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The Determinants of Foreclosures for Single-Family Homes in the United States

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Abstract

What are the key determinants causing the current record number of foreclosures? To answer this, the study will use the most recent national foreclosure data and attempt to find a model with results that can be interpreted to suggest potential policy implications.

Tucker, Joan S., Howard S. Friedman, Joseph E. Schwartz and Michael H. Criqui. "Parental Divorce: Effects on Individual Behavior and Longevity." *Journal of Personality and Social Psychology*, 1997, 73 (2), pp. 381-391.

The Determinants of Foreclosures for Single-Family Homes in the United States

Bryan Duling

I. Introduction

In the United States, homeownership creates numerous benefits for individuals, families and society and is the cornerstone of the "American dream." Low foreclosure rates of residential mortgages and the stigmatism associated with the term foreclosure are indicative of the value that Americans put on owning their homes. However, the rate of mortgages entering the foreclosure process during the 2nd quarter of 2007 was 0.65%. This rate is the highest in history, up seven basis points from the first quarter, twenty-two basis points from 2006 and showing no signs of a decrease (Ackerman, 2007). Below, Figure 1 shows the percentage of homes that were in foreclosure at the end of the quarter from 1995 to 2007. Figure 1 illustrates how the current number of foreclosures is close to surpassing the foreclosure totals seen during the post September 11th recession.

Although still a small percentage of all mortgage originations, defaults and subsequent foreclosures are large in absolute numbers and produce crushing losses to lenders and investors, higher finance costs to consumers, and devastating damage to borrowers and homeowners directly affected. The entire macroeconomy is beginning to feel the effects with the real possibility of increased unemployment due to a recession that is imminently looming. This paper analyzes factors that cause borrowers to default on their mortgages and lose their homes to foreclosure.

National foreclosure proceedings have been inflated by significant increases in California, Florida, Nevada, and Arizona. These markets are dominated by investor loans, which are loans to buyers who do not plan on living in the houses. Nationally, home prices have fallen by 3% causing investors to abandon their mortgages, driving up foreclosure rates. These markets are also dominated by subprime loans: deals offered by lenders to borrowers with blemished credit histories that have higher rates of interest. During this period of subprime lending, underwriting standards were lowered and new affordability products such as extra-long term, interest only mortgages, and loans with low teaser interest rates that balloon after a few years (hybrid mortgages) were offered (Ackerman, 2007). While more than a third of all subprime adjustable rate loans are in the previous four Southern states, Ohio and Michigan are two Midwestern states contributing to the foreclosure problem. These troubles are driven by economic problems created by job losses in the manufacturing and the auto industries (Ackerman, 2007).

Many lenders, such as Countrywide Financial, have suffered enormous losses after late payments and subsequent defaults mounted. General Motors, the world's largest carmaker, is in danger of having to take a $1 billion charge to cover bad mortgage loans of its subsidiary, Residential Capital ("Subprime", 2007).

Thanks to problems in the subprime mortgage sector, the subsequent decline in housing

Figure 1: % of Loans in Foreclosure at End of Quarter

construction and sales has had an immediate economic impact. A number of real-estate agents, mortgage brokers, investment bankers, movers, painters, contractors, landscapers, etc. are experiencing lower wages and even losing their jobs. Because home sales and moves stimulate purchases of appliances, electronics, and furniture, giant chains like Home Depot and Sears have reported sales down around 5%. In addition, auto sales were down 12% in July 2007 from the previous year and consumers reported falling home equity and rising mortgage payments as a main reason why (Gross, 2007).

With all of this damage being done to the economy, an important question needs to be asked: What are the key determinants causing the current record number of foreclosures? To answer this, the study will use the most recent national foreclosure data and attempt to find a model with results that can be interpreted to suggest potential policy implications. Section II of the paper describes

literature on the topic of foreclosures and related theory. Section III and IV explain the data and then lay out an empirical framework, respectively. The model includes traditional determinants of foreclosure, current lending practices, and economic conditions. With the modeling framework laid out, Section V discusses the results from estimation of the model. Finally, Section VI presents a detailed summary of the findings, possible policy implications and avenues for future research.

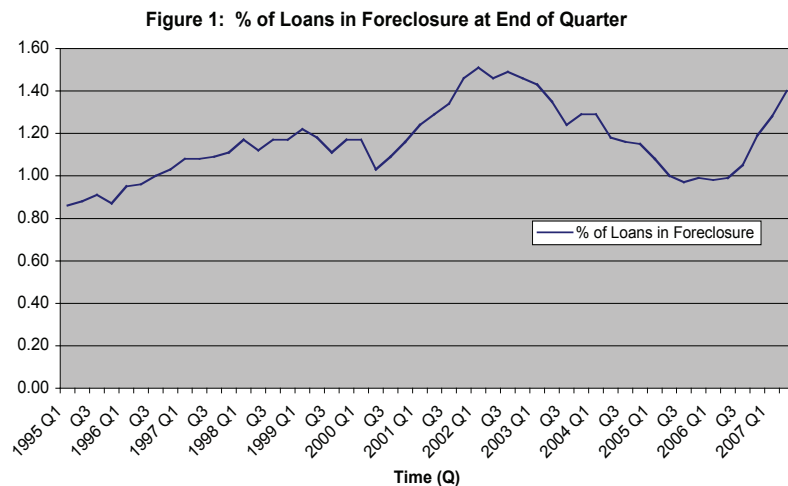## II. Review of the Literature and Theoretical Model

Many studies throughout the late 20th century have looked at the determinants of foreclosure. Traditionally, these determinants have included unemployment rates, change in interest rates, loan-to-value ratios, and home price appreciation. In addition, most studies have been able to look at the micro side of the housing issue. However, data sources will force my study to take a more national level approach. In addition to looking at more of the national side of the problem, I will examine a couple of new, untested variables as determinants of foreclosure and use the most recent foreclosure data.

