

## **Changes in Characteristics of Adjustable-rate Mortgage Borrowers between 2001 and 2004**

To examine whether the characteristics of adjustable-rate mortgage borrowers changed over the 2001-2004 period, the study compares the distributions of these demographic characteristics in the 2001 and 2004 Survey of Consumer Finance (SCF) using two methods. However, we find that there are different results when we apply the two methods. The study explains the differences between these two approaches and concludes that a small change exists in the use of adjustable-rate mortgages (ARMs) by lower income, younger, single-headed, low-education families. Meantime, a noteworthy increase of ARM use exists in higher income or wealthy, well-educated and white families. **Keywords:** Mortgage market, adjustable-rate mortgages, mortgage financial education

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### **Introduction**

Despite rising house prices, more and more people became homeowners. The homeownership rate increased from 68.0% in 2002 to 68.8% in 2005 as shown by U.S. Department of Housing and Urban Development. A recent study performed by Finke, Huston, Siman and Corlija which used Survey of Consumer Finance (SCF) data set from 1989 through 2001 suggests that households holding adjustable-rate mortgage shifted to financially vulnerable families such as lower income, younger and less educated families. Their study urged those vulnerable groups to be targeted for special financial education in the long run interest.

Have the characteristics of adjustable-rate mortgages (ARMs) borrowers changed over the 2001-2004 period? In order to examine the change in the proportion of ARMs that is in the mortgage market and in the characteristics of ARMs borrowers respectively, the present paper that followed the study of Finke et al. compares the proportions of ARMs in the SCF between 2001 and 2004. The two different results are found by two different methods. We explain the differences in the two results and then find the changes in the characteristics of ARMs borrowers. The analysis of the surveys indicates that the proportion of ARMs, as a proportion of total loan, substantially increased in the mortgage market over the 2001-2004 period. But the proportion of ARMs held by low income or low wealth families presented a small change during the same period. Finally, we support the suggestion that it is necessary to implement the financial education for these financially vulnerable groups.

### **Literature Review**

Fixed rate mortgages (FRMs) have a fixed rate cost for the length of a loan, while the rate on an ARM fluctuates with the market. The appeal of an ARM is the low initial interest rate, easing borrowing constraints. However, the danger is an unanticipated increase in the rate could hurt some families' ability to pay off (Curry, 2004) if the rate is reduced the borrowers benefit. But with rates going up, hundreds or even thousands of dollars may be added to a borrower's annual interest expense and monthly payment. In addition, Hagerty (2004)

believes if rates do rise and stay high, most borrowers will reduce other kinds of spending because they need to pay off the increasing monthly payments. That would have a negative impact for the economy as a whole.

One reason for the substantially rising homeownership rate is low mortgage rates experienced during 2001-04 period. The adjustable rate of mortgage dropped 1.85% from January of 2001 to April of 2004<sup>3</sup>. With respect to mortgage type, ARMs have become more popular among consumers in recent years. The share of ARMs, as a percentage of all mortgages, accounted for 34% of mortgage market in 2004 (FREDDIE MAC ARM annual survey, 2004). According to the Mortgage Bankers Association's (MBA) 2004 Single-Family Mortgage Activity Survey (2005), in the second half of 2004, 46% of new mortgages were ARMs. About half of these ARMs were hybrids which had initial low fixed-rate periods of at least three or five years, followed by an adjustable rate.

A common accepted opinion is that households with more stable income, lower risk aversion, and higher probability of moving prefer to choose ARM (Campbell and Cocco, 2003). Also, Khazeh and Decker (1991) found more affluent and younger borrowers favored ARM and they tend to purchase more expensive homes. However, a survey by the Consumer Federation of America (2004) concludes that ARM borrowers were more likely to be younger, lower income and less educated families. This view is identical with the study of Finke, et al. which analyzed the trend of ARM distribution from 1989 to 2001 and then found ARM borrowers had shifted to more financially vulnerable households.

