

# ADJUSTABLE RATE MORTGAGES: IS THE “COST OF FUNDS RISK” ASSUMED BY THE BORROWER?

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## Abstract

Prior to the early 1980s the dominant mortgage type was the 30 year Fixed Rate Mortgage (FRM). In 1982, The Alternative Mortgage Transaction Parity Act (AMTPA) was passed. It allowed mortgage lenders to introduce new mortgage instruments such as adjustable rate mortgages (ARM's). The original purpose of this new instrument was to assist lending institutions in managing "cost of funds" risk ARM's clearly transfer the cost of funds risk from the lender to the borrower. The Risk-Return Trade-Off axiom, states that We won't take on additional risk unless we expect to be compensated with additional return. This paper is an attempt to examine this axiom and to see if ARM borrowers actually realized a lower average mortgage rate over the life span of their loans, as compared to the rate on FRMs, which existed at the time the loans were originated. In other words, since the ARM borrower assumed the cost of funds risk, was he or she rewarded by paying lower average mortgage rates than would have been paid by those choosing FRMs?

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## Introduction

The three main risks facing mortgage lenders are: “cost of funds” (or Gap) risk, credit/default risk, and prepayment risk. Cost of funds risk is the potential inability of the lender to match rising liability costs with asset returns. Credit/default risk is associated with the inability of borrowers to pay outstanding debt. Prepayment risk is the potential loss associated with a borrower refinancing a loan during periods of falling interest rates.

Prior to the early 1980s the dominant mortgage type was the 30 year Fixed Rate Mortgage (FRM). In 1982, The Alternative Mortgage Transaction Parity Act (AMTPA) was passed. It allowed mortgage lenders to introduce new mortgage instruments such as adjustable rate mortgages (ARM's). The original purpose of this new instrument was to assist lending institutions in managing “cost of funds” risk. As stated by Mills and Gardner, “It was clear from the financial problems of the thrift industry during 1980-82 that widespread usage and acceptance of ARMs were needed if lenders were to achieve the portfolio flexibility that would enable them to survive another period of relatively high interest rates”<sup>1</sup>

AMTPA specifically states that: “The Congress hereby finds that:

- (1) Increasingly volatile and dynamic changes in interest rates have seriously impaired the ability of housing creditors to provide consumers with fixed-term, fixed-rate credit secured by interests in real property, cooperative housing, manufactured homes, and other dwellings;
- (2) Alternative mortgage transactions are essential to the provision of an adequate supply of credit secured by residential property necessary to meet the demand expected during the 1980's”<sup>2</sup>

ARM's clearly transfer the cost of funds risk from the lender to the borrower. The risk-return trade-off axiom, as described in a popular corporate finance text reads as follows: “We won't take on additional risk unless we expect to be compensated with additional return.”<sup>3</sup> In other words, if a borrower assumes the risk of an adjustable rate mortgage, he or she should be compensated with a lower average cost over the life of the loan.

This paper is an attempt to examine this axiom and to see if ARM borrowers actually realized a lower average mortgage rate over the durations of their loans as compared to the rate than would have been paid on FRMs that existed at the time the loans were originated. In other words, since the ARM borrower assumed the cost of funds risk was he or she rewarded by paying lower average mortgage rates

than would have been realized by those choosing FRMs?

### **Methodology**

Data on ARM rates were available starting with January 1984. Average realized ARM rates for various assumed mortgage lives were calculated using the following assumptions:

1. ARM rates adjust annually
2. The rates adjust to an index. The index used was the one-year T-Bill rate. Other indexes include the LIBOR and the Fed Funds rate.
3. The adjusted ARM rates were the T-Bill rates at the time of the adjustment plus 2.75%. The maximum annual adjustment was plus or minus 2%.
4. The maximum adjustment in ARM rates over the lives of the mortgages was plus or minus 6%.

Geometric averages were then calculated for the original and adjusted rates given assumed lives of 10, 9, 8, 7, 6 and 5 years. For example, if the life was 10 years, it was assumed that the borrower made payments over that period and then either refinanced or paid off the loan. As is shown in Appendix I, the average mortgage life span is between 5-10 year.

A summary of the findings is found in the appendix.

