The Pricing of Subprime Mortgages by Mortgage Brokers and Lenders

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Mortgage Brokers and the Subprime Mortgage Market

1. Introduction

A mortgage broker is an intermediary that brings a borrower and a lender together to obtain a mortgage loan. The broker takes the application, performs a financial and credit evaluation, produces documents, and closes the loan. The lender underwrites and funds the loan and may service it. Mortgage brokers play a major role in the mortgage market. In 2003, about 44,000 mortgage brokerage firms originated about 65 percent of all mortgages (Schneider 2003).

That mortgage brokers originate over half of mortgages suggests that mortgage brokers perform a useful function. Descriptive literature on the industry indicates that mortgage brokers may provide benefits for both borrowers and lenders.[1] Brokers typically deal with several different lenders. By searching for loans through a broker, a borrower receives information on price and availability of credit from several lenders in a single enquiry. Thus, a broker may reduce borrowers' search costs and enable borrowers to obtain lower cost credit than they could find themselves. Similarly, a broker dealing with several different lenders may be able to originate loans at a lower cost through economies of scale and specialization than a lender originating loans through a branch office. Moreover, by using many different brokers, a lender may be able to reach more borrowers than it could on its own.

Despite the benefits suggested by their market share, mortgage brokers have a mostly bad reputation in the press and among consumerist organizations. The press reports regulatory agencies' actions against unscrupulous brokers (Savage 2003; Mason 2003) and warnings against predatory practices by brokers (Ehrenfeld 2000; Vickers and Timmons 2002; Hechinger 2003). Consumerist organizations allege that inadequate disclosure, lack of borrower sophistication, and broker incentives that tie compensation to loan origination lead to market failure (Renuart and Sanders 1998; Kim-Sung and Hermanson 2003). Brokers steer borrowers to higher cost loans that generate higher compensation, do not give adequate consideration to borrowers' ability to repay, and encourage excessive refinancing of existing mortgages. Consumerists assert that these problems are especially prevalent in the subprime market, which they characterize as predominately low income, minority, and elderly.

There is little research and virtually no empirical evidence on the behavior of mortgage brokers. Evidence is not available on whether mortgage brokers reduce borrowers' and lenders' costs or whether the problems with brokers are prevalent throughout mortgage markets or isolated cases. This paper provides empirical evidence that helps address some of the questions about broker behavior in the subprime mortgage market. Using a large database that is estimated to include nearly half of the subprime mortgage market, the paper examines the pricing of broker- and lender-originated subprime mortgages. Specifically, the paper investigates whether broker-originated mortgages are more costly to the borrower than lender-originated mortgages.

[1] See, for example, various issues of *National Mortgage Broker* magazine.

2. The Economics of Mortgage Brokerage

In a broker-originated mortgage transaction, the broker takes the application, performs a financial and credit investigation, produces documents, and closes the loan.[2] The broker may also conduct financial counselling with the borrower. Mortgage brokers' revenue comes from an origination fee paid directly by the borrower. Brokers may also obtain revenue from the spread between retail and wholesale prices of loans.[3]

The lender in a broker-originated transaction underwrites and funds the loan and may service it. The lender bears the credit and interest rate risk. The lender's revenue comes chiefly from the periodic payments of interest and principal. The lender also may receive revenue from fees, such as late-payment fees or prepayment penalties.

The role of the mortgage broker is simply that of a seller of mortgages. It obtains a mortgage for a buyer from one of several lenders with which it has an arm's-length business relationship. They are not normally agents of either the borrower or the lender. Mortgage brokers compete with other brokers and with retail lenders.

Descriptive literature on mortgage brokers suggests that brokers may help lenders reduce origination costs in several ways. Specialization and economies of scale may enable brokers to originate loans at a lower cost than lenders, enabling a lender to economize on its own origination costs. By using brokers, a lender may be able to expand or contract mortgage lending more quickly and at a lower cost than would be possible using its own employees and offices. In addition, use of brokers may enable a lender to reach more potential customers without increasing marketing costs.

Brokers' working with different lenders may also reduce borrowers' transaction costs. Borrowers may obtain information on prices charged by different lenders at lower cost by using brokers than by shopping themselves. Borrowers who are uncertain of their qualifications may reduce the costs of learning different lenders' credit standards and the standards for which borrowers qualify. Borrowers who lack experience in the mortgage market may reduce the cost of learning about the availability of different mortgage products, terms, and lenders through broker counselling.

Broker Efficiency

Theoretical analyses of the brokerage function indicate that brokers may indeed reduce buyers' and sellers' search costs. While there is no theoretical model for mortgage

[2] Brokers originate loans in one of three ways: A broker may process a loan that is closed in the lender's name, close the loan in its own name without providing funding and immediately transfer the loan to the lender, or close and temporarily fund the loan using its own capital until the loan is sold.

[3] The retail price is the combination of points and contract rate that the broker quotes to the borrower. The borrower typically can choose from a menu of different points and contract rates. The wholesale price is from a menu of loan prices (expressed as a percentage of the loan amount) that the creditor is willing to pay for different contract rates with specific lock-in terms, which is based on the value of the loan in the secondary mortgage market. The broker's spread, which is called the yield spread premium, is equal to the loan price less 100 plus the number of points paid by the borrower.

brokerage *per se*, there are a few general models of the brokerage function, which have mainly been used to analyze the role of brokers in real estate and labor markets.[4]

Yavas's (1994) model of brokers in a bilateral search market is one such model, which may be applied to the mortgage market. The model examines the role of brokers who match buyers and sellers in a market in which both buyers and sellers search for each other. That buyers search for a seller is generally recognized, but it is also important to recognize that a seller must search for customers. A seller's search may involve telephone or mail solicitations or, more generally, advertising. Yavas assumed probability distributions to represent buyers' and sellers' reservation prices. A trade takes place when a buyer and seller meet, and the buyer's reservation price is greater than or equal to the seller's reservation price.

