2012

An Analysis of the Metropolitan Atlanta Residential Real Estate Market: Beyond the Housing Bubble

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A thesis submitted to the faculty of the University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College

Oxford
May 2012

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This thesis is dedicated to my mother, Melanie Platt, who has provided me with an incredible foundation of writing skills, which I will be able to utilize for the rest of my life. It is also dedicated to my father, Mac Platt, for his steadfast support throughout my undergraduate experience.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to my advisor, Dr. Matthew Hill, for his guidance and patience. This thesis would have been impossible without him. I would like to thank Dr. Bonnie Van Ness and Dr. Shane Moser for serving as readers and participating in my thesis defense. I want to express my gratitude to the Sally McDonnell Barksdale Honors College for helping fund my research and providing me the opportunity to write this thesis and to Altos Research, LLC for compiling the data used in my analyses. Finally, it is a pleasure for me to thank Dr. Hill, Dr. Van Ness, Dr. Moser, and the rest of my finance professors at the University of Mississippi for helping me develop a passion for finance, which I will continue to build on for many years to come.

ABSTRACT
An Analysis of the Metropolitan Atlanta Residential Real Estate Market: Beyond the Housing Bubble

This thesis examines the Metropolitan Atlanta housing market after the collapse of the Atlanta housing bubble between 2007 and 2011. Time-series analyses were performed for home prices, the amount of time homes spent on the market (days on market), and the number of homes listed for sale (inventory). Simple linear regression analyses were used to determine the effects of days on market and inventory on home prices. Homes were separated into quartiles and the analyses were repeated to determine how different price ranges behaved over the four-year period. Following the collapse of the Atlanta housing bubble, home prices and inventory fell dramatically and the amount of time homes spent on the market increased. The lowest price range of homes experienced the greatest decrease in price and continually suffered from the worst market conditions. Days on market and inventory both had significant effects on the reduction of home prices during the four-year period. As of January 2012, it seems unlikely that the Atlanta housing market will recover in the near future, as home prices continued to trend downward from their peak in the summer of 2007.

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Introduction

This study provides an overview of the Metropolitan Atlanta single-family housing market from spring 2007 through summer 2011. A time-series analysis of the entire market was performed to help better understand the relationships between the price of residential real estate and changes in key variables. Variables examined as potential determinants of home prices include days on market and housing stock (inventory). While this study does not cover the effect of home prices on other variables, it does investigate the factors that influence home prices as well as the direction of the relation.

Understanding the factors that influence residential real estate prices is important for multiple reasons. First, residential real estate averages between seventeen and eighteen percent of annual U.S. gross domestic product (National Association of Home Builders, 2012). Home prices also have an effect on the local and national lending environment. For example, when home values fall below mortgage values, the likelihood of defaulting increases because of reduced equity or "skin in the game," (Krainer, 2009). With defaults, banks are forced to foreclose on homes and likely take losses. Recently, the reduced equity problem has become so bad that a new phenomenon has taken shape in which individuals that can afford their mortgages are defaulting. This phenomenon has been dubbed as the strategic default crisis. In fact, Krainer (2009) states, "some homeowner[s] may conclude that default costs are less onerous than trying to maintain the mortgage." In response, banks begin a process of tightening credit by limiting the availability of loans and raising interest rates.

Metropolitan Atlanta is of interest because, with a population of more than five million citizens, it is the ninth largest metropolitan statistical area in the country. It covers more than 8,300 square miles and includes 28 counties in North Georgia. Atlanta was also one of only three cities to add more than a million residents between 2000 and 2010. Atlanta's impact on its surrounding region is certainly important, as it serves as an economic center for the Southeastern United States. Despite its size and growth, Atlanta is often ignored as a focus of real estate analysis. The metropolitan area did not experience the high levels of price appreciation seen in southwestern and coastal cities during the housing bubble, but it did experience one of the worst declines following the collapse of the housing bubble and has yet to recover.

Having lived in Atlanta for eighteen years, I was able to witness much of the growth that took place during the 1990s and 2000s. I remember, as a teenager, hearing adults discuss speculative investing in residential real estate and how they were able to make extra income through "flipping houses." I also remember the downturn that took place in the Atlanta housing market and reading about entire subdivisions that were being foreclosed upon. Because I have witnessed both sides of the Atlanta housing bubble first-hand, this study not only interests me, but also directly relates to my life and the lives of my friends and family.

Study results show that home prices in Metropolitan Atlanta peaked in July 2007, at the height of the local housing bubble (Case-Shiller Home Price Inxex). Following the collapse of the Atlanta housing bubble, the median home price in the area began a decline that would last more than four years. Median days on market increased dramatically over this period before falling in 2010. The increase in days on market indicates that houses

were taking much longer to sell after being listed and reflects a decrease in demand. Median inventory in the Atlanta housing market fell substantially during the years after the collapse. The reduction in inventory and decline in median home price indicates that as the prices of homes decreased, fewer homeowners were listing their homes for sale. The simple linear regression analyses determined the individual effects of days on market and inventory on median price. The negative relationship between days on market and median price suggests that, as the number of days a house is listed for sale increases, the price at which it will be sold decreases. The positive relationship between inventory and price indicates that, as the number of houses listed for sale decreased, the median price of homes in Metropolitan also decreased. The time-series quartile analysis provided information as to how variables for homes in different price ranges changed over the four-year period of interest. Houses in lower quartiles experienced the worst market conditions in the years following the collapse of the Atlanta housing market, as they suffered the greatest price decline. The simple linear regression analyses for each quartile provided results that differed within each individual quartile, but were still consistent with the results form the simple linear regression analyses of the overall Atlanta housing Market. Median prices of lower quartiles were more affected by changes in days on market. Changes in inventory, however, had the greatest effect on median price for quartiles one and four. While signs of a possible recovery for the Atlanta residential real estate market appeared during the summer of 2011, a recovery failed to occur. Instead, during the next six months, home prices in Metropolitan Atlanta fell to their lowest level in more than a decade. Although a recovery will eventually take place, it seems unlikely that the Atlanta housing market will recover in the near future.

I. Background of the Housing Bubble

The collapse of the U.S. housing bubble is undoubtedly one of the most influential events to take place in the modern financial era. Its effects rippled through the global financial system, impacting homeowners, lenders, private investors, and national governments. There is no single, direct cause for the formation of the housing bubble, but instead, many factors that combined to create an unsustainably high level of growth in an asset class that had historically experienced low, steady growth.

For decades, the GDP of the United States and many other advanced countries has been increasing at approximately three percent annually. Over the past century, the real prices of homes also rose at three percent a year (Shiller, 2008). Thus, home ownership, historically, has provided little more than a hedge against inflation. Robert Shiller states, "if one looks squarely at the issue, it is clear that the rise in value of existing urban areas has shown no tendency at all to make investors rich," (Shiller, 2008). Between 1997 and the peak of the housing bubble in 2006, however, "real home prices for the United States as a whole increased 85%," and many homeowners were able to accumulate significant wealth through homeownership (Shiller, 2008). This new phenomenon led to a high degree of speculative investment in the U.S. housing market, a major contributing factor to the creation of the housing bubble. Shiller conducted a survey in 2005 and found that "the median expected price increase among San Francisco home buyers over the next ten years was 9% a year, and the mean expected price increase was 14% a year," (Shiller, 2008). With an annualized rate of nine percent, home prices would more than double in

nine years. These expectations reflect that homebuyers believed prices would not only continue to increase at historically high levels, but also increase at a higher rate than over the past decade. Because of the high level of optimism surrounding the housing market, "everyone came to believe that they [were] entitled to make a killing in residential real estate, up and down the food chain – not just distant investors, intermediate mortgage packagers, and nearby speculators and mortgage brokers – but including far too many homebuyers and homeowners," (Stone, 2009). This sense of entitlement helped fuel the U.S. housing bubble as homebuyers began to view their investment as a means of generating a high level of return not historically associated with home ownership.

Another factor that led to the creation of the housing bubble was the "overdependence on debt and the private capital markets to finance housing" (Stone 2009). As home prices across the United States increased dramatically during the housing bubble, new financial products and lending standards were made available to homebuyers, which allowed them to purchase houses that were previously unaffordable. Many of these loans required the borrower to put little or no money down at the time of origination. Others charged low initial interest rates, known as "teaser rates." Loans with teaser rates often reset to a higher, potentially unaffordable, rate after a specified period of time. The price escalation that occurred over the build up of the bubble created "favorable price expectations [that eased] the default concerns of lenders and thus [increased] their willingness to extend loans to risky borrowers," (Brueckner, Calem, and Nakamura, 2011). The favorable price expectations led lenders to believe that, even if the borrower could no longer make interest payments and was forced to default, the house would continue to appreciate in value over the time of the loan and could be sold to

generate a positive return. This belief, combined with lenders ability to sell mortgages on the secondary market, helped drive risky lending prices that added to the creation of the housing bubble in the United States.

The belief that home prices would continue to appreciate at record-setting rates was certainly common with everyday homeowners because many of them had seen the value of their investment increase dramatically during the housing bubble. This mentality, however, was not confined to homeowners with limited financial knowledge. Investors and financial institutions with vast financial knowledge and resources also believed they could prosper through the home price appreciation. The widespread belief that investing in residential real estate could provide a high, yet safe return on investment fueled the housing bubble in the U.S. and provided the basis for the financial crisis that followed. In 2000, the Case-Shiller Home Price Index, which tracks prices in the ten and twenty largest metropolitan areas of the United States reset to a value of 100 for all cities and the two national indices. At the peak of the national housing bubble, in July 2006, the ten and twenty city indices had values of 226.17 and 206.52 respectively, as seen in Figure 1. Based on the housing markets included in the indices, home prices more than doubled over the six and a half year period. In the year following the collapse of the national housing market, the twenty-city index fell 3.78 percent. This decline marked the beginning of the collapse of the U.S. housing bubble.