### **Summary of the Outcomes and Conclusions**

Among the major changes that took place in the mortgage industry since the early 1980s is the phenomenon of refinancing. The fact is that, currently, the average mortgage life span is somewhere between five and ten years (see Appendix I). Hence, in this study, the authors calculated the average annual adjustable mortgage rate for assumed mortgage life spans ranging from 5 to 10 years. These rates were then compared with the existing FRM rates at the mortgage initiation date.

It is very difficult to reproduce the very large spreadsheet used for these calculations. This

spreadsheet will be shown and explained by the authors during our presentation. Tables #1 and #2 present a small portion of the outcomes. Chart #1 is a summary of all the outcomes.

Table #1 presents the monthly outcomes for 1984 for six different mortgage life spans. For example, if one borrowed using a 30-year FRM in January 1984, the annual cost, regardless of the mortgage life span, was 13.37%. However, if one took out an ARM in January 1984 and held it for five years, the actual realized annual rate was 10.3%, or 3.07 % lower than the FRM rate. If the same loan was held for six, seven, eight, nine, or ten years, the annual realized rate was 10.54%, 10.55%, 10.41%, 10.07%, and 9.68% respectively.

If the loan was originated during any of the 12 months of 1984 and if it was held for between five and ten years, in all cases the borrower of the ARM realized a lower average annual rate than the FRM that existed on the loan origination date.

Table #2 presents the same outcomes for loans that were originated on the month of January for each year from 1984 till 2000. Clearly, in most cases, the ARM averaged better than the FRM. Also, for ARMs that were originated on January and lasted 10 years, the cost always averaged better than that for an existing FRM. However, this was not always the case for 5 or 6 year ARMs. In other words, while it seems that more often than not, the ARM averaged below the relevant FRM, it seems that ARMs with longer durations (9 or 10 years) were more efficient to the borrower.

Chart #1 is a summary of all the observations. Clearly, the FRMs exceeded the average realized ARM rates in most cases. Notable exceptions are the years 1987, 1994, 1996 and also 1998-1999.

Table #3 presents a statistical summation and comparison of all the outcomes. The first two rows show the range of the advantage (“minus”) and disadvantage (“plus”) of ARMs over FRMs for the various life spans. For example, if one borrowed using an ARM from 1984 until 2000 (a span of five years), the largest advantage realized was

-4.32% and the disadvantage was +0.75%. The 10 year life span seemed to be more advantageous because the largest difference was -5.14% while the worst case scenario was only a +0.50%.

It seems that, while in all cases the ARM borrower realized an average overall advantage, the longer the life span the better. A mortgage held for 5 or 6 years had an average advantage of -1.21% (A 1.21% average lower annual rate as compared to the existing FRM ); the average advantage over the 10 year life span was -1.81%.

Overall, 142 starting dates were analyzed for a 10 year assumed mortgage life. In only 10 months or 7% of the time were the FRMs advantageous. For all of the 202 starting dates for the 5 year loans, FRM borrowers realized an advantage only 34 times (17% of the cases). Again, it seems that while, generally speaking, the risk-return trade-off was proven correct, the mortgages with 9-10 years life spans were better for the borrower.

The standard deviations of the outcomes again help in proving that the ARM borrower was rewarded for assuming the cost of funds risk. Assuming that the data are normally distributed (which may or may not be the case), the 10 year borrower had a 95% chance that the loan will cost him/her between 0.6% to 3% below the existing FRM.

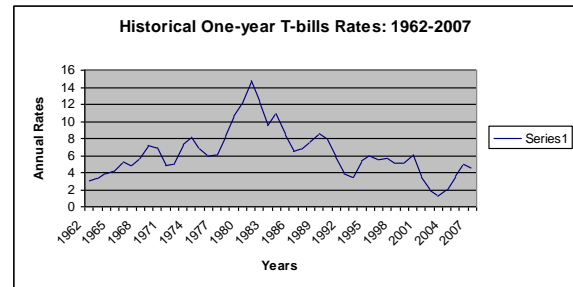
#### **Limitations of the Study and Additional Comments**

It is obvious that the potential advantages (or disadvantages) that ARM borrowers have as compared to FRM borrowers is a function of the trend of interest rates and the initial gap between FRM and ARM rates on the origination date.

