

**FACTORS INFLUENCING DENIAL:**  
A Study of Home Mortgage Disclosure Act Data for  
the Greensboro - High Point Metropolitan Statistical  
Area 2006

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## EXECUTIVE SUMMARY

The Greensboro - High Point Metropolitan Statistical Area (MSA) is one of the thirty metropolitan areas in the United States with the largest black populations. While residential segregation levels are somewhat lower than most in the South and much lower than those in the North, historic segregation still persists as an issue in housing and urban planning. This is important when considering that restricted spatial mobility has been shown to limit access to jobs, education, and services, and is associated with poor health and high stress.

In 2006, there were 65,970 loan applications in the Greensboro - High Point MSA reported in the Home Mortgage Disclosure Act (HMDA) dataset. The primary focus of this report is to observe disparities in mortgage application approval rates by race/ethnicity and by sex of the applicant. After a thorough descriptive analysis, and exploration of correlations between variables, logistic regression models<sup>1</sup> were constructed to determine what factors were statistically associated with mortgage application approval. Probabilities of loan acceptance were plotted and logistic regression was used to predict the odds that a loan application would be approved when holding constant the loan characteristics, property characteristics, applicant characteristics, and community factors.

### Summary of Findings

**Most loans were approved** - In 2006, two-thirds of loan applications were approved. The average loan amount was \$117,928 (mean). Increasingly, loan applications were for the purchase of a home with a conventional loan.

**Male primary applicants were more likely to be approved than female applicants** - On average 66.0% of male applicants (n=22,971) and 60.5% of female applicants (n=11,720) were approved for a loan. This difference of 5.5% was statistically significant.

**Regardless of the sex of the applicant, poor credit history is the primary reason for denial** - Denial reasons by sex occur in similar patterns for males and females and are

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<sup>1</sup> A straight-forward explanation of logistic regression may be found at:

fairly consistent throughout the 2004 to 2006 period. “Credit History” is the primary reason for denial (41.3% of males and 42.7% of females in 2006), followed by “Other” (32.7% males, 31.8% females in 2006), “Debt-to-Income Ratio” (21.6% males, 23.7% females in 2006), and “Collateral” (21.2% males, 19.2% females in 2006; See Table 24).

**Overall approval rate for applications varied greatly among lending institutions -** Nearly a third of the institutions (30.7% or 130 institutions) had 100% approval of applications accounting for 5.6% of approvals (or 2,108 of 37,555 approvals). Conversely, 51 institutions (12.1%) had 0% approval rates accounting for 1.0% of all application that were not approved (or 196 of 19,476 applications that were not approved).

**Minorities were less likely to be approved -** In 2006, more than two-thirds (70.3%) of applications made by Non-Hispanic White primary applicants were approved. In comparison, only 54.9% of applications from Non-White primary applicants were approved. This 15.4 percentage point difference was statistically significant. Pacific Islanders had the highest approval rates (78.8%, though they account for only a small proportion of loan applications), followed by Non-Hispanic White applicants (70.4%), Asians (67.0%), Hispanics (66.6%), Multiracial applicants (59.0%), African Americans (53.4%), and American Indians (52.4%). Rates of approval were fairly consistent over the three year period.

**There was a clear association between income and approval rates -** However, as income increased so to did the size of the loan amount requested. This relationship necessitates the calculation of a loan to income ratio to control for the curvilinear relationship between income and amount of loan.

**Community characteristics were correlated with approval -** Census tracts with higher populations were approved on average more than those with lower populations. Census tracts with lower percentages of ethnic/racial minorities were approved more often on average. Likewise, tracks with a higher relative income, more owner occupied dwellings, and more one to four family residences had higher mean approval rates. Population,

percent minority, and tract to MSA income ratio were all statistically significant ( $p < .001$ ).

## **Logistic Regressions**

Three logistic regression models were constructed to observe loan approval rates by controlling for loan characteristics, community context, and to test personal characteristics of the lenders:

*Model 1:* When controlling for other factors, the sex, minority status, and income of the applicant were statistically significant predictors of the probability of loan approval.<sup>2</sup> Female applicants were 12.1% less likely to have a loan approved than male applicants when all other factors were held constant. **The probability that mortgage applications from minority primary applicants would be approved was 47.0% lower than that of Non-Hispanic White applicants.**

*Model 2:* This model further distinguishes between minority race/ethnic groups and their likelihood of loan approval. Income did provide a mediating factor in that for every \$1,000 increase in the annual reported family income the odds of loan approval increased 0.3%. When all other factors were equal, **the probability that mortgage applications would be approved from primary applicants who were Hispanic (-27.5%), Asian (-23.1%), and African American (-38.7%) were significantly lower than odds of approval for Non-Hispanic White applicants.**

*Model 3:* This model accounted for the aforementioned curvilinear relationship between income and loan amount by using the loan to income ratio in lieu of income and loan amount. **The odds of approval were found to decrease significantly as the gap between loan amount and income increased. The odds of approval for females, Hispanic, Asian, and African American continued to be significantly lower than Non-Hispanic White males.**

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<sup>2</sup> In testing loan approvals by ethnic/racial group, logistic regression assumes applicants are equal in sex, income, loan amount, other loan characteristics, and the homes are in a similar community. The test variable would then be ethnicity. If ethnicity was shown to be statistically significant, then we could say “when all other factors are equal” ethnicity is an important determinant of loan approval.

## **Recommendations**

The analysis has provided clear evidence, consistent with studies of HMDA data in other locations, that sex and race/ethnicity are yet a major factors in loan approvals in the Greensboro - High Point MSA. When controlling for all factors (within the limitations of the dataset), odds of loan approval were significantly lower for Non-Whites. Definitive causes for the disparities cannot be found within the HMDA data as it does not track all of the variables which play a part in the loan approval process. However, given the evidence of inequality shown in the current analysis it is recommended that the City of Greensboro engage in the following activities to reduce disparities in mortgage approvals:

1. **Institutional Analysis & Fair Lending Testing** - Conduct further institutional studies in order to determine which institutions have the most disparate outcomes by sex and race/ethnicity. With some effort, the existing dataset may be joined with descriptive data on each of the lending institutions to investigate the patterns of loan approvals and denials. This research may be beneficial in identifying which particular institutions have a record of consistently denying loans from particular race/ethnic minorities. This would allow for targeted fair lending testing such as outlined in Turner, Freiberg, Godfrey, Herbig, Levy, and Smith (2002). This analysis could also be used to identify best-practice lenders, awarding them a Greensboro Human Relations Fair Housing “Stamp of Approval” or similar incentive.
2. **GIS Mapping & Targeted Programs**- A thorough Geographic Information Systems (GIS) analysis of the distributions of approvals/denials and their intersection with community measures (those from the HMDA as well as housing indicators like age of housing stock, percent movers in last 5 years, percent sub-standard housing, crime statistics, etc.) would be useful for targeting particular neighborhoods for outreach activities in an effort to improve home-ownership rates.
3. **Analysis of Mortgage Process** - Conduct additional data collection to determine where in the mortgage process the discrimination is most likely to occur. The literature indicates that there should be less discrimination in mortgage lending as a result of the automation of underwriting and the financial incentives for the mortgage officer to approve as many

loans as possible (Ross and Yinger 2002). However, there still exists a significant disparity in the approval rates in Greensboro - High Point and other markets. Turner *et al* (2002) point out: “The mortgage lending process consists of a complex series of stages, including advertising and outreach by lending institutions, responses to pre-application inquiries from potential borrowers, approval or denial of loan applications and determination of loan terms and conditions, and finally, loan administration. Discrimination may occur at any of these stages and may take different forms at different stages.” It is recommended that the City of Greensboro engage in a systematic study of each stage of the lending process in order to determine where in the greatest discrepancies exist.

4. **Home Buyer Credit Building Courses** - Develop courses which train prospective tenants with stable incomes on how to begin the process of building credit and applying for a loan. The analysis of causes of denial showed consistency between sexes, and among race/ethnic groups across the three years of analysis. Credit history was the primary cause of denial in known cases. It may be of use for lending institutions and those promoting home-ownership to provide workshops in target areas that would teach prospective buyers how to improve their credit ratings and prepare for the loan application process well before beginning the search for a home. This could both lower the overall denial rate and improve home ownership within target communities. This could be done in coordination with lenders who have a track record of equitable lending practices and could be targeted to particular communities identifies in GIS analysis.

## **INTRODUCTION**

Forty years ago, the Fair Housing Act of 1968 became law, but despite some improvements, testing has revealed continuing patterns of housing discrimination against minorities. When minorities find their residential mobility blocked, it creates a barrier to spatial assimilation - a key component to socioeconomic and occupational mobility. After a brief introduction covering housing segregation and discrimination, this study will present findings based on descriptive, bivariate, and multivariate analysis of Home Mortgage Disclosure Act (HMDA) data for the Greensboro-High Point Metropolitan Statistical Area (MSA). This data was examined to uncover the factors which impact mortgage acceptance or denial in the Greensboro area with a focus on race/ethnic disparities. This report was produced by Dr. Stephen J. Sills from the Department of Sociology at the University of North Carolina at Greensboro under contract with the City of Greensboro - Department of Housing and Community Development and the Human Relations Department.

### **Changing Demographics**

Greensboro is one of the thirty metropolitan areas in the United States with the largest black populations, and its segregation levels are somewhat lower than most in the South and much lower than those in the North (Massey 2000). Even though this area compares favorably to other cities, the Gini Index scores (a common measure of segregation) for Greensboro are in the fifties and sixties. This may be interpreted as meaning that over half the black population would have to move in order to achieve perfect integration. This is more apparent in particular areas and among particular income levels.

Like much of the South, Greensboro has been undergoing change in its racial composition over the past few decades. In 1960, Greensboro was about three-quarters white and one-quarter black (with .3% “other” recorded by the Census Bureau that year). By 2000, the figures showed 55.5% white and 37.4% black. Figures for Hispanics were not available until 1980. At that time the Census showed the area as having .4% Hispanic ethnicity. By 2000, however, Greensboro’s Hispanic presence had risen to 4.4%. The overall picture is one of a city that once experienced race as “binary” black-white, but has become less white and less binary, as Asians, Hispanics, biracial and multiracial groups have become a more visible part of the everyday social

landscape. In particular, Mexican immigration flows have shifted from their traditional destinations (Florida, Texas, and the West Coast states) to the mid-South. North Carolina led the nation in Hispanic population growth from 1995 to 1999, with Mexican migrants often beginning as agricultural workers and then moving into other low-wage sectors such as poultry processing, construction, and service work.

It is important first to understand the context for this study. Discrimination in the real estate sales market is a significant problem with important consequences, and it has been studied extensively (Helper 1969; Wienk, Reid, Simonson, and Eggers 1979; Hakken 1979; Yinger 1986, 1995, 1997, and 1998; Fisher and Massey 1993 and 2004; Yzaguirre 1999; Ondrich, Stricker, and Yinger 2002 and 2003; Ross and Turner 2005; Turner, Richardson, and Ross 2007). These studies have often found a gap in homeownership rates by race/ethnicity. Minorities have been shown to have different patterns of home ownership than do Non-Hispanic whites (Masnick and Di 2003). Likewise there has been a significant gap in homeownership between native-born Americans and foreign-born residents (Chiswick and Miller 2003). In Guilford County a little over a third (35%) of the population rents a home while nearly two-thirds (65%) own the home in which they live (Greensboro Planning Department, 2003). However, when we observe these figures by race and ethnicity we find that 75% of white heads of household are homeowners, whereas only 46% of black and 25% of Hispanic heads of household own homes. The majority of blacks and Hispanics living in Guilford County rent rather than own homes (Greensboro Planning Department, 1993 and 2003).

### **History of Residential Segregation in America**

Residential racial segregation emerged in America between 1900 and 1940 (Massey and Denton 1993; Farley and Frey 1994). In this period, over a million black Southerners migrated to cities in the North on the promise of better-paying industrial work (Hahn 2003; Wilson, 1978). In the South, the Jim Crow system governed the terms of inter-racial contact by subordinating blacks and enforcing strict public separation of the races, but it did not create or enforce residential segregation (Massey and Denton 1993). Segregation levels were lower in 1900 than they are now (Farley and Frey 1994). In the North, with no such system in place, working-class whites responded with alarm to the rapid influx of potential competitors, and increasingly used

violence and threats to keep the new arrivals contained in less desirable housing and jobs (Massey and Denton 1993). Between 1900 and 1921, white mob attacks and riots directed against blacks were followed by a wave of bombings aimed at black homes and offices. As the violent trend crested, whites increasingly turned to more institutionalized methods to exclude minorities (Massey and Denton 1993).

### *Neighborhood Associations and Restrictive Covenants*

Massey and Denton (1993) provide a comprehensive review of the strategies used by white homeowners to formalize the exclusion of blacks from their neighborhoods. Middle-class homeowners formed “neighborhood improvement associations” and other voluntary property owners’ corporations, ostensibly to promote security and property values, but with the implicit purpose of preventing black entry into their neighborhoods. They lobbied city councils for zoning restrictions and the closing of businesses that attracted blacks, and they pressured real estate agencies to support their agenda. They implemented restrictive covenants, which were contractual agreements binding property owners to sell only to whites, and they pressured neighbors who were reluctant to sign. Restrictive covenants spread widely throughout the country after 1910, often under the leadership of local real estate boards.

### *Racial Zoning*

Beginning in 1910, Southern cities began the use of municipal ordinances establishing separate black and white neighborhoods. In 1916, the Supreme Court found these ordinances unconstitutional, and in 1948, another Supreme Court ruling declared restrictive covenants unenforceable. Civil rights historian William Chafe (1980) noted that in Greensboro, NC, where our study takes place, there was a city ordinance on the books from 1914 to 1929 that prohibited blacks from living on streets that contained a majority of white households. As late as 1967, more than 90 % of Greensboro’s black residents lived in the southeast quadrant of the city, an area covering only 14 % of the city’s space, hemmed in by infrastructural barriers including an interstate highway, an industrially-zoned district, and the commercially-zoned downtown area.

### *Lending Policies and Practices*

Sociologists and urban historians have detailed the comprehensive ways in which the federal

government instituted practices that contributed heavily to the racial discrimination and the spatial reorganization of American housing patterns (Jackson 1985; Massey and Denton 1993; Mohl 1997, 2002; Rabin 1997; Shipp 1997; Hall 2002). During the New Deal, the Home Owners' Loan Corporation (HOLC) was created to protect small homeowners from foreclosure and to boost homeownership rates. The HOLC developed the modern mortgage loan system and pumped billions of dollars into low-interest loans and refinancing. However, it also institutionalized the real estate profession's practice of "red lining" (assessing value and risk using racial, ethnic, and class characteristics of each neighborhood). Secret, detailed, color-coded "Residential Security Maps" indicated neighborhood racial composition (Jackson 1985; Massey and Denton 1993; Mohl 1997). Black, mixed, and changing neighborhoods were systematically undervalued and excluded from this cash infusion, as were high-density and older city neighborhoods (Jackson 1985; Massey and Denton 1993). Private banks, the Federal Housing Administration, and the Veterans' Administration adopted the HOLC's system, virtually excluding minorities from the unprecedented postwar housing boom that massively expanded homeownership and reshaped the entire housing industry throughout the 1940s and 1950s (Jackson 1985; Massey and Denton 1993).

#### *Interstate Highways and the Second Ghetto*

Mohl (1997, 2002) examined the spatial reorganization of the American social landscape after 1956. It was shown that the federal government provided massive amounts of funding for "slum clearance" and highway construction while doing little to link the highway program to assistance for displaced residents. While the funding was mostly federal, state and local officials were awarded the decision-making power to select the routes. They could - and did - use that power to carry out local racial segregation agendas. Displaced families were pressed into low-cost housing in working-class neighborhoods on the fringe surrounding the ghetto, creating population pressure on limited resources and growing the intensely-concentrated and racially-segregated "second ghetto."

#### **Continued Relevance of Studying Residential Segregation**

The deleterious effects of residential segregation have been widely studied. The Chicago School of Urban Sociology developed the spatial assimilation model, demonstrating the links between

ecological and social conditions (Park 1926; Foote 1943; Drake and Cayton 1945; Warner and Srole 1945; Duncan and Duncan 1957; Taeuber and Taeuber 1965). Yet, there are some researchers who argue against focusing attention on housing segregation. For example, historical sociologist Orlando Patterson (1997) argues that housing segregation is relatively unimportant, because Americans are increasingly integrated in other life domains, particularly the workplace, and because white attitudes towards integration continue their decades-long improvement trend. Thernstrom and Thernstrom (1997) point to the declining nation-wide mean segregation scores to justify their argument that residential segregation no longer poses a significant problem deserving action. However, the national average masks an important distinction: On the one hand, the newer and smaller metropolitan areas of the south and west, and areas that contain colleges, military bases, and large stocks of post-1970 housing have accomplished precipitous declines in racial residential segregation (Frey 2006). On the other hand, in older metropolitan areas that are home to a disproportionate number of minorities, segregation persists at high levels (Iceland et al 2002; Massey and Denton 1988). In essence, areas where few minorities reside are becoming more integrated, while the traditional ethnic neighborhoods experience little change in the degree of segregation and are actually experiencing increasing poverty and declining wellbeing (Wilson 1987, 1996). Restricted spatial mobility has been shown to limit access to jobs, education, and services (Wilson 1987; Yinger 1999; Katz and Turner 2006; Turner 2007), and is associated with poor health and high stress (Massey 2003; Epstein 2003).

### **Addressing Discrimination**

In 1967, President Johnson set up the National Advisory Commission on Civil Disorders, with Governor Kerner of Illinois at its head, to address the urban rioting that had been occurring across the country. The Kerner Commission made its investigation and returned with its conclusion: “Our nation is moving toward two societies, one black, one white - separate and unequal” (National Advisory Commission on Civil Disorders 1968). The report identified the chief underlying cause as residential segregation. It also recommended a remedy: comprehensive, enforceable fair housing legislation (National Advisory Commission on Civil Disorders 1968). Johnson had been pushing for such legislation since 1966, but Republicans in the Senate had been chronically resistant, and it was not until Martin Luther King was assassinated that Johnson was able to wrangle a behind-the-scenes compromise with moderate

Republicans that allowed the Fair Housing Act to pass, albeit significantly watered down (Mathias and Morris 1999; Kotz 2006). The new law banned racial discrimination in the housing market, whether rental or sales, but its enforcement mechanisms were idiosyncratic and lacking in force (Massey and Denton 1993; Schill and Friedman 1999; Massey 2001; Kotz 2006; Goering 2007; Turner et al 2007).

There had been previous legal efforts to fight racial residential segregation and discrimination, resulting in some limited government action addressing various facets of housing discrimination. Supreme Court rulings banned municipal racial zoning in 1917 and rendered homeowners' restrictive covenants unenforceable in 1948 (Massey and Denton 1993; Rabin 1997; Farley and Frey 1994; Roisman 1999; Chafe 1980; Katz and Turner 2006). In 1962, Kennedy issued an executive order banning discrimination in new federally-funded housing (Branch 1988; Rabin 1997). Despite these efforts, in 1968 it was still standard practice for realtors, landlords, and rental agents to discriminate with impunity against non-whites in a wide variety of ways. Real estate professionals regularly advertised properties according to race, directed people to a particular area because of race, misrepresented availability of units to minority clients, screened applicants differently according to race, charged minorities higher rents and fees, and often flat-out refused to do business with anyone but whites (Helper 1969; Farley and Frey 1994; Fischer and Massey 2004). The Fair Housing provisions of the Civil Rights Act of 1968 put an end to the legality of such practices, but because the law was the result of so much contention and compromise in Congress (Mathias and Morris 1999; Denton 1999; Schill and Friedman 1999; Kotz 2006), it lacked adequate enforcement provisions and had the effect of simply making ongoing discrimination harder to detect (Schill and Friedman 1999; Massey and Denton 1993; Yinger 1986). The Fair Housing Amendments of 1988 corrected the 1968 legislation's major flaws by strengthening enforcement mechanisms and broadening the scope of the original law (Massey and Denton 1993; Mathias and Morris 1999; Schill and Friedman 1999).