Both buyers and sellers face search costs. In the mortgage market, for example, buyers face search costs to identify lenders and learn their prices for different mortgage products. Sellers incur marketing costs to attract borrowers. There is uncertainty whether a seller and a buyer will trade. The buyer's reservation price may be lower than the seller's reservation price. Moreover, when the price involves borrowers' uncertain promises to make future payments, borrowers must demonstrate their creditworthiness, and lenders perform credit evaluations to avoid unacceptably risky promises. A broker may also facilitate matching a borrower and lender on the basis of creditworthiness. Matching on the basis of creditworthiness is likely to be especially important in subprime mortgage lending, where the pricing of products is explicitly tied to creditworthiness.

Sellers and buyers search if the expected gains from search exceed the costs. They use a broker if the expected gain from search is less than the expected gain from going to the middleman. Use of a broker, however, requires that the buyer or seller share part of the gain with the middleman.

Yavas examined conditions under which buyers and sellers search, go directly to a broker, or use a broker only after search. Several results are of interest. An increase in search by either the borrower or the seller increases the probability of a trade and hence a benefit to the other. As neither the buyer nor the seller takes this positive externality into account, buyers and sellers search less than would be in their joint interest. The broker internalizes this externality in return for a fee. The broker does not increase the amount of search, however. The broker reduces the uncertainty of completing a trade and hence increases the volume of trades. Yavas notes that buyers and sellers could always choose additional search rather than incur the broker's commission. That a buyer or seller chooses to deal with a broker implies that the broker is more efficient in forming matches than the buyer and seller.

[4] The literature distinguishes between two types of brokers: market-makers and matchmakers. Market-makers buy and trade for their own account. Matchmakers only match buyers and sellers. They do not trade for their own account. For a review of various models of the brokerage function, see Yavas (1992).

Potential Agency Problems

Allegations of broker misconduct are based largely on agency issues, which involve possible conflicts of interest between brokers and lenders or between brokers and consumers. The lender's revenue is derived mainly from the stream of periodic payments of principal and interest from the loan. In contrast, the broker's revenue is derived from the origination of loans, not the stream of payments. The potential conflict of interest arising from different sources of revenue may affect brokers' behavior in several ways.

First, a broker may attempt to originate loans to borrowers who do not qualify. In taking an application and performing the financial and credit investigation, a broker may be in a position to misrepresent a borrower's creditworthiness to qualify a marginal borrower in order to make a sale. Such behavior would subject the lender to greater risk than the lender is willing to assume. Such behavior might also harm consumers by exposing them to a relatively high risk of losing their homes.

Second, a broker has a greater incentive to contact borrowers about the possibility of refinancing than the lender. Brokers may solicit previous customers about refinancing loans.[5] The broker's access to the price lists of the several lenders with whom it has relationships may provide the broker more opportunities to offer favorable terms for refinancing than individual lenders.

Brokers' incentive originate loans regardless of the borrower's interest or ability to repay is the basis for allegations that mortgage brokers are more likely than lenders to engage in certain abusive or "predatory" practices. One practice is repeatedly refinancing a borrower's mortgage solely to receive the origination fee. In abusive cases, high-pressure salesmanship and fraud may be used to convince the borrower to refinance, often in the absence of any conceivable benefit to the borrower.

A third way in which an agency problem may affect behavior involves asymmetric knowledge. Mortgage markets provide some scope for haggling. Mortgage brokers' knowledge and experience may give them an advantage in negotiating with some consumers. Their access to loans from different creditors may provide brokers opportunities to steer customers to mortgages that provide higher compensation to the broker but are not necessarily the lowest cost or most advantageous to the customer.

There are considerations that may mitigate agency problems associated with mortgage brokers. Since loans that are misleading or fraudulent may subject the lender to additional credit risk, legal risks, and reputational damage, lenders may take actions to control risk associated with broker originations. Lenders may set higher standards on loans originated by brokers than those originated by employees, limit their dealings to brokers that are known to be reputable, or choose not to offer certain risky products through brokers. Mortgage brokers' incentive to steer borrowers to higher cost mortgages that provide greater compensation may be tempered by market competition. A broker quoting a higher

[5] Contracts between lenders and brokers typically have nonsolicitation clauses, which prohibit solicitation of previous customers for any purpose, including refinancing. Evasions of such clauses are often difficult to detect, however.

price to receive a little more compensation risks receiving no compensation at all if the prospective borrower chooses a mortgage from a competitor.

Empirical Evidence

Empirical evidence on the behavior of mortgage brokers is very limited. None of the available studies address brokers' behavior in the subprime market.

In one study, LaCour-Little and Chun (1999) found evidence consistent with lenders encountering an agency problem when third parties, such as brokers or correspondents, originate mortgages. As mentioned, third-party originators receive revenue from originations, not from the stream of mortgage payments. Since completing transactions with previous customers is often easier than finding new customers, third-party originators have an incentive to contact previous customers about refinancing existing loans. Third-party originators would have also little incentive to discourage refinancing if contacted by previous customers. For these reasons, LaCour-Little and Chun hypothesized that prepayment rates on third-party originations would be greater than those on lender originations.

