observe this variable being significant in both segments of the market, not just the above-the-median segment. While we hesitate to declare causation, the positive correlation between HOMEAGE and incidence of seller financing for this group is, at a minimum, consistent with our hypothesis that seller financing serves, in part, as an asset quality signaling mechanism whereby sellers convey quality information to asymmetrically less-well-informed buyers.

Regardless of whether the DNPAY% is below or above the median, sellers are less likely to finance as the term of the mortgage lengthens. Sellers prefer relatively short-term mortgages so that buyers' equity accumulates quickly, which makes it less likely that buyers will succumb to the temptations of not taking care of the property.

CONCLUDING COMMENTS

The spirit and implications of the asset quality-signaling hypothesis either describe or show considerable similarity to a number of problems, characterized by asymmetric information, in Finance and Economics.

THE LEMONS PROBLEM AND THE SUB-PRIME LOAN DEBACLE

Among the investors in the US-based mortgage backed securities (MBS) were countries, such as Iceland, that consequently faced unimagined financial duress, leading even to default. Asymmetric information, between the issuers of and the investors in MBSs, about the quality of the mortgages in the mortgage pools underlying the MBSs is a fundamental cause of these ongoing troubles. The lending parties that assemble the mortgage pools in the primary markets observe the quality (and other dimensions) of the mortgages in the mortgage pools. But, the secondary market easily buries deeply the information about the quality and several other aspects of the underlying mortgages in the mortgage pools through the impersonal securitization process, leaving the MBS investors in the dark. The sub-prime loan debacle is a prime example of how the principal-agent issues, fueled by the greed of asymmetrically much-better informed MBS originators, can fail the quality certification by reputational capital. This kind of capital is earned with a lot of hard work over along period of time and its presence, under normal circumstances, can cure the adverse consequences of asymmetric information about asset quality.²⁴ In our opinion, the genesis of the sub-prime loan crisis lies in investors' failures both in realizing that they are asymmetrically informed about the quality of mortgage pools and in having robust processes of due diligence. An investor, which would have sought a properly put together seller financing contract in investing these assets, would have avoided the disaster, which, the evidence shows clearly, was expected by the issuers.

CORPORATE FINANCE PROBLEMS

Earnout contracts in mergers mitigate two informational asymmetry problems (KA,2000). First is the disagreement between the bidders and targets on the value of the target firm. Second is a maintenance concern. When the realizable target value depends uniquely on human capital, such as key target managers who may or may not agree to stay after the merger occurs, this disagreement may be enhanced. KA (2000) point out that earnouts contain a front-end payment at the time of the merger and a deferred payment, which is contingent on the target's ability to achieve certain measurable pre-specified performance standards. Their evidence supports the effective role of earnout contracts in certifying firm value and retaining the key managers in the firm.

Agency problems of equity may be a problem for firms that are going public. Ross et al. (1999, p. 452) note that "Owners may retain a large portion of the stock to convince new shareholders that no shirking is planned." This might be an explanation of the discount in IPO prices. Since agency costs of equity are expected to be small when the owners hold a large proportion of the IPO issues, underpricing should be less. Further, the experience period component of seller financing might be a viable strategy for the IPO issuers to minimize the discount.

OTHER AREAS OF FINANCE

Seller financing of a small business is also the pension for its seller. Therefore, the seller maintains a long-term post-sale interest in the success and maintenance of his/her business even after it is sold. That is why seller financiers may be available, even after the business is sold, to serve their old clients in order to maintain goodwill for the business under the new owner. This interpretation of seller

²⁴ See various papers in Bardhan et al (2012) and Kau et al. (2012) for an account of the sub-prime loan debacle and its causes, especially the asymmetric information problems, and scope.

financing of small businesses originates from the need to signal the quality of the business rather than exploiting the tax loopholes or tight credit markets.²⁵

Reverse annuity mortgages (RAM) and shared appreciation mortgages are other financing arrangements in which lenders may be subject to borrowers' post-financing opportunistic behavior (Miceli and Sirmans, 1994). Lenders face the risk that borrowers may not properly maintain the property.²⁶

In conclusion, our theory and evidence from the mortgage contracts on residential properties offer insights into the design of contracts for several financing arrangements, characterized by asymmetric information about the quality of the asset and a need to address the buyer's opportunistic behavior in the post-purchase maintenance of the asset.

²⁵ We thank Jean Reinhardt, Esq, for this point. Ho (November 30, 1999) quoted Richard Brinkley, the CEO of VR Business Brokers, as stating that more than 90% of the 4,000 small business sales his franchise operation handles each year used seller financing. It was/is a common way to buy businesses and real estate.

²⁶ This risk under GFC is even higher than before. Moeller (March 16, 2012) notes: "Homeowners are considering reverse mortgages at younger ages, a study says, in part because they are experiencing rising debt levels. And while earlier users of the reverse loans used them to improve the quality of their lives and plan for the future, people today have more immediate and pressing financial worries." Given that the US government insures almost all RAMs through its Home Equity Conversion Mortgage (HECM) program, all risk attached to RAMs must also be of concern to the US government.

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