### *Housing Discrimination Today*

Some researchers suggest that an emphasis on discrimination as a factor in residential segregation is misplaced. Schelling (1971), Clark (1991, 1992, 2002), and Fossett (2006) argue that relatively small differences in neighborhood composition preferences between whites and nonwhites will quickly result in stable patterns of segregation, even in the absence of

discriminatory actions. However, Massey and Denton (1993) argue that active discrimination must occur in order for whites to have neighborhoods to flee to in keeping with their preferences for neighborhoods with low numbers of nonwhites. Patterson (1997) suggests that continuing segregation is largely a voluntary phenomenon on the part of blacks, and he and others believe that it is not discrimination, but behavioral and cultural factors, that perpetuate segregation (Moynihan 1965; Thernstrom and Thernstrom 1997; Patterson 1998; Sowell 2002). Yet other researchers have concluded that housing discrimination contributes to the perpetuation of racial residential segregation (Feagin 1999; Galster 1986, 1987, 1988a, 1988b, 1991; Massey et al 1994; Charles 2003), which in turn restricts access to some local public services, such as education (Yinger 1999) and appears to constrain access to employment opportunities (Massey and Denton 1993; Wilson 1987; Jencks and Mayer 1990; Blank 2001; Massey 2001; Pastor 2001). Discrimination in the housing market can also create significant financial costs for minority home seekers whose available options are restricted relative to whites (Yinger 1997).

## **INVESTIGATING SEGREGATION AND HOUSING DISCRIMINATION**

Otis and Duncan (1955) asserted that the various ways of measuring segregation in use in the early 1950s could all be boiled down to a single construct - the “segregation curve” - using the dissimilarity index and the proportion minority within a geographic unit of measure (census tract, zip code, etc). Taeuber and Taeuber (1965) reaffirmed this conclusion, and the dissimilarity index remained the standard measurement of black-white segregation until the late 1970s when various other instruments proliferated (Massey and Denton 1988). In 1988, Massey and Denton effectively redefined the standard with the publication of their paper “The Dimensions of Residential Segregation” in which they analyze data from the 1980 census from 60 metropolitan areas and developed a five-dimensional conceptual model of residential segregation.

Massey and Denton (1988) conclude that racial-residential segregation has a structure of five basic distributional characteristics, as follows: (1) *evenness*, or the differential distribution of groups, which can be measured using the dissimilarity index (AKA Gini index or Gini coefficient); (2) *exposure*, or the potential contact, which can be measured using the isolation index; (3) *concentration*, or the relative amount of geographical space occupied, which is measured using the delta index; (4) *centralization*, which indicates the degree to which a group is

situated near an urban center, and which may be measured using the absolute centralization index; and (5) *clustering*, or the degree to which minority group members live disproportionately in contiguous areas, and which can be measured using the spatial proximity index. Empirically, the first two dimensions have more significant correlation and are relatively more important than the other three dimensions. Massey and Denton argue that although these five dimensions of variation overlap, they are nonetheless conceptually distinct. For instance, the first two dimensions have significant empirical correlations, but whereas the first dimension, evenness, measures the degree of departure from an abstract ideal of proportional distribution, the second, exposure, gets at the lived experience of the people involved and their chances of physical encounters with people belonging to different groups.

A weakness of this model is its use of a two-group framework for statistical analysis, which uses non-Hispanic whites as a reference group for analysis of all the other groups, in the context of subject material that the authors fully understand is multidimensional and complex. Iceland (2004) critiqued both the dissimilarity and isolation indexes for their inability to calculate segregation when dealing with more than two groups. These indexes must calculate each minority groups in reference to whites, which in the past was an adequate fit with the traditional black-white dual group model of race relations, but no longer reflects the nature of race relations in the U.S. which have become more diverse since 1965 changes to immigration law. Iceland's study measures diversity in a multi-ethnic context. He employs the multi-race information theory index (H), and uses the multi-group entropy or diversity score (not a measure of segregation per se) as a measure of evenness or the extent to which groups are evenly distributed across geographic units. Using this measure, Iceland (2004) examined U.S. Census data from 1980 to 2000 to investigate the effect of diversity on segregation. He found that black-white segregation is the most pronounced type of segregation, but its rate has been modestly declining since 1980. Hispanics and Asians experienced lower levels of segregation, but those levels have not dropped in the same time period. Increases in diversity are associated with increases in overall segregation and increases in segregation for whites, Asians, and Hispanics, but higher diversity is strongly associated with declines in black segregation. This suggests that high levels of multi-group diversity may be collections of ethnically homogeneous immigrant enclaves, rather than integrated neighborhoods. Iceland (2004) posits that the persistence of immigrant enclaves is probably related to the high concentration of recent immigrants outweighing effect of dispersion

of longer-term residents, as well as other factors including mobility decisions, which are in turn influenced by socioeconomic differences and housing costs, housing market information and perceptions, preferences, and discrimination. Iceland (2004) notes that his data is consistent with the Farley and Frey's (1996) hypothesis that the presence of Hispanics and Asians may serve as a "buffer" between black and white neighborhoods, thus decreasing black segregation. Iceland indicates that a growing urban Hispanic population is consistent with declining black segregation, and that the presence of multiple minority groups is altering the dualistic framework for understanding race relations that was the dominant paradigm in the past.

Early housing discrimination studies (Helper 1969; National Committee Against Discrimination in Housing 1970) revealed that housing agents used steering, discouragement, evasion, misrepresentation, withholding information, delay, and differential screening and pricing, or downright refusal to do business with nonwhites. What these studies did not do was reveal the frequency with which such practices occurred (Fix and Turner 1998; Yinger 1999). After the passage of the Fair Housing Act in 1968, local fair housing advocacy organizations began developing what is now the methodological centerpiece of housing discrimination investigation: the fair housing audit (Fix and Turner 1998; Yinger 1998; Fischer and Massey 2004). This process of paired-tester audits systematizes the study of discrimination with a quasi-experimental design that can measure the incidence of discrimination in a housing market and provides researchers with greater control and more internal validity than other designs common in the social sciences (Fischer and Massey 2004).

As noted, discrimination occurs at different stages in the process of buying a home. Yet, the final measure would be whether or not a house is sold. It would be very difficult, not to mention costly, to conduct paired testing with the actual origination of a loan and purchase of a home as the final outcome. Thus, data from actual loans must be analyzed for patterns of disproportional in approvals or denials on the basis of racial or ethnic characteristics of the borrower. This is possible as the Loan Application Register (LAR), a standard reporting form submitted by lending institutions to the Federal Financial Institutions Examination Council (FFIEC), is readily available and reported in a public use datasets as per the Home Mortgage Disclosure Act (HMDA) of 1975. The LAR captures information regarding the type of loan, the type of property, the purpose of the loan, whether the property will be owner occupied, the loan amount, if pre-approval was requested, and the action taken on the loan application.

Another common methodology is the fair lending logistic regression study (Avery and Beeson 1994; Calem and Longhofer 2002; Courchane, Nebhut, and Nickerson 2001; Covington 2000). This methodology has been used quite broadly. For example it has been used to find that the odds of receiving higher-priced mortgages are increased for minority borrowers (Apgar, Bendimerad, and Essene 2007) as well as the fact that the odds of loan approval for black borrowers decrease at black-owned institutions (Black, Collins, and Cyree 1997). This method allows for the investigation of which factors are most salient in determining approval or denial of a loan, while controlling for loan characteristics, amount of loan, income of the borrower or other characteristics which may factor in the lending decision.

The primary focus of this report is to observe differences in mortgage applications approval rates by race/ethnicity of the applicant. The goal is to see if there is evidence of structural barriers or impediments to home ownership for minority groups. After a thorough descriptive analysis of the dataset, and exploration of bivariate relationships or correlations between variables, logistic regression models will be constructed to determine which factors are statistically associated with the dependent variable: whether the mortgage application is accepted or not accepted. Probabilities of loan acceptance are plotted and multivariate regression is used to predict the odds that a loan application would be approved when holding constant the loan characteristics, property characteristics, applicant characteristics, and community factors. The logistic regression models were developed based upon what was learned in the previous sections regarding the factors associated with acceptance rates and the causes of denials.

## **DESCRIPTIVE ANALYSIS OF HMDA DATA 2004 TO 2006**

The descriptive analysis which follows is provided to give an understanding of each of the variables in the HMDA data set. Where appropriate, comparisons are made with other variables, and trends are noted across the three years of data provided.

### **Loan Application Characteristics**

The following section describes the loan characteristics for applications filed in the Greensboro - High Point MSA as well as the general characteristics of the lending institutions.

#### **Type of Loan**

According to the 2006 HMDA data file there were 65,970 loan applications in the Greensboro - Highpoint Metropolitan Statistical Area (MSA) in 2006 (compared with 69,503 in 2005 and 62,290 in 2004). Most were for conventional loans (93.4% or 61,459 applications) followed by applications for Federal Housing Administration (FHA) loans (5.5% or 3,634 loans), Department of Veteran's Affairs (VA) loans (1.0% or 670 loans), and finally 27 applications for Farm Service Agency (FSA) or Rural Housing Loans (RHS) loans (See Table 1). Interestingly, the number of FHA, VA, and FSA/RHS loan applications decreased over the period 2004-2006.

#### *Property Type*

Increasingly, loan applications were for conventional loans. In 2006, 96.0% (63,160) applications were for loans on one to four family properties. A small number of loan applications were for manufactured housing (3.9% or 2,570 applications). Less than one-tenth of one-percent (0.1%) were for multifamily properties (See Table 2).

#### *Purpose of Loan*

Increasingly between 2004 and 2006 loan applications have been for the purchase of a home though nearly half of loan applications in 2006 were for refinancing existing mortgages (49.6% or 32,652 applications) followed by applications for the purchase of a home (44.8% or 29,488) and home improvement loans (5.5% or 3,650 applications) (See Table 3).

**Table 1 - Type of Loan 2004-2006**

Loan Type	Percent 2006	Percent 2005	Percent 2004
Conventional	93.4	93.4	91.3
FHA	5.5	5.4	7.0
VA	1.0	1.2	1.6
FSA or RHS	0.0	0.0	0.1
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 2 - Property Type 2004-2006**

Property Type	Percent 2006	Percent 2005	Percent 2004
One to four family	96.0	95.3	94.6
Manufactured Housing	3.9	4.5	5.3
Multifamily	0.1	0.1	0.1
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 3 - Purpose of Loan 2004-2006**

Loan Purpose	Percent 2006	Percent 2005	Percent 2004
Purchase	44.8	40.6	37.2
Improvement	5.5	5.9	5.5
Refinance	49.6	53.5	57.2
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 4 - Owner Occupancy 2004-2006**

Occupancy	Percent 2006	Percent 2005	Percent 2004
Owner Occupied	89.6	90.7	90.8
Not Owner Occupied	10.1	8.8	8.7
NA	.3	.5	.5
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 5 - Loan Amount 2004-2006**

Amount	2006	2005	2004
Mean	\$117,928	\$116,132	\$111,928
Median	\$100,000	\$98,000	\$97,000
Minimum	\$1,000	\$1,000	\$1,000
Maximum	\$16,925,000	\$23,700,000	\$13,000,000
N	65,790	69,503	62,290

### *Owner Occupancy*

Most applications were for properties that would be owner occupied (89.6% or 58,945 applications). This has remained fairly consistent since 2004. About a tenth (10.1% or 6,629 applications) were for properties that would not be owner occupied. Occupancy information was missing for 216 applications (.3% of all applications; See Table 4).

### *Amount of Loan*

The loan amount requested on applications ranged from a minimum of \$1,000 to a maximum of \$16,925,000 in 2006 (See Table 4). The average loan application was for \$117,928 (mean). This average has increased \$8,000 since 2004. Average loan requests varied by the purpose of the loan: \$124,875 (mean) for the purchase of a home, \$57,723 (mean) for the improvement of a home, and \$ 118,384 (mean) for the refinancing of a home. Logically, loan amounts were associated with the income of the applicant when using the Pearson correlations as a measure of linear association (See Table 5).<sup>3</sup>

### *Pre-approval*

In 2006, pre-approval information was only available for 10,888 applications (16.6% of all applications up from only 12.7% in 2004; See Table 7). In only 1.8% of cases (1,196 of the 10,888 applications) the applicant requested pre-approval. The remaining 9,692 applications (14.7%) for which this data was provided indicated that no pre-approval was requested. Approval rates were found to be associated with pre-approval requests. Of those requesting pre-approval in 2006, 85.5% were approved as compared with 78.3% of those who did not request pre-approval and 63.6% who were approved but for whom not pre-approval data was provided (See Table 8).

### *Loan Action*

In accordance with the reporting convention of other Fair Housing agencies (1997), the variable “Loan Action” of the Loan Application Register data originally coded as “Loan originated”

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<sup>3</sup> The Pearson Correlation assesses the degree of relationship between two continuous variables. Correlation is a bivariate measure of association (strength) of the relationship between two variables. It varies from 0 (no relationship) to 1 (perfect linear relationship) or -1 (perfect negative linear relationship).

**Table 6 - Correlation Matrix Income by Loan Amount (2006)**

2006 HMDA Data		Income	Loan to Income Amount Ratio
Amount (000s)	Pearson Correlation	.408(**)	.288(**)
	Sig. (2-tailed)	.000	.000
Loan to Income Amount Ratio	N	58259	58259
	Pearson Correlation	-	1
	Sig. (2-tailed)	.000	.000
	N	58259	58259

**Table 7 - Pre-approval 2004-2006**

Occupancy	Percent 2006	Percent 2005	Percent 2004
Pre-approval requested	1.8	2.4	1.7
Pre-approval not requested	14.7	12.3	11.0
No Data	83.5	85.4	87.3
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 8 - Crosstabulation of Approval vs. Pre-Approval Request (2006)**

2006 HMDA Data	Not Approved	Approved
Pre-approval requested	14.5%	85.5%
	173	1023
Pre-approval not requested	21.7%	78.3%
	2100	7592
No Data	36.4%	63.6%
	20000	34902
Total	33.9%	66.1%
	22273	43517

**Table 9 - Loan Action 2004-2006**

Action	Percent 2006	Percent 2005	Percent 2004
Loan Originated	42.1	41.9	43.3
Application Approved by not Accepted	7.0	6.7	5.9
Application denied by financial institution	22.1	23.0	23.8
Application withdrawn by applicant	9.0	11.2	10.3
File closed for incompleteness	2.8	2.6	2.3
Loan purchased by institution	17.1	14.7	14.4
Pre-approval request denied by financial institution	0.0 (n=7)	0.0 (n=26)	NA
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

(42.1%), “Application approved but not accepted” (7.0%), or “Loan purchased by the institution” (17.1%) were recoded as “Approved” for this analysis (See Table 9). Two-thirds of loan applications were approved (66.1% or 43,517 applications). Those applications coded as “Application denied by financial institution” (22.1%), “Application withdrawn by applicant” (9.0%), “File closed for incompleteness” (2.8%), or “Pre-approval request denied by financial institution” (>0.1%) were coded as “Not Approved (Denied, Withdrawn, or Incomplete)” and represented a third of applications (33.9% or 22,273 applications). This approval rate has decreased modestly (See Table 10).

### *Mortgage Brokers and Lending Institutions*

In 2006, there were 423 institutions in the Greensboro - High Point MSA from which LAR data was received (compared with 420 in 2005 and 413 in 2004). There was a wide range in the number of applications from these institutions. More than a fifth (21.7% or 92 institutions) reported only one application and a half of them (50.3% or 213 institutions) had fewer than ten applications. Conversely the fifteen largest institutions (in terms or number of applications) accounted for half of all applications. On average institutions submitted data from 134.8 applications (146.1 in 2005, and 122.8 in 2004) with a range from 1 to 3,603 applications.

### **Applicant Information**

The Loan Application Register (LAR) includes the sex, race, ethnicity, and income of the applicants. The following sections describe these demographic characteristics for applications filed in the Greensboro - High Point MSA.

#### *Sex*

The sex of the applicant was known in about 82.4% (54,204) of 2006 applications. This represented an increase of missing data from 14.5% in 2004 to 17.6% in 2006 (See Table 11). A little over a third of primary applicants were female (35.8% or 19,378 applicants) and two-thirds (64.2%) were male. This ratio was fairly consistent over the three years of data. In the 30,666 mortgage applications of 2006 that had a co-applicants, 76.6% (16,993) were female. This ratio

**Table 10 - Loan Approval 2004-2006**

Approved	Percent 2006	Percent 2005	Percent 2004
Not Approved (Denied, Withdrawn, or Incomplete)	33.9	36.7	36.4
Approved	66.1	63.3	63.6
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

**Table 11 - Sex of the Applicant 2004-2006**

Sex	2006		2005		2004	
	Percent	Valid Percent	Percent	Valid Percent	Percent	Valid Percent
Male	52.9	64.2	54.4	64.3	56.1	65.6
Female	29.5	35.8	30.2	35.7	29.4	34.4
Missing	17.6		15.4		14.5	
Total	100.0	100.0	100.0	100.0	100.0	100.0
N	65,790		69,503		62,290	

**Table 12 - Sex of the Co-Applicant 2004-2006**

Sex	2006		2005		2004	
	Percent	Valid Percent	Percent	Valid Percent	Percent	Valid Percent
Male	7.9	23.4	8.2	23.1	7.8	21.1
Female	25.8	76.6	27.2	76.9	29.2	78.9
Missing	12.9		11.3		12.4	
No Co-applicant	53.4		53.3		50.7	
Total	100.0	100.0	100.0	100.0	100.0	100.0
N	65,790		69,503		62,290	

**Table 13 - Applicant Ethnicity**

Ethnicity	Percent 2006	Percent 2005	Percent 2004
Hispanic	3.0	2.9	2.6
Non-Hispanic	72.0	71.5	64.8
Missing	25.0	25.6	32.6
Total	100.0	100.0	100.0
N	65,790	69,503	62,290

was also consistent over the three years of data (See Table 12). Notable are the 8,483 applications (12.9% of the records or 27.7% of all applications with co-applicants) that lacked the sex of the co-applicant.

### *Race/Ethnicity*

The Loan Application Register records ethnicity as Hispanic or Non-Hispanic (See Table 13) and race as American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White (See Table 14). This allows for multiple selections of up to five racial categories plus ethnicity for both the applicant and the co-applicant. Unfortunately this system creates difficulties for analysis. In addition, over a quarter of the applications (25.2% or 16,551 applications in 2006) lacked race/ethnic information entirely. To facilitate analysis, race/ethnicity variables were collapsed and recoded into a single categorical variable (See Table 15). Hispanic ethnicity was treated as a unique race/ethnic identifier in *any* combination with race. All instances of multiple races (excluding combinations with Hispanic) were coded as “multiracial non-Hispanic.” Overall, the presentation of minority applicants was seen to rise slightly during the period 2004 to 2006 (See Table 15).