In the study of Finke and Huston, they calculated the proportions of ARM and FRM borrowers in different groups by seven categories such as income, net worth, age, and race for each three year survey period between 1989 and 2001. The denominator used to define the proportion of ARM is the total ARM holders, dividing into the number of ARM holders in each group which is the numerator. The same case exists in computing proportion of FRM holders in each group. This method is one of two methods used in the present study.

### **Data**

The study is based on the Survey of Consumer Finances (SCF). The SCF, sponsored by the Board of Governors of the Federal Reserve System, has been conducted every three years since 1983. The SCF has an extensive, high quality dataset on U.S. household wealth and demography.

The data in this study come from the 2001 and 2004 surveys. In the 2004 survey, 4,522 families were interviewed; and in the 2001 survey, 4,449 families were interviewed (Bucks, Kennickell and Moore, 2006). Households selected for our study are required to have initiated a mortgage within the past five years. This study weights the data to mirror the characteristics of the U.S. population. All dollars in this study are adjusted to 2004 dollars using the consumer price index (CPI).

### **Analysis**

The study analyzes and compares the proportions of ARMs and FRMs holders using two methods. The first method regards the total number of ARM holders as the denominator just as that in the study of Finke, et al. when proportions of ARMs are calculated. The second method uses the total number of ARMs and FRMs holders in each demographic group as the denominator when proportions of ARMs are computed.

There are six demographic groups in this study. Income and net worth percentile categories reflect the households' ability to resist interest rate risks and affordability constraints (Finke, Huston and Siman, 2005). Affordability is predicted by mortgage borrowers' education, race and age. Besides, education and age signify

borrowers' future earnings path and mobility, respectively. Marital status has been identified as an indicator of ability to resist income risk by prior literature.

3. Here are adjustable rates of mortgages from 2001 to 2004:

Year	Month	Interest Rate (%)	Year	Month	Interest Rate (%)
2001	1	6.51	2003	1	5.22
2001	4	6.46	2003	4	4.98
2001	7	6.47	2003	7	4.67
2001	10	6.05	2003	10	5.08
2002	1	6.01	2004	1	4.91
2002	4	5.91	2004	4	4.66
2002	7	5.44	2004	7	5.36
2002	10	5.31	2004	10	5.33

Source: Federal Housing Finance Board Monthly Interest Rate Survey

In the study, the Z-test<sup>4</sup> is applied to test differences between two proportions within two sample years at the 0.05 level of significance. The proportion of ARMs within each row category in 2001 is compared to the proportion of ARMs within the same category in 2004. The same comparison exists in proportions of FRMs. The greater proportions are bolded and the smaller values are italicized and bolded if they have significant difference.

## Results

Table 1 explains the weighted descriptive statistics of mortgage holders who obtained mortgages within the last five years in the 2001 and 2004 survey. The proportions of the two mortgage holders show that ARMs have increased from 15% in 2001 to 18.5% in 2004.

Table 1

### Sample Size and ARM Proportion

	2001	2004
Adjustable-rate mortgages	190	311
Fixed-rate mortgages	1096	1367
ARM/Total Mortgage	15%	18.5%

### The First Method

The denominator of proportions in the first method is the total number of borrowers who held ARM or the total number of borrowers who held FRM.

The distribution of ARMs and FRMs by the income category is presented in table 2. Results from the Z-tests show that ARMs borrowers in the 40-60 percentile income group had a notably higher rate 24.19% in 2001 than ARMs borrowers with the rate 13.25% in 2004. While the proportion of ARMs borrowers in the 80-90th percentile jumped from 9.17% in 2001 to 18.53% in 2004. For FRMs, the proportion of borrowers increased by 3.43% during the 2001-2004 period.

4. The function of z-test for difference between two proportions:

$$Z = (P_1 - P_2) / (S_{P_1 - P_2})$$

$P_1$  &  $P_2$  are the two proportions to be contrasted.

$S_{P_1 - P_2}$  is the standard error of the difference between two proportions.

