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Abstract

Subprime mortgage lending expanded in New York City between 2004 and mid-2007, and delinquencies on these subprime loans have been rising sharply. We use a rich, loan-level data set of the city's outstanding subprime loans as of January 2009 to describe the main features of this lending and to model the performance of these loans. These subprime loans represent a smaller share of total housing units in the city than is true nationwide. In addition, they are found to be clustered in neighborhoods where average borrower credit quality is low and, unlike prime mortgage loans, where African-Americans and Hispanics constitute relatively large shares of the population. We estimate a model of the likelihood that these loans will become seriously delinquent and find a significant role for credit quality of borrowers, debt-to-income and loan-to-value ratios at the time of loan origination, and estimates of the loss of home equity.

Key words: New York City, subprime lending

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I. Introduction

Concern about delinquencies and foreclosures on nonprime mortgages nationwide, both subprime and Alt-A, has been rising since mid-2007. In August of that year, 12% of nonprime loans were reportedly seriously delinquent; i.e., more than 90 days in arrears or in foreclosure, but by March 2009, the delinquency rate had risen to 25%.[1] These nonprime loans had traditionally been used as a way of extending credit to homebuyers and property investors who did not qualify for prime mortgages. A higher risk of delinquency on these nonprime mortgages was associated with the borrower's blemished credit record, failure to meet prime underwriting limits on the loan size relative to the home value (LTV) or debt as a share of income (DTI), or to provide adequate documentation of income and assets. Delinquencies have been rising steadily for several years for all nonprime loan types, though the deterioration in the performance of subprime adjustable rate mortgages (ARMs) has been most dramatic and widely reported.[2]

The worsening performance of subprime ARMs was initially attributed to a combination of lax underwriting standards, shocks to payments from interest rate resets, and weakening economic conditions. However, current research finds falling home prices to be a primary factor underlying delinquencies across all mortgage types. Borrowers with little or no equity at the time of origination and whose home price has fallen relatively steeply have a weakening incentive to continue to make timely mortgage payments. As a result, delinquencies and foreclosures tend to be clustered in states, areas, or communities where home price declines have been relatively severe.

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[1] An early discussion of the problems with subprime mortgages is in Kroszner, Randall, "The Challenges Facing Subprime Mortgage Borrowers," speech at the Consumer Bankers Association 2007 Fair Lending Conference, Washington, D.C., November 5, 2007, available at www.federalreserve.gov/newsevents/speech/kroszner20071105a.htm..

[2] Mayer, Pence and Sherlund (2009) and the Government Accountability Office (2009) present data on the deteriorating performance of nonprime mortgages nationwide.

Although the mortgage crisis has hit a number of regions of the country particularly hard, the New York City housing market has been to some degree insulated. The city did experience a rapid growth in subprime lending associated with the relatively rapid growth in the supply of housing and homeownership during 2005 and 2006.[3] The scope for nonprime lending in the city, however, is somewhat narrower than in the nation as multi-unit (more than four) rental properties, which house a disproportionately large share of the city's population, require commercial rather than residential financing. This is especially true in the borough of Manhattan where more than two-thirds of the population lives in large rental buildings. Nevertheless, nonprime loans have penetrated the housing market throughout the city. Like the nation, serious delinquencies on these nonprime loans also began rising in mid-2006 and accelerated in mid-2007, particularly for subprime ARMs where the serious delinquency rate in New York City in early 2009 approached 60%. Foreclosed properties in urban areas can pose problems for the homeowners, renters and, to the extent that these loans are clustered in particular neighborhoods, for the broader communities in which the properties are located.

This article uses information from a rich, loan-level data set on outstanding nonprime loans in January 2009 to examine two key dimensions of nonprime lending in New York City—prevalence and performance. Most nonprime loans in the city were originated between 2004 and mid-2007, and so our data set of outstanding loans in January 2009 effectively excludes those loans which either defaulted or were prepaid shortly after origination. In the next section we describe the data we use in our analysis of mortgage lending and review the literature on the features of nonprime lending in urban areas. In Section III, we describe the number and characteristics of the outstanding nonprime loans in New York City, and compare them to a sample of outstanding nonprime loans nationwide. For the city, we use zip codes to define

[3] Furman Center (2007).

neighborhoods, and we pay particular attention both to the spatial clustering of this lending across neighborhoods and to the characteristics of the neighborhoods where this lending is prevalent. We then turn to an analysis of the performance of these nonprime loans in New York City. We employ a regression model to identify the correlates of seriously delinquent nonprime loans in the city, including the credit quality of borrowers, debt-to-income and loan-to-value ratios at the time of loan origination, and estimates of the loss of home equity. We compare these estimates for nonprime loans with the estimates from a similarly specified model for prime loans. We conclude in Section V with a summary of the key features of the penetration of nonprime mortgages in New York City and the major influences on their performance.

II. Nonprime Mortgage Data and Analyses

a) Mortgage data

FirstAmerican CoreLogic LoanPerformance (LP) serves as our primary data source for nonprime loans. The data base consists of information provided by loan servicers on securitized loans—loans pooled together and packaged into nonprime mortgage-backed securities.[4] The data provide rich detail on loan characteristics, including the size, initial interest rate, loan-to-value ratio (LTV), property type, location and purpose of the loan. Reported borrower characteristics include the FICO credit score, debt-to-income ratio (DTI), and degree of documentation of income and assets.[5] LP also tracks the loans on a monthly basis and includes data on the monthly payment status of the loan, balance, and monthly payment amount and interest rate.

[4] These securities are often referred to as private-label securities. Nonprime loans not securitized but held in the portfolio of the bank which made the loan are excluded from our nonprime mortgage data.

[5] The FICO score, developed by the Fair Isaac Corporation, is the most common individual credit score used in mortgage markets to measure creditworthiness. The score ranges from 300 (poor credit) to 850 (excellent credit).

Although there is no formal definition of nonprime loans, the term is conventionally used to define a broad category of subprime and Alt-A loans that do not meet federal guidelines for conforming loans as determined by the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac), the government sponsored entities (GSEs) that purchase and securitize prime home mortgages.[6] In the LP data, a loan is defined as subprime or Alt-A according to the pool of mortgages into which the loan has been placed. For our purposes, a loan securitized in a pool that is labeled subprime is defined as subprime, while a loan securitized in an Alt-A pool is defined likewise. Coverage of securitized nonprime lending in the LP data is high, as about 75% of securitized subprime loans and 90% of securitized Alt-A loans are captured in the data. The data are available both for New York City and nationwide; for computational ease, we select a one percent random sample of loans made nationwide to capture the characteristics of U.S. nonprime lending.[7]

Subprime loans are generally made to borrowers with a past credit problem and low credit scores, or those who do not meet the criteria for obtaining a prime mortgage loan. Some of the more exotic loan types tend to be subprime, and more than half of the existing subprime loans nationwide are adjustable rate mortgages (ARMs). This means that they are linked to an interest rate and margin that determines what the monthly payment will be. Many of these loans had a

[6] These prime loans meet specific dollar value, LTV and DTI limits. Prime borrowers also have well-documented income and assets. The other GSEs are the 12 Federal Home Loan Banks, the Farm Credit System, and the Federal Agricultural Mortgage Corporation (Farmer Mac).

[7] An alternative source of subprime lending data is loan-level information provided by banks to the Federal Financial Institutions Examination Council (FFIEC) in accordance with the Home Mortgage Disclosure Act (HMDA). These HMDA data include information on the loan type as well as the applicant's income, gender, race, and the Census tract in which the property is located. However, subprime, or nonprime, loans are not separately identified, and the payment status of the loans are not tracked. Previous analyses using this data base have defined subprime loans as (1) having relatively high interest rates, generally three percentage points or more above comparable-term Treasury bonds or (2) having been made by one of a number of lenders identified as subprime lenders by the Department of Housing and Urban Development (HUD). Extensive analysis of subprime lending has been based on home loans in Massachusetts made by HUD-identified subprime mortgage lenders. For additional discussion and usage of these data sources, see Calem, Gillen, and Wachter (2004), Mayer and Pence (2008), and Gerardi, Shapiro and Willen (2008).

30-year term with a relatively low fixed interest rate for the first two or three years, after which the interest rate would reset semi-annually for the remainder of the loan term.[8] At the time of reset, borrowers could experience a sharp increase in their monthly payment.

Alt-A loans are considered near-prime in that the underwriting characteristic of the borrowers tend to be similar to those who are able to obtain prime loans. Compared to subprime borrowers, Alt-A borrowers have lower DTIs and higher FICO scores. However, Alt-A loans are larger in value and are originated with less documentation; in fact, Alt-A borrowers often choose these loans because they do not wish to provide extensive documentation. In our sample, only 22% of the outstanding Alt-A fixed-rate mortgages (FRMs) in New York City was fully-documented at origination compared to 63% of the outstanding subprime FRMs in the city.