### *Income*

In 2006, income data was available for 58,259 applications (88.6% of applications) and ranged from \$1,000 to \$7,767,000 per annum (See Table 16). The mean reported income in 2006 was \$73,200 and a median income of \$57,000. Income was directly associated with other demographic characteristics of the applicants. For example, in 2006 male primary applicants had a mean reported family income of \$80,497 while female primary applicants had a mean family income of only \$59,813. Similarly, variation existed between income and race/ethnicity (See Table 17). In 2006, American Indian primary applicants had a mean reported family income of \$80,873, followed by Non-Hispanic white applicants (\$78,519), multiracial applicants (\$75,955), Asian applicants (\$75,142), Pacific Islander applicants (\$72,944), Hispanic applicants (\$61,831), and African American applicants (\$59,957) (See Table 17). An ANOVA test of difference between groups<sup>4</sup> was statistically significant ( $F=79.659$   $df=6$   $p<.001$ ). A Tukey’s Post Hoc Multiple Comparison Test demonstrated that only the incomes of Non-Hispanic Whites and

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<sup>4</sup> See [http://www.socialresearchmethods.net/kb/stat\\_t.php](http://www.socialresearchmethods.net/kb/stat_t.php) for a clear explanation of this statistical procedure.

**Table 14 - Race Multiple Responses (Race 1 to Race 5)**

Race/ Ethnic Group	Responses		Percent of Cases	Percent of Cases	Percent of Cases
	N	Percent	2006	2005	2004
American Indian	269	0.4	0.4	0.5	0.6
Asian	1072	1.6	1.6	1.7	1.5
African American	12048	18.3	18.3	17.8	16.9
Pacific Islander	187	0.3	0.3	0.3	0.3
White	35621	54.0	54.1	54.6	55.0
DK	10022	15.2	15.2	17.1	17.5
NA	6788	10.3	10.3	8.2	8.4
Total	66007	100.0	100.3	100.3	100.2

**Table 15 - Applicant Race/Ethnicity Recode 2004-2006**

Race	2006		2005		2004	
	Percent	Valid Percent	Percent	Valid Percent	Percent	Valid Percent
American Indian	0.2	0.3	0.5	0.7	0.4	0.5
Asian	1.6	2.1	1.6	2.2	1.4	1.9
African American	18.0	24.1	17.5	23.3	16.7	22.3
Hispanic	3.0	4.1	2.8	3.7	2.6	3.5
Pacific Islander	0.2	0.2	0.2	0.2	0.1	0.2
Non-Hispanic White	51.6	69.0	52.3	69.6	53.3	71.3
Multiracial Non-Hispanic	0.3	0.3	0.2	0.2	0.2	0.3
Missing or Don't Know	25.2	-	24.9	-	25.3	-
Total	100.0	100.0	100.0	100.0	100.0	100.0
N	65,790		69,503		62,290	

**Table 16 - Reported Family Income 2004-2006**

Amount	2006	2005	2004
Mean	\$73,200	\$70,270	\$67,910
Median	\$57,000	\$54,000	\$52,000
Minimum	\$1,000	\$1,000	\$1,000
Maximum	\$7,767,000	\$5,400,000	\$9,999,000
N	65,790	69,503	62,290

**Table 17 - Income by Race/Ethnicity 2006**

Race/Ethnicity (recoded)	Mean Income 2006	Mean Income 2005	Mean Income 2004	Percent Increase 2004 to 2006
American Indian	\$80,873	\$59,140	\$71,209	13.6%
Asian	\$75,142	\$76,007	\$66,754	12.6%
African American	\$59,957	\$56,258	\$55,193	8.6%
Hispanic	\$61,831	\$61,051	\$52,901	16.9%
Pacific Islander	\$72,944	\$69,981	\$73,895	-1.3%
Non-Hispanic White	\$78,519	\$75,053	\$72,694	8.0%
Multiracial non-Hispanic	\$75,955	\$59,100	\$68,540	10.8%

Asians were significantly greater ( $p < .001$ ) than the incomes of Hispanics and African

Americans.

### **Community Measures (Census Data)**

In order to control for community characteristics as well as to provide context for the applications, census data has been linked to each of the application records in the HMDA data set. The census tract population, percent minority, tract to MSA median family income percentage (a measure of relative wealth), number of owner occupied units, and the number of 1-to 4 family units are provided for the tract in which the property is located.

The community measures were compared against the applicant's income and the amount of the loan requested. These correlations indicate that there is a statistically significant linear relationship. For example, income of the applicant is higher in areas with greater population. Conversely income is lower in areas with a greater percentage minority. Persistent links between geographic place and social indicators (race/ethnicity and poverty) were one of the main reasons that Fair Housing Laws were adopted and HMDA data is monitored. It is difficult, however, to attribute the causes of geographic concentrations of wealth, poverty, ethnic groups to any one factor. These measure are simply used to control for context and to measure tract-by-tract change over time.

### **ANALYSIS OF LOAN APPROVAL VS. NON-APPROVAL**

As noted previously those applications coded as "Application denied by financial institution," "Application withdrawn by applicant," "File closed for incompleteness," or "Pre-approval request denied by financial institution" were coded as "Not Approved" for the purposes of this study and represented a third of all applications (33.9% or 22,273 applications in 2006). However, applications withdrawn or those closed for incompleteness, while clearly not approved, are not considered *denied* in the Loan Application Register (LAR). Thus, no information on reason for incompleteness or withdrawal was provided for these cases. Moreover, reasons for denial are only available for 8,882 of the 14,559 (61.0% in 2006) applications considered denied in the Loan Application Register. Thus data is missing for a sizeable proportion of the denied applications, creating limitations to the power of the statistical findings.

**Table 18 - Community Measures (2006)**

	Minimum	Maximum	Mean
Population	550	15822	5724
Percent Minority	1.9%	99.4%	28.1%
Tract to MSA Income Percent	36.7%	281.9%	108.9%
Owner Occupied Units	9	4390	1643
One to Four Family Units	54	5106	2106

N=65790

**Table 19 - Correlation Matrix Census Information by Loan Characteristics (2006)**

		Income	Amount000s
Population	Pearson Correlation	.024(**)	.028(**)
	Sig. (2-tailed)	.000	.000
	N	58259	65790
Percent_Min	Pearson Correlation	-.092(**)	-.109(**)
	Sig. (2-tailed)	.000	.000
	N	58259	65790
Tract_to_MSA_inc	Pearson Correlation	.191(**)	.177(**)
	Sig. (2-tailed)	.000	.000
	N	58259	65790
OwnerOCCunits	Pearson Correlation	.043(**)	.055(**)
	Sig. (2-tailed)	.000	.000
	N	58259	65790
One_to_four_famunits	Pearson Correlation	.013(**)	.025(**)
	Sig. (2-tailed)	.002	.000
	N	58259	65790

\*\* Correlation is significant at the 0.01 level (2-tailed).

**Table 20 - Reasons for Denial 2004-2006**

Reason for Denial	Responses 2006		Percent of Cases 2006	Percent of Cases 2005	Percent of Cases 2004
	N	Percent			
Debt-to-income ratio	1908	16.6%	21.5%	15.1%	18.0%
Employment history	113	1.0%	1.3%	1.1%	1.3%
Credit history	3802	33.1%	42.8%	37.4%	37.7%
Collateral	1799	15.7%	20.2%	16.0%	15.5%
Insufficient cash	287	2.5%	3.2%	2.1%	2.4%
Unverifiable information	271	2.4%	3.0%	2.6%	2.3%
Credit application incomplete	527	4.6%	5.9%	8.8%	9.7%
Mortgage insurance denied	9	.1%	.1%	.0%	.0%
Other	2772	24.1%	31.2%	38.7%	33.3%
Total	11488	100.0%	129.3%	121.8%	120.2%

**Table 21 - Loan Type by Approval 2004-2006**

Loan Type	Percent Approved 2006	Percent Approved 2005	Percent Approved 2004
Conventional	64.9	61.9	61.9
FHA	84.0	82.9	81.1
VA	86.7	86.9	82.1
FSA/RHS	85.2	86.4	91.2
Total	66.1	63.3	63.6

Up to three reasons for denial are recorded in the Loan Application Register (LAR). A multiple response table combining these three variables was created using SPSS (See Table 20). The primary reason for denial in 2006 was credit history; 42.8% of applications denied listed this as one of the three reasons for denial. Debt-to-income ratio (21.5% of applications denied) and lack of collateral (20.2% of applications denied) were also common reasons for denial. “Other reason” was listed for denial in nearly a third of the cases (31.2%). These statistics were fairly consistent over the 2004 to 2006 period.

### **Approvals by Type and Purpose of Loan**

Nearly two-thirds of all applications were approved (66.1% in 2006, up slightly from 63.3% in 2005 and 63.6% in 2004). However, approval rates varied by both the type of the loan and the purpose of the loan. Perhaps due to greater pre-application scrutiny and stricter requirements for application, the VA, FSA/RHS, and FHA loans had higher approval rates than conventional loans (86.7%, 85.2%, and 84.0% approvals respectively in 2006). Of 61,459 conventional loan applications, 39,862 were approved (64.9%). Likewise, loan applications for the purpose of purchasing a home were more likely to be approved (81.8% approved) than for refinancing (54.1% approved) or improving a home (47.5% approved).

### **Approval Rates by Institution and Race/Ethnicity**

In 2006, twenty-two companies served only non-white applicants. These institutions reported only between 1 and 8 applications each (39 applications total). One-hundred institutions served only non-Hispanic white applicants, reporting between 1 and 9 applications each (205

**Table 22 - Leading Institutions Serving Non-White Applicants (2006)**

Institution	White Applicants	Non-white Applicants	Total Applicants	Percent non-white	Overall Approval Rate	White Approval Rate	Non-White Approval Rate	Difference in White/Non-White Approvals
Wells Fargo	2368	801	3169	25.3%	83.0%	87.0%	72.0%	14.0%
Beneficial Company LLC <sup>3</sup>	1242	774	2016	38.4%	13.0%	14.0%	12.0%	2.0%
Bank of America	1563	751	2314	32.5%	83.0%	84.0%	76.0%	8.0%
Countrywide Home Loans	2059	677	2736	24.7%	76.0%	80.0%	64.0%	16.0%
Wachovia Bank	2018	562	2580	21.8%	75.0%	78.0%	60.0%	17.0%
HFC Company LLC <sup>5</sup>	1116	555	1671	33.2%	12.0%	12.0%	10.0%	2.0%
CitiFinancial Services, INC	508	359	867	41.4%	56.0%	57.0%	56.0%	1.0%
Branch Banking and Trust	2276	335	2611	12.8%	77.0%	79.0%	56.0%	22.0%
National City Bank	635	332	967	34.3%	86.0%	88.0%	85.0%	3.0%
American Home Mortgage Corp	743	304	1047	29.0%	88.0%	88.0%	84.0%	5.0%

applications total). Interestingly a large proportion of institutions had no data or missing data on race/ethnicity of the applications. For example, while both HSBC Center (180 applications) and RESMAE Mortgage Corp. (166 applications) had a large number of applications from the Greensboro - High Point MSA, but neither reported the race/ethnicity of *any* of the applicants. A total of 164 of the 423 (38.8%) lacked complete race/ethnicity information on applicants. The following data presents the ten leading institutions in terms of greatest number of non-white applicants processed and their corresponding mortgage approval rates in 2006 (Table 22).<sup>6</sup>

The overall approval rate for applications varied greatly between institutions. Nearly a third of the institutions (30.7% or 130 institutions) had 100% approval of applications. Conversely, 51 institutions (12.1%) had 0% approval rates for applications. Of most interest to this study were the institutions with the greatest difference between White and non-White approval rates. Differences between the proportion of Whites and non-Whites were computed and then converted into a z-score.<sup>7</sup> These scores were then rank ordered from highest to lowest to see which institutions had the greatest difference between Whites and Non-Whites in the approval of loan applications (See Table 23). Difficulty in interpreting this data exists in that there is a great

<sup>5</sup> Note that Beneficial and HFC had very low approval rates (12%-13%). All of the applications to Beneficial and 99.1% of applications to HFC were for refinancing or home improvement loans. No denial reasons were listed in either case

<sup>6</sup> The complexity of extracting information by institution and analyzing across years was outside of the goals and the scope of this analysis. However, a study of this type may indicate particular institutions with a record of low approval rates for race/ethnic minorities.

<sup>7</sup> A measure of the distance in standard deviations of a score from the mean.

**Table 23 - Comparison of Approval Rates Whites vs. Non-Whites (2006)**

	Total Applications	Overall Approval Rate	White Approval Rate	Non-White Approval Rate	Difference in White/ Non-White Approvals	Zscore: Difference in White/ Non-White Approvals
Carolina First Bank	4	75.0%	100.0%	0.0%	100.0%	3.46189
Corporate America Family CU	4	50.0%	100.0%	0.0%	100.0%	3.46189
Thrivent Financial Bank	3	67.0%	100.0%	0.0%	100.0%	3.46189
Security Savings Bank	31	87.0%	93.0%	0.0%	93.0%	3.19915
First Bank of Georgia	16	63.0%	83.0%	0.0%	83.0%	2.82695
U.S. Bank NA	138	91.0%	78.0%	0.0%	78.0%	2.60472
Patrick Henry National Bank	27	74.0%	76.0%	0.0%	76.0%	2.54758
Woodforest National Bank	6	50.0%	75.0%	0.0%	75.0%	2.50948
North American Savings Bank	12	67.0%	100.0%	33.0%	67.0%	2.19201
Home Equity of America	7	57.0%	67.0%	0.0%	67.0%	2.19201
US Mortgage Corp	12	42.0%	63.0%	0.0%	63.0%	2.03328
Southern Bank and Trust Co	56	77.0%	85.0%	25.0%	60.0%	1.95391
Allegacy Federal Credit Union	26	85.0%	95.0%	40.0%	55.0%	1.75662
Crevecor Mortgage Inc	44	98.0%	100.0%	50.0%	50.0%	1.55707
Dynamic Capital Mortgage Inc	14	71.0%	100.0%	50.0%	50.0%	1.55707
Amtrust Mortgage Corp	7	71.0%	100.0%	50.0%	50.0%	1.55707
Citizens Bank	6	83.0%	100.0%	50.0%	50.0%	1.55707
Cardinal Financial Company	6	33.0%	50.0%	0.0%	50.0%	1.55707

**Table 24 - Denial Reason by Sex 2004-2006**

Denial Reasons	2006		2005		2004	
	Male	Female	Male	Female	Male	Female
Debt-to-income ratio	1008 21.60%	726 23.70%	831 14.60%	588 17.30%	1108 17.20%	805 20.30%
Employment history	64 1.40%	41 1.30%	71 1.30%	36 1.10%	94 1.50%	56 1.40%
Credit history	1933 41.30%	1305 42.70%	2191 38.60%	1318 38.80%	2433 37.70%	1558 39.30%
Collateral	992 21.20%	587 19.20%	952 16.80%	496 14.60%	986 15.30%	529 13.30%
Insufficient cash	168 3.60%	94 3.10%	140 2.50%	69 2.00%	156 2.40%	98 2.50%
Unverifiable information	156 3.30%	92 3.00%	176 3.10%	81 2.40%	146 2.30%	88 2.20%
Credit application incomplete	264 5.60%	158 5.20%	468 8.20%	290 8.50%	552 8.60%	349 8.80%
Mortgage insurance denied	4 0.10%	4 0.10%	2 0.00%	1 0.00%	3 0.00%	0 0.00%
Other	1528 32.70%	974 31.80%	2130 37.50%	1291 38.00%	2219 34.40%	1343 33.90%
N	4676	3059	5678	3393	6448	3965

variation in the number of applications as well as the amount of missing race/ethnic data. For example, it is difficult to determine if the difference between White and non-White approval rates (78%) for U.S. Bank NA is noteworthy when only 42 applications of 138 (30.4%) had race/ethnic data.

### **Approvals by Applicant Characteristics**

Bivariate analysis of approval rates and reasons for denial based on the demographic characteristics of applicants were performed using SPSS. Reported are differences by sex, race/ethnicity, and income level.

#### *Sex*

On average 66.0% of male applicants (n=22,971) and 60.5% female applicants (n=11,720) were approved for a loan in 2006. This difference of 5.5% was statistically significant (Pearson Chi-Square =162.523  $df= 1$   $p<.001$ ,  $\Phi=-.055$ ,  $p<.001$ ). This disproportionate approval rate may be related to income differences noted between males and females (See *Income*). This pattern is consistent across the 2004 to 2006 time period with 63.8% of male applicants and 59.2% of female applicants approved for a loan in 2004 and 63.8% of males and 59.3% of females in 2005.

Denial reasons by sex occur in similar patterns for males and females and have been fairly consistent in the 2004 to 2006 period. “Credit History” is the primary reason for denial (41.3% of males and 42.7% of females in 2006), followed by “Other” (32.7% males, 31.8% females in 2006), “Debt-to-Income Ratio” (21.6% males, 23.7% females in 2006), and “Collateral” (21.2% males, 19.2% females in 2006; See Table 24).

#### *Race/Ethnicity*

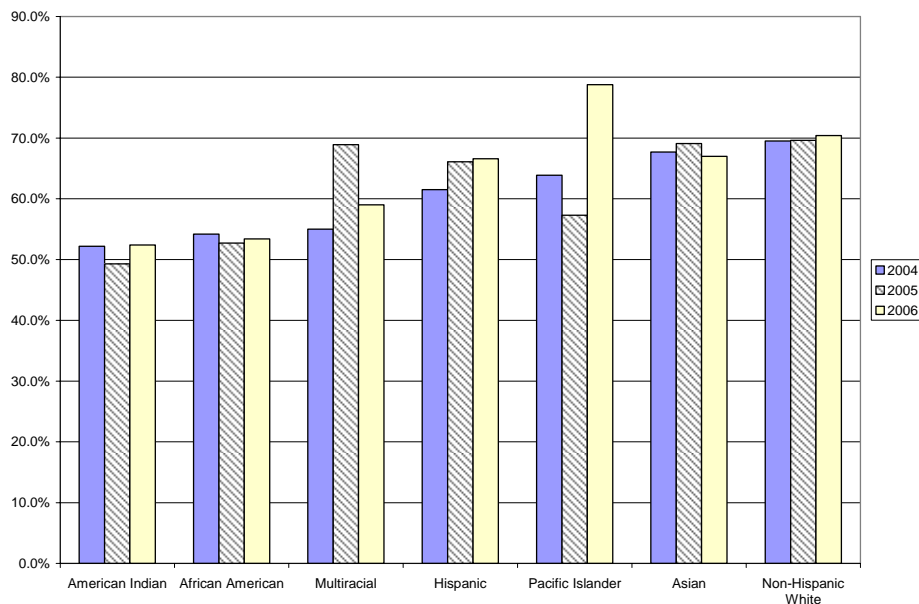
In 2006, more than two-thirds (70.3%) of applications made by Non-Hispanic White primary applicants were approved. In comparison, only 54.9% of applications from Non-White primary applicants were approved. This 15.4 percentage point difference was statistically significant (Pearson Chi-Square =1054.748  $df= 1$   $p<.001$ ,  $\Phi=-.146$ ,  $p<.001$ ). Comparisons were made between each of the race/ethnic groups. Pacific Islanders had the highest approval rates (78.8%), followed by Non-Hispanic White applicants (70.4%), Asians (67.0%), Hispanics (66.6%),

Multiracial applicants (59.0%), African Americans (53.4%), and American Indians (52.4%). Rates of approval were fairly consistent over the three year period. Variations were mostly seen in the rates of approval for ethnic groups with small total populations (Multiracial and Pacific Islanders). Hispanics show the most consistent gain in approvals rising from 61.5% in 2004 to 66.6% in 2006 (See Table 25 and Figure 1).