LaCour-Little and Chun used two sets of data to test this hypothesis: loan-level data from a single national mortgage loan-servicing firm and aggregate prepayment data from Mortgage Information Corporation (the former name of LoanPerformance System). With the loan-level data, they estimated logistic regression models of the probability of prepayment as a function of the age of the loan, original loan size, the spread between the contract interest rate and the 10-year constant maturity Treasury rate, borrower income, and whether the loan was originated by a third party. Regression results indicated that loans originated by a third party were statistically significantly more likely to prepay than loans originated by a lender for each of four types of mortgages analyzed. The third-party effect was quite large, moreover. Over all types of mortgages, third-party loans were about three times more sensitive to refinancing incentives than lender-originated loans.

The aggregate prepayment data representing many lenders provided evidence that prepayment rates were generally greater for third-party originations than lender originations. Prepayment rates on loans originated between 1994 and 1998 were greater for third-party originations than for lender originations. Prepayment rates for loans originated before 1994, however, were not greater for third-party originators.

In a preliminary working paper, Woodward (2003) examined the relationship of loan and borrower characteristics to the level of mortgage brokers' compensation at one lender. Woodward was especially interested in whether the borrower's shopping strategy affected broker compensation. Her hypothesis was that consumers' lack of information and difficulty in assessing tradeoffs between interest rates and points caused "confusion," which resulted in brokers receiving higher compensation for loans when points were paid than when points were not paid.

Woodward argued that the easiest shopping strategy for the consumer is to roll all settlement costs into the interest rate and shop for the lowest interest rate and that the

most difficult shopping strategy is to pay all settlement costs in cash and pay points to reduce the interest rate. Note that the easiest shopping strategy is not necessarily the optimal strategy. Lenders typically set the tradeoff between contract rate and points for a period considerably less than the full term to maturity.[6] A borrower who expects to repay the loan over a longer period of time than that assumed in the rate sheets may pay less if he pays points than if he does not.

Empirical results suggest that broker compensation varied systematically across different sets of mortgage terms and borrower characteristics. Higher broker compensation does not imply higher mortgage cost to the borrower, however. Higher broker compensation may be offset by a lower interest rate or other loan fees. Thus, Woodward's preliminary results do not provide evidence on the efficiency and agency issues discussed in the beginning of this section.

3. Empirical Analysis

This paper investigates whether subprime mortgages originated by brokers are more costly to borrowers than mortgages originated by lenders. Results provide empirical evidence on whether broker steering causes borrowers obtaining broker-originated loans to pay higher prices than borrowers obtaining lender-originated loans. After accounting for loan terms and risk-related borrower characteristics, a finding that mortgages originated by brokers are more costly would support the steering hypothesis. In contrast, a finding that broker-originated mortgages are no more or less costly than lender-originated mortgages would support the hypothesis that competition forces brokers to share efficiencies in originating mortgages with borrowers.[7]

The paper also investigates broker pricing in minority and lower income areas and in states that have restrictive licensing requirements for individual mortgage originators. Because of a lack of resources, experience, and financial sophistication, many consider minority and lower-income market segments to be especially vulnerable to abuses. Restrictive licensing requirements for individual mortgage originators include pre-licensing education, testing, and continuing education. Such requirements may inhibit competition and thus pressure brokers to share origination efficiencies with borrowers by making entry or expansion slower and more costly.

Data

Data are from the American Financial Services Association's (AFSA) subprime mortgage database for the fourth quarter of 2003. Ten large subprime mortgage subsidiaries of AFSA member companies contributed to the database. The database includes all mortgages originated or purchased by these companies between the third quarter of 1995 and the fourth quarter of 2003. Staten and Elliehausen (2001) estimated that the AFSA's

[6] Woodward found that tradeoffs between contract rate and fees were based on a seven- to 10-year expected term in rate sheets for 30-year mortgages for the creditor that funded the mortgages in her sample.

[7] Lower mortgage prices on broker-originated loans after accounting for loan terms and risk-related borrower characteristics would be consistent with systematic misrepresentation of borrower creditworthiness. The data on borrower characteristics were those from lenders' files and used by lenders to make the underwriting decision. Thus, a finding of lower mortgage prices is unlikely to reflect systematic misrepresentation by brokers.

subprime mortgage database covered about 40 percent of subprime mortgage originations in 1998. The analysis in this paper includes all closed-end first and second mortgages.

Pricing Model

The dependent variable is the cost of the mortgage to the borrower as measured by the annual percentage rate. The annual percentage rate is an annualized discount rate that equates the actual amount of credit received by the borrower with the flow of periodic payments required to repay the loan. The annual percentage rate reflects all finance charges, which are defined as "… any charge payable directly or indirectly by the consumer to the creditor and imposed directly or indirectly by the creditor as an incident to or condition of the extension of credit (12 CFR Ch. II § 226.4 (a)." The finance charge also includes "[f]ees charged by a mortgage broker (including fees paid by the consumer directly to the broker or to the creditor for delivery to the broker) … even if the creditor does not require the consumer to use a mortgage broker and even if the creditor does not retain any portion of the charge (12 CFR Ch. II § 226.4 (a)(3)."

Explanatory variables are the type of origination, loan characteristics, and property or borrower characteristics associated with credit risk, year of origination, and state (Table 1). The loan characteristics include loan amount, term to maturity, and, for first mortgages, the loan-to-value percentage.[8]

The type of origination is a dummy variable that equals one if the loan was originated through a broker and zero otherwise. A negative coefficient would support the hypothesis that competition forces brokers to pass economies in search and origination costs to borrowers.