Another source of loan-level data for New York City is available from LP Applied Analytics, to which we refer in the remainder of the paper as McDash. This data set is also gathered from loan servicers and includes information on more than 40 million mortgages, and consists of both prime and nonprime mortgages, including loans that have been securitized into GSE and non-agency securities or held in bank portfolios. While the loan-level attributes of the McDash data are similar to those of LP, the McDash data set has considerably better coverage of prime loans than of nonprime loans. Due to this relatively less representative coverage of nonprime loans, we limit our use of McDash data to prime loans only.

(b) **Prevalence of Subprime Lending in Urbanized Areas**

A consistent finding of studies of subprime mortgage lending in urban areas is its prevalence in lower-income and minority neighborhoods. An examination of subprime lending trends in the 1990s by Canner et al (1999) illustrated the differences in the spatial patterns of

[8] These types of 30-year loans are often referred to as 2/28s or 3/27s to reflect the fixed and adjustable rate periods. For the loans outstanding in New York City as of January 2009, 40% reset after two years, 18% after three years, and 20% after 5 years.

subprime and prime mortgage lending. Using loan-level information provided by banks in accordance with the Home Mortgage Disclosure Act (HMDA data), the authors found that between 1993 and 1998 subprime home loans accounted for 17% of the overall growth in home purchase lending, but 26% of the growth in lending in lower-income neighborhoods (Census tracts) and 36% of the growth in lending in predominantly minority population neighborhoods.[9] A report on the growth of subprime mortgages over roughly the same period in the New York City metropolitan area, also based on the HMDA data, showed that these nonprime loans were an increasingly important source of home mortgage refinancing, and that the lending was disproportionately concentrated in lower-income and predominantly minority neighborhoods.[10] Both of these studies noted that their findings were consistent with the focus of the subprime mortgage market on borrowers who may not qualify for prime mortgage financing.

The sources of this observed concentration of subprime lending in lower-income and minority neighborhoods was further examined in models that controlled for both borrower credit characteristics and measures of neighborhood credit quality. Calem, Gillen and Wachter (2004) focused on subprime lending in neighborhoods in Philadelphia and Chicago. They combined the HMDA loan data with information on borrower credit characteristics and neighborhood (Census tract) demographic and credit risk profiles, and modeled the subprime share of total loans originated in a neighborhood in 1999. They found that increased credit risk of borrowers in a neighborhood is positively and significantly associated with higher subprime lending shares, and these risk characteristics account for a sizeable part of the association with neighborhood

[9] Minorities are defined as black and Hispanic borrowers. Subprime loans are those loans in the HMDA data made by HUD-identified subprime lenders. These authors separately examined subprime residential loans and manufactured (pre-fabricated and mobile) housing loans. Our analysis combines nonprime loans for all property types.

[10] U.S. Department of Housing and Urban Development (2000). The metropolitan area includes the five boroughs and Westchester County.

demographic characteristics. Even after adjusting for these neighborhood risk characteristics, however, subprime lending shares in both cities was still positively and significantly associated with the share of the minority population in the neighborhood. These findings were supported by the results of a loan-level analysis of the likelihood of a borrower obtaining subprime financing in ten cities, including New York City, in Calem, Hershaff and Wachter (2004). In their study, neighborhood and borrower income were negatively associated with the probability that a resident would obtain a subprime loan, and the neighborhood percent black population and borrower black race were positively associated with the probability of obtaining a subprime loan.[11]

The spatial features of subprime lending in the recent financial crisis have been described in several studies. Mayer and Pence (2008) use the LP data to examine nonprime (subprime and Alt-A) loan originations nationwide by zip code in 2005. Higher shares of nonprime loans in both housing units and loan originations were positively and significantly associated with higher risk characteristics of neighborhoods (zip codes) and with the black and Hispanic share of the population in the neighborhood. They also found that nonprime lending shares are higher for borrowers with average credit scores though not for borrowers with relatively low income. Gerardi and Willen (2008), using deed registry data from Massachusetts, found subprime lending within the city of Boston was clustered in neighborhoods with a heavily minority population.

An examination of subprime lending in New York City over the 1996 to 2006 period, using the HMDA data, shows a rapid expansion of this lending from 2003 to 2005 and then a modest decline in 2006 (Furman Center, 2007). In 2005, subprime loans constituted about one-quarter of all home loans originated; in that year, subprime home purchase loans were more than

[11] Larger shares of the population of a neighborhood with a college degree or higher are also negatively associated with the probability of a loan being subprime.

40% of home purchase loans to black homebuyers and 33% to Hispanic homebuyers, compared to 8% of loans to white homebuyers. Notably, subprime loan dollar values in the city are high relative to the nation and these loans do not appear to have been concentrated to any significant degree among low-income borrowers.

Since nonprime loans are inherently risky and typically default at higher rates than prime loans, the expansion of nonprime lending into low-income and predominantly minority neighborhoods in urban areas, including New York City, raise concerns about their performance. Higher rates of delinquency that lead, ultimately, to foreclosure can be problematic for individual borrowers and their neighbors, and can lead to a potential clustering of foreclosures in neighborhoods. The evidence on the use of nonprime loans to finance multi-unit properties in urban areas suggests further that these foreclosures might affect the renters occupying a foreclosed multi-unit property who might find themselves in jeopardy of losing their residence. Foreclosed properties may also depress home prices in the neighborhood, helping to push surrounding borrowers into negative equity, thereby increasing the probability of additional foreclosures. Knowing others who have experienced foreclosure can also reduce the stigma of the event. In a neighborhood where many people are defaulting on the mortgages on their homes, for instance, it is more likely that a borrower who is having difficulty will be inclined to default compared to a borrower who may be the only person to default in her neighborhood. The evidence on the magnitude of these spillover effects of delinquencies and foreclosures is not extensive. A study of the Chicago housing market by Immergluck and Smith (2005) suggested that negative externalities associated with foreclosures could be sizeable. They estimated that foreclosures of home loans in 2003 had a significant negative impact on the neighborhood, with

each foreclosure associated with a 0.9% decline in the value of homes located within an eighth of a mile of the foreclosed property.

III. Prevalence of Nonprime Mortgage Lending in New York City

Like the nation, New York City saw an expansion of nonprime mortgage lending that accelerated in early 2005 and continued through mid-2007. Data on outstanding nonprime loans in January 2009 show a total loan value of about $30 billion: At that time there were about 75,000 outstanding nonprime mortgage loans with an average loan balance of almost $400,000 (**Table 1**).[12] The average value of subprime ARMs was $411,000 and the average value of Alt-A ARMs exceeded $500,000.

Despite the large number and value of these nonprime loans, their penetration of the city's housing market has been relatively modest: Outstanding nonprime mortgage loans in the city constitute 2.2% of the 3.31 million housing units whereas nonprime loans nationwide constitute 4.1% of housing units.[13] The prevalence of nonprime lending in New York City is also low in comparison with subprime lending in other major cities. Nonprime loans as a share of housing units in Atlanta, Dallas, Chicago, Los Angeles and San Francisco all exceed the share in New York City.[14]

Part of the explanation for this relatively lower prevalence of subprime lending in New York City is the fact that two-thirds of city residents are renters, not owners. The majority of these renters, moreover, reside in buildings with five or more units, which are normally financed

[12] These nonprime loans were split roughly evenly between subprime mortgages and Alt-A mortgages.

[13] Other measures suggest a potentially more significant role for subprime lending in the NYC housing market. For instance, if it is assumed that each nonprime loan that was originated for a 2-4 unit building affects an average of three units, then subprime lending in the city would cover almost 7.2% of all housing units in the city compared to 7.1% nationwide.

[14] Computed as nonprime loans in each city reported in the LP data as a share of housing units in the city as reported in the American Housing Survey.

by commercial mortgages.[15] This housing composition is most evident in Manhattan (New York County) where owner-occupied units comprise only 24% of all housing units, and over 90% of rental units are in buildings with 10 or more units. The composition of the housing stock differs across the other boroughs (counties) in the city. The largest shares of single-family homes in housing units are found in Staten Island (Richmond County) and Queens, though even there single-family homes comprise only about half of all housing units, much lower than the 67% share of single-family homes in housing units in the nation.[16] More than half of all nonprime loans in the city were made for the purchase or refinance of residential buildings containing 2 - 4 units. Nationwide, the vast majority of subprime lending, about 71 %, was for the purchase of single-family homes. Thus, the two-to-four unit property is an important and unique feature of nonprime lending in the city.[17] This property type is particularly interesting because it always functions as an investment property, even if the owner lives in one of the units. Previous research has found that the factors affecting delinquencies and foreclosures differ between owners and investors.[18] Unlike owners, investors do not experience the costs associated with moving to a new home when they lose their property to foreclosure. But in a situation where the investor is also an owner, losing the home to foreclosure includes these added costs of moving.