**Table 25 - Approval Rates by Race/Ethnicity**

	2006		2005		2004	
	Not Approved	Approved	Not Approved	Approved	Not Approved	Approved
American Indian	47.6%	52.4%	50.7%	49.3%	47.8%	52.2%
	59	65	187	182	120	131
Asian	33.0%	67.0%	30.9%	69.1%	32.3%	67.7%
	337	683	349	780	287	601
African American	46.6%	53.4%	47.3%	52.7%	45.8%	54.2%
	5526	6326	5754	6420	4756	5626
Hispanic	33.4%	66.6%	33.9%	66.1%	38.5%	61.5%
	667	1328	662	1290	626	999
Pacific Islander	21.2%	78.8%	42.7%	57.3%	36.1%	63.9%
	22	82	47	63	30	53
Non-Hispanic White	29.6%	70.4%	30.4%	69.6%	30.5%	69.5%
	10058	23920	11049	25283	10136	23058
Multiracial	41.0%	59.0%	31.1%	68.9%	45.0%	55.0%
	68	98	33	73	54	66
Total	34.0%	66.0%	34.7%	65.3%	34.4%	65.6%
	16737	32502	18081	34091	16009	30534

**Figure 1 - Approval Rates by Race/Ethnicity 2004-2006**



An ANOVA test of difference between groups was statistically significant for 2006 data (F=197.457 df=6 p<.001). A Tukey’s Post Hoc Test showed that only the approval rates of Pacific Islanders and Non-Hispanic Whites were significantly greater (p<.001) than the approval rates for American Indians, African Americans, and Multiracial applicants. Approval rates for Pacific Islanders, while 8.2 percentage points above Non-Hispanic Whites, were not statistically greater than Non-Hispanic Whites.<sup>8</sup> Approval rates for Non-Hispanic Whites were also significantly greater than approval rates for Hispanics.

Comparing Non-Hispanic Whites to Non-Whites, it was found that denial reasons occurred in similar proportions to one another with “Credit History” being the primary reason (41.3% of males and 42.7% of females), followed by “Other” (32.7% males, 31.8% females), “Debt-to-Income Ratio” (21.6% males, 23.7% females), and “Collateral” (21.2% males, 19.2% females) (Table 26). We see some denial reasons were of greater importance for a race/ethnic groups, than other reasons. For example, the percentage of Asian applicants denied for “insufficient cash” was three times greater than the mean: 11.5% of Asian applicants denied as compared with 3.7% of all denials. Asians and Hispanics were disproportionately likely to have unverifiable information or incomplete credit applications (Table 27).

**Table 26 - Minority Status and Denial Reasons (2006)**

Denial Reasons*	Non-Hispanic White	Non-White
Credit history	42.4% 1730	44.8% 1122
Other	30.0% 1224	31.1% 779
Debt-to-income ratio	23.6% 961	24.2% 607
Collateral	22.3% 909	19.5% 488
Credit application incomplete	6.1% 250	5.8% 145
Insufficient cash	3.8% 153	3.6% 90
Unverifiable information	3.0% 124	3.8% 95
Employment history	1.4% 56	1.3% 32
Mortgage insurance denied	.1% 3	.1% 3
<b>Total</b>	<b>4077</b>	<b>2506</b>

<sup>8</sup> Due to the far lower number of Pacific Islander applicants.

**Table 27 - Race/Ethnicity and Denial Reasons**

Race/Ethnicity		Debt-to-income ratio	Employment history	Credit history	Collateral	Insufficient cash	Unverifiable information	Credit application incomplete	Mortgage insurance denied	Other	Row Totals
American Indian	Count	9	0	9	4	0	0	1	0	7	22
	%	40.9%	.0%	40.9%	18.2%	.0%	.0%	4.5%	.0%	31.8%	
Asian	Count	42	2	49	28	16	9	11	0	28	139
	%	30.2%	1.4%	35.3%	20.1%	11.5%	6.5%	7.9%	.0%	20.1%	
African American	Count	518	25	1008	429	67	79	122	3	707	2215
	%	23.4%	1.1%	45.5%	19.4%	3.0%	3.6%	5.5%	.1%	31.9%	
Hispanic	Count	88	14	120	66	15	23	24	2	92	325
	%	27.1%	4.3%	36.9%	20.3%	4.6%	7.1%	7.4%	.6%	28.3%	
Pacific Islander	Count	5	0	7	5	0	0	0	0	3	14
	%	35.7%	.0%	50.0%	35.7%	.0%	.0%	.0%	.0%	21.4%	
Non-Hispanic White	Count	901	46	1651	858	143	107	235	1	1163	3846
	%	23.4%	1.2%	42.9%	22.3%	3.7%	2.8%	6.1%	.0%	30.2%	
Multiracial	Count	5	1	8	7	2	1	2	0	3	22
	%	22.7%	4.5%	36.4%	31.8%	9.1%	4.5%	9.1%	.0%	13.6%	
Total	Count	1568	88	2852	1397	243	219	395	6	2003	6583

Percentages and totals are based on respondents.

## Approvals by Income

Bivariate analysis of approvals by income show that in 2006 applications that were approved showed a mean income \$14,210 over that of applications that were not approved. According to an independent samples t-test, the difference is statistically significant ( $F=199.558$   $p<.001$ ,  $t=20.253$   $df=58257$   $p<.001$ ). In order to further analyze the relationship between income and approval rate, applicant incomes were recoded into five categories based on z-score: below the mean income (less than \$74,000), mean income to +1 standard deviation above (up to \$156,000), between +1 and +5 standard deviations above the mean (up to \$482,000), between +5 and + 20 standard deviations above the mean (up to \$1.7 million), and more than +20 standard deviations above the mean (over \$1.7 million). The resulting crosstabulation shows that, as expected, the approval rate goes up with income, but only to a certain point (See Table 28). The association was statistically significant (Pearson Chi-Square =993.920  $df= 4$   $p<.001$ ). Note that the percentage of approvals goes up as income increases until the fourth group (incomes above \$482,000). The percentage of approvals drops significantly then begins to climb again.

It was surmised that the decrease in the percentage of approvals at the \$482,000 to \$1.7 million range was due in part to the loan amounts requested on the applications. As income increased so to do the size of the loans ( $r=.408$   $p<.001$ ). A loan to income ratio was then calculated to control for this issue. A ratio of less than 1.0 would mean a loan amount of less than the income of the applicant. A ratio of 2.0 (the mean) would be a loan amount requested that is twice the annual reported income of the applicant. This ratio was then converted into a Z-score and recoded into five categories: below the mean (a ratio of 1.99 or less), mean income to +1 standard deviation above (a ratio of up to 3.90), between +1 and +5 standard deviations above the mean (a ratio of up to 11.66), between +5 and + 20 standard deviations above the mean (a ratio of up to 46.32), and more than +20 standard deviations above the mean (loans of more than 46.33 times the annual reported income of the applicant). A crosstabulation of approvals vs. loan to income ratio shows that, as expected, the approval rate decreases consistently as the ratio increases (See Table 29). The association was statistically significant (Pearson Chi-Square =615.970  $df= 4$   $p<.001$ ).

**Table 28 - Income and Approval**

Income Range based on Zscore	Approved		
		Not Approved	Approved
Below mean income	Count	15967	23027
	%	40.9%	59.1%
Mean income to +1 Standard Dev	Count	4621	11246
	%	29.1%	70.9%
+1 to +5 Standard Dev	Count	689	2460
	%	21.9%	78.1%
+5 to + 20 Standard Dev	Count	88	148
	%	37.3%	62.7%
More than +20 Standard Deviations above the mean	Count	3	10
	%	23.1%	76.9%
Total	Count	21368	36891
		36.7%	63.3%

**Table 29 - Loan to Income ratio and Approval**

Loan to Income ratio	Approved		
		Not Approved	Approved
Below mean ratio	Count	10484	20778
	%	33.5%	66.5%
Mean ratio to +1 Standard Dev	Count	8812	14266
	%	38.2%	61.8%
+1 to +5 Standard Dev	Count	2009	1825
	%	52.4%	47.6%
+5 to + 20 Standard Dev	Count	54	21
	%	72.0%	28.0%
More than +20 Standard Deviations above the mean ratio	Count	9	1
	%	90.0%	10.0%
Total	Count	21368	36891
	%	36.7%	63.3%

**Table 30 - Community Measure Means Approved vs. Not Approved**

	Approved	N	Mean	Std. Deviation	Std. Error Mean
Population	Not Approved	22273	5630.7	2569.5	17.217
	Approved	43517	5772.0	2766.5	13.262
Percent_Min	Not Approved	22273	31.4	25.9	0.174
	Approved	43517	26.4	22.5	0.108
Tract_to_MSA_inc	Not Approved	22273	102.5	29.5	0.198
	Approved	43517	112.1	33.6	0.161
OwnerOCCunits	Not Approved	22273	1601.6	846.6	5.673
	Approved	43517	1664.2	873.3	4.187
One_to_four_famunits	Not Approved	22273	2091.7	936.9	6.278
	Approved	43517	2113.7	967.1	4.636

## **Approvals by Community Measures**

Community measures provide for the setting in which properties are located. These geographic settings (neighborhoods, census tracts, blocks) are highly related to the social characteristics of individuals living within them. We see by comparing mean numbers of approvals to non-approvals that census blocks that had higher populations were approved on average more than those with lower populations. Census tracts with lower percentages of ethnic/racial minorities were approved more often on average. Likewise, tracts with a higher relative income, more owner occupied dwellings, and more one to four family residences had higher mean approval rates. Population, percent minority, and tract to MSA income ratio were all statistically significant ( $p < .001$ ). Thus, it is important to control for community factors when analyzing application approval.

## **ODDS OF APPROVAL: LOGISTIC REGRESSION ANALYSIS OF HMDA DATA**

The primary focus of this report is to observe differences in mortgage applications by race/ethnicity of the applicant to see if there is evidence of structural barriers to home ownership for minority groups. Logistic regression is a common technique for studying fair lending practices across applications (Avery, Beeson, Calem 1997; Covington 2000; Giles and Courchane 2000; Calem and Longhofer 2002). In a logistic regression analysis the dependent variable is binary: the mortgage application is accepted or not accepted. Since the dependent variable is not continuous<sup>9</sup> other multivariate analysis techniques that would control for the various independent variables (loan characteristics, property characteristics, applicant characteristics, and community factors) may not be used. Instead, probabilities of loan acceptance are plotted and multivariate regression is used to predict the odds that a loan application would be approved when holding constant the loan characteristics, property characteristics, applicant characteristics, and community factors. The following logistic regression models were then developed based upon what was learned in the previous section about the factors associated with acceptance rates and the causes of denials.

### **Model 1 Approval Odds for Minority vs. Non-Hispanic White Populations**

As a baseline model, loan characteristics, community characteristics, and applicant characteristics were explored (Table 32 Model 1). The first block of the model (loan

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<sup>9</sup> Variable where the scale is not made up of discrete steps. Therefore the variable may be expressed by a large range (often infinite) of values. For example: age, amount of loan, and family income are continuous variables in this data set.

characteristics) shows that when all other factors are equal, there is a 70.7% decrease in the probability that loans for home improvements or refinancing would be approved when compared to loans for the purchase of a home.<sup>10</sup> The probability that loans for properties that were *not* to be owner occupied were increased by 37.7% over loans for owner occupied properties. The probability that a loan for a manufactured or multifamily house were 66.2% less than for one to four person housing. The probability of approval for an FHA, VA, or an FHS loan was increased 162.3% over the odds of approval for a conventional loan. Finally, the probability of approval decreased 0.2% for every thousand dollar increase in the loan amount above the mean amount of \$124,875. The cumulative effect of this is that for every \$10,000 above the mean the probability of approval is decreased by almost 2.0%.

The second block of the model takes into consideration community characteristics. When controlling for other factors, Population, Census tract to MSA Income and Owner Occupancy were the only community characteristics found to be statistically significant at the  $p < .05$  level or higher. While significant, they were not powerful influences on approval of loans. Percent minority and number of one to four family units were not statistically significant. When all other factors are controlled for, there is a 0.003% increase in the probability that a loan would be approved for every additional person in the population of the census tract. Thus, for every 1,000 people above the mean of 5,724 per tract, there would be an increase in the likelihood of approval by 3.2%. The percent of census tract income to MSA income (a measure of relative wealth of the area) shows that for every one-percent increase (above the mean of 108.9) of the tract income over the MSA median income, there is a 0.9% increase in the probability that the loan would be approved. For every additional owner occupied property within a census tract (above the mean of 1,643 per tract) the odds of approval of the loan were reduced by .02%. Again, the cumulative effect would mean that for every 100 additional owner-occupied units in a tract there would be a 2.0% reduction in the probability of approval, all else being held constant.

The third block of the model takes into consideration individual characteristics of the primary applicant. When controlling for other factors, the sex, minority status, and income of the applicant were statistically significant predictors of the probability of loan approval. Female applicants were 12.1% less likely to have a loan approved than male applicants when all other factors were equal. The probability that mortgage applications from minority primary applicants would be approved was 47.0% lower than that of Non-Hispanic White applicants. Finally, for

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<sup>10</sup> Transformation of the log *it* coefficient to percentage change in odds calculated using:  $100 * (e^b - 1)$ .

every \$1,000 increase in the annual reported family income (over the mean of \$73,203) the odds of loan approval increased 0.4%. Thus, all else being equal, an applicant with an income of \$100,000 would have a 10.2% higher probability of loan approval than an applicant with the mean income.<sup>11</sup>

### **Model 2 Approval Odds by Distinct Race/Ethnic Groups vs. Non-Hispanic White Populations**

The second model also uses loan characteristics, community characteristics, and applicant characteristics but explores additional information regarding the race/ethnicity of the primary applicant (Table 31: Model 2). The first block of the model (loan characteristics) again shows that when all other factors are equal, there is a decrease in the probability that loans for home improvements or refinancing (-72.8%), or for manufactured or multifamily houses (-62.3%), would be approved. The probability of approval was increased on loan applications for properties that were *not* to be owner occupied (+45.7%), and FHA, VA, or FHS loans (162.7%). Finally, the probability of approval decreased 0.20% for every thousand dollar increase in the loan amount over the mean.

The second block of the model takes into consideration community characteristics. When controlling for other factors, Population, Percent Minority, Census tract to MSA Income and Owner Occupancy found to be statistically significant. Percent minority was not significant in the previous model. When all other factors are controlled for, there is a *decrease* in the probability of approval of 0.36% for every one-percent increase in the percent minority of a census tract (over the mean of 28.1%). Thus, tracts with a higher proportion of minorities would have lower approval rates.<sup>12</sup> There was an increase in the probability that a loan would be approved for every additional person in the population of the census tract over the mean (0.004%). Likewise for every one-percent increase over the mean tract to MSA income ratio, there is a 0.9% increase in the probability that the loan would be approved. For every additional owner occupied property within a census tract the odds of approval of the loan were reduced by .03%.

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<sup>11</sup>  $(100-73.203) * .38\% = 10.2\%$

<sup>12</sup> It may be beneficial to further investigate this finding using a Geographic Information Systems (GIS) analysis of the geo-spatial distributions of approvals and the intersection with community measures.

	Model 1			Model 2			Model 3		
	$\beta$	Sig.	Exp ( $\beta$ )	$\beta$	Sig.	Exp ( $\beta$ )	$\beta$	Sig.	Exp ( $\beta$ )
Constant	43.757	**	1.008	-.184	-	.832	1.500	***	4.484
<b>Loan Characteristics</b>									
Home Improvement or Refinancing	-1.227	***	0.293	-1.302	***	0.272	-1.326	***	0.266
Not Owner Occupied	0.320	***	1.377	0.383	***	1.467	0.374	***	1.454
Manufactured or Multifamily housing	-1.084	***	0.338	-1.004	***	0.367	-1.040	***	0.353
Non-Conventional Loan	0.964	***	2.623	0.966	***	2.627	1.053	***	2.866
Loan Amount (Thousands) <sup>†</sup>	-0.002	***	0.998	-0.002	***	0.998	-	-	-
<b>Community Characteristics</b>									
Population <sup>†</sup>	0.000	*	1.000	0.000	**	1.000	0.000	***	1.000
Percent Minority <sup>†</sup>	-0.001	-	0.999	-0.004	***	0.996	-0.004	***	0.996
Census tract to MSA Income <sup>†</sup>	0.009	***	1.009	0.009	***	1.009	0.008	***	1.008
Owner Occupancy <sup>†</sup>	0.000	**	1.000	0.000	***	1.000	0.000	***	1.000
One to four family units <sup>†</sup>	0.000	-	1.000	0.000	-	1.000			
<b>Applicant Characteristics</b>									
Female	-0.129	***	0.879	-0.130	***	0.878	-0.102	***	0.903
Minority	-0.635	***	0.530	-	-	-	-	-	-
Hispanic	-	-	-	-0.321	***	0.725	-0.300	***	0.741
Asian	-	-	-	-0.263	***	0.769	-0.253	***	0.776
African American	-	-	-	-0.490	***	0.613	-0.487	***	0.614
Other (Multiracial, Native American, Pacific Isl)	-	-	-	-0.041	-	0.960	-0.047	-	0.954
Income (Thousands) <sup>†</sup>	0.004	***	1.004	0.003	***	1.003	-	-	-
Loan to Income Ratio <sup>†</sup>	-	-	-	-	-	-	-0.211	***	0.810
Classification Table Percent Correct	69.5%			68.8%			69.1%		
-2 Log likelihood	53808.57			60384.16			59968.89		
Cox & Snell R2	0.133			0.136			0.143		
Nagelkerke R2	0.183			0.186			0.195		
Model Chi-square	6693.03	***		7545.73	***		7961.01	***	
df	13			16			14		
N	47004			51773			51773		
Missing	18786			14017			14017		

\* p .05; \*\* p .01; \*\*\* p .001

<sup>†</sup> Centered on Mean

Table 31 - Logistic Regression Models 1-3

**Table 32 - Model 2 Comparison of Odds Ratios as Percent Likelihood of Approval**

	Constant $\beta$	Female $\beta$	Hispanic $\beta$	Asian $\beta$	African American $\beta$	Sum	Exp ( $\beta$ )	Odds (approved minority category)/Odds (approved WM)	Percent Difference	Percent Likelihood of Approval
White Male	-0.184					-0.184	0.832	2.298	129.8%	129.8%
White Female	-0.184	-0.130				-0.314	0.731	0.8781	-12.2%	117.6%
Hispanic Male	-0.184		-0.321			-0.505	0.604	0.72542	-27.5%	102.3%
Hispanic Female	-0.184	-0.130	-0.321			-0.635	0.530	0.63699	-36.3%	93.5%
Asian Male	-0.184			- 0.263		-0.447	0.640	0.76874	-23.1%	106.7%
Asian Female	-0.184	-0.130		- 0.263		-0.577	0.562	0.67503	-32.5%	97.3%
Black Male	-0.184				-0.490	-0.674	0.510	0.61263	-38.7%	91.1%
Black Female	-0.184	-0.130			-0.490	-0.804	0.448	0.53794	-46.2%	83.6%

The third block of the model takes into consideration the sex, race/ethnicity, and income of the applicant. All of these indicators were statistically significant predictors of the probability of loan approval except for “Other race/ethnicity” (which included Multiracial, Native American, Pacific Islanders combined due to the low total number of these groups in the dataset). Female applicants were again less likely to have a loan approved than male applicants (-12.2%) when all other factors were equal. The probability that mortgage applications would be approved from primary applicants who were Hispanic (-27.5%), Asian (-23.1%), and African American (-38.7%) was significantly lower than odds of approval for Non-Hispanic White applicants. Income again provides a mediating factor in that for every \$1,000 increase in the annual reported family income the odds of loan approval increased 0.3%.