More detail is presented in *Statistics: A fresh approach. (5<sup>th</sup> ed.)* Sanders, D.H.(1990) New York: McGraw-Hill, Inc.

Table 2

Mortgage Type by Household Income

Mortgage Type	Income percentile		
	category		
ARM		2001	2004
	0-20	10.64	7.08
	20-40	14.7	15.63
	40-60	<b>24.19</b>	<b>13.25</b>
	60-80	24.83	25.33
	80-90	<b>9.71</b>	<b>18.53</b>
	>90	15.93	20.19
FRM		4.74	4.72
	0-20	11.16	11.02
	20-40	<b>19.38</b>	<b>22.81</b>
	40-60	28.11	28.32
	60-80	18.01	16.79
	80-90	18.6	16.34
	>90		

The study divides the income category into a lower income group which is below the 60th percentile and a higher income group which is no less than 60th percentile. Figure 1 shows ARMs proportions among higher and lower income categories. Over the 2001-04 periods, the proportion of ARMs for the lower income group fell 14%. However the result of the previous study shows that the proportion of ARMs had an increasing trend for lower income group from 22.7% in 1989 to 49.5% in 2001(Finke, et al, 2005).

For FRMs holders, the proportions of lower and higher income groups had a small change from 35.28% to 38.55% and from 64.72% to 61.45%, respectively over the 2001-2004 period.

Figure 1

ARM Proportion among High and Low Income Groups

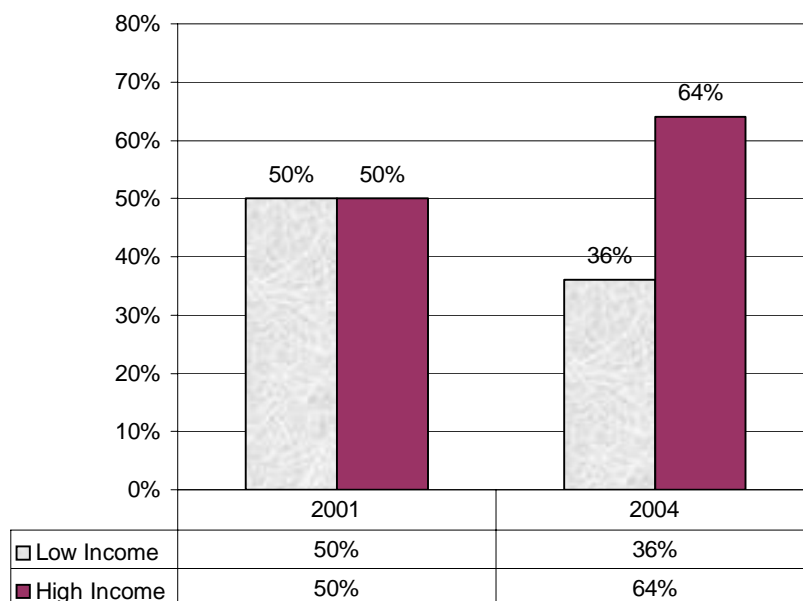


Table 3 indicates the proportion of ARMs and FRMs by net worth category. Respondents in the highest percentile in 2001 had a significant lower proportion of ARMs compared with those in 2004. At the same time, respondents who held FRMs in the 50-75th percentile in 2001 also had a lower proportion than FRMs holders in 2004.