The average credit quality of these nonprime loans in New York City generally matches or exceeds the average quality of nonprime loans nationwide. Mean FICO scores of borrowers are somewhat higher in the city, including those for subprime ARM borrowers. DTIs and LTVs

[15] Furman Center (2007).
[16] Constraints on the use of nonprime loans to finance co-operative apartments also likely contributed to the comparatively smaller share of subprime lending in the city as this form of property ownership is found almost exclusively in New York City.
[17] Only about 21% of outstanding prime loans in New York City in January 2009 were for 2 -4 unit properties.
[18] Haughwout et al (2008).

in the city compare favorably to the nation as well. The extent of full documentation of loans, however, is lower on average across all loan types in the city than in the nation.

The spatial distribution of nonprime lending in New York City indicates that the penetration of this lending varied sharply both across and within the city's five boroughs (counties). We use zip codes to define neighborhoods and our measure of subprime lending prevalence is the ratio of nonprime loans to total housing units within a zip code. The zip code prevalence ratios are grouped into quintiles and shown in **Map 1.** The plot indicates a heavy concentration of this lending in zip codes in Staten Island, the eastern section of the Bronx, and in a broad cluster of adjacent zip codes in eastern Brooklyn (Kings County) and southern Queens. There was relatively little penetration of nonprime mortgage lending in Manhattan.

To isolate the areas where nonprime lending had a greater prevalence relative to prime lending, we express the ratio of nonprime loans to prime loans by zip code, and then group the zip codes by quintile. This measure of relative penetration identifies three clusters of zip codes where there was a relatively large incidence of nonprime lending. One of these three clusters includes much of the Bronx, a second is in eastern Brooklyn, and a third in southeast Queens **(MAP 2).** Manhattan and Staten Island show little relative penetration of nonprime lending. The high prevalence of nonprime loans in these three clusters of zip codes suggests that borrowers in these areas might have traditionally not been eligible for prime loans or might have increased their preference for nonprime loans relative to prime loans.[19]

A Model of Nonprime and Prime Lending Shares in New York City

Regression analysis was used to identify and compare the key correlates of the prevalence of both nonprime and prime lending in zip codes in New York City as of January

[19] Average FICO credit scores of prime borrowers in these zip codes were much lower than that of prime borrowers citywide.

2009.[20] The correlates represent five sets of zip code level characteristics: the credit quality of borrowers; housing structure; income; demographic characteristics; and home price appreciation and monthly apartment rent.[21] Although the correlates other than the demographic characteristics are entered in the model as dummy variables, representing the tercile or quintile ranking of the zip code, we report the average values of each correlate in the categories used in the model in **Table 2.**

Average FICO credit scores of borrowers are measured at origination and capture credit quality. Zip codes with lower average FICO scores are expected to be associated with larger shares of nonprime loans and smaller shares of prime loans. The average FICO scores are grouped into three categories (terciles) to reflect the broad ranges of FICO scores used by underwriters to characterize borrower credit quality. The housing structure is described by the share of total housing units in 1-4 unit buildings and the share of owner-occupied housing units in the zip code.[22] Since the housing structure, particularly the prevalence of large multi-unit rental properties, can constrain the scope for mortgage lending, it is expected that larger shares of housing units in 1 - 4 unit buildings and owner-occupied units will be associated with higher lending shares of both nonprime and prime mortgage lending. In the model we allow for nonlinearities in the relationship of the housing structure to nonprime lending prevalence by using a dummy variable that indicates the quintile in which the zip code falls.

Zip codes with lower (higher) median incomes are expected to be associated with higher (lower) shares of nonprime lending. Following previous studies, we allow for nonlinearities in

[20] About 8% of zip codes were not included in the regression model because they did not represent a clearly identifiable neighborhood but rather a post office box or a single building. We also exclude a small number of zip codes that had fewer than 10 loans, and as a result we use 157 zip codes in the analysis of nonprime loans and 161 zip codes in the analysis of prime loans.

[21] This model has several variables in common with the model of subprime loan penetration across zip codes nationwide in Mayer and Pence (2008).

[22] Data on housing structure of zip codes and on the demographic composition of the population of the zip code are from the 2005 American Housing Survey.

the relationship of income to lending, and we enter the income variable in the model as a dummy variable indicating the quintile in which the zip code falls. Demographic characteristics are represented by the shares of the population in the zip code that are black, Hispanic, and that have completed college. Previous studies of the correlates of nonprime lending lead us to expect that larger shares of blacks and Hispanics in a neighborhood will be positively (negatively) associated with the incidence of nonprime (prime) lending. The share of the population that has completed college is expected to be negatively (positively) associated with nonprime (prime) lending. Housing market price trends are measured by the percentage change in the average home price in the zip code over the period 2003 – 2007 and by the median gross monthly rent in the zip code.[23] Faster home price appreciation and higher monthly rents are assumed to capture the strength of demand for housing, and are expected to be positively associated with higher nonprime and prime lending. In the model, average home price appreciation is entered as a dummy variable representing quintiles.

The model is a straightforward linear regression that relates the share of loans in total housing units in the zip code to these correlates. The results show that the penetration of nonprime mortgages across city zip codes is significantly related to the credit quality of borrowers and the race and ethnicity of the population **(Table 3).** Average nonprime lending shares in zip codes with the riskiest borrowers—zip codes with average FICO score in the bottom tercile of the distribution of average FICO scores--were significantly higher than in the zip codes with the least risky borrowers. The variables representing the share of the black and Hispanic population in the zip code were positively and significantly associated with nonprime

[23] The home price data were computed by the Furman Center for Real Estate and Urban Policy at New York University and graciously supplied to the authors. The data on home price changes are annual estimates and were computed from repeat sales data taken from mortgage records and are reported for each of 100 Community Boards that make up New York City. The authors converted these Community Board based measures to a zip code basis.

lending. The estimated coefficients show that a 10 percentage point higher than average share of blacks and Hispanics in the population of the zip code is associated with a 0.4 and 0.3 percentage point increase in nonprime lending shares, respectively.

The model estimates confirm the role of the housing structure in helping to shape the prevalence of nonprime lending across zip codes. Larger values of the two variables that represent the ownership potential in the zip code—owner-occupied units as a percent of total housing units and the percentage of owner-occupied units in 1 – 4 unit buildings—are positively and significantly related to higher nonprime lending shares. Nonprime lending rates in zip codes in the lowest (first) ownership quintile top quintile are about 1.8 percentage points lower than in zip codes with the highest home ownership rates.

Neither median household income nor the share of the population with a college degree was significantly associated with nonprime prevalence. Home price appreciation was not consistently linked to the incidence of nonprime lending. Only zip codes experiencing moderate home price appreciation had significantly higher shares of nonprime loans compared to zip codes with the highest rates of appreciation. Average monthly rents were positively and significantly associated with higher nonprime lending shares, though the magnitude of the impact is relatively small.

A similarly specified model was used to identify the effect of these correlates on the distribution of prime mortgage lending across zip codes in New York City. A comparison of these model estimates show two major differences in the key drivers of prime compared to nonprime lending. One is the significant association of income in prime mortgage lending. Relatively poorer zip codes have significantly lower shares of prime mortgage loans than the wealthiest zip codes: prime loan shares are 8.4 percentage points lower in the poorest zip codes

than in the wealthiest zip codes. The other key difference is the fact that the race and ethnicity variables bear no significant relationship to the extent of prime lending.

Interestingly, lower credit quality of prime borrowers was found to be positively and significantly associated with prime lending shares. Prime lending shares of housing units in the first and second tercile are significantly higher, about 2.5 and 3.2 percentage points, respectively, relative to those zip codes with the highest credit quality borrowers. This somewhat surprising result could reflect the fact that relatively high credit quality prime borrowers live in relatively low income or otherwise overall high credit risk neighborhoods. Also, the observed variation in FICO scores of prime borrowers in the lowest tercile is larger than in either the lowest tercile of the distribution of nonprime loans or in the highest tercile of prime loans.

We also examined the spatial distribution of the residuals of nonprime regressions reported above to determine if there were systematic influences on the prevalence of lending beyond those included in the model. Based on the number and location of zip codes more than two standard deviations away from the average error, both positively and negatively, the clustering of these residuals is far less than the clustering observed for overall lending. There are only a few zip codes where the model seriously over-predicted the prevalence of lending by more than two standard deviations, and none where it seriously under-predicted prevalence. Thus we feel our model captures the factors that systematically influence the prevalence of nonprime lending across city neighborhoods.

IV. Performance of Nonprime Loans in New York City

The spatial prevalence of nonprime mortgage lending across neighborhoods in New York City was seen to be significantly related to relatively low average credit scores of borrowers and the demographic composition of the population, factors that were not strongly related to the

prevalence of prime mortgage lending. In order to determine to the extent to which this expansion of nonprime lending was problematic, we examine the performance of these nonprime loans. We define loans as *seriously delinquent* if they are 90 days or more in arrears or in foreclosure.[24] The rate of serious delinquencies on the outstanding nonprime loans in New York City has been rising since the fall of 2005, and in January 2009 was about 25%, roughly equivalent to the nation (**Figure 1**). Within the nonprime category, the rate of seriously delinquent loans is highest for subprime ARMs, which in January 2009 exceeded 50%. The comparable rate of serious delinquency for prime mortgage loans in the city at that time was about 3.5%.