II. Models Used for Analysis

This study focuses on the influence of days on market and inventory on home prices in Metropolitan Atlanta. First, the relation between home prices and days on market was examined. An inverse relation between the variables was expected because an increase in days on market suggests a decrease in liquidity and a weakening housing market (Krainer, 2008). Next, the relation between home prices and housing stock was explored. A negative relationship was expected because inventory is a measurement of supply. Lawrence Yun, chief economist for the National Association of Realtors, stated an "inventory [decline] suggests that many markets will see prices stabilize or grow moderately," (National Association of Realtors, 2012).

To examine these relations, simple ordinary least square (OLS) regressions are estimated. The following models show the estimation frameworks:

$$Price = \beta_0 + \beta_1 DOM + \varepsilon \quad ,(1) \text{ and}$$

$$Price = \beta_0 + \beta_1 INV + \varepsilon \quad (2).$$

The dependent variable is the median price of residential real estate in Metropolitan Atlanta measured in dollars. The intercept is represented by β_0. In Equation (1), the variable of interest is *DOM*, which equals the median number of days homes in Metropolitan Atlanta spent listed for sale. Thus, in this model, $\beta_1$represents the change in price that is associated with a one-day increase in the number of days that a property is on

the market. In Equation (2), the variable of interest is *INV*, defined as the median number of homes listed for sale in a single zip code. In this model, $\beta_1$represents the change in price associated with a one-home increase in the number of homes listed for sale per zip code. For both models, ε represents the proportion of *Price* that is unexplained by the control variable.

III. Time Series Analysis of the Atlanta Housing Market

1. Descriptive Statistics for the Atlanta Housing Market (2007-2011)

The data set used in this study was compiled by Altos Research, LLC, a real estate research firm located in Mountain View, California. The set contains weekly updated rolling averages of variables for each zip code in the Atlanta Metropolitan Statistical Area. Each zip code is further broken down into quartiles based on median price. Every week, for each quartile in a given zip code, the data set provides rolling averages for multiple variables. The three main variables that are analyzed in this study are price, days on market, and inventory. Between March 2007 and July 2011, the mean and median home prices in Metropolitan Atlanta were $182,672 and $181,583, respectively, as seen in Table 1. Over this period, houses spent a mean of 113 days and a median of 119 days, or nearly four months on the market. Mean and median per-zip code inventories for the Atlanta housing market were 153 and 154 houses, respectively. Other variables, such as the percent of homes that decreased in price over a given week were utilized in the study to provide additional information about price behavior.

2. Conditions Leading Up to Collapse

In the spring of 2007, before the collapse of the Metropolitan Atlanta housing bubble, the median home price was above $205,000, as seen in Figure 2. This price level marks the peak of the Atlanta residential real estate market. According to the Case-Shiller Home Price Index, the Atlanta market peaked in July 2007 at 136.47. Home prices had

risen 36.47 percent since January 2000 to a median price of $207,267. In April 2007, Atlanta homes spent a median of less than a month on the market before selling. In the months leading up to the collapse of the bubble, this number steadily rose, indicating that houses were taking increasingly longer to sell, as seen in Figure 3. By the peak of the housing bubble in the summer of 2007, median days on market had increased to 70. Although houses were taking increasingly long to sell, the number of houses listed for sale was only slightly higher when compared to prior months. Prior to the collapse of the housing bubble, median inventory in the Metropolitan Atlanta housing market was 165 and at the time of the collapse, median inventory had only slightly increased to 168.

3. Conditions Following Collapse

The Atlanta housing bubble peaked in July 2007. Afterward, median price began to fall, but the major decline did not begin until February 2008. At that point, the median home price in Metropolitan Atlanta had fallen from a peak of $207,267 to $205,320, a 0.94 percent decrease. Over the next year, median price would fall by more than $25,000. Median days on market fell through the fourth quarter of 2007, but rose back to 70 in February 2008. Median inventory peaked in August 2008 at 185, up twelve percent from pre-bubble levels, as seen in Figure 4. The rise in inventory indicates an influx of houses for sale in the market. As of May 2009, the median home price in the Metropolitan Atlanta housing market had fallen more than twelve percent from the time of the collapse to $179,923. The Case-Shiller Home Price Index for Atlanta had a value of 105.98, reflecting that home prices in Atlanta were only six percent above their 2000 level. By April 2009, median days on market had more than doubled from 70 to 148. Over the

previous fourteen months, the median length of time houses spent on the market before being sold rose by more than two and a half months. Over the same period of time, median inventory fell more than ten percent to 152. The increase in days on market suggests that demand for houses was decreasing and thus, driving prices lower.

Median inventory reached its lowest level in January 2010 at 114.38, a 38.38 percent decrease from its peak in August 2008. Home prices fell by more than thirteen percent over the same period. As median price continued to trend downward, median days on market peaked in March of 2010 at 179. Homes in Metropolitan Atlanta now spent a median of nearly six months on the market before being sold. This amount of time spent on the market was three and a half months longer than at the time of the collapse and five months longer than pre-bubble conditions. Over the next five months, days on market fell to 101.77. Over this same period, median price fell $7,533, a 4.36 percent decrease.

As of March 2011, the median home price in Metropolitan Atlanta was $144,723. This price level reflects a 30.18 percent decrease from the peak in the summer of 2007. The Case-Shiller Index value for Metropolitan Atlanta was 100.33, implying that home prices in the Atlanta market had lost all of the value accumulated since 2000. During late spring and summer of 2011, median price flattened out around $145,000. Over this time, days on market continued to decline. The trend of flattening price, combined with decreasing days on market, was a positive signal and suggested improvement in the Atlanta housing market.

4. Future Outlook

While the Atlanta Case-Shiller Home Price Index slightly increased during the summer of 2011, the Atlanta housing market failed to recover. The Atlanta index fell off sharply during the last quarter of 2011 and, as of January 2012, the index had a value of 85.49, down nearly fifteen percent since 2000 and 37.36 percent since the collapse of the Atlanta housing bubble in July 2007. At this time, Atlanta was one of four cities tracked by the Case-Shiller Home Price Index that had a value less than 100, with only Detroit being lower. With home prices in Atlanta well below the 2000 level and continuing to drop, it is clear that the market has yet to recover.

IV. Effect of Variables on Price

1. Days on Market

Table 1 presents the results after estimating a simple regression model with price as a function of days on market. The simple regression was used to determine the effect that the number of days a house spends listed for sale has on its price.

The estimate of interest is $\hat{\beta}_1$, capturing days on market's effect on price. The number of days a house spends on the market is indirectly and significantly related to its price. The negative relationship between days on market and price implies that as the amount of time a house is listed for sale increases, the price at which it will be sold decreases. This relationship is logical, assuming home buyers are rational, because houses should sell at a fair market value. Thus, if days on market continue to increase, the home is likely over-priced with regard to its fair market value and will continue to remain on the market until it is perceived to be listed at the market value.

The estimated value for $\hat{\beta}_1$ indicates that for every day a median-priced house spends on the market in Metropolitan Atlanta, its price will decrease by $321.51. This estimate is statistically significant at the one percent level due to its P-Value of less than .0001. The regression output in Table 1 translates to a $2,251 decrease in price per week, resulting in a decrease of over $10,000 per month a home is listed for sale. Given the intercept, $\hat{\beta}_0$, of $218,616 and a median of 113 days on market, a home's price would decrease $36,331, nearly seventeen percent, between the date it is listed and the date

when it is sold. The R-Squared of 39.49 indicates that nearly forty percent of the changes in price can be attributed to days on market.

2. Inventory

Table 3 displays the output of a simple linear regression model with price as a function of inventory. The model was used to determine the effect of inventory, the number of homes listed for sale, on the price of homes at a given point in time.

The estimate of $\hat{\beta}_1$ captures the effect of inventory on price. The results of the regression indicate that inventory is directly and significantly related to price. Economically, this result suggests that home prices increase with the number of homes listed for sale. Under normal market conditions, however, this relationship would likely be opposite to what took place following the collapse of the housing bubble. Instead, over this period of time when prices were declining, inventory declined by nearly twenty percent. These trends could be explained by a decrease in seller confidence. For example, as housing conditions continued to deteriorate, sellers began to take their homes off the market and homeowners were less willing to list their homes, thus reducing inventory.

A value of 870.03 for $\hat{\beta}_1$ indicates that price increases by $870 for an additional listed home. This estimate is statistically significant at the one percent level due to its P-Value of less than .0001. Based on the dependent mean, or mean price of $182,762, if inventory in a given zip code increased by 20 houses, the result would be a price increase of $17,400, or 9.52 percent. The R Square of 66.02 indicates that 66.02 percent of the change in price can be explained by change in inventory.

V. Quartile Analysis

1. Introduction

For further analysis of the Metropolitan Atlanta residential real estate market, homes were separated into price quartiles. This strategy provides understanding as to how houses in different price ranges behaved over time and how variables affected prices for each quartile. The Case-Shiller Home Price Tiered Index also provides a means of measuring price based on low, middle, and high tiers. While the home value ranges for quartiles are different than the tiers used in their index, both provide insight as to how different price ranges of homes behaved over time.

2. Conditions Leading Up to the Collapse

In April 2007, the median prices for quartiles one, two, three, and four were $141,088, $185,011, $239,675, and $390,213, respectively, as seen in Figure 7. At this point, the Case-Shiller Home Price Tiered Index, shown in figure 8, had a value above 137 for the low and high tiers, thus the price index for both tiers had risen 37 percent since 2000. The median price in quartile one fell 6.79 percent between April and July of 2007. Over the three months, the median price of homes listed for sale in the lowest twenty-fifth percentile fell nearly $10,000. Quartile four, over the same three-month period, experienced a 1.04 percent increase in median price. All quartiles increased with regard to median days on market leading up to the collapse, although higher quartiles spent a greater number of days on the market, as seen in Figure 10. At the time of the

collapse. 24.20 percent of homes in the first quartile were declining in value, the highest percent for all quartiles. 16.54 percent of homes in the fourth quartile were decreasing in price.