Annual percentage rates are expected to vary inversely with loan size. Smaller subprime mortgages are often riskier and may be relatively more costly to originate and service than larger ones.[9] Subprime rate sheets often include adjustments to compensate for these costs. Annual percentage rates are expected to be inversely related to term to maturity, as interest rates for shorter-term mortgages are typically lower than interest rates for longer-term mortgages.

Annual percentage rates normally increase with the loan-to-value percentage, reflecting the greater risk of default when borrowers' equity in the property is lower. However, very high loan-to-value mortgages are not normally offered to high-risk borrowers (see Calomiris 1998). Thus, pricing of very high loan-to-value mortgages may differ from that of other mortgages. To allow for nonlinearity in the pricing of mortgages at different loan-to-value levels, five dummy variables are used to measure the effect of the loan to value percentage. Annual percentage rates are expected to be inversely related to property value, which reflects both the quantity and quality of the collateral.

[8] Loan-to-value percentages are not available for second mortgages because these companies generally do not keep the amount of senior liens at origination in their machine-readable databases.

[9] Jumbo loans are not included.

The borrower characteristics are borrower income and FICO risk score. Annual percentage rates are expected to be inversely related to FICO credit risk score, as higher FICO risk scores indicate greater predicted risk.[10] Annual percentage rates are also expected to be inversely related to borrower income. As a rule, borrowers with relatively high FICO risk scores or high incomes would not use subprime mortgages unless other considerations were present. For example, such borrowers may have difficulty or may be unwilling to document income, have low levels of assets, have high levels of other debts, or have a history of minor delinquencies. Therefore, to allow for nonlinearities in the relationship between annual percentage rates and borrower characteristics, FICO risk score is represented by seven dummy variables and borrower income is represented by six dummy variables.

Year of origination is included to account for differences in economic and market conditions during the Q3 1995-Q1 2002 time period. State is included to account for differences in regulatory environments and economic conditions across states.

We specify six separate models for combinations of lien types (first and second mortgages) and type of interest rates (fixed, variable, and hybrid).

Selection Bias

Borrowers may canvass mortgage originators without taking into account or even knowing whether an originator is a broker or lender. However, it is possible that some borrowers self-select. For example, some borrowers may intentionally seek to increase the efficiency of search or reduce the cost of search by canvassing mortgage brokers, taking advantage of mortgage brokers' ability to quote the lowest rate from among several lenders' offers. Borrowers may also self-select based on the source of their information on the identity of mortgage originators. Borrowers purchasing a house may be referred to mortgage brokers by real estate agents, whose experience with a large number of home buyers provides them with information on originators that obtain low rates for customers. In contrast, borrowers seeking a cash-out refinancing for debt consolidation often approach a lender in response to the lender's advertisement for debt consolidation loans. In this latter case, borrowers may have some urgency in obtaining such credit and may not be inclined to search extensively for the lowest price.

If borrowers self-select, then the choice of a broker may be correlated with the error in the pricing model, making the estimate of the coefficient for type of origination biased and inconsistent. A remedy for this problem is to find instrumental variables that are correlated with the choice of a broker and uncorrelated with the error in the pricing equation. The instrumental variables are used to predict the probability of choice of a

[10] The FICO risk score is a prediction of the likelihood of serious delinquency, bankruptcy, or other major delinquency during the next two years. The prediction is based solely on information in credit bureau files, which consists largely of credit use and payment performance data. Since credit bureau files do not include the borrower's current income, FICO risk scores do reflect the adequacy of available income to repay debts. FICO risk scores also do not reflect borrowers' history of minor delinquencies, which raise collection costs and may therefore be considered in lenders' pricing decisions.

broker for each observation. The predicted probability of choosing a broker is then used in place of the broker dummy variable to estimate the pricing equation.

Variables used to estimate the probability of choice of broker may include characteristics of the borrower, the borrower's social environment, and the local mortgage market. Borrower characteristics are income and the reason for taking out the loan. Income reflects the borrower's ability to search. Higher income is associated with greater knowledge and experience in credit markets.[11] Reason for taking out a loan, as suggested, may be related to sources of information about subprime mortgages and lenders.

Consumers receive information and understanding of markets through their social environment (Engel, Blackwell, and Mineard 1997). Much of consumers' knowledge comes from experiences of family and friends. If a borrower lives in an area in which consumers have high levels of information and knowledge of the market, the borrower is likely to benefit from the experiences of others. Variables used to characterize the borrower's social environment are distributions of the population in the zip-code area by education, income, sex, and race, or ethnic origin.

The size, quality, and turnover in a market influence the availability of information and the prevalence of brokers in a market (see Stigler 1961). Variables used to characterize the market are population, population density, percentage of owner-occupied homes, distributions of home values, and time since the last move. The prevalence of brokers may also be influenced by state licensing requirements for mortgage brokers and other mortgage originators.

Variable definitions and descriptive statistics are provided in the first two columns of Table 2. Results for the logistic regression predicting broker choice are provided in the third column of the table.

The results for the logistic regression suggest that broker choice can be reasonably accurately predicted on the basis of characteristics of the borrower, the borrower's social environment, and the local mortgage market. The logistic regression model is statistically significant at the 1 percent level of significance (chi squared = 502,712 with 37 degrees of freedom). Nearly all of the individual explanatory variables are also statistically significant. Seventy-nine percent of all mortgages are correctly classified as broker or lender originated on the basis of the model's predicted probability, when 50 percent is used as the threshold for classification (number not in table). Classification errors for broker- and lender-originated mortgages are similar. About one in five broker-originated mortgages are incorrectly classified as lender originated, and about one in five of lender-originated mortgages are incorrectly classified as broker originated.