Table 3

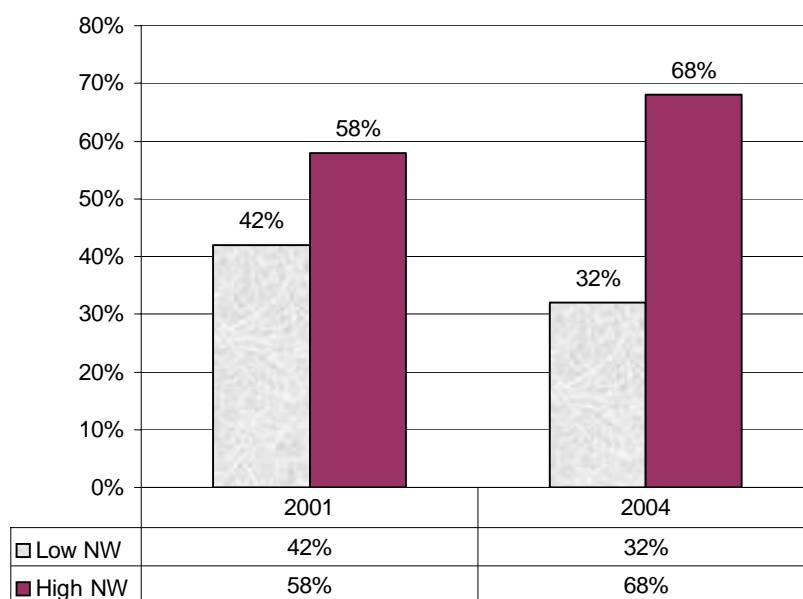
Mortgage Type by Household Net Worth

Mortgage Type	Net Worth		
	percentile category	2001	2004
ARM	0-25	14.6	9.08
	25-50	26.98	23.12
	50-75	32.02	29.64
	75-90	16.12	20.36
	>90	<b>10.28</b>	<b>17.80</b>
FRM	0-25	7.03	6.27
	25-50	30.13	29.49
	50-75	<b>31.64</b>	<b>36.13</b>
	75-90	19.23	17.63
	>90	11.98	10.48

Figure 2 reflects the ARMs percentage distribution among the lower (below the 50th percentile) and higher (50th percentile and above) net worth groups. The proportion of ARMs for the lower net worth group declined from 42% to 32%. However, the findings from the previous years (Finke, et al, 2005) suggest a decrease in the proportion of ARMs for the higher net worth group with a corresponding climb in ARMs for the lower net worth group.

Figure 2

ARM Distribution among High and Low Net Worth Groups



The proportion of the two mortgage types by education category is explained by table 4. The proportion of ARMs consumers with a high school education showed a significant decline, decreasing from 32.45% in 2001 to 18.22% in 2004. In contrast, ARMs consumers in 2004 with some college had an obviously greater proportion compared with those in 2001. Table 4 also shows the proportion of FRMs consumers who had not high school diploma reduced from 2001 to 2004, by 2.73%. While the proportion of FRMs consumers with college degree rose 4.44% during the same period.

Table 4

Mortgage Type by Education of Respondent

Mortgage Type	Education	2001	2004
ARM	no high school	11.2	8.33
	high school/GED	<b>32.45</b>	<b>18.22</b>
	some college	<b>14.44</b>	<b>23.71</b>
	college degree	41.91	49.73
FRM	no high school	<b>8.84</b>	<b>6.11</b>
	high school/GED	27.14	27.10
	some college	19.03	17.35
	college degree	<b>44.99</b>	<b>49.43</b>

Table 5 signifies the mortgage distribution by race of respondent across 2001-04 period. The results of z-test show the proportion of ARMs for white consumers in 2001 is strongly lower than that of ARMs in 2004. And the proportion of FRMs held by other consumers climbed from 1.96% to 3.68% across 2001 to 2004.

Table5

Mortgage Type by Race of Respondent

Mortgage Type	Race	2001	2004
ARM	White	<b>73.05</b>	<b>81.09</b>
	African American	11.63	8.63
	Hispanic	10.33	7.07
	Other	4.99	3.21
FRM	White	81.99	79.63
	African American	10.06	9.43
	Hispanic	5.99	7.25
	Other	<b>1.96</b>	<b>3.68</b>

Table 6 shows the share of ARMs versus FRMs consumers by age group. The z-test indicates a substantial movement of ARMs by age group between 2001 and 2004. The less-than-35 age group saw a substantial decline in the proportion of ARMs—11.03%—over the 2001-2004 period. For FRMs, the proportion rose from 1.12% to 3.06% for consumers who were more than 75 years old in the same period.