3. First Year Following the Collapse

Between the summers of 2007 and 2008, the median price for all quartiles, except the fourth, declined. In the fall of 2007, roughly 30 percent of homes in quartile four were decreasing in price on a week-by-week basis and between 25 and 30 percent of homes were increasing in price. During the same period, the first quartile experienced weeks when more than 50 percent of homes decreased in price, yet only 15 to 20 percent of homes increased. In August of 2008, median price for quartile four peaked at a value of $406,946, up 3.22 percent from July 2007. Over the same period, median home price in the lowest quartile fell more than twelve percent. Houses in the second and third quartiles fell seven and one percent respectively.

Median inventory for all four quartiles peaked in August 2008, with higher priced homes experiencing the greatest increases. Since the collapse of the Atlanta housing market, median inventory in the fourth quartile rose by 34.6 percent to 57, whereas median inventory for the first quartile only rose by 12.5 percent to 47, as seen in Figure 9. Quartiles two and three rose by 20.94 and 31.21 percent, respectively. Houses in the fourth quartile, as of August 2008, spent a median of 100 days on the market. This reflects a 29.87 percent increase since July 2007, as seen in Figure 10. Median days on market for quartile one increased by 30.8 percent. Although median days on market for each quartile increased by similar percentages, houses in quartile four spent three weeks longer on the market than those in quartile one.

4. Second Year After the Collapse

After peaking in the summer of 2008, the median price for quartile four began to decline. During the following months, less than four percent of homes in the fourth quartile increased in price during any given week, yet nearly 30 percent decreased. By May 2009, median price for the fourth quartile had fallen 5.75 percent since the previous summer and 2.95 percent since the collapse of the Atlanta housing bubble to $383,534. The median price for the first quartile had declined by 20.95 percent since the beginning of the collapse to $104,042.

Between the summer of 2008 and February 2009, median days on market rose dramatically, with higher quartiles experiencing the greatest increases. During this time, median days on market for the fourth quartile rose by 130 percent, while days on market for the first quartile rose by 83 percent. Houses in quartile four, as of February 2009, spent more than eleven weeks longer on the market than those in quartile one. Over the same time period, median inventory for all quartiles decreased significantly. Although higher quartiles saw the greatest reduction in inventory, they also experienced the greatest increase in median days on market.

On February 17 2009, President Obama signed the "American Recovery and Reinvestment Act of 2009," which provided tax credits to homebuyers (National Association of Realtors, 2011). After the bill was passed, home prices began to flatten out and even rose slightly during the summer of 2009. Lower quartiles experienced the most benefit during the months following the passage of the bill. For example, the median price for quartile one increased 3.62 percent between March and July 2009 to $108,156.

After accounting for the short-term increase, this value was still more than seventeen percent below the level at the time of the collapse of the housing market. The introduction of the "American Recovery and Reinvestment Act of 2009" had little effect on home prices in the fourth quartile, as they fell slightly between March and July of 2009. Median days on market also decreased through the summer of 2009 for each quartile, with higher quartiles experiencing the greatest decline. These were the first sustained positive signals for the Atlanta housing market in nearly two years, especially for the lower quartiles, which had been hit the hardest since the bubble popped. These positive trends, however, were not driven by the market and proved to be unsustainable after the expiration of the bill.

5. Third Year Following the Collapse

Median inventory for all quartiles continued to decline since peaking in the summer of 2008 and bottomed out in January 2010. At this time, median inventory for the fourth quartile had decreased 38.6 percent from its peak in the summer of 2008 and median inventory for quartile one decreased by 38.3 percent. Quartiles two and three decreased by 36.5 and 40 percent, respectively. Lower quartiles still maintained lower levels of inventory, but the difference between the quartiles had grown smaller.

Median days on market for all quartiles peaked in late March and early April 2010. At this point, houses in quartile four spent a median of 268 days on the market, implying that they took nearly nine months to sell after being listed. This 248 percent increase from the collapse of the Atlanta housing bubble translates to an additional 6.37 months on the market. Houses in quartile one spent a median of 125 days on the market,

a 94.41 percent increase. As of April 2010, houses in the fourth quartile were spending more than four and a half months longer on the market than houses in the first quartile and more than two months longer than houses in the third. Although median days on market for quartile four increased by a greater percent and magnitude than for quartile one, quartile one experienced the greatest decline in median price.

After peaking in March and April, median days on market for all quartiles declined sharply in the following months. By August 2010, median days on market for the fourth quartile had fallen by 50 percent and median days on market for the first quartile had fallen 33.6 percent. Over the same period, inventory for all quartiles rose by approximately five houses. As of August 2010, the median home price for the fourth quartile had fallen 10.42 percent from July 2007 to $353,985. Median home price for the first quartile had dropped 34.35 percent to $86,400. Home prices in the first quartile had not only decreased by a higher percent than the fourth quartile, but also by a higher magnitude. This decrease indicates that houses in the lowest price range were still experiencing the worst market conditions since the end of the Atlanta residential real estate bubble.

6. Fourth year following the collapse

Following the sharp decline in days on market that took place during spring and summer 2010, quartiles two, three and four rose, but quartile one flattened out. Inventory also continued to increase for all quartiles and peaked at the highest levels since spring 2009 in October and November of 2010. This marked the first period that inventory and days on market were simultaneously increasing in nearly two years.

In October 2010, median price for the fourth quartile began a sharp decline that lasted until April 2011. Over these six months, the median home price for the fourth quartile fell 11.72 percent from $350,438 to $309,379. This marked the largest drop in fourth quartile median price for a given six-month period since the collapse of the Atlanta housing market. Over the same six months, however, median price for quartile one decreased by nearly seventeen percent.

Between April and June 2011, the median price for quartiles three and four began to rise and days on market declined. The median price for quartile one continued to fall, and days on market remained relatively flat. As of June 2011, the median home price for quartile four was $317,500, down 21.98 percent from its peak in summer of 2008 and 19.66 percent from the collapse of the Atlanta housing market. The Case-Shiller Home Price Tiered Index, had a value of 108.29 for the high tier, indicating that homes in the top tier still remained eight percent above their 2000 price level. Median home prices for quartiles two and three were $125,500 and $189,301, down 30.31 and 22.82 percent, respectively. The median home price in quartile one suffered the greatest loss since the collapse of the housing bubble, falling 44.54 percent to $72,991 in June 2011. The low tier in the Case-Shiller Home Price Tiered Index had a value of only 62.12. This value implies that home prices in the low tier were nearly 40 percent below their 2000 level. It was also the lowest value for the tier since the index began in 1991.

Houses in the upper quartiles began to show signs of recovery in 2011, as they were spending fewer days on the market and prices were beginning to rise. These patterns, however, are also consistent with the seasonal nature of the housing market and similar trends that occurred in previous years. Whether or not these trends continued past

the spring and summer months will provide important insight as to whether or not a recovery began to take place. A recovery for quartile one seemed less likely as home prices continued to decline and days on market remained at a level similar to that experienced in the prior year.

7. Analysis Beyond Altos Dataset

While a recovery for the upper quartiles seemed possible as of June 2011, it did not occur. The high tier in the Case-Shiller Home Price Tiered Index continued to fall through 2011 and as of January 2012, the high tier had a value of 99.63, the lowest since 1999. As predicted in the data analysis of the first quartile, the lowest priced homes continued to fall. In January 2012, the low tier had a value of 49.68, down 20 percent from the previous summer. At this time, home prices in the low tier were more than 50 percent below the 2000 level and more than 22 percent below the level when the index began in 1991.

VI. Effect of Variables on Price by Quartile

1. Days on Market

Tables 4-7 show the outputs of simple linear regressions estimating price as a function of days on market for each quartile. These models were used to determine if the effect of days on market on price differed for houses in different price ranges.

As before, $\hat{\beta}_1$provides the effect of days on market on price for each quartile. The results indicate that days on market affected price differently for each quartile. The negative relationship for each quartile is consistent with the simple regressions performed for the entire Atlanta market. For each quartile, as days on market increases, the median price for the given quartile decreases. The different values for $\hat{\beta}_1$ imply that the days on market's negative relationship with price was stronger for homes in lower price ranges.

The estimated values for $\hat{\beta}_1$indicate that lower quartiles experienced a greater price decrease as days on market increased for each quartile. For example, the $\hat{\beta}_1$ value for quartile one indicates that for every extra day a house spent on the market, price decreased by $512.45. $\hat{\beta}_1$ estimates for quartiles two and three were -320.14 and -201.43, respectively. The $\hat{\beta}_1$ estimate for quartile four of -171.77 indicates that for every one-day increase in days on market price decreases by $171.77, $340.68 less than quartile one. Moreover, the price of homes in lower quartiles, combined with the higher price decrease estimated by days on market, reflects that the decrease as a percent of price is dramatically higher. These estimates are statistically significant at the one percent level

due to their P-Values of less than .0001. The results are consistent with the time-series quartile analysis of the Atlanta housing market, as median price for quartile one saw the greatest decline in median price, yet experienced fewer days on market throughout the time of the analysis. The simple linear regressions for quartiles one and two have coefficients of determination values above .33, which indicates that more than one-third of the variation in median price can be explained by days on market. The coefficient of determination for quartiles three and four are .26 and .16, respectively. These lower values suggest that less variation in median price for houses in higher price ranges can be explained by the number of days they spend on the market.

2. Inventory

The outputs of the simple linear regressions in Tables 8-11 show the estimate of median price as a function of median inventory for each quartile. This analysis was performed to determine the effect of median inventory on median price for houses in different price ranges. It was also used to determine if this effect was dissimilar among the price quartiles.