As mentioned, the predicted probability of obtaining a mortgage from a broker is calculated for all observations using this logistic regression model. This predicted

[11] See Aizcorbe, Kennickell, and Moore (2003) for evidence that credit market experience is positively related to income.

probability is then substituted for the broker choice dummy variable to account for the possibility of selection.[12]

Estimation of the Pricing Model

Altogether, 2,207,712 mortgages had complete zip-code, mortgage term, and borrower characteristics.[13] These mortgages consisted of 615,712 fixed-rate first mortgages, 247,377 variable-rate first mortgages, 209,048 hybrid-rate first mortgages, 672,587 fixed-rate second mortgages, 5,150 variable-rate second mortgages, and 457,838 hybrid-rate second mortgages.

We estimated each of the six pricing equations first using the dummy variable indicating whether the mortgage was originated by a broker and second using the instrumental variable for probability of using a broker in place of the dummy variable. Results for first mortgages are shown in Table 3, and results for second mortgages are shown in Table 4.

All of the estimated models are statistically significant at the 1 percent level of significance. The models explain a high percentage of the variation in annual percentage rates, ranging from 54.1 percent to 77.3 percent for first mortgages and 58.9 percent to 69.4 percent for second mortgages.

Nearly all of the individual coefficients are also statistically significant and generally have the expected signs. Results for the models that do not account for possible borrower selection are similar to those for comparable models that account for selection.

Except for fixed-rate second mortgages, the coefficients for loan amount are negative, reflecting the effect of spreading largely fixed operating costs over a larger loan amount. The coefficient for term to maturity is also generally negative.

The dummy variables for the loan-to-value percentage in the pricing models for first mortgages are negative in the 71 to 90 percent range. This result indicates that mortgages in this range have lower annual percentage rates than mortgages with 70 percent loan to value or less. Normally, one would expect that higher loan-to-value percentages are associated with greater risk and therefore higher interest rates. The lower annual percentage rates for borrowers in the 71 to 90 percent range occur because nearly all borrowers with high loan-to-value mortgages have relatively high credit risk scores and income. Lenders do not make high loan-to-value mortgages to high-risk borrowers. Thus, the high loan-to-value percentage is a signal of high credit quality. This result is consistent with findings by Calomiris (1998).

[12] This approach for addressing selection bias was suggested by Barnow, Cain, and Goldberger.

[13] Some data in the AFSA subprime database are missing because companies' information systems do not always maintain all variables in machine-readable form. Mortgages purchased from other lenders' portfolios more often had missing values than mortgages originated by the lender, regardless of whether the loan was originated by a broker or the lender's employees. For discussion, see Staten and Elliehausen (2001).

In the 91 to 100 percent loan-to-value range, coefficients are either positive or negative, but the negative values are usually smaller in absolute value than the negative coefficients in the lower loan-to-value categories. Loan-to-value percentages greater than 100 percent have positive coefficients. Apparently, the risk on these higher loan-to-value mortgage products offsets the low credit risk (higher FICO risk scores) of the borrowers.

The value of the home is negatively related to the annual percentage rate for both first and second mortgages. This result is consistent with the hypothesis that greater collateral reduces risk.

The income dummy variables are generally negative, indicating that borrowers with incomes less than $100,000 had lower annual percentage rates than borrowers with incomes of $100,000 or more. The effects of income differ across products. For fixed-income mortgages, the middle-income borrowers paid the lowest annual percentage rates. For first mortgages, the largest negative coefficients in absolute value were in the $35,000-49,000 and $50,000-74,999 income groups. For second mortgages, the largest negative coefficients in absolute value were in the $25,000-34,999, $35,000-49,000, and $50,000-74,999 income groups. In contrast, lower-income borrowers paid the lowest annual percentage rates for variable- and hybrid-rate mortgages.

The effects of income on annual percentage rates may reflect the other variables that are related to income. A large part of the subprime mortgage market consists of moderate-income borrowers who have a history of credit problems. High-income borrowers typically qualify for prime credit. That a high-income borrower uses a subprime mortgage suggests that some other variable precludes a prime mortgage. For example, the borrower may have difficulty or may be unwilling to document income, or the borrower's income might be unstable. Lower-income borrowers with relatively good credit histories may have problems qualifying for lower annual percentage rates because low income makes debt service payments high relative to income. This problem may be less acute for variable and hybrid-rate mortgages, which because of their initially lower annual percentage rates require lower current monthly payments. Such considerations may, in part, explain the estimated income effects.

The coefficients for FICO risk score dummy variables are positive and rise from highest FICO score group (low risk) to lowest FICO score group (high risk). The omitted FICO score group, 680 or above, represents the lowest risk borrowers. Thus, borrowers pay ever higher annual percentage rates from lower to higher risk groups.

Increases in annual percentage rates across FICO score groups are quite large. For example, fixed-rate first mortgages to borrowers with risk scores that are nearly prime (640-679) have annual percentage rates that are 0.378 percentage point greater than first mortgages to prime borrowers. In the middle FICO score group (600-619) annual percentage rates are 1.092 percentage points greater, and in the highest risk group (less than 540) annual percentage rates are 2.036 percentage points greater. The pattern is similar for the other mortgage products. These results indicate quite clearly that annual

percentages rise substantially with increases in the risk of serious delinquency, bankruptcy, or other major derogatory event.