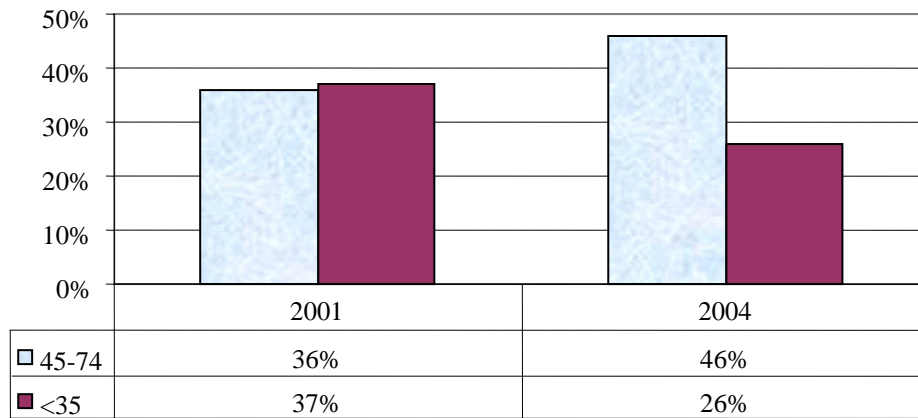
Table 6

Mortgage Type by Age of Respondent

Mortgage Type	Age	2001	2004
ARM	<35	<b>36.99</b>	<b>25.96</b>
	35-44	25.49	23.34
	45-54	21.88	27.05
	55-64	<b>8.74</b>	<b>16.47</b>
	65-74	5.21	2.76
	>=75	1.69	4.41
FRM	<35	22.86	20.24
	35-44	33.44	29.82
	45-54	24.67	27.37
	55-64	11.68	13.48
	65-74	6.23	6.02
	>=75	<b>1.12</b>	<b>3.06</b>

According to figure 3 which displays ARM distribution by age from 45 to 74 compared to those less than 35 years old, total proportion of ARMs increased by 10 percent for borrowers between 45-74 years old while the proportion reduced from 37 percent to 26 percent for borrowers less than 35 years old.

Figure 3  
ARM Distribution by Age



There are no significant differences for the share of ARMs by marital status group between 2001 and 2004, as table 7 indicates. But for FRMs, the married group lessened the usage of FRMs by 4.22% while the single group raised the usage of FRMs by the same proportion during the 2001-2004 period.

Table 7  
Mortgage Type by Marital Status of Respondent

Mortgage Type	Marital Status	2001	2004
ARM	married/partner	70.54	69.58
	single	29.46	30.42
FRM	married/partner	<b>76.96</b>	<b>72.74</b>
	single	<b>23.04</b>	<b>27.26</b>

The second method

The denominator of proportions in the second method is the total mortgage borrowers in each demographic category.

Table 8 shows the proportions of the two mortgage types by income category by this method. The result of z-test indicates that for borrowers who were in the 80-90th percentile income group and the highest percentile group, there are significant changes in the proportions of ARMs. 6.65% of the ARMs (here the denominator is the total number of mortgage borrowers who were just in the 80-90th percentile income group) went into the 80-90th percentile income group in 2001, while 16.16% went to that group in 2004. At the same time, the proportion of ARMs that went to the highest income group increased from 10.17% in 2001 to 17.75% in 2004. There is not the significant change in the proportion of ARMs for the low income groups.