The estimates of interest are $\hat{\beta}_1$, capturing inventory's effect on price for each quartile. Findings suggest a positive relationship between inventory and price. Thus, as the number of homes listed for sale in a given quartile increases, so does the median price of the houses. Because price was declining over the time series analyzed from the data set, the relationship can best be described: as inventory in each quartile decreases, so does the median price of homes listed for sale. This relationship is consistent with the results of the simple linear regression output for the entire market.

The estimated values for $\hat{\beta}_1$ indicate that home prices in quartiles one and four are more sensitive to changes in inventory than those in quartiles two and three. For example, the $\hat{\beta}_1$ estimate for quartiles one and four indicate that for every one-house decrease in inventory, price decreased by $3,723 and $3,266, respectively. $\hat{\beta}_1$ estimates for quartiles two and three were $2,535 and $2,166, respectively. A five-house reduction in inventory would suggest an $18,615 decrease in median price for quartile one and a $10,830 decrease for quartile three. As mentioned in the analysis of the overall Atlanta housing market, the market conditions experienced following the collapse of the housing bubble were abnormal. A reduction in inventory indicates a decrease in supply, which would inherently drive price up, assuming demand was held constant. The associated decrease in median price suggests that the decrease in demand, following the collapse of the housing bubble, was outpacing that of supply for all quartiles. This trend could also be explained by a decline in seller confidence; as prices continued to trend downward, homeowners took their houses off the market in hopes of being able to sell at a higher price sometime in the future.

These values are much larger than the estimates for the entire market because inventory was divided among quartiles. For example, median inventory for the first quartile ranged between 29 and 46, one-fourth that of the entire market. Thus, a one-house change in inventory has a greater estimated impact on price for individual quartiles, as it reflects a proportional change. The effect of inventory on median price, however, remains consistent with the analysis of the entire Atlanta housing market.

Conclusion

Housing plays a vital role in the U.S. economy as it averages between seventeen and eighteen percent of the country's gross domestic product (National Association of Homebuilders, 2012). The increase in home prices that took place during the bubble period was an unsustainable level of growth that was fueled by risky lending, overdependence on debt financing, and speculative investing in the housing market. When the housing bubble collapsed, the effects rippled through the global financial system impacting individuals, firms, and national governments across the world.

During the national housing bubble, home prices across the country more than doubled between 2000 and 2006 based on the Case-Shiller twenty-city index. Many cities across the country experienced more than 100 percent growth over this period, but the Atlanta market price index only rose 36.47 percent. The peak of the national housing bubble occurred during the summer of 2006, but the Atlanta housing bubble lasted a year longer. During the years following the collapse of the Atlanta housing market, the number of days houses spent on the market before being sold increased dramatically. Over the same time, housing inventory declined to levels far below pre-collapse conditions. Increasing days on market, declining inventory, and many other factors combined to drive Atlanta housing prices to their lowest levels in more than a decade. Although the Atlanta housing market experienced less growth than the national average during the housing bubble, it certainly felt the consequences. The Metropolitan Atlanta

estimates, indicating that home prices in these quartiles were most strongly affected by changes in inventory. This relationship demonstrates the abnormal market conditions that took place following the collapse of the Atlanta housing market, which existed due to the sustained decreases in price and inventory that took place in the time-series data.

Signs of a possible recovery emerged in the summer of 2011, as days on market began to decrease and price stabilized. Quartiles two, three, and four also experienced increases in inventory. The Atlanta housing market failed to recover and declined over the following year. As of January 2012, the Case-Shiller Home Price Index for Atlanta was fifteen percent below the 2000 level, the second lowest of all cities tracked by the twenty-city index. Moreover, the low tier had an index value of 49.68, indicating that the lowest priced homes were at a price level that was more than 50 percent below the 2000 level. The high tier index remained near the benchmark 100 level at 99.63. As seen in the time series analysis, homes in the lowest price range continued to experience the worst market conditions. Little indication of a recovery exists for the Atlanta housing market as home prices have continued to decline through 2012. While a recovery will certainly take place at some point, it seems unlikely in the near future.