Behavior of Mortgage Brokers

The estimated coefficients for the broker choice variable are negative and significantly different from zero for fixed- and variable-rate first mortgages and all types of second mortgage. The estimated coefficient for broker choice is not significantly different from zero for hybrid-rate first mortgages. These findings indicate that other variables held constant, borrowers obtaining subprime mortgages from brokers paid annual percentage rates that were less than and equal to those paid by borrowers obtaining loans directly from the lender.

The conclusions do not differ when the possibility of borrower selection is taken into account. The coefficients for predicted probability of using a broker are negative and significantly different from zero for all types of first and second mortgages. These findings indicate that borrowers obtaining subprime mortgages from brokers paid annual percentage rates that were less than those paid by borrowers obtaining loans directly from the lender.

In sum, regardless of whether the possibility of borrower selection is taken into account, the evidence suggests that borrowers obtaining loans from brokers do not pay more and generally pay less than borrowers obtaining loans directly from lenders. The evidence supports the predictions of theoretical models of brokerage that brokers reduce the costs of matching borrowers. The evidence suggests that customers of brokers do not generally pay higher prices than customers of lenders and that any incentive to steer borrowers to higher priced loans is tempered by competition. One cannot conclude that the customers of brokers obtained the lowest price for which they qualified, however. One can conclude only that brokers' customers paid less than lenders' customers.

A finding of differences in annual percentage rates for broker- and lender-originated mortgages may not be unreasonable. The subprime market is quite heterogeneous, and there is considerable variation in borrower risk, which is reflected in the range of annual percentage rates from near prime to 18 to 20 percent or more. Brokers may be able to shop from a larger set of loans than a single lender and find a better match between borrower risk and annual percentage rate. Brokers also may be better able than consumers shopping on their own to match borrower risk and annual percentage rate.

The estimated differences in annual percentage rates may not be attributable entirely to broker efficiencies that are shared with borrowers. There may be other loan terms and borrower risk characteristics not included in the model that are correlated with broker originations.

4. Conclusions

The findings reported in this paper indicate that broker-originated mortgages are less costly to the borrower than lender-originated mortgages after holding other loan terms and borrower characteristics constant. The results are not conclusive because the

differences in annual percentage rates between broker- and lender-originated mortgages may not be attributable entirely to broker efficiencies that are shared with borrowers. There may be other loan terms and borrower risk characteristics not included in the model that are correlated with broker originations. Despite this qualification, the results presented do not support the hypothesis that borrowers obtaining mortgages through brokers pay more than borrowers obtaining mortgages directly from lenders.

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Table 1. Loan Pricing Model, Variable Definitions, and Descriptive Statistics

		First mortgages		Second mortgages	
Variable	Definition	Mean	Std. dev.	Mean	Std. dev.
APR	Annual percentage rate, percent	11.895	2.373	12.065	2.785
BROKER	Broker origination, dummy variable	.295	.456	.471	.499
LNAMT	Loan amount, $thousands	98.266	63.589	62.095	56.367
TERM	Term to maturity, months	287.470	96.371	242.576	95.086
LTV≤70	Loan to value ≤ 70%, dummy variable	.241	.428	…	…
LV71-80	Loan to value 71-80%, dummy variable	.221	.415	…	…
LV81-90	Loan to value 81-90%, dummy variable	.207	.405	…	…
LV91-100	Loan to value 91-100%, dummy variable	.118	.322	…	…
LV>100	Loan to value > 100%, dummy variable	.213	.409	…	…
VHOME	Value of home, $thousands	121.562	79.425	161.842	95.738
IN<15	Income < $15,000 dummy variable	.051	.219	.016	.127
IN15-24	Income $15,000-24,999, dummy variable	.128	.334	.058	.234
IN25-34	Income $25,000-34,999, dummy variable	.163	.370	.105	.306
IN35-49	Income $35,000-49,999, dummy variable	.251	.433	.229	.420
IN50-74	Income $50,000-74,999, dummy variable	.251	.434	.299	.458
IN75-99	Income $75,000-99,999 dummy variable	.100	.300	.152	.359
IN≥100	Income ≥ $100,000, dummy variable	.056	.230	.142	.349
S<540	Risk score < 540 dummy variable	.135	.341	.089	.284
S540-579	Risk score 540-579 dummy variable	.184	.388	.137	.344

Table 1. Loan Pricing Model: Variable Definitions and Descriptive Statistics (continued)

		First mortgages		Second mortgages	
Variable	Definition	Mean	Std. dev.	Mean	Std. dev.
S580-599	Risk score 580-599 dummy variable	.107	.309	.071	.257
S600-619	Risk score 600-619 dummy variable	.118	.323	.073	.260
S620-639	Risk score 620-639 dummy variable	.123	.329	.084	.278
S640-679	Risk score 640-679 dummy variable	.201	.401	.220	.414
S≥680	Risk score ≥ 680 dummy variable	.132	.418	.324	.468

Notes:
1. Information for year and state variables is not shown.
2. … Variable not included in model.