Using this model we may compare applicants on the basis of different social characteristics by incorporating the corresponding coefficients ( $\beta$ ) and holding all other elements constant (see Table 32). For example, we could compare the odds of approval for Non-Hispanic White male applicants (constant) against all other groups when they are equal in all other respects such as a reported family income of \$57,000 (median) applying for a \$124,875 (mean for the purchase of a home) conventional loan for the purchase of a one to four family home that would be owner occupied in a census tract with 5,724 persons (mean), that is 28.1% minority (mean) with a tract to MSA income percentage of 108.9% (mean), 1,643 owner occupied units (mean), and 2,106 one to four family units (mean).<sup>13</sup> From the comparison, we clearly see that the combination of protected statuses (Female and minority) results in lower odds of approval.

### **Model 3 Approval Odds by Distinct Race/Ethnic Groups vs. Non-Hispanic White Populations Accounting for Loan to Income Ratio**

The third model attempts to improve fit by decreasing the number of variables (and thus the degrees of freedom *df*). Fit statistics are used to help the researcher arrive at a model that uses the least number of variables to explain the greatest amount of variance. While only a marginal improvement, model 3 takes into account the interaction between income and amount of loan noted previously and eliminates the non-significant community measure of number of one to

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<sup>13</sup> Odds of Approval =  $\text{EXP}((.709 + (124.875 * -.002) + (5724 * 0.00004) + (28.1 * -.004) + (108.9 * .009) + (1643 * 0.0003) + (2106 * 0.00008) + (57 * .003)) / (1 + \text{EXP}((.709 + (124875 * -.002) + (5724 * 0.00004) + (28.1 * -.004) + (108.9 * .009) + (1643 * -.0003) + (2106 * 0.00008) + (57 * .003)))) + (-1.02 \text{ If Female})$

four family houses in a tract. It uses all of the other variables (loan characteristics, community characteristics, and applicant characteristics) of model 2 with nearly equal results (Table 31: Model 3). The added variable loan to income ratio clearly shows that the odds of approval decrease significantly (-19.0%) for every one unit increase in the loan to income ratio. For example, a house that is three times the reported family income would be 19.0% *less* likely to be approved than one that is two times the family income.

## CONCLUSIONS

While the Greensboro - High Point MSA has a large African American community, and a growing Hispanic population, home ownership for these groups has lagged behind Non-Hispanic Whites. Residential segregation, in particular concentration or clustering of minorities in particular neighborhoods, has continued to be a defining characteristic of racial/ethnic map of the area. As explained in the introduction, segregation is of particular concern due to the association with deleterious outcomes (poor health, high stress) as well as reducing access to opportunities for economic and social mobility. Segregation may be caused by a number of factors including the after-effect of policies in the early 1900s, personal preferences to reside within ethnic neighborhoods, and discriminatory practices of the housing market (both at the individual and structural levels). This report has detailed disparities in mortgage applications approval rates throughout the period 2004 to 2006 by both the race/ethnicity and sex of the applicant. While the findings in no way point to a specific cause of discrimination and resulting segregation, they do illuminate the degree of disparities that occur between race/ethnic groups when applying for a mortgage.

While two-thirds of all loan applications were approved, those submitted by female primary applicants were less likely to be granted (60.5% approved compared with 66.0% for males). Denial reasons by sex were consistent in the 2004 to 2006 period as well as between sexes. Of known reasons for denial, "Credit History" was found to be primary reason for denial with "Debt-to-Income Ratio" and "Collateral" being frequent reasons as well.

Disparities were even more noticeable between Non-Hispanic White applicants (70.3% approved) and minority applicants (54.9% approved). This difference was statistically significant. Further illustrating the stratification between ethnic/racial categories the analysis noted that Pacific Islanders had the highest approval rates (78.8%, though they account for only a small proportion of loan applications), followed by Non-Hispanic White applicants (70.4%), Asians (67.0%), Hispanics (66.6%), Multiracial applicants (59.0%), African Americans (53.4%), and American Indians (52.4%). The findings were fairly consistent over the three year period of 2004 to 2006.

Income was an important mediating factor as there was a clear increase in approval rates with

increased income. However, as the loan amounts increased, incomes became less a factor of approval. In the regression models the ratio between income and loan amount was found to be a better predictor of approval than income and amount of loan.

Findings from logistic regression models consistently showed that when controlling for other factors, the sex, minority status, and income of the applicant were statistically significant predictors of the probability of loan approval. Female applicants were less likely to have a loan approved than male applicants when all other factors were equal. The probability that mortgage applications from minority primary applicants would be approved was 47.0% lower than that of Non-Hispanic White applicants. Additional modeling which further distinguished between minority race/ethnic groups and their likelihood of loan approval showed that when all other factors were equal, the probability that mortgage applications would be approved from primary applicants who were Hispanic (-27.5%), Asian (-23.1%), and African American (-38.7%) were significantly lower than odds of approval for Non-Hispanic White applicants. These figures were found to be marginally better than those reported by Ross and Yinger (2002) where nationally African Americans were twice as likely to be denied a loan as Non-Hispanic Whites.

## **Recommendations**

The analysis has provided clear evidence, consistent with studies of HMDA data in other locations, that race/ethnicity is yet a major factor in loan approvals in the Greensboro - High Point MSA. When controlling for all factors (within the limitations of the dataset), odds of loan approval were significantly lower for Non-Whites. Definitive causes for the disparities cannot be found within the HMDA data as it does not track all of the variables which play a part in the loan approval process. However, given the evidence of inequality it is recommended that the City of Greensboro engage in the following activities to reduce the disparities in mortgage approvals:

5. **Institutional Analysis** - Conduct further institutional studies in order to determine which institutions have the most disparate outcomes by sex and race/ethnicity. With some effort, the existing dataset may be joined with descriptive data on each of the lending institutions to investigate the patterns of loan approvals and denials. This research may be beneficial in identifying which particular institutions have a record of consistently denying loans from particular race/ethnic minorities. This would allow for targeted fair-

lending testing such as outlined in Turner, Freiberg, Godfrey, Herbig, Levy, and Smith (2002). This analysis could also be used to identify best-practice lenders, awarding them a Greensboro Human Relations Fair Housing “Stamp of Approval” or similar incentive.

6. **GIS Mapping** - A thorough Geographic Information Systems (GIS) analysis of the distributions of approvals/denials and their intersection with community measures (those from the HMDA as well as housing indicators like age of housing stock, percent movers in last 5 years, percent sub-standard housing, crime statistics, etc.) would be useful for targeting particular neighborhoods for outreach activities in an effort to improve home-ownership rates.
7. **Analysis of Mortgage Process** - Conduct additional data collection to determine where in the mortgage process the discrimination is most likely to occur. The literature indicates that there should be less discrimination in mortgage lending as a result of the automation of underwriting and the financial incentives for the mortgage officer to approve as many loans as possible (Ross and Yinger 2002). However, there still exists a significant disparity in the approval rates in Greensboro - High Point and other markets. Turner *et al* (2002) point out: “The mortgage lending process consists of a complex series of stages, including advertising and outreach by lending institutions, responses to pre-application inquiries from potential borrowers, approval or denial of loan applications and determination of loan terms and conditions, and finally, loan administration. Discrimination may occur at any of these stages and may take different forms at different stages.” It is recommended that the City of Greensboro engage in a systematic study of each stage of the lending process in order to determine where in the greatest discrepancies exist.
8. **Home Buyer, Credit Building Courses** - Develop courses which train prospective tenants with stable incomes on how to begin the process of building credit and applying for a loan. The analysis of causes of denial showed consistency between sexes, and among race/ethnic groups across the three years of analysis. Credit history was the primary cause of denial in known cases. It may be of use for lending institutions and those promoting home-ownership to provide workshops in target areas that would teach prospective buyers how to improve their credit ratings and prepare for the loan

application process well before beginning the search for a home. This could both lower the overall denial rate and improve home ownership within target communities. This could be done in coordination with lenders who have a track record of equitable lending practices and could be targeted to particular communities identified in GIS analysis.

## **Limitations**

Many of the factors which enter into the loan officer's decision to approve or deny a loan were not contained in the HMDA dataset. For example: wealth and savings, employment history, debt to income ratio (P/I ratio), loan-to-value ratio, personal credit history and credit score are not a part of the Loan Application Register. These factors would be important controls for a more rigorous test of sex or race/ethnic disparities in mortgage application approvals.

Another limitation comes from the great deal of missing or incomplete data in the records. Dietrich (2001) notes that missing data has been a consistent problem with HMDA data, explaining that in 1999 nearly a fifth of conventional loan applications and up to half of the FHA loans for home improvements lacked race/ethnic data. In this report, it was noted that the sex of the applicant was unknown in about 17.6% of cases for 2006 applications. More importantly, about a quarter of applications were missing ethnicity (down from 32.6% in 2004). Likewise, 39% of applications that were denied lacked reason for denial. In logistic regression missing data presents a problem for bias. Deletion of a case occurs if there is a missing value for any single variable in the model. A fifth of cases (21.3%) were omitted in the logistic regression due to missing data.

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**APPENDIX A - INSTITUTIONAL APPROVAL RATES**

	Institutional ID (HMDA) <sup>14</sup>	Not Approved*	Approved*	Rate Denied, Withdrawn or Incomplete	Total Loan Applications
1	3100460	28	0	100.00%	28
2	7507300007	24	0	100.00%	24
3	7647200002	17	0	100.00%	17
4	1707500002	16	0	100.00%	16
5	7769600009	13	0	100.00%	13
6	57709	8	0	100.00%	8
7	1813900002	8	0	100.00%	8
8	16406	7	0	100.00%	7
9	7554200008	7	0	100.00%	7
10	2033000009	6	0	100.00%	6
11	7177900003	6	0	100.00%	6
12	1077600005	4	0	100.00%	4
13	5649	3	0	100.00%	3
14	80118	3	0	100.00%	3
15	4035	2	0	100.00%	2
16	7756	2	0	100.00%	2
17	8173	2	0	100.00%	2
18	16660	2	0	100.00%	2
19	152057	2	0	100.00%	2
20	542046140	2	0	100.00%	2
21	1412900001	2	0	100.00%	2
22	7187700001	2	0	100.00%	2
23	7505400005	2	0	100.00%	2
24	5621	1	0	100.00%	1
25	8183	1	0	100.00%	1
26	8333	1	0	100.00%	1
27	13303	1	0	100.00%	1
28	15445	1	0	100.00%	1
29	15732	1	0	100.00%	1
30	16456	1	0	100.00%	1
31	17953	1	0	100.00%	1
32	17960	1	0	100.00%	1
33	22983	1	0	100.00%	1
34	34250	1	0	100.00%	1
35	34607	1	0	100.00%	1
36	57071	1	0	100.00%	1
37	57717	1	0	100.00%	1
38	57854	1	0	100.00%	1

<sup>14</sup> A ten-digit number used to identify a HMDA reporting institution. The lookup table for these IDs is on the HMDA Raw Data Software.

39	60275	1	0	100.00%	1
40	61068	1	0	100.00%	1
41	3486436	1	0	100.00%	1
42	541900445	1	0	100.00%	1
43	1345700002	1	0	100.00%	1
44	2467100004	1	0	100.00%	1
45	7230000003	1	0	100.00%	1
46	7281500005	1	0	100.00%	1
47	7439600003	1	0	100.00%	1
48	7503100002	1	0	100.00%	1
49	7584600006	1	0	100.00%	1
50	7632300003	1	0	100.00%	1
51	7842500000	1	0	100.00%	1
52	7756600001	1380	52	96.40%	1432
53	1390800005	25	1	96.20%	26
54	169653	36	3	92.30%	39
55	640713034	205	22	90.30%	227
56	1830200003	85	10	89.50%	95
57	1958100003	52	7	88.10%	59
58	1993734	1658	230	87.80%	1888
59	2041007	360	50	87.80%	410
60	2294709990	7	1	87.50%	8
61	1881185	1880	284	86.90%	2164
62	1917700009	370	58	86.40%	428
63	7069000008	790	145	84.50%	935
64	1556900003	74	14	84.10%	88
65	223039548	5	1	83.30%	6
66	2085300005	71	15	82.60%	86
67	1851400008	14	3	82.40%	17
68	7364800008	16	4	80.00%	20
69	7555300005	12	3	80.00%	15
70	7299000001	4	1	80.00%	5
71	2630	136	39	77.70%	175
72	23160	108	35	75.50%	143
73	1066700001	6	2	75.00%	8
74	1010930	3	1	75.00%	4
75	24095	17	6	73.90%	23
76	3394401	278	100	73.50%	378
77	1857500007	47	17	73.40%	64
78	481290152	11	4	73.30%	15
79	7943800003	45	17	72.60%	62
80	1958200004	46	19	70.80%	65
81	15044	49	22	69.00%	71
82	458600405	108	50	68.40%	158

83	14362	6	3	66.70%	9
84	931186856	4	2	66.70%	6
85	7158700003	4	2	66.70%	6
86	9007	2	1	66.70%	3
87	67389	2	1	66.70%	3
88	351887380	2	1	66.70%	3
89	7718200008	2	1	66.70%	3
90	2752527	307	160	65.70%	467
91	7162800002	71	37	65.70%	108
92	7568300002	22	13	62.90%	35
93	30118	5	3	62.50%	8
94	4856500006	510	314	61.90%	824
95	1557900001	29	19	60.40%	48
96	7185300006	162	107	60.20%	269
97	1261700007	50	33	60.20%	83
98	3802909995	9	6	60.00%	15
99	14470	58	40	59.20%	98
100	1991500005	98	68	59.00%	166
101	7971400001	7	5	58.30%	12
102	7875200001	581	419	58.10%	1000
103	1665100001	4	3	57.10%	7
104	26870	88	70	55.70%	158
105	1461	147	119	55.30%	266
106	1942602	238	200	54.30%	438
107	12504	137	118	53.70%	255
108	1534900004	219	196	52.80%	415
109	7892800004	50	47	51.50%	97
110	7071400009	32	31	50.80%	63
111	481290145	14	14	50.00%	28
112	14939	7	7	50.00%	14
113	2064900008	7	7	50.00%	14
114	3382538	4	4	50.00%	8
115	16892	3	3	50.00%	6
116	68215	2	2	50.00%	4
117	7771600006	2	2	50.00%	4
118	12004	1	1	50.00%	2
119	13918	1	1	50.00%	2
120	15909	1	1	50.00%	2
121	17094	1	1	50.00%	2
122	18297	1	1	50.00%	2
123	23957	1	1	50.00%	2
124	24645	1	1	50.00%	2
125	31084	1	1	50.00%	2
126	913940	1	1	50.00%	2

127	593151342	1	1	50.00%	2
128	7469500007	1	1	50.00%	2
129	7479600006	1	1	50.00%	2
130	7767800008	1	1	50.00%	2
131	22746	48	49	49.50%	97
132	5848	15	16	48.40%	31
133	233031	14	15	48.30%	29
134	1141000000	12	13	48.00%	25
135	4216200005	473	519	47.70%	992
136	7592700002	40	45	47.10%	85
137	14640	16	19	45.70%	35
138	6809	5	6	45.50%	11
139	14761	63	77	45.00%	140
140	12642	36	44	45.00%	80
141	2751810	410	521	44.00%	931
142	5536	21	27	43.80%	48
143	2971869	3	4	42.90%	7
144	1856900004	44	62	41.50%	106
145	25653	126	187	40.30%	313
146	24340	28	42	40.00%	70
147	2182409993	4	6	40.00%	10
148	26348	2	3	40.00%	5
149	61104540	134	205	39.50%	339
150	1405200006	86	136	38.70%	222
151	3919409997	24	38	38.70%	62
152	7233200004	5	8	38.50%	13
153	1750800001	8	13	38.10%	21
154	7604800006	177	291	37.80%	468
155	2738	9	15	37.50%	24
156	27423	6	10	37.50%	16
157	955809996	3	5	37.50%	8
158	16782	16	27	37.20%	43
159	1891200009	87	154	36.10%	241
160	15648	5	9	35.70%	14
161	2712969	5	9	35.70%	14
162	330703444	57	107	34.80%	164
163	7840	110	210	34.40%	320
164	13558	36	71	33.60%	107
165	34452	12	24	33.30%	36
166	3927	4	8	33.30%	12
167	22584	3	6	33.30%	9
168	857	2	4	33.30%	6
169	8045	2	4	33.30%	6
170	9343	2	4	33.30%	6

171	15054	1	2	33.30%	3
172	7152500000	1	2	33.30%	3
173	7515900008	25	51	32.90%	76
174	7900200006	110	229	32.40%	339
175	3000809992	82	175	31.90%	257
176	1259600009	74	161	31.50%	235
177	20448	5	11	31.30%	16
178	24189	16	37	30.20%	53
179	5962	3	7	30.00%	10
180	7927200007	10	24	29.40%	34
181	8475	7	17	29.20%	24
182	8529	7	17	29.20%	24
183	2360000005	4	10	28.60%	14
184	7794500000	2	5	28.60%	7
185	7784800005	13	33	28.30%	46
186	675332	118	304	28.00%	422
187	227	7	18	28.00%	25
188	7373400006	7	18	28.00%	25
189	24003	17	44	27.90%	61
190	8876	3	8	27.30%	11
191	66258	10	27	27.00%	37
192	1316	6	17	26.10%	23
193	16613	7	20	25.90%	27
194	1583600006	8	23	25.80%	31
195	1	707	2102	25.20%	2809
196	7197000003	47	141	25.00%	188
197	2281148	11	33	25.00%	44
198	31286	4	12	25.00%	16
199	2033300001	3	9	25.00%	12
200	1810000005	2	6	25.00%	8
201	7431	1	3	25.00%	4
202	13964	1	3	25.00%	4
203	17935	1	3	25.00%	4
204	26849	1	3	25.00%	4
205	7811300008	1	3	25.00%	4
206	7975	40	123	24.50%	163
207	3831400006	25	79	24.00%	104
208	1644643	815	2595	23.90%	3410
209	23446	47	150	23.90%	197
210	3970	72	231	23.80%	303
211	9846	690	2254	23.40%	2944
212	8412	20	66	23.30%	86
213	1088890	54	179	23.20%	233
214	15359	13	43	23.20%	56