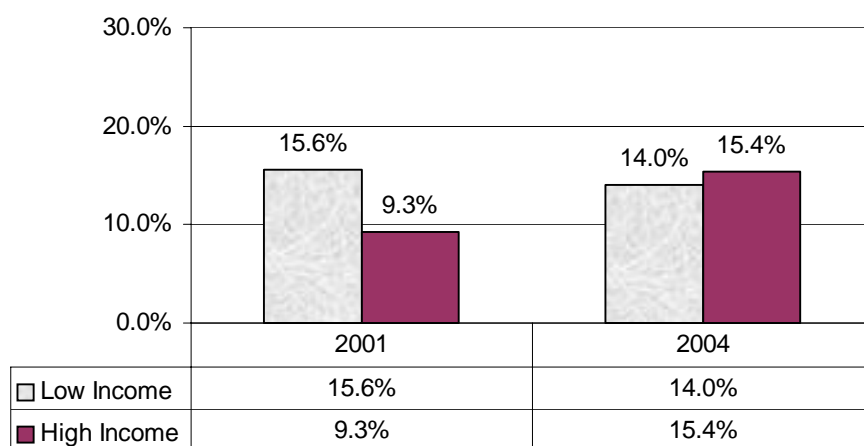
Table 8

Mortgage Type by Household Income

Mortgage Type	Income percentile		2001	2004
	category			
ARM	0-20		22.89	20.76
	20-40		14.82	19.86
	40-60		14.16	9.21
	60-80		10.46	13.51
	80-90		<b>6.65</b>	<b>16.16</b>
	>90		<b>10.17</b>	<b>17.75</b>
FRM	0-20		77.11	79.24
	20-40		85.18	80.14
	40-60		85.84	90.79
	60-80		89.54	86.49
	80-90		93.35	83.84
	>90		89.83	82.85

Figure 4 proves the small change of ARMs choice in the low income group. The proportion of ARMs borrowers in the lower income group (0-60th percentile) only declined 1.6%, while the proportion of ARMs borrowers in the higher income group (greater than 60th percentile) rose 6.1% over 2001-2004 period.

Figure 4

ARM Proportion among High and Low Income Groups

Of the net worth groups, there were also substantial changes of the ARMs proportion in the last two high percentile groups. ARMs holders from 2001 to 2004 drove a 6.81% point increase in the share of the holders who were in the 75-90th percentile group. The ARMs borrowers in the highest percentile in 2004 had more than twice as the share as those in 2001. (the data shown in the table 9). There is not a strong movement in the proportion of ARMs for the low net worth groups according to the result of z-test.

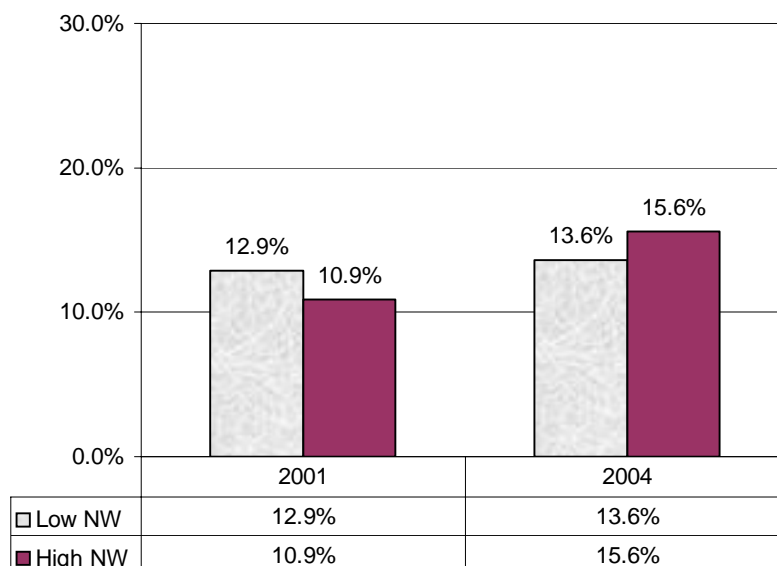
Table 9

Mortgage Type by Household Net Worth

Mortgage Type	Net Worth		2001	2004
	percentile category			
ARM	0-25		21.55	20.20
	25-50		10.58	12.04
	50-75		11.80	12.53
	75-90		<b>9.98</b>	<b>16.79</b>
	>90		<b>10.19</b>	<b>22.88</b>
FRM	0-25		78.45	79.80
	25-50		89.42	87.96
	50-75		88.20	87.47
	75-90		90.02	83.21
	>90		89.81	77.12

Figure 5 displays the proportion changes of ARM borrowers with low (below 50th percentile) and high net worth (greater than 50th percentile) between 2001 and 2004. There is a small increase in the proportion of the lower net worth households who chose ARM, by 0.7%. However, borrowers with high net worth increased their ARM loans by 4.7%.