The rate of seriously delinquent loans in New York City reflects, in part, the time loans spend in the foreclosure process, as the length of time that properties spend in foreclosure in New York State is much greater than the nationwide average. That is, loans in other parts of the country move through the process and are disposed of more quickly. A look at the nonprime loans made in New York City in 2005 and 2006 is instructive. On average, loans of this vintage that were in foreclosure as of January 2009 in New York City spent 11 of the past 24 months in foreclosure; the corresponding number for the nation is 5 months. [25]

A Model of Seriously Delinquent Loans in NYC

A regression model was used to estimate the influence of a number of correlates of serious delinquencies in New York City for nonprime, subprime ARM, and prime loans. Our

[24] We exclude properties that are classified as REO, or real estate owned. We consider these properties to have moved through the foreclosure process and the mortgagee is now the owner.

[25] At the 95th percentile of the distribution of the months these same loans have spent in foreclosure, loans in New York City have spent all 24 months in foreclosure while loans in the rest of the nation have spent 18 of the 24 months in foreclosure. However, a smaller share of nonprime loans is in REO (Real Estate Owned by the lending bank) than nationally implying that foreclosed properties in the city are resold relatively quickly.

analysis is done on a loan-level basis, and we classify each outstanding loan in our data set as either seriously delinquent or not as of January 2009. Following previous studies, we group the correlates of seriously delinquent loans into five categories: credit quality; underwriting criteria; borrower equity; property and owner type; and selected features of the mortgage and the neighborhood.[26] Although we enter some of the variables as dummies in the model, we report the average values of each of the correlates in **Table 4.**

Credit quality is measured by the borrower's FICO score at origination, and the three groupings roughly represent quality ranges used by underwriters. Nonprime loans are more concentrated in the low FICO score range than prime loans, and subprime ARMs are distinguished by the large share of loans with borrower FICO scores less than 620—twice the share of nonprime loans and almost 9 times larger than prime loans. The underwriting criteria are the DTI and LTV at origination, and the extent of income and asset documentation provided at origination.[27] In our nonprime data set the DTI is the ratio of the total amount of recurring debt, inclusive of the mortgage payment, to monthly income, which can be interpreted as reflecting the borrower's ability to make their monthly payments. Underwriters normally judge a DTI above 41 as too high to qualify a borrower for a prime loan, and a DTI below 31 as easily qualifying a borrower for a prime loan. Nonprime loans are more concentrated in the above 41 category compared to prime loans, and the majority of subprime ARM loans have a DTI greater than 41. It should be noted that the DTI is not reported (missing) in our data set for a relatively large share of both nonprime and prime loans, though these loans are still included in our analysis.

[26] The LP data has been used in several similar models of subprime loan delinquencies. See Demyanyk and Van Hemert (2008), Danis and Pennington-Cross (2005), Sherland (2008), and Haughwout, Peach and Tracy (2009).
[27] We use the combined LTV, which includes any second liens, where it is reported in the data.

The LTV is one measure of the borrower's incentive to keep current on a mortgage. Borrowers with a high LTV at origination have little or no equity in their home at the outset of the loan, and subsequent home price declines can easily erode any positive equity and put the borrower "underwater," thus lessening the incentive for borrowers to continue to make payments on their mortgage. The majority of nonprime loans have LTVs above 80; i.e., the borrower made a down payment less than the conventional 20% of the home value. The majority of prime loans have LTVs below 80. As for documentation level, only a small share of nonprime and prime loans were made with no documentation, though more than 60% of both nonprime and subprime ARM loans had less than full documentation at origination compared to only about 10% of prime loans.

The impact of borrower equity, or the change in the value of the loan relative to the change in the value of the property, is of particular importance in a delinquency model as negative equity in a property has been shown to be a strong driver of delinquencies.[28] Our data set has information on the value of the property at origination, the initial loan value, and the monthly loan balance, and we use this information to estimate the changes in borrower equity. Changes in loan amount (L) are computed from changes in the loan balance. Changes in the value of the home (V), both positive and negative, are estimated by applying changes in the Case-Shiller home price index for the New York metropolitan area to the value of the property from the month of loan origination to January 2009 (**Figure 2**); loan balance changes are reported over the same period.[29] Average loan balances on all three types of outstanding mortgages have declined since origination, though the size of the decline has been largest for

[28] See Haughwout, Peach and Tracy (2009).

[29] Haughwout and Okah (2009) use the Case-Shiller and FHFA indexes to calculate changes in home values and homeowners' equity in major metropolitan areas of the country. Positive and negative changes in HPA are entered separately to account for possible asymmetries in the effect of changing home prices on delinquencies.

prime loans. For properties with positive home price appreciation (HPA), the increase has been relatively modest for those financed with nonprime loans; for properties that experienced negative home price appreciation, however, the average (absolute value) decrease has been larger for properties financed with nonprime loans.[30]

We estimate three specifications of our delinquency model that differ in the treatment of borrower equity. **Model 1** is estimated excluding any explicit variables relating to borrower equity. In **Model 2**, we include both home price changes (positive and negative HPA) and loan balance changes separately. In **Model 3**, we augment the specification in Model 2 by including the LTV at origination to capture the borrower's initial equity in the home.

The results for the estimates of a linear probability model of seriously delinquent mortgages in January 2009 are shown in **Tables 5a (nonprime loans), 5b (subprime ARM loans) and 5c (prime loans)**. Across all specifications for nonprime loans, relatively low borrower credit quality significantly increases the likelihood that a loan will be seriously delinquent (**Table 5a**). In Model 1, nonprime borrowers with FICO scores less than 620 are 13% more likely to be seriously delinquent than a borrower with a credit score above 720. Controlling for the LTV at origination (Model 3) magnifies the effect of these low FICO scores, and loans with the worst scores (first tercile) are 21% more likely to default than those with the best credit scores.[31]

The impact of underwriting criteria on serious delinquencies is broadly consistent with the findings of other studies. Having a DTI over 31 has a positive and significant effect on a

[30] These different home price trends reflect in part differences in the vintages of nonprime and prime loans in our sample. About 90% of nonprime loans were made in 2004 compared to about 65% of prime loans. A larger share of properties financed with prime loans thus experienced price appreciation than nonprime loans.

[31] We also estimated a probit model of seriously delinquent loans. The signs and statistical significance of the variables were virtually identical to the estimates from the linear probability model, and the marginal effects of the independent variables were also similar. These results are available upon request.

borrower's likelihood of a serious delinquency for nonprime loans in Models 1 and 2; nonprime loans with DTIs above 41 are 10% more likely to be seriously delinquent than loans with a DTI less than 31. However, the effect of DTI is sharply reduced with the introduction of LTV at origination (Model 3), and only DTIs above 41 have a positive and significant effect on delinquencies. Moreover, the dummy variable representing loans with missing DTIs, a little over 36% of the sample, also has a positive and significant effect on serious delinquencies, suggesting that the non-reporting of a DTI may be revealing something about the borrower's likelihood of being delinquent on the loan. Nonprime loans with little or no documentation are significantly more likely to become seriously delinquent than loans with full documentation.

The variables that capture the level and changes in borrowers' equity—changing loan balance, estimates of changing home prices, and the initial loan-to-value ratio—had significant effects on the likelihood of serious delinquencies. Falling loan balances reflect the borrower's efforts to pay off the mortgage and are estimated to lower the likelihood of a loan being seriously delinquent, though the effect is relatively small (Models 2 and 3). Both home price appreciation and depreciation are estimated to raise the likelihood of serious delinquencies, though the impact of rising prices is relatively small (Model 2). A borrower's initial equity in the home is measured by the LTV at origination, and high LTVs, or low equity, are associated with an increased likelihood of serious delinquency (Model 3). Loans with an initial LTV over 100 are estimated to have a 30% higher probability of delinquency compared to loans with initial LTVs below 80. Controlling for the initial LTV, rising home prices lose their statistical significance while falling home prices continue to significantly raise the likelihood that a loan will be seriously delinquent (Model 3).

Given the relatively high concentration of nonprime mortgage lending in the city on 2 -4 unit property types, each of our model specifications includes dummy variables representing seven property types, with the single-family property type excluded. We report the estimate of the 2 – 4 unit property type only. We also include a dummy variable that measures whether the borrower self-identified as an investor, as previous studies have generally found a systematically higher propensity of investors to be delinquent relative to owners. Further, we include dummy variables capturing whether that investment was in a 2 – 4 unit property and whether it was reported to be a second home.