Table 2 Model for Broker Choice: Variable Definitions, Descriptive Statistics, and Logistic Regression Results

Variable	Definition	Mean	Std. dev.	Estimated parameter (Std. error)
INCOME	Borrower income, dollars (in thousands)	56.781	37.628	.015 ** (.000)
PURP1	Home purchase loan, dummy variable	.065	.247	3.797 ** (.012)
PURP2	Home improvement loan, dummy variable	.024	.153	1.017 ** (.011)
PURP3	Refinancing, cash out for debt consolidation, dummy variable	.464	.499	.996 ** (.003)
PURP4	Refinancing, cash out for other purpose, dummy variable	.176	.381	.356 ** (.004)
HSCHOOL	Proportion of population with high school diploma	.419	.143	4.720 ** (.277)
SOMECOL	Proportion of population with some college	.302	.061	7.832 ** (.280)
COLLEGE	Proportion of population with college degree	.192	.083	3.726 ** (.281)
GRADSC	Proportion of population with graduate degree	.079	.048	6.162 ** (.284)
HH15-24	Proportion of households with income $15,000-24,999	.142	.050	- .146 (.287)
HH25-34	Proportion of households with income $25,000-34,999	.136	.033	-3.974 (.316)
HH35-49	Proportion of households with income $35,000-49,999	.154	.024	-1.949 ** (.293)
HH50-74	Proportion of households with income $50,000-74,999	.172	.040	.515 (.373)
HH75-99	Proportion of households with income $75,000-99,999	.114	.043	2.276 ** (.288)
HH100-149	Proportion of households with income $100,000-149,999	.084	.045	2.276 ** (.288)
HH≥150	Proportion of households with income $150,000 or more	.055	.046	.012 (.134)
WCOL	Proportion of workers in white collar occupations	.558	.124	.087 ** (.027)
MALE	Proportion of population that is male	.491	.021	- .625 ** (.088)
WHITE	Proportion of population that is white	.687	.255	- .623 ** (.050)
BLACK	Proportion of population that is black	.138	.210	- .953 ** (.050)
ASIAN	Proportion of population that is Asian	.035	.594	-1.499 ** (.059)
HISPANIC	Proportion of population that is Hispanic	.084	.104	- .992 ** (.074)

Table 2. Model for Broker Choice: Variable Definitions, Descriptive Statistics, and Logistic Regression Results (continued)

Variable	Definition	Mean	Std. dev.	Estimated parameter (Std. error)
POPGR	Population growth, 1990 -2001, percent	24.697	116.431	4.090 ** (.246)
DENSITY	Population density, population per square mile (thousand)	21.997	28.517	.005 ** (.000)
HV100-149	Proportion of owner-occupied homes valued $100,000-149,999	.254	.170	.127 ** (.012)
HV150-199	Proportion of owner-occupied homes valued $150,000-199,999	.108	.123	- .140 ** (.018)
HV200-299	Proportion of owner-occupied homes valued $200,000-299,999	.056	.100	.300 ** (.027)
HV300-499	Proportion of owner-occupied homes valued $300,000-499,999	.021	.059	1.165 ** (.043)
HV≥500	Proportion of owner-occupied homes valued $500,000 or more	.008	.041	.601 ** (.053)
M2-5	Proportion of population who last moved 2-5 years ago	.212	.080	1.384 ** (.047)
M6-10	Proportion of population who last moved 6-10 years ago	.292	.066	1.580 ** (.048)
M11-20	Proportion of population who last moved 11-20 years ago	.138	.030	-1.039 ** (.063)
M21-30	Proportion of population who last moved 21-30 years ago	.184	.051	.806 ** (.050)
M>30	Proportion of population who last moved 30 or more years ago	.088	.043	.612 ** (.078)
LICOR	All mortgage originators must be licensed, dummy variable	.199	.399	.054 ** (.005)
LICBR	Only broker mortgage originators must be licensed, dummy variable	.091	.288	.250 ** (.006)
Intercept				-7.441 ** (.300)
Memo:				
Logistic regression chi-squared				502,712 **
(Degrees of freedom)				37

Notes:
1. Values less than 0.0005 are reported as 0.000.
2. ** Significant at 0.01% level.

Table 3. Estimation Results for Pricing of First Mortgages

	No selection			Adjusted for selection		
Variable	Fixed	Variable	Hybrid	Fixed	Variable	Hybrid
BROKER	- .871 **	- .321 **	.548	- .142 **	- .223 **	-1.873 **
	(.007)	(.005)	(.165)	(.015)	(.008)	(.036)
LNAMT	- .005 **	- .002 **	- .004 **	- .004 **	- .002 **	- .003 **
	(.000)	(.000)	(.000)	(.001)	(.000)	(.000)
TERM	- .004 **	- .003 **	- .000 **	- .007 **	- .003 **	- .000 **
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
LV71-80	- .232 **	- .373 **	- .123 **	- .413 **	- .372 **	- .117 **
	(.007)	(.006)	(.012)	(.007)	(.007)	(.012)
LV81-90	- .076 **	- .384 **	- .157 **	- .353 **	- .383 **	- .156 **
	(.008)	(.007)	(.012)	(.008)	(.008)	(.012)
LV91-100	.007	- .154 **	- .099 **	- .049 **	- .096 **	- .126 **
	(.009)	(.012)	(.012)	(.010)	(.012)	(.013)
LV>100	.305 **	.594 **	.324 **	.294 **	.770 **	.286 **
	(.009)	(.012)	(.013)	(.010)	(.012)	(.013)
VHOME	- .003 **	- .002 **	- .000 **	- .006 **	- .002 **	- .001 **
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
IN<15	- .091 **	- .155 **	- .779 **	.068 **	- .219 **	-1.135 **
	(.015)	(.024)	(.019)	(.018)	(.025)	(.021)
IN15-24	- .036 **	- .147 **	- .394 **	- .083 **	- .200 **	- .760 **
	(.014)	(.011)	(.015)	(.017)	(.011)	(.018)
IN25-34	- .129 **	- .190 **	- .206 **	- .256 **	- .235 **	- .567 **
	(.013)	(.009)	(.014)	(.016)	(.009)	(.017)
IN35-49	- .189 **	- .174 **	- .145 **	- .339 **	- .214 **	- .485 **
	(.013)	(.008)	(.013)	(.016)	(.008)	(.015)
IN50-74	- .237 **	- .132 **	- .088 **	- .335 **	- .165 **	- .379 **
	(.012)	(.007)	(.012)	(.015)	(.007)	(.014)
IN75-99	- .163 **	- .070 **	- .060 **	- .193 **	- .091 **	- .243 **
	(.014)	(.007)	(.013)	(.017)	(.008)	(.015)
S<540	2.036 **	1.110 **	1.249 **	2.066 **	1.097 **	1.267 **
	(.009)	(.008)	(.012)	(.009)	(.009)	(.012)
S540-579	1.711 **	.784 **	1.214 **	1.778 **	.776 **	1.218 **
	(.008)	(.008)	(.009)	(.008)	(.009)	(.009)
S580-599	1.377 **	.571 **	1.139 **	1.457 **	.566 **	1.150 **
	(.009)	(.009)	(.010)	(.010)	(.009)	(.010)
S600-619	1.092 **	.418 **	.908 **.	1.179	.408 **	.921 **
	(.008)	(.009)	(.009)	(.009)	(.009)	(.010)
S620-639	.858 **	.290 **	.689 **	.934 **	.287 **	.697 **
	(.008)	(.009)	(.009)	(.009)	(.010)	(.009)
S640-679	.378 **	.178 **	.354 **	.443 **	.176 **	.357 **
	(.007)	(.008)	(.008)	(.008)	(.009)	(.008)
Intercept	13.066 **	12.460 **	11.368	13.988 **	12.538 **	11.839 **
	(.018)	(.028)	(.021)	(.022)	(.030)	(.023)
R-squared	.596	.773	.704	.541	.712	.705
F-statistic	10,339 **	11,884 **	6,979 **	9,316 **	11,159 **	6,669 **