215	7386700002	3	10	23.10%	13
216	1512400000	86	292	22.80%	378
217	1966578	17	58	22.70%	75
218	66310	245	843	22.50%	1088
219	1141600006	5	18	21.70%	23
220	11063	43	158	21.40%	201
221	8	185	687	21.20%	872
222	14191	26	98	21.00%	124
223	7292600000	31	120	20.50%	151
224	2736291	16	62	20.50%	78
225	8145	10	41	19.60%	51
226	34321	15	64	19.00%	79
227	7768100008	9	39	18.80%	48
228	7868600006	3	13	18.80%	16
229	1072246	243	1063	18.60%	1306
230	8953	56	245	18.60%	301
231	5135809997	57	254	18.30%	311
232	1623500007	6	27	18.20%	33
233	1741	627	2976	17.40%	3603
234	3039300	20	96	17.20%	116
235	13044	460	2246	17.00%	2706
236	24469	5	25	16.70%	30
237	1695	1	5	16.70%	6
238	23892	1	5	16.70%	6
239	1620300009	1	5	16.70%	6
240	15115	6	32	15.80%	38
241	7	4	22	15.40%	26
242	24438	4	22	15.40%	26
243	3228001	2	11	15.40%	13
244	33527	33	187	15.00%	220
245	1494240	35	201	14.80%	236
246	8083	12	70	14.60%	82
247	4728209997	7	41	14.60%	48
248	7909100002	35	215	14.00%	250
249	786	159	1004	13.70%	1163
250	3027509990	32	202	13.70%	234
251	1059700002	4	26	13.30%	30
252	28139	4	27	12.90%	31
253	1463600006	8	55	12.70%	63
254	1679800001	1	7	12.50%	8
255	7699300007	144	1049	12.10%	1193
256	3197134	68	500	12.00%	568
257	7979400002	29	216	11.80%	245
258	35365	9	73	11.00%	82

259	34348	8	65	11.00%	73
260	23748	1	9	10.00%	10
261	2888798	1	9	10.00%	10
262	3028209994	1	9	10.00%	10
263	24141	86	815	9.50%	901
264	7499100008	34	325	9.50%	359
265	1956000003	1	10	9.10%	11
266	1478900009	17	171	9.00%	188
267	8551	65	664	8.90%	729
268	11507	4	41	8.90%	45
269	24	12	126	8.70%	138
270	4410	13	139	8.60%	152
271	336	5	53	8.60%	58
272	7428900001	9	97	8.50%	106
273	7810600004	2	22	8.30%	24
274	7389300008	53	648	7.60%	701
275	2635086	12	146	7.60%	158
276	2317700005	5	63	7.40%	68
277	34454	3	39	7.10%	42
278	16799	6	83	6.70%	89
279	6069	43	748	5.40%	791
280	3197871	31	547	5.40%	578
281	542409990	6	114	5.00%	120
282	7516800003	2	38	5.00%	40
283	12267	10	197	4.80%	207
284	15019	8	185	4.10%	193
285	7291100002	6	145	4.00%	151
286	34903	1	26	3.70%	27
287	4072	7	187	3.60%	194
288	3177332	1	35	2.80%	36
289	7605000005	1	39	2.50%	40
290	1045600000	1	43	2.30%	44
291	2010300006	5	254	1.90%	259
292	1596200005	1	51	1.90%	52
293	57803	5	296	1.70%	301
294	2295609996	0	887	0.00%	887
295	8534	0	489	0.00%	489
296	24522	0	180	0.00%	180
297	390925	0	82	0.00%	82
298	7343000001	0	41	0.00%	41
299	7289300004	0	36	0.00%	36
300	57282	0	29	0.00%	29
301	18562	0	26	0.00%	26
302	7745	0	21	0.00%	21

303	1565900005	0	17	0.00%	17
304	17936	0	15	0.00%	15
305	63020	0	13	0.00%	13
306	66924	0	12	0.00%	12
307	501105	0	11	0.00%	11
308	7590700002	0	9	0.00%	9
309	15590	0	8	0.00%	8
310	16954	0	8	0.00%	8
311	24366	0	8	0.00%	8
312	1461700004	0	8	0.00%	8
313	6214	0	6	0.00%	6
314	2352507	0	6	0.00%	6
315	7006300002	0	6	0.00%	6
316	8569	0	5	0.00%	5
317	17969	0	5	0.00%	5
318	2276200003	0	5	0.00%	5
319	7893200005	0	5	0.00%	5
320	8399	0	4	0.00%	4
321	21098	0	4	0.00%	4
322	22995	0	4	0.00%	4
323	29561	0	4	0.00%	4
324	45627	0	4	0.00%	4
325	2723750	0	4	0.00%	4
326	1283400003	0	4	0.00%	4
327	7569700002	0	4	0.00%	4
328	8159	0	3	0.00%	3
329	8854	0	3	0.00%	3
330	66357	0	3	0.00%	3
331	424035	0	3	0.00%	3
332	593606823	0	3	0.00%	3
333	1522600000	0	3	0.00%	3
334	1635900004	0	3	0.00%	3
335	1809900002	0	3	0.00%	3
336	7280100005	0	3	0.00%	3
337	7545800001	0	3	0.00%	3
338	5500	0	2	0.00%	2
339	7937	0	2	0.00%	2
340	8043	0	2	0.00%	2
341	15100	0	2	0.00%	2
342	15504	0	2	0.00%	2
343	16941	0	2	0.00%	2
344	22458	0	2	0.00%	2
345	27552	0	2	0.00%	2
346	541101	0	2	0.00%	2

347	1216291	0	2	0.00%	2
348	1421161	0	2	0.00%	2
349	3103108	0	2	0.00%	2
350	3211759	0	2	0.00%	2
351	1392000005	0	2	0.00%	2
352	1411700003	0	2	0.00%	2
353	1868900005	0	2	0.00%	2
354	3447609992	0	2	0.00%	2
355	7042100008	0	2	0.00%	2
356	7081500008	0	2	0.00%	2
357	7184500000	0	2	0.00%	2
358	7815800008	0	2	0.00%	2
359	7952900006	0	2	0.00%	2
360	114	0	1	0.00%	1
361	435	0	1	0.00%	1
362	1644	0	1	0.00%	1
363	2036	0	1	0.00%	1
364	3385	0	1	0.00%	1
365	5224	0	1	0.00%	1
366	5380	0	1	0.00%	1
367	5551	0	1	0.00%	1
368	5588	0	1	0.00%	1
369	8149	0	1	0.00%	1
370	8186	0	1	0.00%	1
371	11307	0	1	0.00%	1
372	15985	0	1	0.00%	1
373	16249	0	1	0.00%	1
374	17022	0	1	0.00%	1
375	18261	0	1	0.00%	1
376	18616	0	1	0.00%	1
377	19307	0	1	0.00%	1
378	19861	0	1	0.00%	1
379	23494	0	1	0.00%	1
380	23828	0	1	0.00%	1
381	23877	0	1	0.00%	1
382	24063	0	1	0.00%	1
383	24665	0	1	0.00%	1
384	35095	0	1	0.00%	1
385	35214	0	1	0.00%	1
386	57725	0	1	0.00%	1
387	57888	0	1	0.00%	1
388	61759	0	1	0.00%	1
389	63425	0	1	0.00%	1
390	66325	0	1	0.00%	1

391	67955	0	1	0.00%	1
392	68095	0	1	0.00%	1
393	68287	0	1	0.00%	1
394	68441	0	1	0.00%	1
395	68486	0	1	0.00%	1
396	223322	0	1	0.00%	1
397	506922	0	1	0.00%	1
398	985620	0	1	0.00%	1
399	1095432	0	1	0.00%	1
400	1356535	0	1	0.00%	1
401	1434826	0	1	0.00%	1
402	2023218	0	1	0.00%	1
403	2788496	0	1	0.00%	1
404	43031982	0	1	0.00%	1
405	510312284	0	1	0.00%	1
406	521440906	0	1	0.00%	1
407	680550727	0	1	0.00%	1
408	1292000001	0	1	0.00%	1
409	1362200002	0	1	0.00%	1
410	1461400001	0	1	0.00%	1
411	1486300009	0	1	0.00%	1
412	1614900001	0	1	0.00%	1
413	1750100005	0	1	0.00%	1
414	7056000000	0	1	0.00%	1
415	7087500006	0	1	0.00%	1
416	7199500000	0	1	0.00%	1
417	7597300000	0	1	0.00%	1
418	7635500004	0	1	0.00%	1
419	7658800002	0	1	0.00%	1
420	7669000006	0	1	0.00%	1
421	7820500001	0	1	0.00%	1
422	7855000003	0	1	0.00%	1
423	7916500005	0	1	0.00%	1
Total		19476	37555		57031

\* Action Taken = Application denied by financial institution, Application withdrawn by applicant, File closed for incompleteness, or Preapproval request denied by financial institution

\*\* Action Taken = Loan originated, Application approved but not accepted, or Loan purchased by the institution

## APPENDIX B - SPSS FREQUENCY REPORTS

### Frequency Tables 2004

[DataSet3] E:\Sociology\Service\HMDA\HMDA2004\_RAW\_GSO-HP\_MSA.sav

#### As of Year

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2004.00	62290	100.0	100.0	100.0

#### Agency Code

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Office of the Comptroller of the Currency (OCC)	14967	24.0	24.0	24.0
Federal Reserve System (FRS)	7440	11.9	11.9	36.0
Federal Deposit Insurance Corporation (FDIC)	5997	9.6	9.6	45.6
Office of Thrift Supervision (OTS)	6233	10.0	10.0	55.6
National Credit Union Administration (NCUA)	1685	2.7	2.7	58.3
Department of Housing and Urban Development (HUD)	25968	41.7	41.7	100.0
Total	62290	100.0	100.0	

#### Loan Type

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Conventional	56880	91.3	91.3	91.3
FHA	4377	7.0	7.0	98.3
VA	976	1.6	1.6	99.9
FSA or RHS	57	.1	.1	100.0
Total	62290	100.0	100.0	

**Property Type**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	one to four family	58938	94.6	94.6	94.6
	Manufactured Housing	3298	5.3	5.3	99.9
	Multifamily	54	.1	.1	100.0
	Total	62290	100.0	100.0	

**Loan Purpose**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Purchase	23201	37.2	37.2	37.2
	Improvement	3451	5.5	5.5	42.8
	Refinance	35638	57.2	57.2	100.0
	Total	62290	100.0	100.0	

**Occupancy**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner Occupied	56544	90.8	90.8	90.8
	Not Owener Occupied	5448	8.7	8.7	99.5
	NA	298	.5	.5	100.0
	Total	62290	100.0	100.0	

**Preapproval**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Preapproval requested	1058	1.7	1.7	1.7
	Preapproval not reequested	6838	11.0	11.0	12.7
	NA	54394	87.3	87.3	100.0
	Total	62290	100.0	100.0	

**Action Type**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan Originated	26964	43.3	43.3	43.3
	Application Approved by not Accepted	3702	5.9	5.9	49.2
	Application denied by financial institution	14805	23.8	23.8	73.0
	Application withdrawn by applicant	6401	10.3	10.3	83.3
	File closed for incompleteness	1445	2.3	2.3	85.6
	Loan purchased by institution	8973	14.4	14.4	100.0
	Total	62290	100.0	100.0	

**Applicant Ethnicity**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	1625	2.6	2.6	2.6
	Non-Hispanic	40359	64.8	64.8	67.4
	DK	11778	18.9	18.9	86.3
	NA	8528	13.7	13.7	100.0
	Total	62290	100.0	100.0	

**Co Applicant Ethnicity**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	582	.9	.9	.9
	Non-Hispanic	17834	28.6	28.6	29.6
	DK	5491	8.8	8.8	38.4
	NA	6812	10.9	10.9	49.3
	No co-applicant	31571	50.7	50.7	100.0
	Total	62290	100.0	100.0	

**Applicant Race 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	368	.6	.6	.6
	Asian	930	1.5	1.5	2.1
	African American	10510	16.9	16.9	19.0
	Pacific Islander	159	.3	.3	19.2
	White	34182	54.9	54.9	74.1
	DK	10929	17.5	17.5	91.6
	NA	5212	8.4	8.4	100.0
	Total	62290	100.0	100.0	

**Applicant Race 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	4	.0	3.2	3.2
	Asian	7	.0	5.6	8.7
	African American	26	.0	20.6	29.4
	Pacific Islander	7	.0	5.6	34.9
	White	82	.1	65.1	100.0
	Total	126	.2	100.0	
Missing	System	62164	99.8		
Total		62290	100.0		

**Applicant Race 3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	1	.0	8.3	8.3
	African American	5	.0	41.7	50.0
	White	6	.0	50.0	100.0
	Total	12	.0	100.0	
Missing	System	62278	100.0		
Total		62290	100.0		

**Applicant Race 4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	African American	2	.0	40.0	40.0
	Pacific Islander	3	.0	60.0	100.0
	Total	5	.0	100.0	
Missing	System	62285	100.0		
Total		62290	100.0		

**Applicant Race 5**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asian	1	.0	25.0	25.0
	White	3	.0	75.0	100.0
	Total	4	.0	100.0	
Missing	System	62286	100.0		
Total		62290	100.0		

**Co Applicant Race 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	192	.3	.3	.3
	Asian	421	.7	.7	1.0
	African American	3465	5.6	5.6	6.5
	Pacific Islander	92	.1	.1	6.7
	White	16214	26.0	26.0	32.7
	DK	5139	8.3	8.3	41.0
	NA	5196	8.3	8.3	49.3
	No co-applicant	31571	50.7	50.7	100.0
	Total	62290	100.0	100.0	

**Co Applicant Race 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	1	.0	2.5	2.5
	Asian	2	.0	5.0	7.5
	African American	7	.0	17.5	25.0
	Pacific Islander	1	.0	2.5	27.5
	White	29	.0	72.5	100.0
	Total	40	.1	100.0	
Missing	System	62250	99.9		
Total		62290	100.0		

**Co Applicant Race 3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	African American	1	.0	50.0	50.0
	White	1	.0	50.0	100.0
	Total	2	.0	100.0	
Missing	System	62288	100.0		
Total		62290	100.0		

**Co Applicant Race 4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	African American	1	.0	50.0	50.0
	Pacific Islander	1	.0	50.0	100.0
	Total	2	.0	100.0	
Missing	System	62288	100.0		
Total		62290	100.0		

**Co Applicant Race 5**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	White	1	.0	100.0	100.0
Missing	System	62289	100.0		
Total		62290	100.0		

**Applicant Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	34937	56.1	65.6	65.6
	Female	18341	29.4	34.4	100.0
	Total	53278	85.5	100.0	
Missing	DK	4049	6.5		
	NA	4963	8.0		
	Total	9012	14.5		
Total		62290	100.0		

**Co Applicant Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	4843	7.8	21.1	21.1
	Female	18163	29.2	78.9	100.0
	Total	23006	36.9	100.0	
Missing	DK	2566	4.1		
	NA	5147	8.3		
	No co-applicant	31571	50.7		
	Total	39284	63.1		
Total		62290	100.0		

**Purchaser Type**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan was not originated or was not sold in calendar year covered by register	37912	60.9	60.9	60.9
	Fannie Mae (FNMA)	5205	8.4	8.4	69.2
	Ginnie Mae (GNMA)	2312	3.7	3.7	72.9
	Freddie Mac (FHLMC)	3753	6.0	6.0	79.0
	Private securitization	1225	2.0	2.0	80.9
	Commercial bank, savings bank or savings association	1669	2.7	2.7	83.6
	Life insurance company, credit union, mortgage bank, or finance company	1506	2.4	2.4	86.0
	Affiliate institution	1868	3.0	3.0	89.0
	Other type of purchaser	6840	11.0	11.0	100.0
	Total	62290	100.0	100.0	

**Denial Reason 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	1559	2.5	13.6	13.6
	Employment history	87	.1	.8	14.4
	Credit history	3880	6.2	33.8	48.2
	Collateral	1404	2.3	12.2	60.4
	Insufficient cash	151	.2	1.3	61.7
	Unverifiable information	198	.3	1.7	63.5
	Credit application incomplete	932	1.5	8.1	71.6
	Mortgage insurance denied	2	.0	.0	71.6
	Other	3257	5.2	28.4	100.0
	Total	11470	18.4	100.0	
Missing	System	50820	81.6		
Total		62290	100.0		

**Denial Reason 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	393	.6	20.3	20.3
	Employment history	43	.1	2.2	22.5
	Credit history	458	.7	23.7	46.2
	Collateral	357	.6	18.4	64.7
	Insufficient cash	103	.2	5.3	70.0
	Unverifiable information	48	.1	2.5	72.5
	Credit application incomplete	62	.1	3.2	75.7
	Mortgage insurance denied	2	.0	.1	75.8
	Other	469	.8	24.2	100.0
	Total	1935	3.1	100.0	
Missing	System	60355	96.9		
Total		62290	100.0		

**Denial Reason 3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	132	.2	25.7	25.7
	Employment history	26	.0	5.1	30.7
	Credit history	27	.0	5.3	36.0
	Collateral	33	.1	6.4	42.4
	Insufficient cash	23	.0	4.5	46.9
	Unverifiable information	16	.0	3.1	50.0
	Credit application incomplete	126	.2	24.5	74.5
	Mortgage insurance denied	1	.0	.2	74.7
	Other	130	.2	25.3	100.0
	Total	514	.8	100.0	
	Missing	System	61776	99.2	
Total		62290	100.0		

**HOEPA Status**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HOEPA loan	19	.0	.0	.0
	not HOEPA loan	62271	100.0	100.0	100.0
	Total	62290	100.0	100.0	

**Lien Status**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secured by a first lien	47758	76.7	76.7	76.7
	Secured by a subordinate lien	4719	7.6	7.6	84.2
	Not secured by a lien	840	1.3	1.3	85.6
	Not applicable (purchased loans)	8973	14.4	14.4	100.0
	Total	62290	100.0	100.0	

**HUD Median Family Income**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	55400.00	62290	100.0	100.0	100.0

**Application Date Prior 2004 Flag**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	49881	80.1	80.1	80.1
	Yes	3436	5.5	5.5	85.6
	NA	8973	14.4	14.4	100.0
	Total	62290	100.0	100.0	

**\$Race Frequencies**

		Responses		Percent of Cases
		N	Percent	
Race/ Ethnic Group( a)	American Indian	373	.6%	.6%
	Asian	938	1.5%	1.5%
	African American	10543	16.9%	16.9%
	Pacific Islander	169	.3%	.3%
	White	34273	54.9%	55.0%
	DK	10929	17.5%	17.5%
	NA	5212	8.3%	8.4%
Total		62437	100.0%	100.2%

a Group

**RaceX**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	251	.4	.5	.5
	Asian	888	1.4	1.9	2.4
	African American	10382	16.7	22.3	24.8
	Hispanic	1625	2.6	3.5	28.2
	Pacific Islander	83	.1	.2	28.4
	Non-Hispanic White	33194	53.3	71.3	99.7
	Multiracial	120	.2	.3	100.0
	Total	46543	74.7	100.0	
Missing	Missing or Don't Know	15747	25.3		
Total		62290	100.0		

## Frequency Tables 2005

[DataSet1] E:\Sociology\Service\HMDA\HMDA2005\_RAW\_GSO-HP\_MSA.sav

### As of Year

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2005.00	69503	100.0	100.0	100.0

### Agency Code

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Office of the Comptroller of the Currency (OCC)	16168	23.3	23.3	23.3
Federal Reserve System (FRS)	13932	20.0	20.0	43.3
Federal Deposit Insurance Corporation (FDIC)	5559	8.0	8.0	51.3
Office of Thrift Supervision (OTS)	7464	10.7	10.7	62.0
National Credit Union Administration (NCUA)	1581	2.3	2.3	64.3
Department of Housing and Urban Development (HUD)	24799	35.7	35.7	100.0
Total	69503	100.0	100.0	