Our results show that these 2 – 4 unit property types are significantly more likely to default than single family property types, and this result is consistent across all specifications. This finding suggests that regardless of whether the borrower is an owner-occupier or investor, the borrower is more likely to default on their mortgages compared to owner-occupiers and investors in single family units. We further examine the influence of investors and owner-occupants on the likelihood of serious delinquency by interacting the (self-reported) investor variable with the 2 – 4 unit property type. In Models 1 and 2, investors (non-owner occupants) in 2 – 4 unit buildings are significantly less likely to become seriously delinquent than investors and owners in other property types. This result is inconsistent with the findings of previous studies that found that investors are more likely than owners to be seriously delinquent on their mortgages, particularly when faced with a significant loss of equity. The implication of the finding is that these self-reported investors are behaving like owner-occupants, possibly reflecting a misrepresentation of their status as pure investors. The positive and significant coefficients on the investor variable across all specifications implies that investors in single-family properties are more likely to become seriously delinquent, a result consistent with

previous studies. Model 3 estimates show that controlling for home price changes and LTVs at origination increases the magnitude of the positive impact of an investor becoming seriously delinquent. The results also show a reduction in the magnitude of the negative impact of an investor in a 2 – 4 unit property on becoming seriously delinquent.

The estimated coefficients on the determinants of seriously delinquent subprime ARMs (**Table 5b)** are broadly similar to the model estimates for nonprime loans. The much higher delinquency rates appear related to their substantially lower average credit quality and relatively poor underwriting criteria than the broader group of nonprime loans. The results of the model of nonprime mortgage loans in the city are broadly similar to those of a similarly-specified model of serious delinquencies of prime mortgages, though with some notable differences **(Table 5c).** Unlike nonprime loans, DTIs for prime loans have a statistically significant effect on serious delinquencies at much lower ratios. The impact of DTIs on the probability of entering serious delinquency is significant at a DTI of 38, and the estimated impact is similar to that of loans with a DTI of 41. The importance of DTI at lower levels may be partially due to its measurement. For the prime loans we use the front-end DTI which is the sum of mortgage-related payments – principle, interest, taxes, and insurance—divided by monthly income. For nonprime loans we use the back-end DTI, which is not limited to mortgage-related payments but includes all recurring debt payments, divided by income. Thus the front-end DTI better estimates the effect of the mortgage payments on the payment status of the loan. The LTVs of prime loans at origination were also positively and significantly associated with serious delinquencies, although only about two percent of prime loans were estimated to be underwater in January 2009. Notably, the probability that a prime mortgage loan will be seriously delinquent is not as

significantly affected by the extent of income or asset documentation at origination, or whether the borrower is an investor or owner. [32]

Finally, a dummy variable representing fixed rate loans was negative and statistically significant across all specifications in the nonprime, subprime and prime delinquency regressions. We also included the three-month lagged rate of seriously delinquent loans in the neighborhood to capture spatial effects on the likelihood of a loan being seriously delinquent. The estimated coefficient was positive though not significant in any of the reported nonprime specifications, and negative though not significant in any of the reported prime specifications. Our model, however, included zip code level fixed effects which could be capturing some of the variation in delinquencies across neighborhoods. A specification excluding zip code fixed effects showed that a three month lagged value of the serious delinquency rate of nonprime loans in a neighborhood significantly raised the probability that a loan in the zip code would be delinquent, giving some support to a "spatial" effect on delinquency.

V. Summary

Our analysis of outstanding nonprime mortgages in New York City as of January 2009 shows a smaller penetration of these loans in the city's housing market than what occurred nationwide: 2.2% of housing units in New York City at that time compared to a 4.1% of housing units nationwide. This relatively smaller penetration reflects in part a more limited scope for home mortgage lending in the city due to the disproportionately large share of renters in

[32] In order to control for differences in the vintages of nonprime and prime loans, the regression model was run separately for nonprime and prime loans made in 2005. For nonprime loans, the correlates and regression estimates were very similar to those for the full sample. For prime loans, the main difference in the correlates in 2005 compared to the full sample was a smaller average decline in the loan balance, little positive price appreciation and a larger average home price decline. The sign and significance of the regression estimates were similar to that for the full sample. The estimates are available upon request.

relatively large rental unit buildings. Moreover, more than half of all outstanding nonprime loans in the city were for 2 – 4 unit buildings, while nationwide about 70% of loans were made for single family residences. Thus nonprime borrowers in the city are often both owner-occupants and investors, and decisions to stop making mortgage payments reflect both investor and owner considerations.

Compared to prime loans in the city, nonprime loans were more likely to be extended to borrowers with relatively poor credit quality and who provided less documentation of income and assets at origination. An analysis of the relative prevalence of nonprime and prime lending across neighborhoods throughout the city showed that the loans outstanding as of January 2009 were more likely to be found in areas with relatively large black and Hispanic populations, a pattern of lending found in several studies of nonprime lending prior to the current financial crisis. Prime lending was less associated with demographic features of the population of a neighborhood and more closely associated with high-income neighborhoods. Clustering was also a feature of nonprime lending in the city, though after controlling for the limitations of the housing structure on the scope for residential lending, only three clusters of neighborhoods were seen to have a disproportionate share of nonprime loans.

While the share of nonprime loans in New York City was shown to be only about half of that nationwide, the rate of serious delinquencies on nonprime loans in the city matches that of the nation and continues to rise. In particular, delinquencies on 2 – 4 unit property types, which were the focus of nonprime lending in the city, were significantly higher than other property types. The rate of serious delinquencies on these nonprime loans is being driven by factors that are similar to those found in studies of nonprime mortgage delinquencies nationwide; namely, weak credit quality of borrowers, high DTIs at origination, and declining borrower equity. Our

analysis indicated only a modest spillover effect of neighborhood delinquency rates on the likelihood of an individual loan in the neighborhood becoming seriously delinquent.

Looking ahead, the relatively poor credit quality of nonprime borrowers in the city is likely to continue to worsen the performance of these loans. The adverse effects of the high DTIs, however, might be mitigated by improving conditions in the city's economy. For a borrower with a high DTI at origination, a subsequent job loss or income decline due to weakening economic conditions likely made him or her increasingly unable to support the monthly payment. An improving job picture would ease the pressure of these high DTIs and help these borrowers keep current on their loans. The trajectory of home prices in New York City will also be a key factor determining the course of nonprime loan performance. Declining home prices in the city have eroded the equity of nonprime borrowers, and the effect on delinquencies of these falling home prices coupled with high LTVs at origination is particularly severe for subprime ARMs. While the future course of home prices in the city is difficult to predict, a bottoming out of home prices would stem the loss of equity. The slowing rate of home price declines that has been observed over the past year is an encouraging sign. The risks to the performance of nonprime loans arising from continuing declines in home prices, however, remain high, and both the city and the nation await further evidence of improved housing markets.

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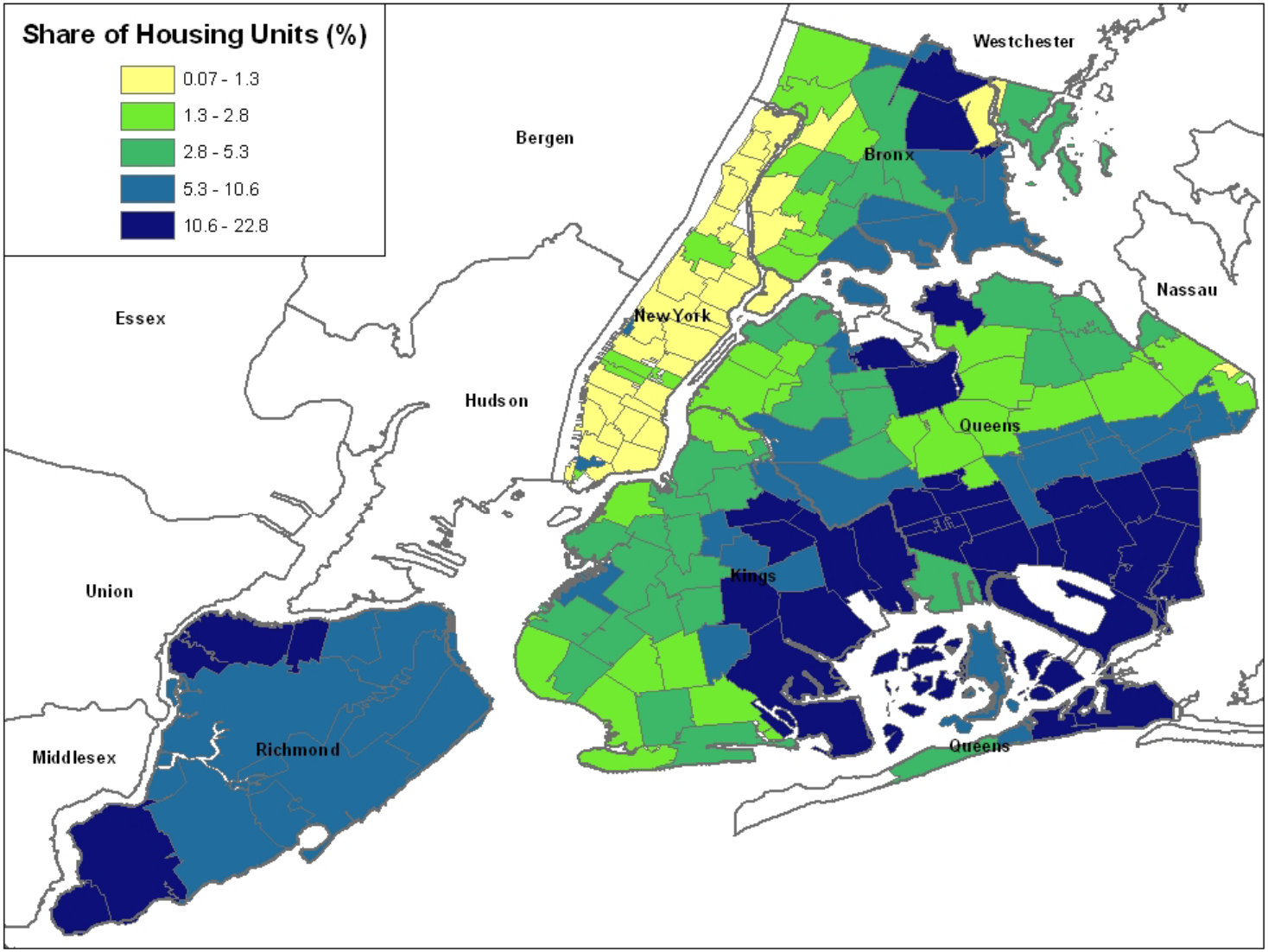
Map 1: Prevalence of Nonprime Lending in New York City