Based on our assumptions, if the original gap between FRM and ARM rates is 6% or higher, ARMs are guaranteed to be preferred to FRMs. The smaller the gap the less the advantage. The lifetime of the mortgage also has an impact. The longer the mortgage is outstanding, the better the advantage,

The other major variable is the overall trend in interest rates. This paper analyzed the period from

1984 to 2004, a period during which interest rates generally declined from a record high in the early 1980s to relatively low levels in the mid 2000's. (See the chart below.) An interesting question is this: would the same results hold during rising interest rate periods? We suspect they would be different. Further study is obviously necessary.



#### **Appendix I: Average Mortgage Life Span**

Mortgage refinancing and declining mortgage lives are phenomena that began in the late 1980s. Currently the typical life span of a mortgage averages between five to ten years.

The authors asked HSH Associate for information on the average life span of mortgages. Their reply was: "With regards to actual life of loan terms, we know of no definitive source"<sup>4</sup>.

Based on the following sources we concluded that the average mortgage life span is between 5 to 10 years:

- "Average mortgage life is seven years"<sup>5</sup>
- "A 10 year period is the historical assumption of the average life of a mortgage loan"<sup>6</sup>
- "30-year mortgages have traditionally been considered to have approximately a twelve year average life"<sup>7</sup>.
- "The average life of a mortgage is only 8 years" (fsbpekase.com/loan-tips.html)
- "Average mortgage length is about seven and a half years" (monstermoving.com)
- "Most mortgages last seven years" (realtimes.com)
- "the average length of time that homeowners stay in their home in the United states is just

over six years” (Modern Woodmen of America.com)

- “The average length of a mortgage is less than five years” (thinkgling.com).

Thus we assume that the average duration of home mortgages is between five and 10 years.

### **Appendix II: The Typical ARM Loan is Riskier than the Typical FRM Loan. Or: Lenders traded off the Cost of Funds Risk for Credit Risk**

An examination of Charts A1-A5 in the Appendix proves the following points:

1. The average ARM loans are much larger than typical FRM loans.
2. A larger percent of non-conforming loans are ARM loans as compared to FRM loans.
3. The larger the loan the better is the probability that it is an ARM loan.
4. ARM loans have larger Loan-to-Value ratios. (Smaller down payments, less equity).
5. More new homes are financed by ARMs as compared with used homes. Since prices of new homes are higher than used homes, the borrower with an ARM is assuming a larger loan amount.

#### **Additional Notes**

This study was originally aimed at examining the risk-return trade-off hypothesis. However, due to the current upheaval in financial markets an added observation is worthwhile. It seems that while the ARM lender eliminated the cost of funds risk, he assumed a much larger default risk. As Appendix #2 indicates, the typical ARM loan is larger than the average FRM loan, and the larger the mortgage the better the probability it is an ARM loan. The typical

ARM loan has a higher loan to price ratio. In other words, the borrower has less equity in the house which makes this loan more risky. Also, more new homes were financed by ARM loans than existing homes. New homes are usually more expensive than existing homes so, again, the typical ARM loan is larger.

Recent market data also indicate that larger proportions of sub prime mortgages were ARM loan and larger percent of ARM loans are in default as compared with FRM loans.

In conclusion, the typical ARM loan is larger than the typical FRM loan; the ARM borrower has less equity in the property; the larger the loan the more likely it is to be an ARM. All this implies that the ARM loans increase the credit /default risk facing lenders. The lender issuing ARMs trades off the “cost of fund risk” for default risk which explains, in part, the current crisis.

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<sup>1</sup> Mills Dixie L. & Gardner Mona J. “Consumer Response to ARMs: Implications of Evidence from Illinois and Wisconsin” The Journal of Consumer Affairs, Vol. 20, No. 1, 1986, p.78

<sup>2</sup> Garn-St Germain Depository Institutions Act of 1982, Section 801 of title VIII of the Act of October 15, 1982 (Pub. L. No. 97--320; 96 Stat. 1545), effective October 15, 1982

<sup>3</sup> Keown et Al Foundations of Finance, Prentice Hall, 3<sup>rd</sup> ed., 2000, p.13

<sup>4</sup> Keith T. Gumbinger, Vice President HSH Associates, April 6, 2005

<sup>5</sup> Frame W. Scott & Wall Larry in Economic Review, Federal reserve Bank of Atlanta, Jan. 2002.