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APPENDIX

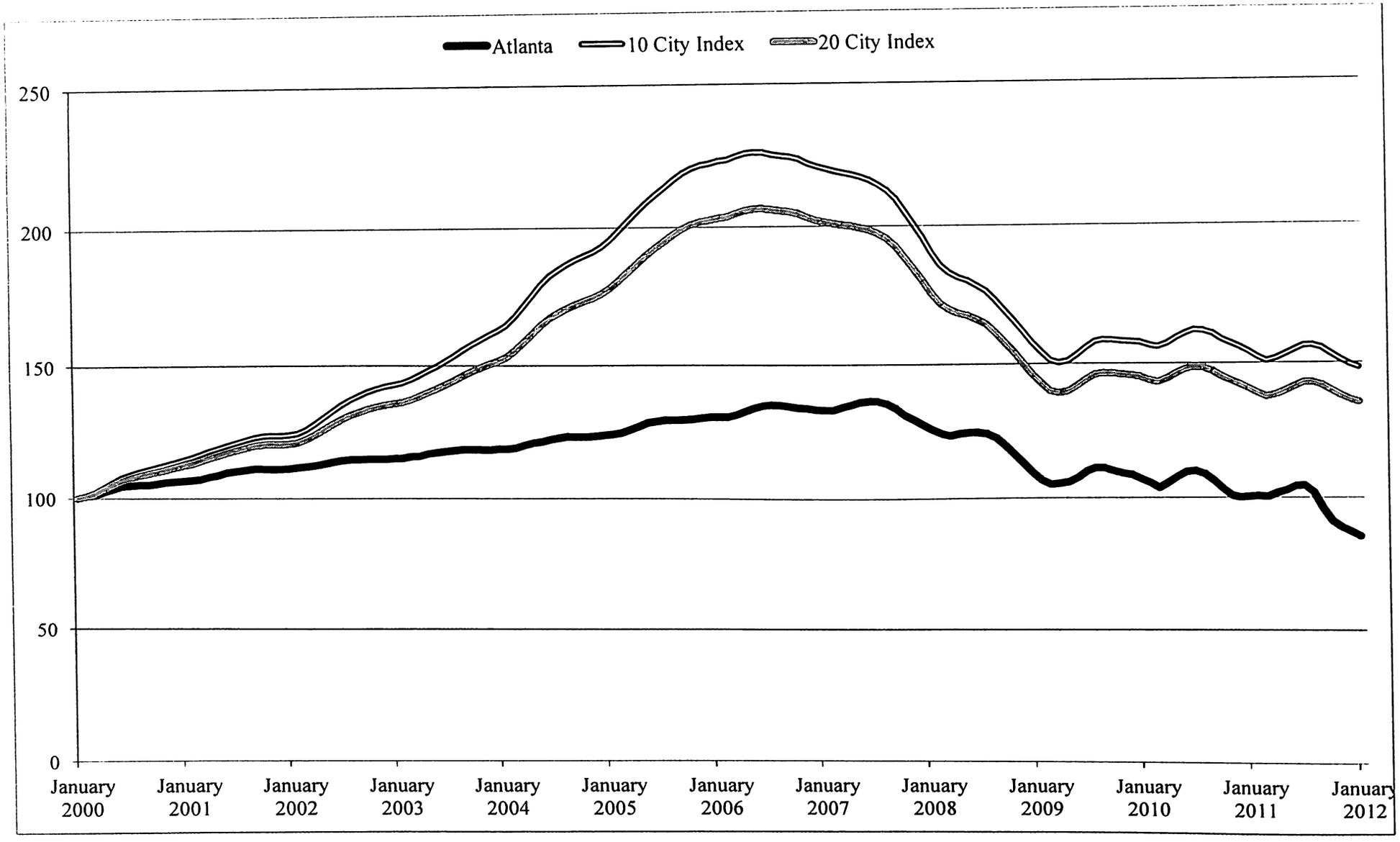

Figure 1: Case-Shiller Home Price Index

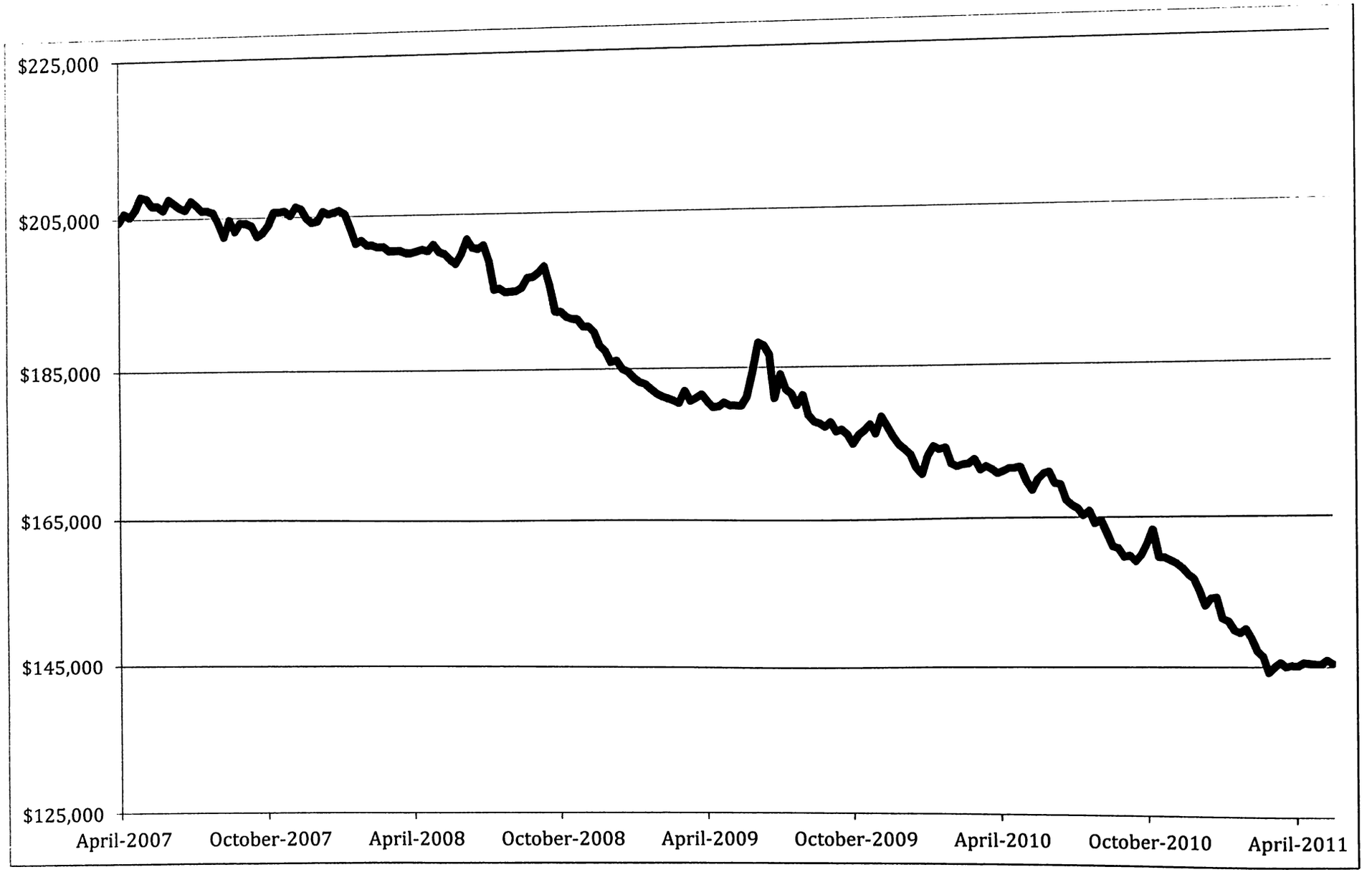

Figure 2: Median Home Price in Metropolitan Atlanta

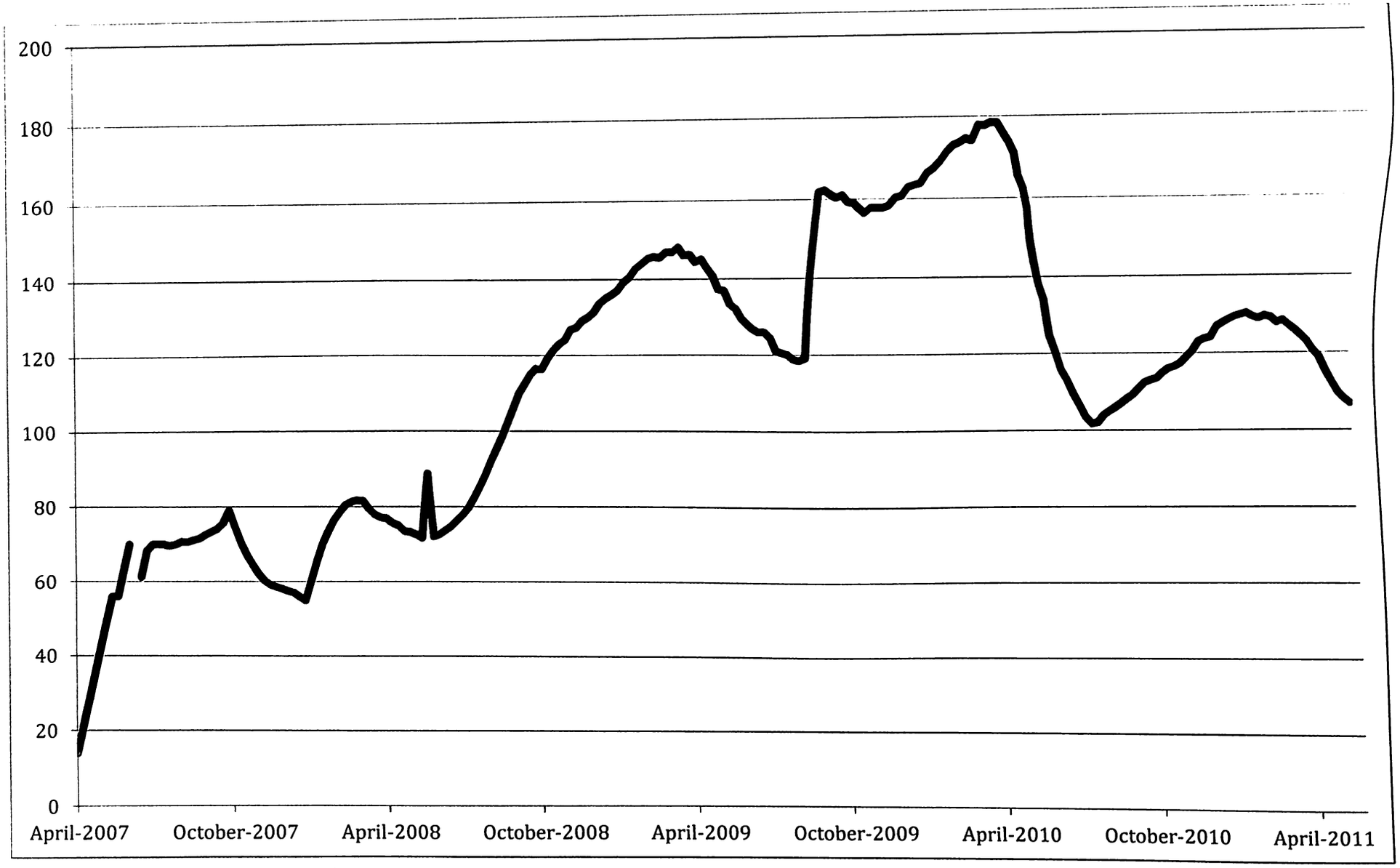

Figure 3: Median Days on Market for Homes in Metropolitan Atlanta

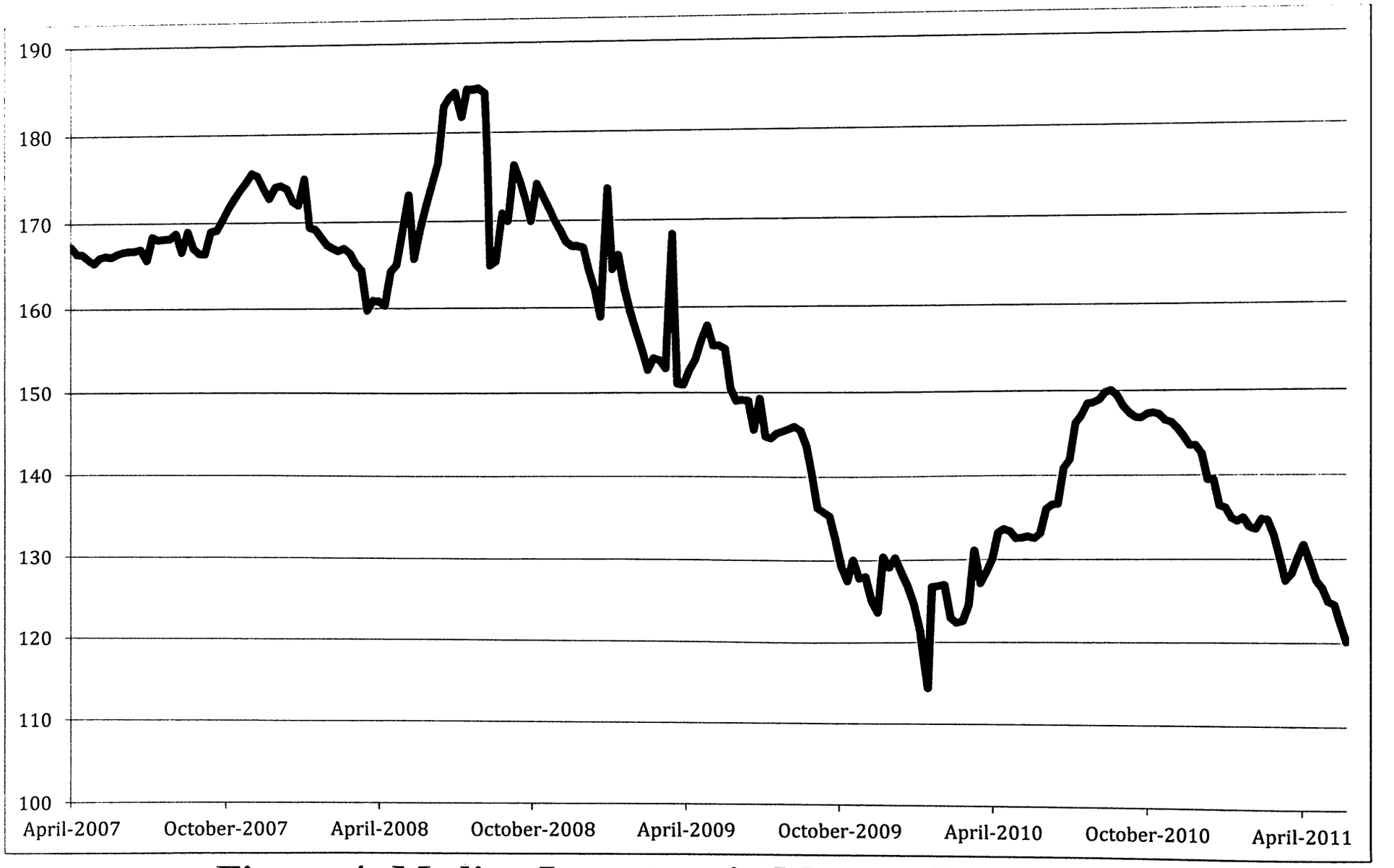

Figure 4: Median Inventory in Metropolitan Atlanta

Table 1: Summary Statistics for Metropolitan Atlanta Housing Market (2007-2011)