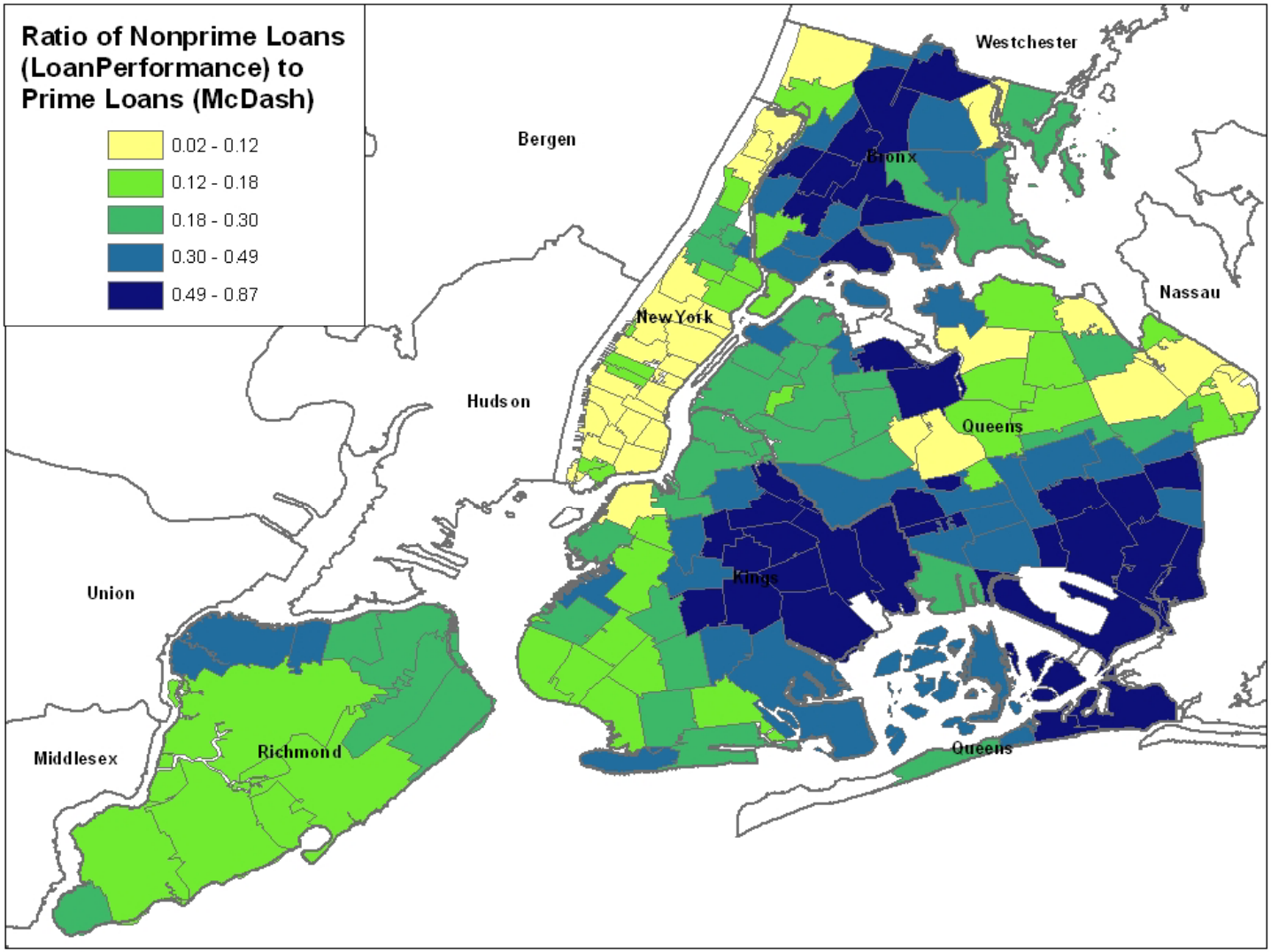
Nonprime Loans as a Share of Housing Units by Zip Code: January 2009



Source: First American CoreLogic LoanPerformance; American Housing Survey

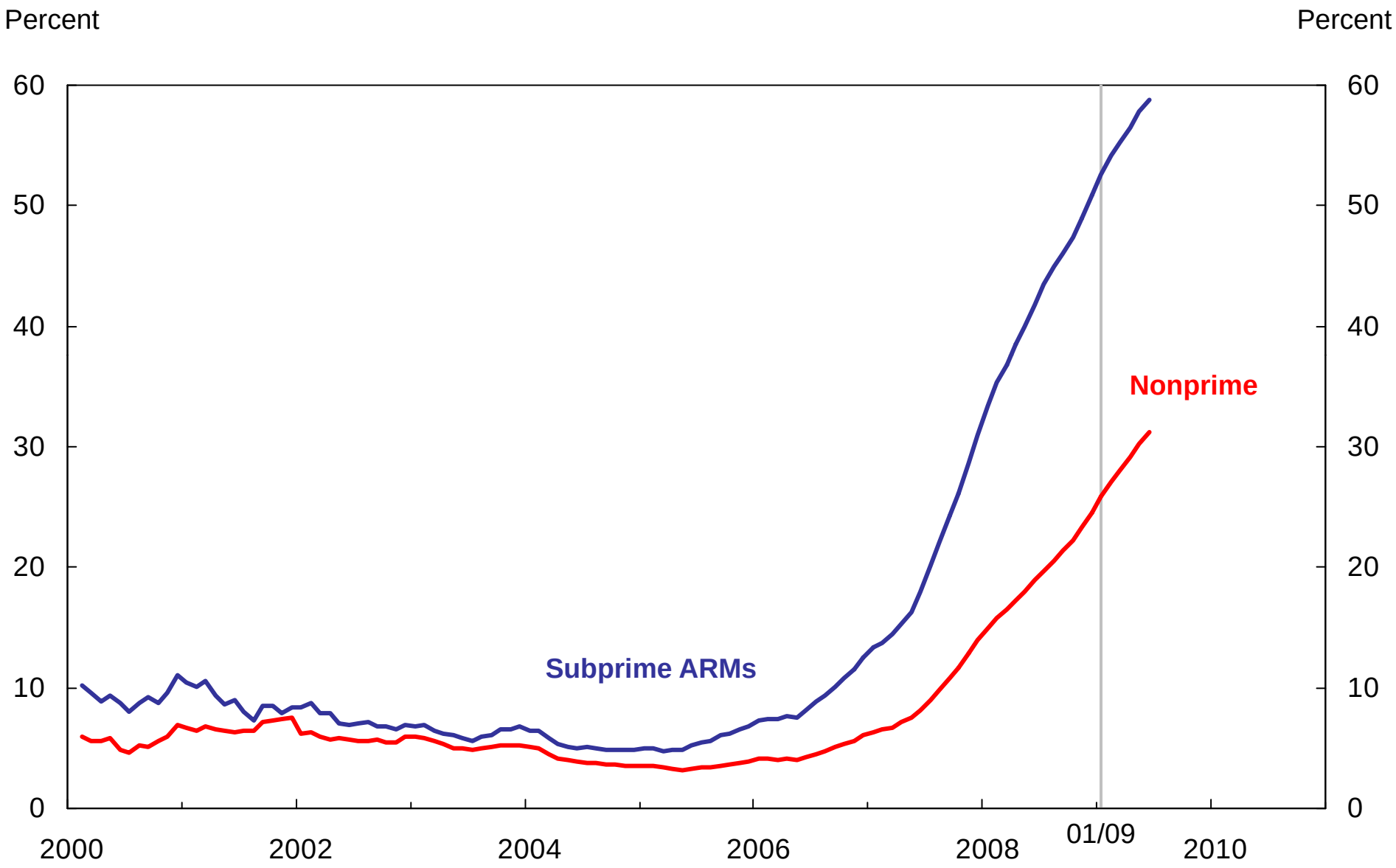
Map 2: Prevalence of Nonprime vs. Prime Lending in New York City