<sup>6</sup> From: The Federal Housing Finance Board web site

<sup>7</sup> The State Department Federal Credit Union web site

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**Table 1:**  
**Realized Average Annual Costs of ARM's For Mortgage Lives From 5 to 10 years**  
**Compared to Fixed Rate Mortgages, Monthly for 1984**

Loan Origination Date	Assumed Life of the Mortgage						FRM
	5yr	6yr	7yr	8yr	9yr	10yr	
Jan-84	10.30	10.54	10.55	10.41	10.07	9.68	<b>13.37</b>
Feb-84	10.27	10.46	10.51	10.33	9.96	9.57	<b>13.23</b>
Mar-84	10.49	10.65	10.71	10.52	10.16	9.75	<b>13.39</b>
Apr-84	10.39	10.61	10.69	10.50	10.12	9.70	<b>13.65</b>
May-84	10.37	10.59	10.66	10.46	10.08	9.68	<b>13.94</b>
Jun-84	10.30	10.44	10.50	10.33	9.96	9.59	<b>14.42</b>
Jul-84	10.35	10.40	10.44	10.26	9.90	9.53	<b>14.67</b>
Aug-84	10.48	10.56	10.55	10.30	9.87	9.50	<b>14.47</b>
Sep-84	10.58	10.64	10.62	10.36	9.92	9.53	<b>14.35</b>
Oct-84	10.53	10.57	10.53	10.25	9.80	9.43	<b>14.13</b>
Nov-84	10.34	10.37	10.33	10.04	9.63	9.30	<b>13.64</b>
Dec-84	10.34	10.36	10.28	9.97	9.57	9.25	<b>13.18</b>

Please note that this is for one year (1984). Our study spanned the period from 1984-2004 and the above table is an illustration of our results.

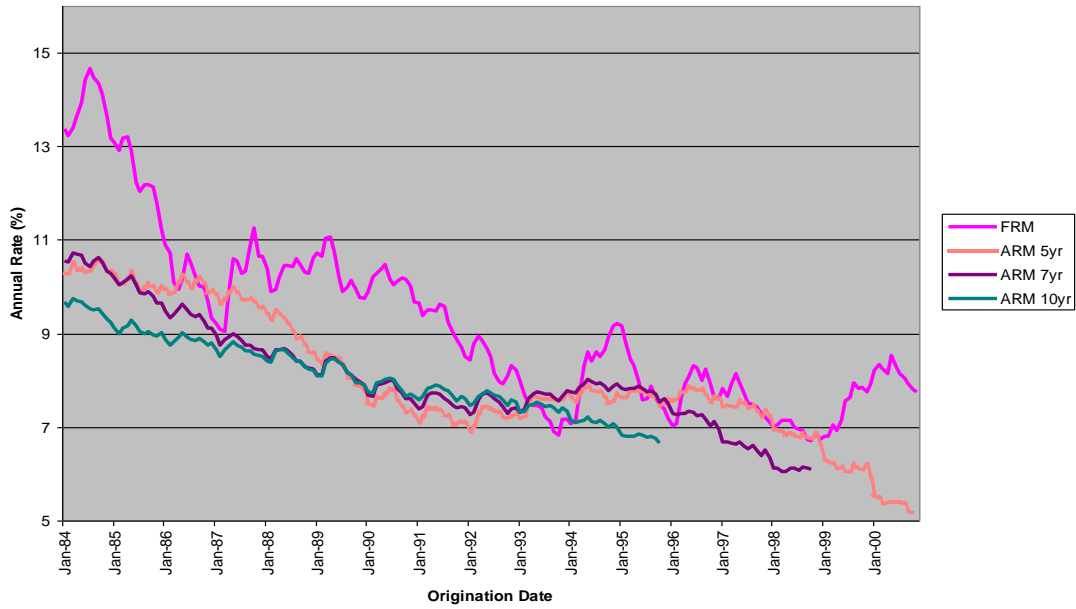
**Table 2:**  
**Realized Average Annual Costs of ARM's For Mortgage Lives From 5 to 10 year**  
**Compared to Fixed Rate Mortgages for each January: 1984 to 2000**