	Variable	N	Mean	Std Dev	Median	Minimum	Maximum
All Quartiles	Median Price	219	$182,762	$19,037	$181,583	$144,273	$215,950
	Median Days on Market	216	112.77	36.85	119	14	179
	Median Inventory	219	152.67	17.78	154	114	185
Quartile 1	Median Price	219	$108,543	$19,702	$106,974	$71,564	$146,425
	Median Days on Market	216	88.11	21.85	90	14	125
	Median Inventory	219	38.45	4.35	39	29	47
Quartile 2	Median Price	219	$158,970	$17,506	$159,440	$124,362	$189,900
	Median Days on Market	216	106.85	34.24	112	14	167
	Median Inventory	219	41.01	4.58	41	33	53
Quartile 3	Median Price	219	$223,622	$17,923	$230,296	$181,631	$250,000
	Median Days on Market	216	123.77	45.07	130	14	212
	Median Inventory	219	42.30	4.54	42	33	55
Quartile 4	Median Price	219	$375,934	$26,808	$388,742	$309,379	$415,900
	Median Days on Market	216	148.85	63.231	155	14	271
	Median Inventory	219	43.20	4.792	42	35	57

Table 2: Effect of Days on Market on Price

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	30172278638	30172278638	139.64	<.0001
Error	214	46238973044	216069967		
Corrected Total	215	76411251682			

Root MSE	14699	R-Square	0.3949
Dependent Mean	182359	Adj R-Sq	0.392
Coeff Var	8.06064		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($_0$)	1	218616	3227.10945	67.74	<.0001
Median Days On Market ($_1$)	1	-321.50972	27.20741	-11.82	<.0001

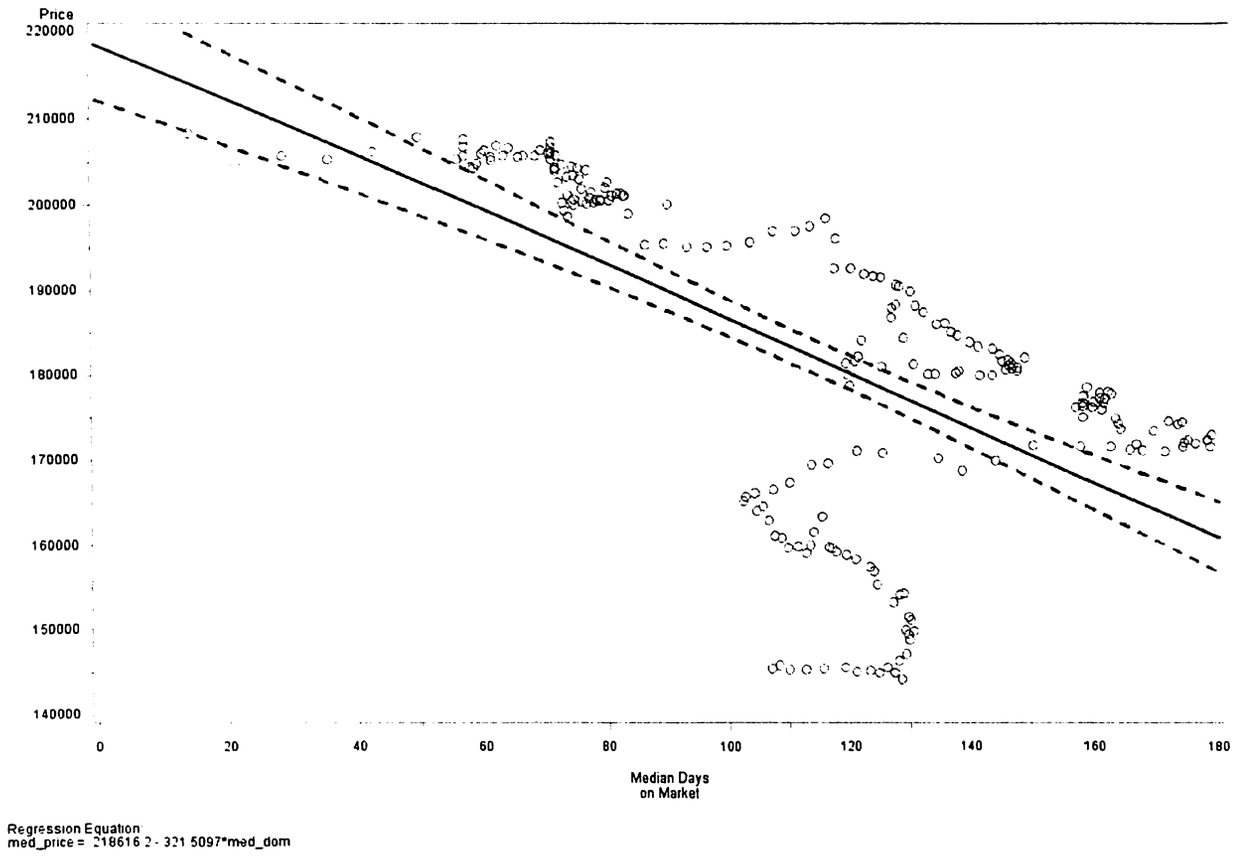

Figure 5: Regression Plot: Effect of Days on Market on Price

Table 3: Effect of Inventory on Price

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	52160354433	52160354433	421.63	<.0001
Error	217	26845280933	123710972		
Corrected Total	218	79005635366			

Root MSE	11123	R-Square	0.6602
Dependent Mean	182762	Adj R-Sq	0.6586
Coeff Var	6.08581		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($_0$)	1	49931	6512.45729	7.67	<.0001
Median Inventory ($_1$)	1	870.0279	42.37084	20.53	<.0001