Figure 5

ARM Distribution among High and Low Net Worth Groups

As shown in the table 10, the proportion of ARMs for the 55-64 years old group almost increased double during the 2001-2004 period, from 9% to 17.59%. For the less-than-35 group, we did not see any substantial difference between two proportions in 2001 and 2004.

Table 10

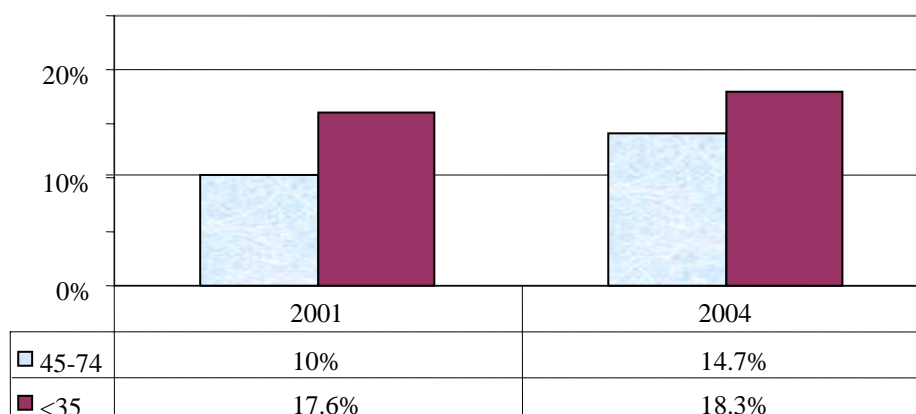
Mortgage Type by Age of Respondent

Mortgage Type	Age	2001	2004
ARM	<35	17.62	18.31
	35-44	9.15	12.03
	45-54	10.49	14.72
	55-64	<b>9.00</b>	<b>17.59</b>
	65-74	9.96	7.42
	>=75	16.54	20.12
FRM	<35	82.38	81.69
	35-44	90.85	87.97
	45-54	89.51	85.28
	55-64	91.00	82.41
	65-74	90.04	92.58
	>=75	83.46	79.88

Figure 6 indicates that ARMs holders who were less than 35 years old had a small change in the rate across 2001 to 2004, with 17.6% of ARMs in 2001 that went to that group and 18.3% in 2004.

Figure 6

ARM Distribution by Age



When the second method is used, different results are also found in other categories. For example, there is not a significant change in the rate of ARMs holders who obtained high school degree and no high school degree according to the z-test. And the percentage of ARMs borrowed by consumers with no high school degree increased from 14.35% in 2001 to 19.24% in 2004. The percentage of ARMs for single borrowers went up from 14.46% in 2001 to 16.32% in 2004 (data not shown in the table).

**Discussion**

Although the characteristics of ARM borrowers has changed a lot recent years, the study of the change

in the characteristics of ARM borrowers during the 2001-2004 period still has the value and can be used for the reference. The results of analysis show that, over the 2001-2004 period, the share of ARM in mortgage market continued to trend up, rising 3.5%.

Based on the results derived from the first method, lower income or wealth, younger, low-educated families obviously reduced their ARM loans from 2001 to 2004. The proportion of ARMs dropped 14% in lower income groups (below the 60th percentile) and decreased 10% in lower net worth groups (below the 50th percentile) over that three-year period. Across age group, borrowers with less than 35 years old reduced their ARMs by 11% during the 2001-2004 period. Of the educational groups, the proportion of ARMs significantly declined for low-educated borrowers during the same period. For the race group, Non-white borrowers dropped the ARMs share insignificantly. By marital status, single families did not show a significant change in the proportion of ARMs.