Ratio of Nonprime to Prime Loans by Zip Code: January 2009



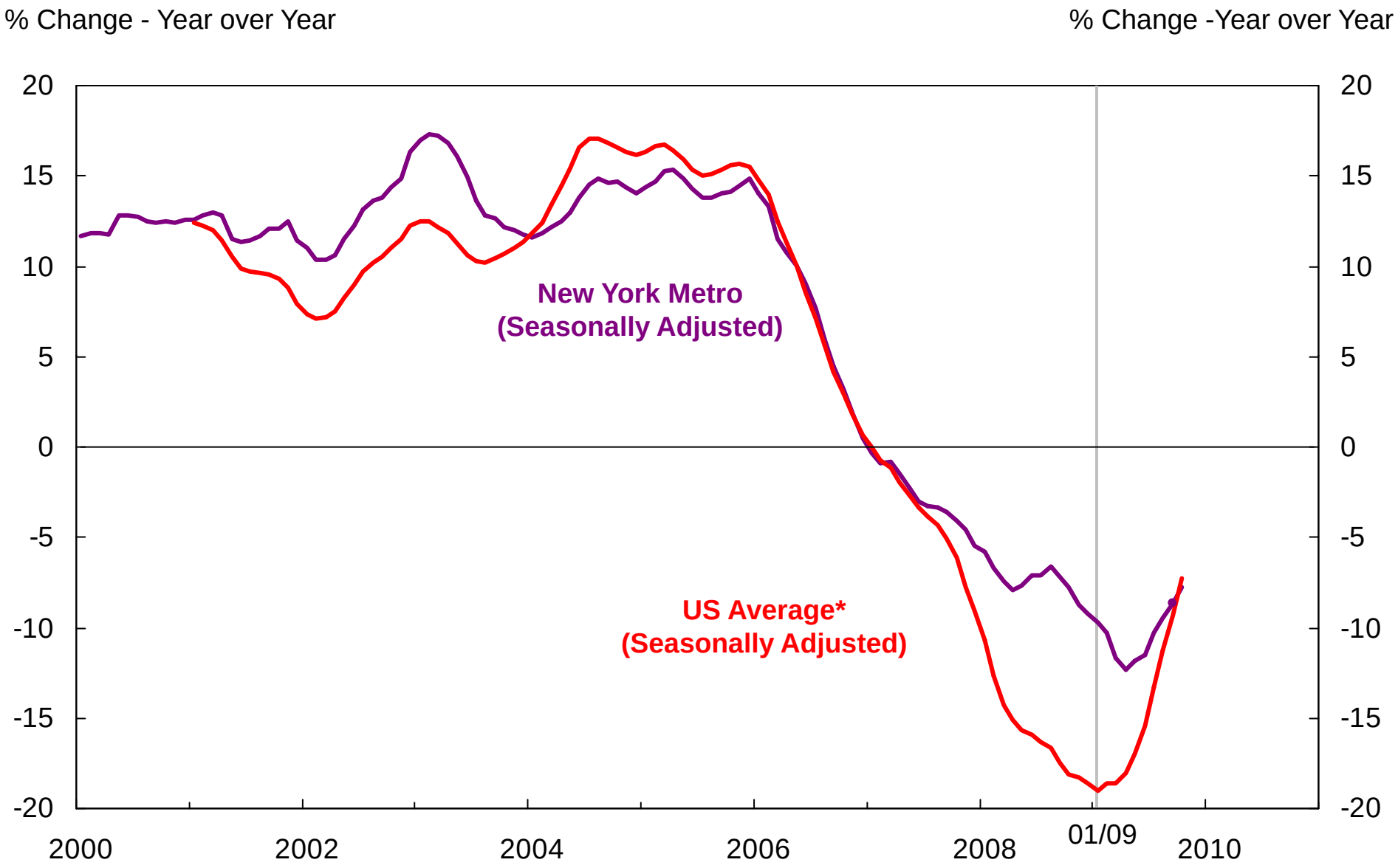
Source: First American CoreLogic LoanPerformance; American Housing Survey

Figure 1: Serious Delinquency Rates for Nonprime Loans in NYC



Source: Case-Shiller; First American CoreLogic LoanPerformance

Figure 2: Case-Shiller Home Price Indices



Source: MacroMarkets

* Composite of 20 metropolitan areas

Table 1: Characteristics of Nonprime Mortgages in New York City: January 2009

New York City	Total	Alt-A Loans			Subprime Loans		
		FRM	ARM	Balloon & Other	FRM	ARM	Balloon & Other
Number of Outstanding Loans	75,049	21,618	12,681	500	17,415	20,957	1,878
% of Housing Units	2.2	0.6	0.4	0.01	0.5	0.6	0.06
Mean Loan Balance	$397,022	$397,961	$502,120	$437,926	$300,272	$411,373	$402,678
Payment Status:							
% Current	62	81	65	64	74	32	58
% Seriously Delinquent*	26	12	23	27	14	53	26
Mean FICO Score**	673	709	704	690	648	639	648
Mean Debt-to-Income Ratio	40	38	37	41	40	43	44
Mean Loan-to-Value Ratio***	77	72	80	82	70	86	78
% with Full Documentation	35	22	16	21	63	36	56
% Single Family Residence	37	31	31	32	43	40	41
% 2-4 Unit Properties	51	50	46	61	50	55	53

United States (1% sample)	Total	Alt-A Loans			Subprime Loans		
		FRM	ARM	Balloon & Other	FRM	ARM	Balloon & Other
Number of Outstanding Loans	52,532	11,754	12,397	142	10,295	17,120	824
% of Housing Units****	4.1	0.9	1.0	0.01	0.8	1.3	0.06
Mean Loan Balance	$230,951	$226,589	$353,851	$248,083	$144,229	$198,800	$192,666
Payment Status:							
% Current	62	83	64	70	71	40	61
% Seriously Delinquent*	26	11	26	20	15	43	23
Mean FICO Score**	663	714	708	691	631	615	623
Mean Debt-to-Income Ratio	38	36	36	39	38	41	41
Mean Loan-to-Value Ratio***	83	78	83	87	79	88	82
% with Full Documentation	51	39	26	37	75	61	74
% Single Family Residence	70	66	59	65	81	75	80
% 2-4 Unit Properties	6	9	6	15	6	5	6

Source: First American CoreLogic LoanPerformance; American Housing Survey
Note: FRM refers to Fixed Rate Mortgages and ARM refers to Adjustable Rate Mortgages.
* 90 days or more delinquent or in foreclosure.
** Mean FICO Score / Debt-to-Income Ratio / Loan-to-Value ratio calculated using loans for which that statistic is reported.
*** Includes second liens where reported.
**** Counts multiplied by 100 for this calculation.

Table 2: Characteristics of New York City Zip Codes: January 2009 (Covariates for Prevalence Regression)

	Variable	Nonprime	Prime
	Number of Zip Codes	157	161
	Loan Type as % of Housing Units	2.9	13.4
Credit Quality	Mean FICO Score:		
	First Tercile	662.7	701.3
	Second Tercile	682.7	725.7
	Third Tercile	712.6	742.6
Housing Structure	Owner-Occupied Units as % of Housing Units:		
	First Quintile	8.2	7.3
	Second Quintile	20.2	19.4
	Third Quintile	29.2	28.5
	Fourth Quintile	45.3	44.3
	Fifth Quintile	67.2	66.8
	% of Owner-Occupied Units in 1-4 Unit Buildings	44.3	43.2
Income	Median Household Income ($):		
	First Quintile	22,059	21,589
	Second Quintile	32,609	32,457
	Third Quintile	40,895	40,895
	Fourth Quintile	49,618	49,630
	Fifth Quintile	69,432	69,952
Demographic Characteristics	% Black	24.9	25.2
	% Hispanic	24.6	24.4
	% College-Educated Adults	28.2	28.3
Home Price Appreciation & Rents	Average Home Price Appreciation 2003-2007 (%):		
	First Quintile	32.4	32.7
	Second Quintile	44.3	45.0
	Third Quintile	49.5	49.7
	Fourth Quintile	52.9	52.9
	Fifth Quintile	72.9	72.6
	Median Gross Monthly Rents ($)	781	787

Source: First American CoreLogic LoanPerformance; American Housing Survey; Furman Center for Real Estate and Urban Policy
Note: Terciles and quintiles are ranked from lowest to highest.