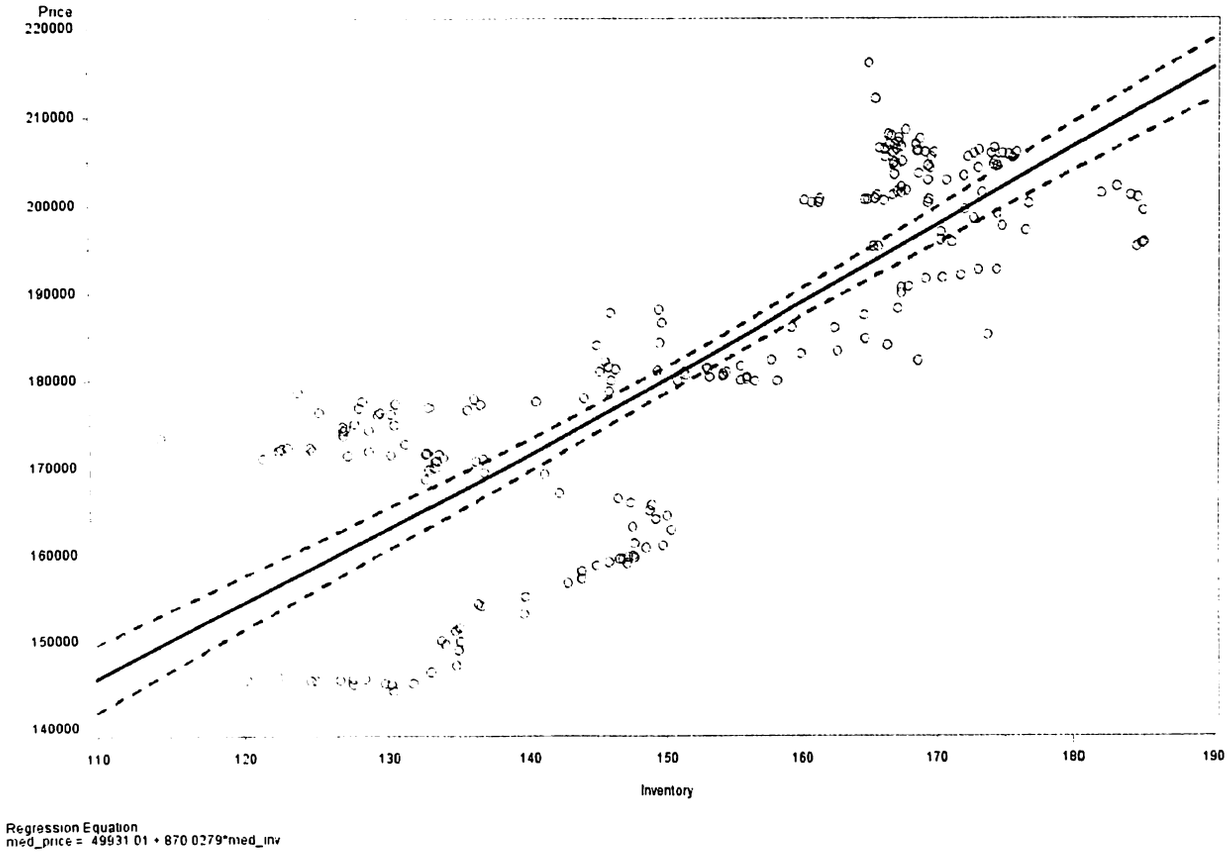

Figure 6: Regression Plot: Effect of Inventory on Price

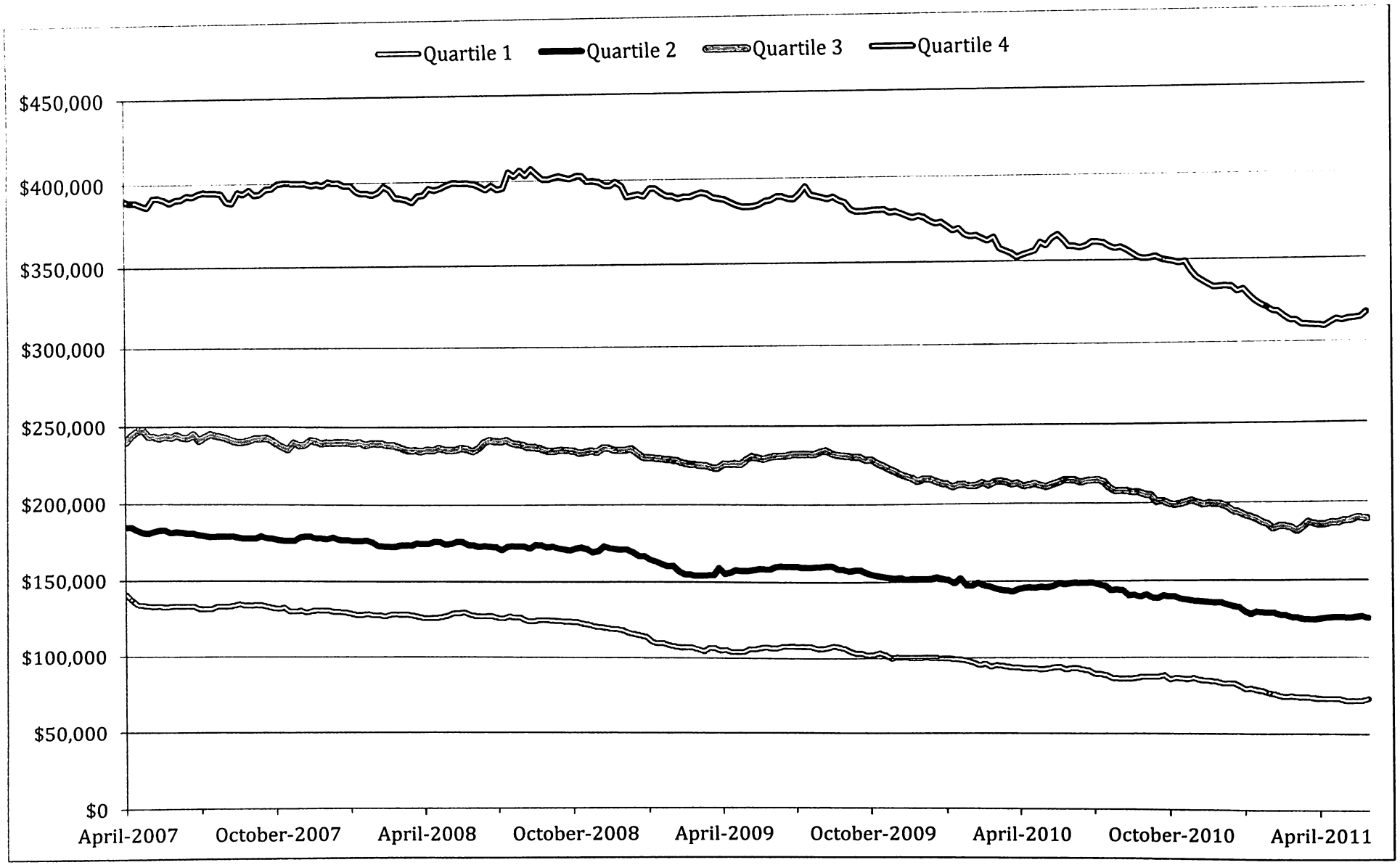

Figure 7: Median Home Price in Metropolitan Atlanta by Quartile

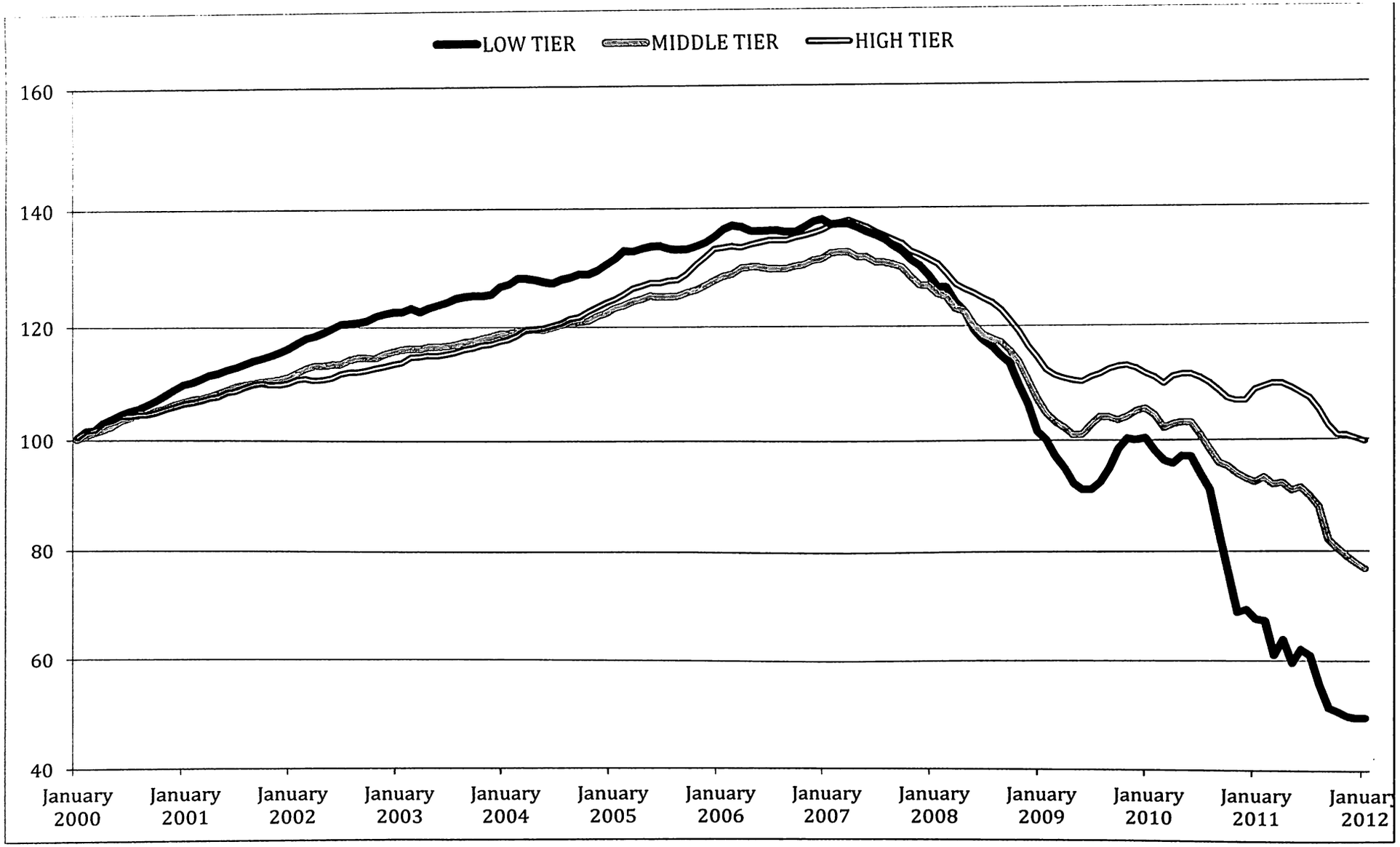

Figure 8: Case-Shiller Home Price Tiered Index for Atlanta

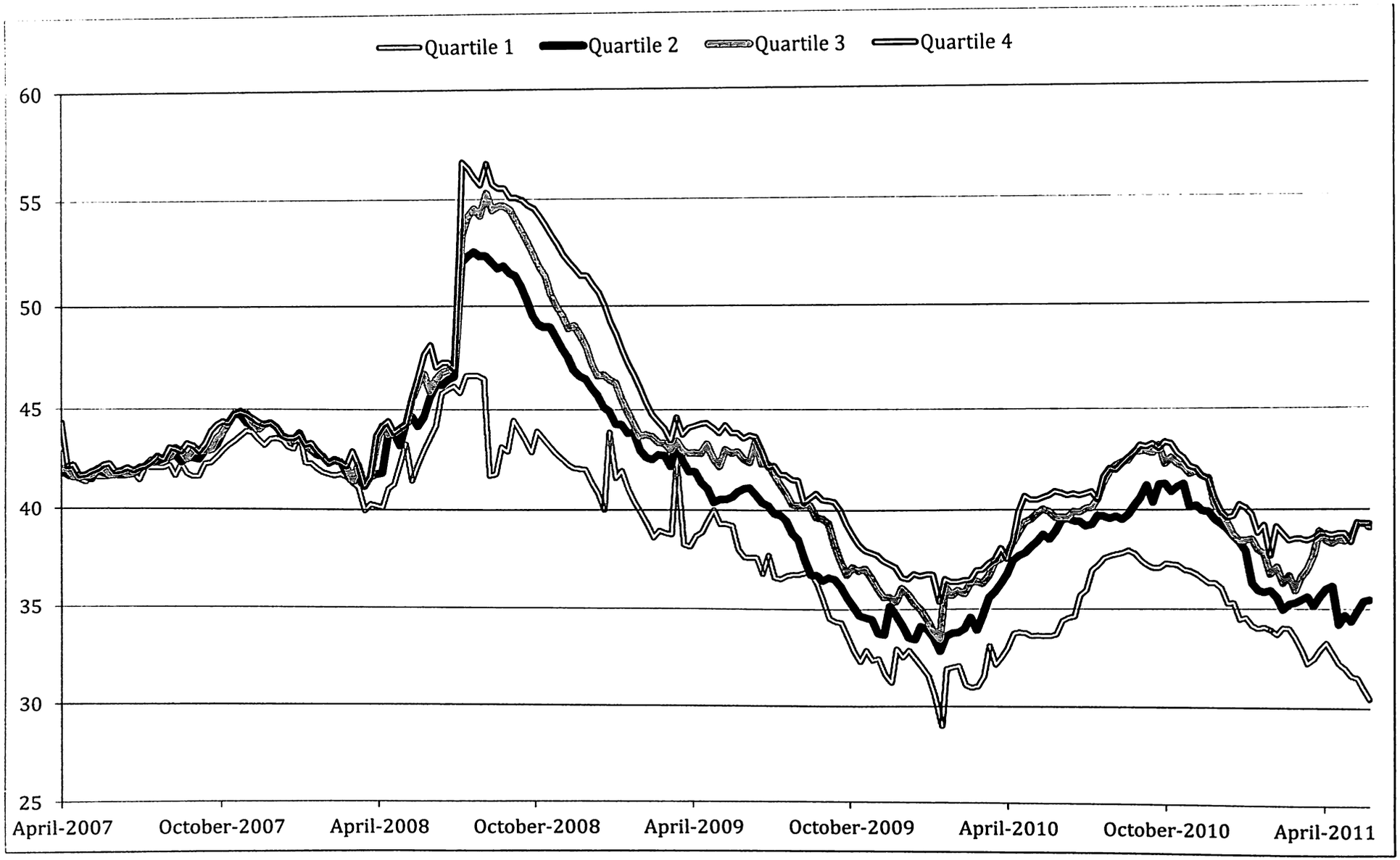

Figure 9: Median Inventory in Metropolitan Atlanta by Quartile

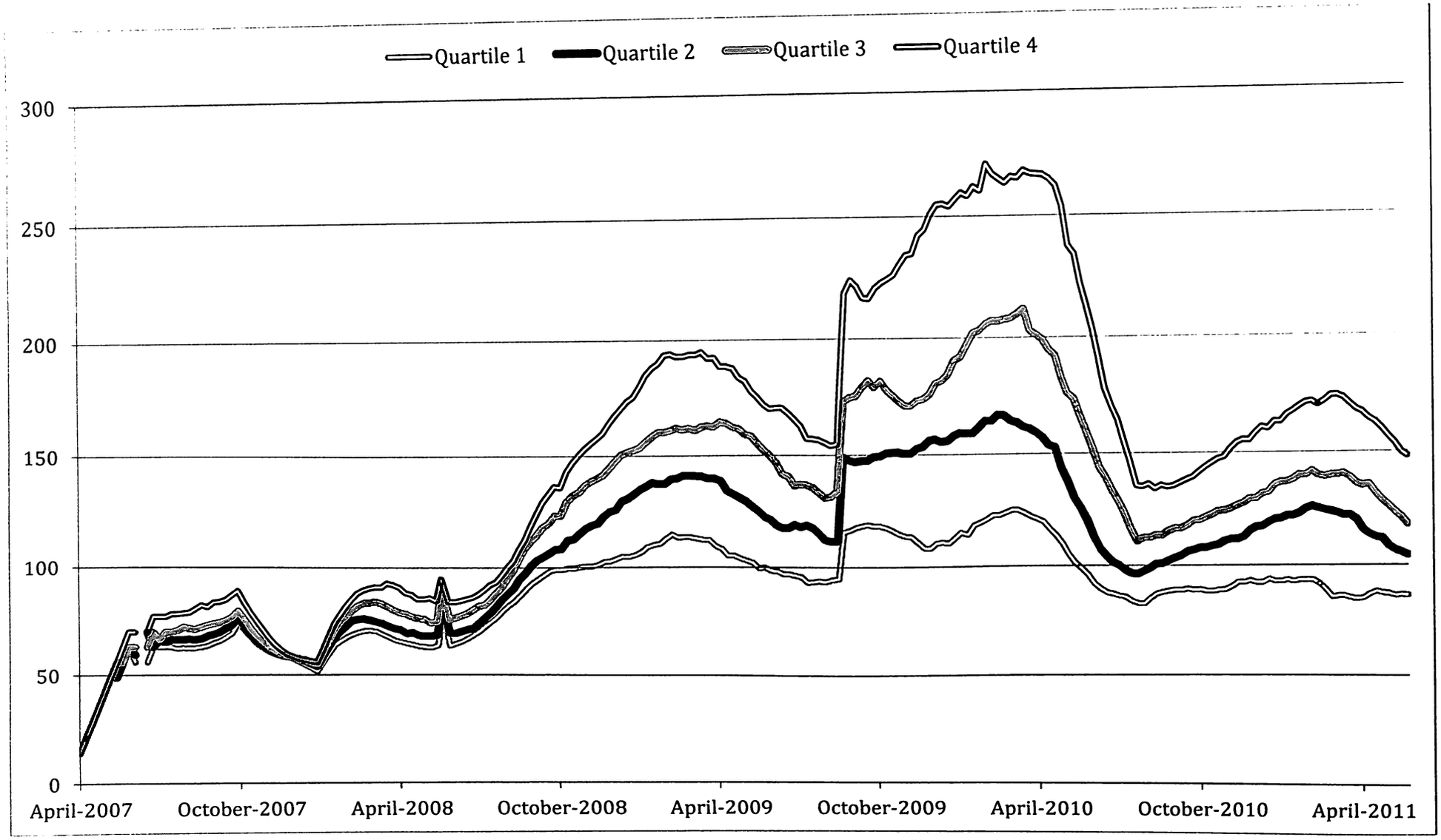

Figure 10: Median Days on Market for Homes in Metropolitan Atlanta

by Quartile

Table 4: Effect of Days on Market on Price for Quartile One

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	26963753327	26963753327	105.85	<.0001
Error	214	54515149608	254743690		
Corrected Total	215	81478902935			

Root MSE	15961	R-Square	0.3309
Dependent Mean	108103	Adj R-Sq	0.3278
Coeff Var	14.76433		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($\hat{\beta}_0$)	1	153256	4521.22842	33.9	<.0001
Median Days on Market ($\hat{\beta}_1$)	1	-512.44951	49.80955	-10.29	<.0001

Table 5: Effect of Days on Market on Price for Quartile Two

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	1	25832794610	25832794610	142.39	<.0001
Error	214	38824852235	181424543		
Corrected Total	215	64657646846			
Root MSE	13469	**R-Square**	0.3995		
Dependent Mean	158604	**Adj R-Sq**	0.3967		
Coeff Var	8.49249				

Parameter Estimates					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept ($\hat{\beta}_0$)	1	192811	3009.628	64.06	<.0001
Median Days on Market ($\hat{\beta}_1$)	1	-320.1447	26.82926	-11.93	<.0001

Table 6: Effect of Days on Market on Price for Quartile Three

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	1	17717009621	17717009621	74.39	<.0001
Error	214	50968145679	238168905		
Corrected Total	215	68685155300			
Root MSE	15433	**R-Square**	0.2579		
Dependent Mean	223337	**Adj R-Sq**	0.2545		
Coeff Var	6.91006				

Parameter Estimates					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept ($\hat{\beta}_0$)	1	248268	3075.42072	80.73	<.0001
Median Days on Market ($\hat{\beta}_1$)	1	-201.42663	23.35416	-8.62	<.0001

Table 7: Effect of Days on Market on Price for Quartile Four

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	1	25362493462	25362493462	42.01	<.0001
Error	214	1.29183E+11	603658760		