Notes:
1. Omitted dummy variables are LV≤70, IN≥100, and S≥680.
2. Coefficients and standard errors year and state variables are not shown.
3. Values less than 0.0005 are reported as 0.000.
4. ** Significant at the 1% level.

Table 4. Estimation Results for Pricing of Second Mortgages

	No selection			Adjusted for selection		
Variable	Fixed	Variable	Hybrid	Fixed	Variable	Hybrid
BROKER	- .706 **	-4.069 **	- .785 **	-2.404 **	-3.019 **	-1.412 **
	(.007)	(.158)	(.006)	(.001)	(.255)	(.013)
LNAMT	.005 **	-.016 **	- .018 **	.001 **	- .014 **	- .018 **
	(.000)	(.001)	(.000)	(.000)	(.001)	(.000)
TERM	.001 **	- .002 **	- .003 **	- .001 **	- .002 **	- .003 **
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
VHOME	- .008 **	- .000 *	.006 **	- .005 **	.000 **	- .006 **
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
IN<15	.256 **	-2.568 **	- .940 **	-.117 **	-2.878 **	-1.430 **
	(.020)	(.986)	(.015)	(.020)	(1.040)	(.016)
IN15-24	- .102 **	- .824 **	- .801 **	- .469 **	-1.380 **	-1.260 **
	(.014)	(.180)	(.010)	(.013)	(.204)	(.011)
IN25-34	- .194 **	- .376 **	- .666 **	- .620 **	- .944 **	-1.100 **
	(.011)	(.100)	(.009)	(.011)	(.125)	(.010)
IN35-49	- .077 **	- .168 *	- .486 **	- .512 **	- .692 **	- .883 **
	(.008)	(.073)	(.008)	(.009)	(.098)	(.009)
IN50-74	- .171 **	- .030	- .240 **	- .557 **	- .495 **	- .576 **
	(.008)	(.065)	(.007)	(.008)	(.087)	(.008)
IN75-99	- .211 **	- .017	- .062 **	- .434 **	- .253 **	- .296 **
	(.008)	(.067)	(.008)	(.009)	(.082)	(.009)
S<540	3.200 **	.583 **	1.390 **	3.473 **	1.014 **	1.353 **
	(.013)	(.092)	(.009)	(.012)	(.103)	(.009)
S540-579	2.991 **	.602 **	1.504 **	3.166 **	1.099 **	1.011 **
	(.011)	(.078)	(.009)	(.010)	(.088)	(.008)
S580-599	2.492 **	.441 **	.952 **	2.750 **	.900 **	.908 **
	(.013)	(.082)	(.009)	(.012)	(.091)	(.009)
S600-619	2.227 **	.329 **	.864 **	2.492 **	.795 **	.800 **
	(.012)	(.079)	(.009)	(.011)	(.088)	(.009)
S620-639	1.942 **	.276 **	.655 **	2.132 **	.780 **	.605 **
	(.010)	(.079)	(.009)	(.010)	(.088)	(.009)
S640-679	1.733 **	.187 *	.418 **	1.671 **	.618 **	.384 **
	(.005)	(.073)	(.009)	(.005)	(.082)	(.009)
Intercept	13.557 **	16.507 **	13.073 **	15.053 **	16.759 **	13.624 **
	(.017)	(.170)	(.017)	(.016)	(.201)	(.018)
R-squared	.589	.605	.694	.614	.571	.692
F-statistic	13,392 **	130 **	14,584 **	14,461 **	99 **	13,926 **

Notes:
1. Omitted dummy variables are LV≤70, IN≥100, and S≥680.
2. Coefficients and standard errors year and state variables are not shown.
3. Values less than 0.0005 are reported as 0.000.
4. **/* Significant at the 1/5% level.