Loan Origination Date	Assumed Life of the Mortgage						FRM
	5yr	6yr	7yr	8yr	9yr	10yr	
Jan-84	10.30	10.54	10.55	10.41	10.07	9.68	<b>13.37</b>
Jan-85	10.09	10.22	10.05	9.67	9.27	9.00	<b>12.92</b>
Jan-86	9.85	9.71	9.33	8.92	8.66	8.74	<b>10.71</b>
Jan-87	9.64	9.20	8.76	8.49	8.59	8.50	<b>9.08</b>
Jan-88	9.29	8.76	8.45	8.47	8.38	8.37	<b>9.89</b>
Jan-89	8.33	8.04	8.13	8.07	8.09	8.09	<b>10.65</b>
Jan-90	7.45	7.64	7.65	7.73	7.77	7.73	<b>10.2</b>
Jan-91	7.21	7.29	7.43	7.51	7.50	7.65	<b>9.37</b>
Jan-92	6.99	7.20	7.32	7.34	7.52	7.51	<b>8.76</b>
Jan-93	7.23	7.37	7.38	7.58	7.56	7.35	<b>7.68</b>
Jan-94	7.52	7.51	7.72	7.68	7.43	7.09	<b>7.15</b>
Jan-95	7.63	7.85	7.79	7.49	7.11	6.79	<b>8.83</b>
Jan-96	7.61	7.58	7.27	6.86	6.54		<b>7.08</b>
Jan-97	7.47	7.13	6.68	6.34			<b>7.65</b>
Jan-98	6.97	6.48	6.12				<b>7.04</b>
Jan-99	6.29	5.91					<b>6.81</b>
Jan-00	5.49						<b>8.33</b>

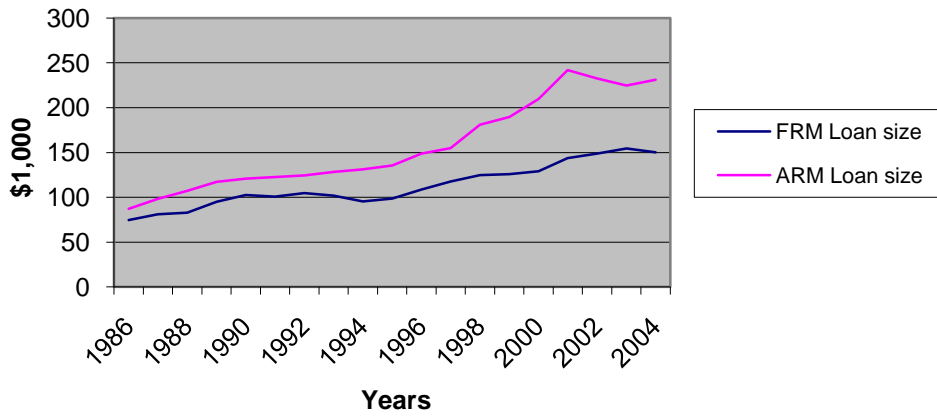
**Table 3: Summary of Outcomes**

The loan Life Span	<u>5 years</u>	<u>6 years</u>	<u>7 years</u>	<u>8 years</u>	<u>9 years</u>	<u>10 years</u>
The largest annual advantage of ARM over FRM	-4.32	-4.27	-4.23	-4.41	-4.77	-5.14
The largest annual advantage of FRM over ARM	0.75	0.67	0.73	0.88	0.78	0.50
Average Difference Between FRM and Calculated ARM Annual rates	-1.21	-1.21	-1.37	-1.50	-1.65	-1.81
StDev	1.18	1.07	1.04	1.08	1.17	1.21
Number of observations	202	190	178	166	154	142
No of Periods ARM>FRM	34	26	21	13	12	10
Percent No of Periods ARM>FRM	17%	14%	12%	8%	8%	7%

**Chart 1  
ARM vs. FRM Rates**



**Chart A1  
FRM and ARM Loan size Comparison**



**Chart A2  
Proportions of Loans exceeding  
Conforming Loan limits**