Corrected Total	215	1.54546E+11			
Root MSE	24569	**R-Square**	0.1641		
Dependent Mean	375602	**Adj R-Sq**	0.1602		
Coeff Var	6.54135				

Parameter Estimates					
Variable	**DF**	**Parameter Estimate**	**Standard Error**	**t Value**	**Pr > |t|**
Intercept ($\hat{\beta}_0$)	1	401170	4284.09246	93.64	<.0001
Median Days on Market ($\hat{\beta}_1$)	1	-171.76975	26.50004	-6.48	<.0001

Table 8: Effect of Inventory on Price for Quartile One

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	57098080014	57098080014	450.2	<.0001
Error	217	27521753757	126828358		
Corrected Total	218	84619833771			
Root MSE	11262	R-Square	0.6748		
Dependent Mean	108543	Adj R-Sq	0.6733		
Coeff Var	10.37544				

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($\hat{\beta}_0$)	1	-34637	6790.85624	-5.1	<.0001
Median Inventory ($\hat{\beta}_1$)	1	3723.44985	175.48619	21.22	<.0001

Table 9: Effect of Inventory on Price for Quartile Two

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	29452005825	29452005825	171.08	<.0001
Error	217	37357653765	172155086		
Corrected Total	218	66809659589			

Root MSE	13121	R-Square	0.4408
Dependent Mean	158970	Adj R-Sq	0.4383
Coeff Var	8.25364		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($\hat{\beta}_0$)	1	54982	7999.62945	6.87	<.0001
Median Inventory ($\hat{\beta}_1$)	1	2535.38844	193.8416	13.08	<.0001

Table 10: Effect of Inventory on Price for Quartile Three

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	21049443901	21049443901	93.26	<.0001
Error	217	48976151696	225696552		
Corrected Total	218	70025595597			

Root MSE	15023	R-Square	0.3006
Dependent Mean	223622	Adj R-Sq	0.2974
Coeff Var	6.71811		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($\hat{\beta}_0$)	1	132014	9540.05977	13.84	<.0001
Median Inventory ($\hat{\beta}_1$)	1	2165.59858	224.24363	9.66	<.0001

Table 11: Effect of Inventory on Price for Quartile Four

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	53421767101	53421767101	112.28	<.0001
Error	217	1.0325E+11	475808039		
Corrected Total	218	1.56672E+11			

Root MSE	21813	R-Square	0.341
Dependent Mean	375934	Adj R-Sq	0.3379
Coeff Var	5.80236		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept ($\hat{\beta}_0$)	1	234813	13400	17.52	<.0001
Median Inventory ($\hat{\beta}_1$)	1	3266.4608	308.2721	10.6	<.0001