### Loan Type

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Conventional	64925	93.4	93.4	93.4
FHA	3727	5.4	5.4	98.8
VA	829	1.2	1.2	100.0
FSA or RHS	22	.0	.0	100.0
Total	69503	100.0	100.0	

### Property Type

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid one to four family	66257	95.3	95.3	95.3
Manufactured Housing	3157	4.5	4.5	99.9
Multifamily	89	.1	.1	100.0
Total	69503	100.0	100.0	

### Loan Purpose

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Purchase	28248	40.6	40.6	40.6
	Improvement	4079	5.9	5.9	46.5
	Refinance	37176	53.5	53.5	100.0
	Total	69503	100.0	100.0	

### Occupancy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner Occupied	63041	90.7	90.7	90.7
	Not Owener Occupied	6137	8.8	8.8	99.5
	NA	325	.5	.5	100.0
	Total	69503	100.0	100.0	

### Preapproval

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Preapproval requested	1655	2.4	2.4	2.4
	Preapproval not reequested	8520	12.3	12.3	14.6
	NA	59328	85.4	85.4	100.0
	Total	69503	100.0	100.0	

### Action Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan Originated	29130	41.9	41.9	41.9
	Application Approved by not Accepted	4637	6.7	6.7	48.6
	Application denied by financial institution	15954	23.0	23.0	71.5
	Application withdrawn by applicant	7758	11.2	11.2	82.7
	File closed for incompleteness	1780	2.6	2.6	85.3
	Loan purchased by institution	10218	14.7	14.7	100.0
	Preapproval request denied by financial institution	26	.0	.0	100.0
	Total	69503	100.0	100.0	

**Applicant Ethnicity**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	2026	2.9	2.9	2.9
	Non-Hispanic	49670	71.5	71.5	74.4
	DK	11905	17.1	17.1	91.5
	NA	5902	8.5	8.5	100.0
	Total	69503	100.0	100.0	

**Co Applicant Ethnicity**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	700	1.0	1.0	1.0
	Non-Hispanic	21149	30.4	30.4	31.4
	DK	5040	7.3	7.3	38.7
	NA	5538	8.0	8.0	46.7
	No co-applicant	37076	53.3	53.3	100.0
	Total	69503	100.0	100.0	

**Applicant Race 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	369	.5	.5	.5
	Asian	1185	1.7	1.7	2.2
	African American	12362	17.8	17.8	20.0
	Pacific Islander	192	.3	.3	20.3
	White	37805	54.4	54.4	74.7
	DK	11870	17.1	17.1	91.8
	NA	5720	8.2	8.2	100.0
	Total	69503	100.0	100.0	

**Applicant Race 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	8	.0	4.4	4.4
	Asian	11	.0	6.1	10.6
	African American	31	.0	17.2	27.8
	Pacific Islander	10	.0	5.6	33.3
	White	120	.2	66.7	100.0
	Total	180	.3	100.0	
Missing	System	69323	99.7		
Total		69503	100.0		

**Applicant Race 3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	2	.0	22.2	22.2
	Asian	2	.0	22.2	44.4
	African American	1	.0	11.1	55.6
	White	4	.0	44.4	100.0
	Total	9	.0	100.0	
Missing	System	69494	100.0		
Total		69503	100.0		

**Applicant Race 4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asian	1	.0	100.0	100.0
Missing	System	69502	100.0		
Total		69503	100.0		

**Applicant Race 5**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	1	.0	100.0	100.0
Missing	System	69502	100.0		
Total		69503	100.0		

**Co Applicant Race 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	172	.2	.2	.2
	Asian	466	.7	.7	.9
	African American	3707	5.3	5.3	6.3
	Pacific Islander	91	.1	.1	6.4
	White	17543	25.2	25.2	31.6
	DK	5040	7.3	7.3	38.9
	NA	5408	7.8	7.8	46.7
	No co-applicant	37076	53.3	53.3	100.0
Total		69503	100.0	100.0	

**Co Applicant Race 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	2	.0	4.1	4.1
	Asian	1	.0	2.0	6.1
	African American	11	.0	22.4	28.6
	Pacific Islander	4	.0	8.2	36.7
	White	31	.0	63.3	100.0
	Total	49	.1	100.0	
Missing	System	69454	99.9		
Total		69503	100.0		

**Co Applicant Race 3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	1	.0	100.0	100.0
Missing	System	69502	100.0		
Total		69503	100.0		

**Co Applicant Race 4**

		Frequency	Percent
Missing	System	69503	100.0

**Co Applicant Race 5**

		Frequency	Percent
Missing	System	69503	100.0

**Applicant Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	37812	54.4	64.3	64.3
	Female	20955	30.1	35.7	100.0
	Total	58767	84.6	100.0	
Missing	DK	5090	7.3		
	NA	5646	8.1		
	Total	10736	15.4		
Total		69503	100.0		

**Co Applicant Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	5672	8.2	23.1	23.1
	Female	18889	27.2	76.9	100.0
	Total	24561	35.3	100.0	
Missing	DK	2491	3.6		
	NA	5375	7.7		
	No co-applicant	37076	53.3		
	Total	44942	64.7		
Total		69503	100.0		

**Purchaser Type**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan was not originated or was not sold in calendar year covered by register	43879	63.1	63.1	63.1
	Fannie Mae (FNMA)	4783	6.9	6.9	70.0
	Ginnie Mae (GNMA)	1789	2.6	2.6	72.6
	Freddie Mac (FHLMC)	3524	5.1	5.1	77.7
	Farmer Mac (FAMC)	2	.0	.0	77.7
	Private securitization	2342	3.4	3.4	81.0
	Commercial bank, savings bank or savings association	1663	2.4	2.4	83.4
	Life insurance company, credit union, mortgage bank, or finance company	2626	3.8	3.8	87.2
	Affiliate institution	3042	4.4	4.4	91.6
	Other type of purchaser	5853	8.4	8.4	100.0
	Total	69503	100.0	100.0	

**Denial Reason 1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	1163	1.7	11.0	11.0
	Employment history	75	.1	.7	11.7
	Credit history	3500	5.0	33.1	44.8
	Collateral	1274	1.8	12.0	56.9
	Insufficient cash	117	.2	1.1	58.0
	Unverifiable information	201	.3	1.9	59.9
	Credit application incomplete	881	1.3	8.3	68.2
	Mortgage insurance denied	3	.0	.0	68.2
	Other	3360	4.8	31.8	100.0
	Total	10574	15.2	100.0	
Missing	System	58929	84.8		
Total		69503	100.0		

**Denial Reason 2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	368	.5	18.9	18.9
	Employment history	32	.0	1.6	20.6
	Credit history	419	.6	21.5	42.1
	Collateral	323	.5	16.6	58.7
	Insufficient cash	82	.1	4.2	62.9
	Unverifiable information	54	.1	2.8	65.7
	Credit application incomplete	34	.0	1.7	67.4
	Mortgage insurance denied	1	.0	.1	67.5
	Other	633	.9	32.5	100.0
	Total	1946	2.8	100.0	
Missing	System	67557	97.2		
Total		69503	100.0		

### Denial Reason 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	65	.1	17.5	17.5
	Employment history	8	.0	2.2	19.6
	Credit history	40	.1	10.8	30.4
	Collateral	93	.1	25.0	55.4
	Insufficient cash	28	.0	7.5	62.9
	Unverifiable information	18	.0	4.8	67.7
	Credit application incomplete	14	.0	3.8	71.5
	Other	106	.2	28.5	100.0
	Total	372	.5	100.0	
Missing	System	69131	99.5		
Total		69503	100.0		

### HOEPA Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HOEPA loan	35	.1	.1	.1
	not HOEPA loan	69468	99.9	99.9	100.0
	Total	69503	100.0	100.0	

### Lien Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secured by a first lien	50549	72.7	72.7	72.7
	Secured by a subordinate lien	8021	11.5	11.5	84.3
	Not secured by a lien	715	1.0	1.0	85.3
	Not applicable (purchased loans)	10218	14.7	14.7	100.0
	Total	69503	100.0	100.0	

### HUD Median Family Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	55400.00	69503	100.0	100.0	100.0

**Application Date Prior 2004 Flag**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	59264	85.3	85.3	85.3
	Yes	21	.0	.0	85.3
	NA	10218	14.7	14.7	100.0
	Total	69503	100.0	100.0	

**Approved**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Approved	25518	36.7	36.7	36.7
	Approved	43985	63.3	63.3	100.0
	Total	69503	100.0	100.0	

**\$Race Frequencies**

		Responses		Percent of Cases
		N	Percent	
Race( a)	American Indian	380	.5%	.5%
	Asian	1199	1.7%	1.7%
	African American	12394	17.8%	17.8%
	Pacific Islander	202	.3%	.3%
	White	37929	54.4%	54.6%
	DK	11870	17.0%	17.1%
	NA	5720	8.2%	8.2%
Total		69694	100.0%	100.3%

a Group

**RaceX**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asian	1129	1.6	2.2	2.2
	African American	12174	17.5	23.4	25.6
	Hispanic	2026	2.9	3.9	29.5
	Pacific Islander	110	.2	.2	29.7
	Non-Hispanic White	36332	52.3	69.9	99.7
	Multiracial	169	.2	.3	100.0
	Total	51940	74.7	100.0	
Missing	Missing or Don't Know	17331	24.9		
	System	232	.3		
Total		17563	25.3		
Total		69503	100.0		

## Frequency Tables 2006

[DataSet2] E:\Sociology\Service\HMDA\HMDA2006\_RAW\_GSO-HP\_MSA.sav

### Year

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2006.00	65790	100.0	100.0	100.0

### Agency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Office of the Comptroller of the Currency (OCC)	18467	28.1	28.1	28.1
	Federal Reserve System (FRS)	14221	21.6	21.6	49.7
	Federal Deposit Insurance Corporation (FDIC)	5665	8.6	8.6	58.3
	Office of Thrift Supervision (OTS)	5344	8.1	8.1	66.4
	National Credit Union Administration (NCUA)	1709	2.6	2.6	69.0
	Department of Housing and Urban Development (HUD)	20384	31.0	31.0	100.0
	Total	65790	100.0	100.0	

### Loan\_Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Conventional	61459	93.4	93.4	93.4
	FHA	3634	5.5	5.5	98.9
	VA	670	1.0	1.0	100.0
	FSA or RHS	27	.0	.0	100.0
	Total	65790	100.0	100.0	

### Property\_Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	one to four family	63160	96.0	96.0	96.0
	Manufactured Housing	2570	3.9	3.9	99.9
	Multifamily	60	.1	.1	100.0
	Total	65790	100.0	100.0	

**Purpose**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Purchase	29488	44.8	44.8	44.8
	Improvement	3650	5.5	5.5	50.4
	Refinance	32652	49.6	49.6	100.0
	Total	65790	100.0	100.0	

**Occupancy**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Owner Occupied	58945	89.6	89.6	89.6
	Not Owener Occupied	6629	10.1	10.1	99.7
	NA	216	.3	.3	100.0
	Total	65790	100.0	100.0	

**Preapproval**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Preapproval requested	1196	1.8	1.8	1.8
	Preapproval not reequested	9692	14.7	14.7	16.5
	NA	54902	83.5	83.5	100.0
	Total	65790	100.0	100.0	

**Action**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan Originated	27717	42.1	42.1	42.1
	Application Approved by not Accepted	4573	7.0	7.0	49.1
	Application denied by financial institution	14552	22.1	22.1	71.2
	Application withdrawn by applicant	5897	9.0	9.0	80.2
	File closed for incompleteness	1817	2.8	2.8	82.9
	Loan purchased by institution	11227	17.1	17.1	100.0
	Preapproval request denied by financial institution	7	.0	.0	100.0
	Total	65790	100.0	100.0	

**Purchaser\_Type**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Loan was not originated or was not sold in calendar year covered by register	40938	62.2	62.2	62.2
	Fannie Mae (FNMA)	4454	6.8	6.8	69.0
	Ginnie Mae (GNMA)	1664	2.5	2.5	71.5
	Freddie Mac (FHLMC)	3262	5.0	5.0	76.5
	Private securitization	2366	3.6	3.6	80.1
	Commercial bank, savings bank or savings association	1629	2.5	2.5	82.6
	Life insurance company, credit union, mortgage bank, or finance company	2860	4.3	4.3	86.9
	Affiliate institution	3102	4.7	4.7	91.6
	Other type of purchaser	5515	8.4	8.4	100.0
	Total	65790	100.0	100.0	

**Approved**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Denied or Incomplete	22273	33.9	33.9	33.9
	Approved	43517	66.1	66.1	100.0
	Total	65790	100.0	100.0	

**Denial\_reason1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	1451	2.2	16.3	16.3
	Employment history	80	.1	.9	17.2
	Credit history	3198	4.9	36.0	53.2
	Collateral	1377	2.1	15.5	68.7
	Insufficient cash	132	.2	1.5	70.2
	Unverifiable information	205	.3	2.3	72.5
	Credit application incomplete	476	.7	5.4	77.9
	Mortgage insurance denied	5	.0	.1	78.0
	Other	1958	3.0	22.0	100.0
	Total	8882	13.5	100.0	
Missing	System	56908	86.5		
Total		65790	100.0		

**Denial\_reason2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	417	.6	18.8	18.8
	Employment history	24	.0	1.1	19.9
	Credit history	542	.8	24.4	44.3
	Collateral	308	.5	13.9	58.2
	Insufficient cash	123	.2	5.5	63.8
	Unverifiable information	54	.1	2.4	66.2
	Credit application incomplete	35	.1	1.6	67.8
	Mortgage insurance denied	3	.0	.1	67.9
	Other	712	1.1	32.1	100.0
	Total	2218	3.4	100.0	
Missing	System	63572	96.6		
Total		65790	100.0		

#### Denial\_reason3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Debt-to-income ratio	40	.1	10.3	10.3
	Employment history	9	.0	2.3	12.6
	Credit history	62	.1	16.0	28.6
	Collateral	114	.2	29.4	58.0
	Insufficient cash	32	.0	8.2	66.2
	Unverifiable information	12	.0	3.1	69.3
	Credit application incomplete	16	.0	4.1	73.5
	Mortgage insurance denied	1	.0	.3	73.7
	Other	102	.2	26.3	100.0
	Total	388	.6	100.0	
Missing	System	65402	99.4		
Total		65790	100.0		

#### Non\_White

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	White	35479	53.9	72.1	72.1
	Non-white	13760	20.9	27.9	100.0
	Total	49239	74.8	100.0	
Missing	System	16551	25.2		
Total		65790	100.0		

#### Non-Hispanic White

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other	15261	23.2	31.0	31.0
	Non-Hispanic White	33978	51.6	69.0	100.0
	Total	49239	74.8	100.0	
Missing	System	16551	25.2		
Total		65790	100.0		

**Hispanic**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	63793	97.0	97.0	97.0
	1.00	1997	3.0	3.0	100.0
Total		65790	100.0	100.0	

**NativeAmerican**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	65530	99.6	99.6	99.6
	1.00	260	.4	.4	100.0
Total		65790	100.0	100.0	

**Asian**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	64740	98.4	98.4	98.4
	1.00	1050	1.6	1.6	100.0
Total		65790	100.0	100.0	

**AfricanAmerican**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	53782	81.7	81.7	81.7
	1.00	12008	18.3	18.3	100.0
Total		65790	100.0	100.0	

**PacificIsInd**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid .00	65621	99.7	99.7	99.7
1.00	169	.3	.3	100.0
Total	65790	100.0	100.0	

**Multiracial**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid no	65610	99.7	99.7	99.7
Multiracial	180	.3	.3	100.0
Total	65790	100.0	100.0	

**RaceX**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid American Indian	124	.2	.3	.3
Asian	1020	1.6	2.1	2.3
African American	11852	18.0	24.1	26.4
Hispanic	1995	3.0	4.1	30.4
Pacific Islander	104	.2	.2	30.7
Non-Hispanic White	33978	51.6	69.0	99.7
Multiracial	166	.3	.3	100.0
Total	49239	74.8	100.0	
Missing Missing or Don't Know	16551	25.2		
Total	65790	100.0		

**Ethnicity**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Hispanic	1997	3.0	3.0	3.0
Non-Hispanic	47342	72.0	72.0	75.0
DK	9335	14.2	14.2	89.2
NA	7116	10.8	10.8	100.0
Total	65790	100.0	100.0	

**Coapp\_Ethnicity**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Hispanic	673	1.0	1.0	1.0
	Non-Hispanic	19676	29.9	29.9	30.9
	DK	4244	6.5	6.5	37.4
	NA	6073	9.2	9.2	46.6
	No co-applicant	35124	53.4	53.4	100.0
	Total	65790	100.0	100.0	

**Race1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	260	.4	.4	.4
	Asian	1050	1.6	1.6	2.0
	African American	12008	18.3	18.3	20.2
	Pacific Islander	169	.3	.3	20.5
	White	35493	53.9	53.9	74.4
	DK	10022	15.2	15.2	89.7
	NA	6788	10.3	10.3	100.0
	Total	65790	100.0	100.0	

**Race2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	8	.0	4.5	4.5
	Asian	21	.0	11.9	16.5
	African American	29	.0	16.5	33.0
	Pacific Islander	9	.0	5.1	38.1
	White	109	.2	61.9	100.0
	Total	176	.3	100.0	
Missing	System	65614	99.7		
Total		65790	100.0		

**Race3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	1	.0	4.5	4.5
	African American	11	.0	50.0	54.5
	Pacific Islander	1	.0	4.5	59.1
	White	9	.0	40.9	100.0
	Total	22	.0	100.0	
Missing	System	65768	100.0		
Total		65790	100.0		

**Race4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pacific Islander	8	.0	100.0	100.0
Missing	System	65782	100.0		
Total		65790	100.0		

**Race5**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Asian	1	.0	9.1	9.1
	White	10	.0	90.9	100.0
	Total	11	.0	100.0	
Missing	System	65779	100.0		
Total		65790	100.0		

**Coapp\_Race1**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	93	.1	.1	.1
	Asian	387	.6	.6	.7
	African American	3705	5.6	5.6	6.4
	Pacific Islander	88	.1	.1	6.5
	White	16063	24.4	24.4	30.9
	DK	4489	6.8	6.8	37.7
	NA	5841	8.9	8.9	46.6
	No co-applicant	35124	53.4	53.4	100.0
Total		65790	100.0	100.0	

**Coapp\_Race2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	American Indian	3	.0	4.8	4.8
	Asian	15	.0	24.2	29.0
	African American	3	.0	4.8	33.9
	Pacific Islander	1	.0	1.6	35.5
	White	40	.1	64.5	100.0
	Total	62	.1	100.0	
Missing	System	65728	99.9		
Total		65790	100.0		

**Coapp\_Race3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	African American	6	.0	75.0	75.0
	White	2	.0	25.0	100.0
	Total	8	.0	100.0	
Missing	System	65782	100.0		
Total		65790	100.0		

**Coapp\_Race4**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pacific Islander	6	.0	85.7	85.7
	White	1	.0	14.3	100.0
	Total	7	.0	100.0	
Missing	System	65783	100.0		
Total		65790	100.0		

**Coapp\_Race5**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	White	8	.0	100.0	100.0
Missing	System	65782	100.0		
Total		65790	100.0		

**Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	34823	52.9	64.2	64.2
	Female	19378	29.5	35.8	100.0
	Total	54201	82.4	100.0	
Missing	DK	4805	7.3		
	NA	6784	10.3		
	Total	11589	17.6		
Total		65790	100.0		

**Coapp\_Sex**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	5190	7.9	23.4	23.4
	Female	16993	25.8	76.6	100.0
	Total	22183	33.7	100.0	
Missing	DK	2638	4.0		
	NA	5845	8.9		
	No co-applicant	35124	53.4		
	Total	43607	66.3		
Total		65790	100.0		

**HOEPASatus**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	HOEPA loan	7	.0	.0	.0
	not HOEPA loan	65783	100.0	100.0	100.0
Total		65790	100.0	100.0	

**LienStatus**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Secured by a first lien	44518	67.7	67.7	67.7
	Secured by a subordinate lien	9378	14.3	14.3	81.9
	Not secured by a lien	667	1.0	1.0	82.9
	Not applicable (purchased loans)	11227	17.1	17.1	100.0
	Total	65790	100.0	100.0	

**HUD\_Medfaminc**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	56400.00	65790	100.0	100.0	100.0

**Appdatepre2004**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	54554	82.9	82.9	82.9
	Yes	9	.0	.0	82.9
	NA	11227	17.1	17.1	100.0
	Total	65790	100.0	100.0	

**Approved \* Preapproval Requested Crosstabulation**

Count

		Preapproval Requested		Total
		.00	1.00	
Approved	Denied or Incomplete	2100	173	2273
	Approved	7592	1023	8615
Total		9692	1196	10888

**Preapproval \* Approved Crosstabulation**

			Approved		Total
			Denied or Incomplete	Approved	
Preapproval	Preapproval requested	Count	173	1023	1196
		% within Preapproval	14.5%	85.5%	100.0%
	Preapproval not reequested	Count	2100	7592	9692
		% within Preapproval	21.7%	78.3%	100.0%
	NA	Count	20000	34902	54902
		% within Preapproval	36.4%	63.6%	100.0%
Total		Count	22273	43517	65790
		% within Preapproval	33.9%	66.1%	100.0%

## APPENDIX C - LOGISITC REGRESSION MODELS

### Logistic Regression - Model 1 Centered

[DataSet1] E:\Sociology\Service\HMDA\HMDA2006\_RAW\_GSO-HP\_MSA.sav

#### Case Processing Summary

Unweighted Cases(a)		N	Percent
Selected Cases	Included in Analysis	47004	71.4
	Missing Cases	18786	28.6
	Total	65790	100.0
Unselected Cases		0	.0
Total		65790	100.0

a. If weight is in effect, see classification table for the total number of cases.