However, we obtained the different results when the second method is applied. The result of the z-test indicates that there are not significant changes in the proportions of ARMs for the lower income, lower net worth, lower education and less than 35 years old groups between 2001 and 2004. And the proportion of ARMs borrowers declined 1.6% in the lower income group, increased 0.7% in the lower net worth households, and rose 0.7% in the group who were less than 35 years old over the 2001-2004 period.

Why is the result different when the different denominator is used? The reason is that, in the first method, the numerator increased much more slowly than the denominator did when the proportion of ARMs was calculated. For example, though the number of ARMs borrowers in the 25-50th percentile net worth group (the numerator) rose between 2001 and 2004, it increased far more slowly than the total number of ARMs borrowers in all group (the denominator) did. The total number of ARMs borrowers increased faster because, according to the analysis, the share of ARMs increased mostly result from borrowers in the middle and higher net worth groups raised the usage of ARMs. As a result, the proportion of ARMs borrowers in the 25-50th percentile net worth group in 2004 displayed a lower value than that in 2001. However, the proportion of ARMs borrowers in the 25-50th percentile net worth group really rose 5.04% when the denominator is the number of all mortgage borrowers in the 25-50th percentile net worth group. The same case exists in ARMs borrowers in the 20-40th percentile income group, and in single-headed groups. But we also notice that borrowers in the 0-20th percentile income group, the 0-25th percentile net worth group and minority groups slightly reduced their ARMs percentage by 1.34% and 0.79%, respectively between 2001 and 2004.

In conclusion, higher income or wealth, well-educated, older, white, and married families are inclined to choose ARMs over that three years period. These borrowers are willing to and have ability to assume additional risk of increased variability in the future payments so as to lower their initial payments. On the other hand, the proportions of low-income or wealth, low-educated, younger, single-headed families who financed houses by ARM have the small change during the 2001-2004 period.

The study of Finke et al (2005) proved the proportions of ARM borrowers who are less wealthy, younger, less-educated, single, and minority were continually climbing during 1989-2001 period. Though the proportions of ARM in these groups had the small change over the 2001-2004 period, some of them still had the increasing trend, such as the proportions in the 20-40th percentile income group, the 25-75th percentile net worth group, less than 35 years old group, no high school diploma group, and single group. So we still need concern the harm result from the inappropriate usage ARMs in these groups when they purchase houses.

The data from the Office of Federal Housing Enterprise Oversight's house-price index (2006) show prices of house increased nearly 27% from 2001 to 2004. And over the past 30 years, house prices at the national level have grown at about a 6 percent annual rate. With house price dramatically going up, it is difficult for less wealthy families during that three years period to afford a house. At the same time, mortgage lenders are

providing lots of innovative ARM products that maximize the ability of borrowers to become homeowners. More than 50 different types of ARM variations can be sold to Freddie Mac. Some lenders are selling these products to unqualified borrowers. The lenders earn more money through the sale of the loan when the lower interest rate enabled some people who might not have qualified for a mortgage to buy a house. Borrowers need to carefully consider how much they can afford the house.

Bucks and Pence (2006) find that some ARM borrowers especially those with low income underestimate or do not know how much their interest rates could change. Subsequently, they also may not fully understand the interest rate risks and may face large unanticipated rising in monthly payment resulting from a rise in short-term interest rates. In addition, borrowers with a limited understanding of mortgage terms may obtain sub-prime mortgages when they could get qualified for less-costly mortgages (Lax, Manti, Raca, and Zorn, 2004). Newman et al (2006) think the high level of sub-prime lending appears to be linked to high foreclosure levels. And they expect nontraditional mortgages such as ARM is one of the leading reasons for foreclosure in the coming years.

Obviously, financial education is still necessary with the continuous increasing proportion of potentially vulnerable borrowers who hold ARMs. Low financial educational levels within some demographic groups leads, for example, lower-income and minority households, to have difficulties making mortgage decisions and make them vulnerable to the market abuse. The government and policymaker should especially focus on the financial education for these vulnerable populations.

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#### Endnotes

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