Table 3: Prevalence of Nonprime Mortgages in New York City: January 2009

	Regression dependent variable: Nonprime/Prime loans as % of total housing units		
	Covariates	Nonprime	Prime
Credit Quality	Mean FICO Score:		
	First Tercile	0.818*	3.208*
	Second Tercile	-0.092	2.532*
Housing Structure	Owner-Occupied Units as % of Housing Units:		
	First Quintile	-1.849*	-8.389**
	Second Quintile	-1.219*	-7.507***
	Third Quintile	-1.188*	-5.386**
	Fourth Quintile	-0.441	-3.866**
	% of Owner-Occupied Units in 1-4 Unit Buildings	0.051***	0.078**
Income	Median Household Income ($):		
	First Quintile	-0.211	-8.297**
	Second Quintile	0.185	-6.605**
	Third Quintile	0.435	-4.909*
	Fourth Quintile	0.011	-4.007**
Demographic Characteristics	% Black	0.044***	0.004
	% Hispanic	0.030***	0.008
	% College-Educated Adults	0.007	-0.006
Home Price Appreciation & Rents	Average Home Price Appreciation 2003-2007 (%):		
	First Quintile	-0.261	1.775
	Second Quintile	0.282	-0.943
	Third Quintile	1.109**	-1.793
	Fourth Quintile	0.578	-1.306
	Median Gross Monthly Rents ($)	0.003***	0.008***
	Constant	-3.367*	12.034*

Notes: Nonprime data on 157 zip codes is from the LoanPerformance dataset, while prime data on 161 zip codes is derived from McDash. R-squared values were 0.836 and 0.782 for the nonprime and prime regressions, respectively.

* significant at the 10% level

** significant at the 5% level

*** significant at the 1% level

Table 4: Means of Covariates for Model of Seriously Delinquent Loans: January 2009

	Variable	Nonprime	Subprime ARM	Prime
	Number of Loans	78,631	20,630	364,429
	Serious Delinquency Rate (% of All Loans)	24.2	50.0	3.5
Credit Quality	FICO Score:			
	< 620 (%)	18.7	36.4	4.1
	620-680 (%)	33.0	39.0	14.3
	680-720 (%)	22.0	14.5	18.2
	Missing (%)	0.8	0.2	15.6
Under-writing Criteria	Debt-to-Income Ratio:			
	31-38 (%)	11.2	9.9	10.8
	38-41 (%)	7.3	8.3	5.1
	> 41 (%)	35.3	59.3	15.8
	Missing (%)	36.3	15.6	38.6
	Loan-to-Value Ratio:			
	80-90 (%)	22.9	24.4	15.2
	90-100 (%)	17.4	22.1	5.5
	> 100 (%)	14.1	29.6	0.6
	% Low Documentation	62.7	62.6	10.4
	% No Documentation	3.7	0.2	0.2
Borrower Equity	Change in Loan Balance (%)	-3.3	-0.8	-12.8
	Positive Change in HPA (%)	2.9	0.9	16.0
	Absolute Value of Negative Change in HPA (%)	11.8	14.2	6.8
Property & Ownership Type	% Investor	10.3	6.1	3.7
	% Investor * 2-4 Unit Property	6.7	4.5	1.7
	% 2-4 Unit Property	50.6	54.8	20.7
	% Second Home	1.0	0.4	1.9
	% Fixed Rate Mortgage	52.2	--	82.8
	Neighborhood Serious Delinquency Rate (%)	20.3	23.7	2.5

Source: First American CoreLogic LoanPerformance
Notes: ARM refers to adjustable rate mortages. HPA refers to home price appreciation since origination, calculated from Case-Shiller index. Neighborhood serious delinquency rate is lagged 3 months.

Table 5a: Determinants of Serious Delinquency: Nonprime Loans in New York City

Binary Dependent Variable: 1 if Seriously Delinquent, 0 Otherwise

	Covariates	Model 1	Model 2	Model 3
Credit Quality	FICO Score:			
	< 620	0.129***	0.129***	0.206***
	620-680	0.114***	0.111***	0.126***
	680-720	0.054***	0.050***	0.050***
	Missing	0.022	0.050**	0.067***
Under-writing Criteria	Debt-to-Income Ratio:			
	31-38	0.020**	0.013*	-0.003
	38-41	0.049***	0.039***	0.01
	> 41	0.104***	0.090***	0.042***
	Missing	0.044***	0.033***	0.019***
	Loan-to-Value Ratio:			
	80-90			0.097***
	90-100			0.163***
	> 100			0.318***
	Low Documentation	0.080***	0.069***	0.064***
	No Documentation	0.043***	0.040***	0.073***
Borrower Equity	Change in Loan Balance (%)		0.001***	0.001**
	Positive Change in HPA (%)		0.0004**	0.0001
	Absolute Value of Negative Change in HPA (%)		0.006***	0.004***
Property & Ownership Type	Investor	0.021*	0.027***	0.061***
	Investor * 2-4 Unit Property	-0.046***	-0.044***	-0.033***
	2-4 Unit Property	0.030***	0.027***	0.023***
	Second Home	-0.018	-0.018	0.012
	Fixed Rate Mortgage	-0.211***	-0.183***	-0.133***
	Neighborhood Serious Delinquency Rate (%)	0.001	0.001	0.001
	Constant	0.149	0.088	-0.016

Notes: Linear probability model on 78,631 nonprime loans from the LoanPerformance dataset. Dummy variables for other property typess were included in all three models along with zip code fixed effects. Neighborhood serious delinquency rate is lagged 3 months. R-squared values for the models were 0.16, 0.17, and 0.21 for models one, two, and three, respectively.

* significant at the 10% level ** significant at the 5% level *** significant at the 1% level

Table 5b: Determinants of Serious Delinquency: Subprime ARM Loans in New York City

Binary Dependent Variable: 1 if Seriously Delinquent, 0 Otherwise

	Covariates	Model 1	Model 2	Model 3
Credit Quality	FICO Score:			
	< 620	0.019	0.027*	0.158***
	620-680	0.085***	0.086***	0.117***
	680-720	0.048***	0.049***	0.056***
	Missing	-0.098	0.039	0.145
Under-writing Criteria	Debt-to-Income Ratio:			
	31-38	0.037*	0.032	0.017
	38-41	0.054**	0.046**	0.021
	> 41	0.106***	0.095***	0.057***
	Missing	0.090***	0.087***	0.069***
	Loan-to-Value Ratio:			
	80-90			0.163***
	90-100			0.209***
	> 100			0.315***
	Low Documentation	0.096***	0.093***	0.095***
	No Documentation	-0.096	-0.075	0.014
Borrower Equity	Change in Loan Balance (%)		-0.002**	-0.004***
	Positive Change in HPA (%)		-0.003***	-0.002***
	Absolute Value of Negative Change in HPA (%)		0.005***	0.004***
Property & Ownership Type	Investor	0.046	0.047	0.091***
	Investor * 2-4 Unit Property	-0.090**	-0.088**	-0.076*
	2-4 Unit Property	0.032***	0.030***	0.028***
	Second Home	-0.086	-0.077	-0.022
	Constant	0.296***	0.234***	0.038

Notes: Linear probability model on 20,630 subprime ARM loans from the LoanPerformance dataset. Dummy variables for other property types were included in all three models along with zip code fixed effects. Neighborhood serious delinquency rate was dropped from all three regressions. R-squared values for the models were 0.04, 0.05, and 0.08 for models one, two, and three, respectively.

* significant at the 10% level ** significant at the 5% level *** significant at the 1% level

Table 5c: Determinants of Serious Delinquency: Prime Loans in New York City

Binary Dependent Variable: 1 if Seriously Delinquent, 0 Otherwise

	Covariates	Model 1	Model 2	Model 3
Credit Quality	FICO Score:			
	< 620	0.075***	0.075***	0.073***
	620-680	0.045***	0.043***	0.041***
	680-720	0.018***	0.016***	0.015***
	Missing	-0.002*	0.012***	0.012***
Under-writing Criteria	Debt-to-Income Ratio:			
	31-38	0.007***	0.002*	0.001
	38-41	0.018***	0.011***	0.010***
	> 41	0.016***	0.011***	0.010***
	Missing	0.025***	0.024***	0.023***
	Loan-to-Value Ratio:			
	80-90			0.040***
	90-100			0.043***
	> 100			0.071***
	Low Documentation	-0.004***	0.004***	0.005***
	No Documentation	-0.022**	-0.002	0.006
Borrower Equity	Change in Loan Balance (%)		0.00005***	0.0003***
	Positive Change in HPA (%)		0.00004***	-0.00003*
	Absolute Value of Negative Change in HPA (%)		0.002***	0.002***
Property & Ownership Type	Investor	0.056***	0.051***	0.054***
	Investor * 2-4 Unit Property	-0.049***	-0.048***	-0.047***
	2-4 Unit Property	0.013***	0.011***	0.013***
	Second Home	0.005*	-0.003	-0.003
	Fixed Rate Mortgage	-0.082***	-0.072***	-0.070***
	Neighborhood Serious Delinquency Rate (%)	-0.004	-0.004	-0.003
	Constant	0.084	0.065	0.052

Notes: Linear probability model on 364,429 prime loans from the McDash dataset. Dummy variables for other property types were included in all three models along with zip code fixed effects. Neighborhood serious delinquency rate is lagged 3 months. R-squared values for the models were 0.08, 0.09, and 0.10 for models one, two, and three, respectively.

* significant at the 10% level ** significant at the 5% level *** significant at the 1% level