#### Dependent Variable Encoding

Original Value	Internal Value
Denied or Incomplete	0
Approved	1

### Block 0: Beginning Block

#### Classification Table(a,b)

Observed			Predicted		Percentage Correct
			Approved		
	Denied or Incomplete	Approved	Denied or Incomplete	Approved	
Step 0	Approved	Denied or Incomplete	0	16164	.0
		Approved	0	30840	100.0
Overall Percentage					65.6

a. Constant is included in the model.

b. The cut value is .500

#### Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	.646	.010	4426.173	1	.000	1.908

**Variables not in the Equation**

			Score	df	Sig.
Step 0	Variables	purposex	3598.244	1	.000
		notocc	148.915	1	.000
		notonetofourfam	336.475	1	.000
		NonConventional	469.669	1	.000
		AmountCentered	52.556	1	.000
Overall Statistics			4358.804	5	.000

**Block 1: Method = Enter**

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	4578.990	5	.000
	Block	4578.990	5	.000
	Model	4578.990	5	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	55922.605(a)	.093	.128

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

**Classification Table(a)**

Observed			Predicted		
			Approved		Percentage Correct
			Denied or Incomplete	Approved	
Step 1	Approved	Denied or Incomplete	524	15640	3.2
		Approved	368	30472	98.8
Overall Percentage					65.9

a The cut value is .500

**Variables in the Equation**

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a) purposex	-1.223	.022	3157.673	1	.000	.294
notocc	.357	.037	91.636	1	.000	1.429
notonetofourfam	-1.129	.048	562.564	1	.000	.323
NonConventional	.795	.051	244.763	1	.000	2.214
AmountCentered	.000	.000	1.196	1	.274	1.000
Constant	15.190	12.654	1.441	1	.230	3954754.779

a Variable(s) entered on step 1: purposex, notocc, notonetofourfam, NonConventional, AmountCentered.

**Block 2: Method = Enter**

**Omnibus Tests of Model Coefficients**

	Chi-square	df	Sig.
Step 1 Step	1064.494	5	.000
Block	1064.494	5	.000
Model	5643.483	10	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	54858.111(a)	.113	.156

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

**Classification Table(a)**

		Predicted		Percentage Correct
		Denied or Incomplete	Approved	
Step 1	Observed Approved	4781	11383	29.6
	Observed Denied or Incomplete	3640	27200	88.2
Overall Percentage				68.0

a The cut value is .500

**Variables in the Equation**

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposex	-1.191	.022	2908.134	1	.000	.304
	notocc	.551	.039	202.694	1	.000	1.734
	notonetofourfam	-1.066	.049	480.852	1	.000	.344
	NonConventional	.877	.051	295.275	1	.000	2.404
	AmountCentered	-.001	.000	48.659	1	.000	.999
	PopulationCen	.000	.000	13.410	1	.000	1.000
	Percent_MinCen	-.008	.001	157.472	1	.000	.992
	Tract_to_MSA_incCen	.009	.001	248.749	1	.000	1.009
	OwnerOCCunitsCen	.000	.000	22.293	1	.000	1.000
	One_to_four_famunitsCen	.000	.000	1.856	1	.173	1.000
	Constant	-92.257	13.414	47.305	1	.000	.000

a Variable(s) entered on step 1: PopulationCen, Percent\_MinCen, Tract\_to\_MSA\_incCen, OwnerOCCunitsCen, One\_to\_four\_famunitsCen.

**Block 3: Method = Enter**

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	1049.541	3	.000
	Block	1049.541	3	.000
	Model	6693.024	13	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	53808.570(a)	.133	.183

a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

**Classification Table(a)**

		Predicted			
		Approved		Percentage Correct	
		Denied or Incomplete	Approved		
Step 1	Observed Approved	Denied or Incomplete	5310	10854	32.9
		Approved	3505	27335	88.6
Overall Percentage					69.5

a The cut value is .500

**Variables in the Equation**

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)						
purposex	-1.227	.022	3004.759	1	.000	.293
notocc	.320	.040	62.799	1	.000	1.377
notonetofourfam	-1.084	.049	486.472	1	.000	.338
NonConventional	.964	.051	352.216	1	.000	2.623
AmountCentered	-.002	.000	215.153	1	.000	.998
PopulationCen	.000	.000	3.955	1	.047	1.000
Percent_MinCen	-.001	.001	1.980	1	.159	.999
Tract_to_MSA_incCen	.009	.001	202.992	1	.000	1.009
OwnerOCCunitsCen	.000	.000	6.719	1	.010	1.000
One_to_four_famunitsCen	.000	.000	.305	1	.581	1.000
SexF	-.129	.022	34.181	1	.000	.879
Non_White	-.635	.026	617.825	1	.000	.530
IncomeXCen	.004	.000	220.369	1	.000	1.004
Constant						10082781
	43.757	17.251	6.434	1	.011	03019115
						0000.000

a Variable(s) entered on step 1: SexF, Non\_White, IncomeXCen.

**Logistic Regression - Model 2 Centered**

[DataSet1] E:\Sociology\Service\HMDA\HMDA2006\_RAW\_GSO-HP\_MSA.sav

**Case Processing Summary**

Unweighted Cases(a)		N	Percent
Selected Cases	Included in Analysis	51773	78.7
	Missing Cases	14017	21.3
	Total	65790	100.0
Unselected Cases		0	.0
Total		65790	100.0

a If weight is in effect, see classification table for the total number of cases.

**Dependent Variable Encoding**

Original Value	Internal Value
Denied or Incomplete	0
Approved	1

**Block 0: Beginning Block**

**Classification Table(a,b)**

Observed			Predicted		Percentage Correct
			Approved		
			Denied or Incomplete	Approved	
Step 0	Approved	Denied or Incomplete	0	18878	.0
		Approved	0	32895	100.0
Overall Percentage					63.5

a Constant is included in the model.  
 b The cut value is .500

**Variables in the Equation**

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	.555	.009	3698.917	1	.000	1.743

**Variables not in the Equation**

			Score	df	Sig.
Step 0	Variables	purposesex	4487.136	1	.000
		notocc	203.362	1	.000
		notonetofourfam	258.329	1	.000
		NonConventional	555.267	1	.000
		AmountCentered	33.936	1	.000
Overall Statistics			5222.938	5	.000

**Block 1: Method = Enter**

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	5511.888	5	.000
	Block	5511.888	5	.000
	Model	5511.888	5	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	62417.997(a)	.101	.138

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

**Classification Table(a)**

Observed			Predicted		Percentage Correct
			Approved		
			Denied or Incomplete	Approved	
Step 1	Approved	Denied or Incomplete	554	18324	2.9
		Approved	391	32504	98.8
	Overall Percentage				63.9

a The cut value is .500

**Variables in the Equation**

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposesex	-1.298	.021	3920.913	1	.000	.273
	notocc	.386	.036	115.732	1	.000	1.470
	notonetofourfam	-1.061	.047	519.641	1	.000	.346
	NonConventional	.800	.049	264.491	1	.000	2.226
	AmountCentered	.000	.000	.039	1	.844	1.000
	Constant	-1.033	11.952	.007	1	.931	.356

a Variable(s) entered on step 1: purposesex, notocc, notonetofourfam, NonConventional, AmountCentered.

## Block 2: Method = Enter

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	1250.973	5	.000
	Block	1250.973	5	.000
	Model	6762.861	10	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	61167.023(a)	.122	.168

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

**Classification Table(a)**

Observed			Predicted		Percentage Correct
			Approved		
			Denied or Incomplete	Approved	
Step 1	Approved	Denied or Incomplete	8200	10678	43.4
		Approved	6096	26799	81.5
Overall Percentage					67.6

a The cut value is .500

**Variables in the Equation**

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposesex	-1.261	.021	3595.589	1	.000	.283
	notocc	.575	.037	240.506	1	.000	1.778
	notonetofourfam	-1.002	.047	444.666	1	.000	.367
	NonConventional	.884	.049	318.869	1	.000	2.420
	AmountCentered	-.001	.000	80.770	1	.000	.999
	PopulationCen	.000	.000	17.047	1	.000	1.000
	Percent_MinCen	-.008	.001	188.368	1	.000	.992
	Tract_to_MSA_incCen	.009	.001	291.621	1	.000	1.010
	OwnerOCCunitsCen	.000	.000	28.097	1	.000	1.000
	One_to_four_famunitsCen	.000	.000	2.298	1	.130	1.000
	Constant	-114.877	12.924	79.007	1	.000	.000

a Variable(s) entered on step 1: PopulationCen, Percent\_MinCen, Tract\_to\_MSA\_incCen, OwnerOCCunitsCen, One\_to\_four\_famunitsCen.

### Block 3: Method = Enter

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	782.868	6	.000
	Block	782.868	6	.000
	Model	7545.730	16	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	60384.155(a)	.136	.186

a Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

**Classification Table(a)**

Observed			Predicted		Percentage Correct
			Approved		
			Denied or Incomplete	Approved	
Step 1	Approved	Denied or Incomplete	8046	10832	42.6
		Approved	5303	27592	83.9
Overall Percentage					68.8

a The cut value is .500

**Variables in the Equation**

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposesex	-1.302	.021	3709.353	1	.000	.272
	notocc	.383	.039	98.680	1	.000	1.467
	notonetofourfam	-1.004	.048	439.909	1	.000	.367
	NonConventional	.966	.050	377.185	1	.000	2.627
	AmountCentered	-.002	.000	261.342	1	.000	.998
	PopulationCen	.000	.000	8.527	1	.004	1.000
	Percent_MinCen	-.004	.001	30.781	1	.000	.996
	Tract_to_MSA_incCen	.009	.001	245.040	1	.000	1.009
	OwnerOCCunitsCen	.000	.000	15.199	1	.000	1.000
	One_to_four_famunitsCen	.000	.000	1.085	1	.298	1.000
	SexF	-.130	.021	39.121	1	.000	.878
	Hispanic	-.321	.055	34.450	1	.000	.725
	Asian	-.263	.073	12.844	1	.000	.769
	AfricanAmerican	-.490	.026	360.587	1	.000	.613
	Other	-.041	.102	.161	1	.689	.960
	IncomeXCen	.003	.000	213.772	1	.000	1.003
	Constant	-.184	16.129	.000	1	.991	.832

a Variable(s) entered on step 1: SexF, Hispanic, Asian, AfricanAmerican, Other, IncomeXCen.

## Logistic Regression - Model 3 Centered

[DataSet1] E:\Sociology\Service\HMDA\HMDA2006\_RAW\_GSO-HP\_MSA.sav

### Case Processing Summary

Unweighted Cases(a)		N	Percent
Selected Cases	Included in Analysis	51773	78.7
	Missing Cases	14017	21.3
	Total	65790	100.0
Unselected Cases		0	.0
Total		65790	100.0

a. If weight is in effect, see classification table for the total number of cases.

### Dependent Variable Encoding

Original Value	Internal Value
Denied or Incomplete	0
Approved	1

## Block 0: Beginning Block

Classification Table(a,b)

Observed			Predicted		
			Approved		Percentage Correct
			Denied or Incomplete	Approved	
Step 0	Approved	Denied or Incomplete	0	18878	.0
		Approved	0	32895	100.0
Overall Percentage					63.5

a. Constant is included in the model.

b. The cut value is .500

### Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Step 0 Constant	.555	.009	3698.917	1	.000	1.743

**Variables not in the Equation**

			Score	df	Sig.
Step 0	Variables	purposex	4487.136	1	.000
		notocc	203.362	1	.000
		notonetofourfam	258.329	1	.000
		NonConventional	555.267	1	.000
	Overall Statistics		5222.931	4	.000

**Block 1: Method = Enter**

**Omnibus Tests of Model Coefficients**

		Chi-square	df	Sig.
Step 1	Step	5511.849	4	.000
	Block	5511.849	4	.000
	Model	5511.849	4	.000

**Model Summary**

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	62418.035(a)	.101	.138

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

**Classification Table(a)**

Observed		Predicted		Percentage Correct	
		Approved			
		Denied or Incomplete	Approved		
Step 1	Approved	Denied or Incomplete	545	18333	2.9
		Approved	380	32515	98.8
	Overall Percentage				63.9

a The cut value is .500

**Variables in the Equation**

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposex	-1.297	.021	3941.867	1	.000	.273
	notocc	.386	.036	116.960	1	.000	1.471
	notonetofourfam	-1.060	.046	525.229	1	.000	.346
	NonConventional	.800	.049	264.464	1	.000	2.226
	Constant	1.315	.018	5534.765	1	.000	3.725

a Variable(s) entered on step 1: purposex, notocc, notonetofourfam, NonConventional.

## Block 2: Method = Enter

### Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	1166.727	4	.000
	Block	1166.727	4	.000
	Model	6678.577	8	.000

### Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	61251.308(a)	.121	.166

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

### Classification Table(a)

Observed		Predicted			
		Approved		Percentage Correct	
		Denied or Incomplete	Approved		
Step 1	Approved	Denied or Incomplete	8025	10853	42.5
		Approved	6059	26836	81.6
Overall Percentage					67.3

a The cut value is .500

### Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposesex	-1.249	.021	3550.606	1	.000	.287
	notocc	.592	.037	255.987	1	.000	1.808
	notonetofourfam	-.959	.047	412.998	1	.000	.383
	NonConventional	.872	.049	311.548	1	.000	2.392
	PopulationCen	.000	.000	31.443	1	.000	1.000
	Percent_MinCen	-.008	.001	188.310	1	.000	.992
	Tract_to_MSA_incCen	.008	.000	441.166	1	.000	1.008
	OwnerOCCunitsCen	.000	.000	47.647	1	.000	1.000
	Constant	1.276	.018	5094.003	1	.000	3.582

a Variable(s) entered on step 1: PopulationCen, Percent\_MinCen, Tract\_to\_MSA\_incCen, OwnerOCCunitsCen.

### Block 3: Method = Enter

#### Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	495.241	5	.000
	Block	495.241	5	.000
	Model	7173.817	13	.000

#### Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	60756.067(a)	.129	.177

a Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

#### Classification Table(a)

Observed		Predicted		Percentage Correct
		Denied or Incomplete	Approved	
Step 1	Approved	7418	11460	39.3
	Denied or Incomplete	5150	27745	84.3
Overall Percentage				67.9

a The cut value is .500

#### Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposesex	-1.276	.021	3612.786	1	.000	.279
	notocc	.550	.037	218.446	1	.000	1.733
	notonetofourfam	-.982	.048	427.537	1	.000	.374
	NonConventional	.905	.050	332.584	1	.000	2.471
	PopulationCen	.000	.000	18.379	1	.000	1.000
	Percent_MinCen	-.003	.001	29.373	1	.000	.997
	Tract_to_MSA_incCen	.008	.000	460.065	1	.000	1.008
	OwnerOCCunitsCen	.000	.000	30.269	1	.000	1.000
	SexF	-.150	.021	53.455	1	.000	.861
	Hispanic	-.333	.055	37.194	1	.000	.717
	Asian	-.278	.073	14.521	1	.000	.757
	AfricanAmerican	-.510	.026	395.001	1	.000	.600
	Other	-.039	.101	.146	1	.702	.962
	Constant	1.486	.021	4933.558	1	.000	4.418

a Variable(s) entered on step 1: SexF, Hispanic, Asian, AfricanAmerican, Other.

## Block 4: Method = Enter

### Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	787.189	1	.000
	Block	787.189	1	.000
	Model	7961.007	14	.000

### Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	59968.878(a)	.143	.195

a Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

### Classification Table(a)

Observed		Predicted			
		Approved		Percentage Correct	
		Denied or Incomplete	Approved		
Step 1	Approved	Denied or Incomplete	7934	10944	42.0
		Approved	5070	27825	84.6
Overall Percentage					69.1

a The cut value is .500

### Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	purposex	-1.326	.022	3787.051	1	.000	.266
	notocc	.374	.038	97.153	1	.000	1.454
	notonetofourfam	-1.040	.048	472.386	1	.000	.353
	NonConventional	1.053	.050	439.966	1	.000	2.866
	PopulationCen	.000	.000	12.992	1	.000	1.000
	Percent_MinCen	-.004	.001	32.383	1	.000	.996
	Tract_to_MSA_incCen	.008	.000	443.895	1	.000	1.008
	OwnerOCCunitsCen	.000	.000	24.218	1	.000	1.000
	SexF	-.102	.021	24.099	1	.000	.903
	Hispanic	-.300	.055	29.832	1	.000	.741
	Asian	-.253	.074	11.845	1	.001	.776
	AfricanAmerican	-.487	.026	354.029	1	.000	.614
	Other	-.047	.102	.210	1	.646	.954
	loan2income	-.211	.008	720.446	1	.000	.810
	Constant	1.920	.027	5006.501	1	.000	6.818

a Variable(s) entered on step 1: loan2income.