Two complementary theories, option theory and the ability-to-pay model, can best explain the underlings of the current foreclosure problem. The basic premise of the option-based model is that borrowers have the option to default on their mortgage during each payment period (Quercia, 2005). Borrowers believe they can benefit from clearing the value of their mortgage off the books and gain free rent in their home between the time they default and the actual event of foreclosure. The negatives of defaulting and going through the foreclosure process for the borrower include giving up the house, costs of moving, losses of attachable assets, lower credit rating, and any psychological or moral costs of defaulting (Hender-

shott, 1993).

Option theory stresses that when interest rates are declining/rising, borrowers have the strong incentive to default/not default, especially in regions where house prices are declining/rising (Elmer, 2007). If home values fall sufficiently, borrowers will "ruthlessly" exercise their option to default (Cutts, 2005). The likelihood of default increases as the market value of equity declines, which occurs if either mortgage value increases or property value decreases (Archer, 2002). However, even when in the money, borrowers may delay or refuse the default option although it makes financial sense to do so, hoping the option becomes even "deeper in the money" (Quercia, 2005; Pennington-Cross, 2006). These borrowers either believe the negatives of defaulting outweigh the costs or believe the volatility in the market could make foreclosure even more attractive in the future.

A second theme of option-based models is that prepayment and default are "competing" risks. If one option is exercised, the other option is terminated. The option to prepay, a call option, will be exercised when the borrower can get a better deal on an interest rate after financing costs. Competing options are especially relevant now because prepayment penalties are common with adjustable rate mortgages. The proportion of subprime loans with prepayment penalties has increased from about 50 percent in 1998 to 80 percent in 2000 (Quercia, 2005). Therefore, this factor limits a borrower's ability to call a mortgage and refinance to a lower rate.

When dealing with the option to default and go through foreclosure, interest rates have a substantial impact. When interest rates are increasing, the cost of borrowing money increases so foreclosures should increase, *ceteris paribus*. However, it is likely that there is a lag between the time the interest rate increases and the time when foreclosures becomes amplified. Adjustable rate mortgages are likely to come with teaser rates, below market interest rates, for a short period of time and then will adjust to the higher market rate.

Therefore, the borrower is not likely to foreclose until the interest rate jumps after a span of a few years.

In addition to option-theory of default, another common reason that individuals default on mortgages is due to "trigger events." This view is characterized by the ability-to-pay model which says a mortgagor will default whenever the mortgagor's current income after expenditures falls below the amount of payment to mortgage principal and interest (Barth, 1983). As defined by Elmer, trigger events are "unanticipated shortfalls in income such that income is no longer sufficient to meet periodic debt obligations" (2007). The sudden change then "triggers" default on the mortgage. Therefore, income and expense-related shocks such as job loss, divorce, or a death in the family may lead to insolvency and mortgage default.

Higher unemployment rates should be an acceptable proxy for labor market conditions and the chance that the borrower himself faces this situation. Danis and Pennington-Cross used unemployment rates lagged one month as a proxy for trigger events and found surprisingly that foreclosures and unemployment are inversely related (2005). This result differs from theory and natural intuition. In addition, divorce can be a major financial stressor especially when alimony or child support payments are involved. With the addition of a second house, living expenses tend to increase dramatically without any corresponding increase in wages. However, while the divorce rate doubled between 1965 and 1976, it has since varied by less than 10% and would not appear to be a determinant causing the most recent increase in foreclosures (Henderschott, 1993).

An issue that is related to trigger events is the financial risk posture of households. Individuals choose their preferred level of savings and insurance to meet those unexpected shocks or "trigger" events. The likelihood that a trigger event has a severe negative impact becomes greater as the individual's savings or insurance decreases. For example, a lender might foreclose on one home

and not another if the foreclosed home's owner has less readily available savings. The theory of financial risk posture suggests a possible interaction between savings and unemployment rates and their impact on foreclosures. In the United States, consumer debt has reached historical highs while the personal savings rate is at all-time lows (Elmer, 2007). This recent trend of an extremely low savings rate may be having a vast impact on today's record foreclosures.

On top of foreclosures caused by trigger events, many argue that lenders are part of the current problem because of the recent development of "predatory" lending tools. Lenders and borrowers have the option of using fixed-rate mortgages, adjustable-rate mortgages, hybrids of the two, among other options. Adjustable-rate mortgages (ARMs), sometimes referred to as a predatory lending instrument, first appeared after the financial deregulation of 1980 and have quickly become a popular mortgage alternative. In 1994 during a period of rising interest rates, 39% of all mortgage originations were ARMs (Ambrose La-Cour-Little, 2005). After the ARM share dropped to around 10% during the late 1990's, it shot back up into its 1994 range during the start of the new millennium. Below, Figure 2 shows the trend of homebuyers financing through adjustable rate mortgages.

Consumers are attracted to the lower initial interest rates of the ARM relative to fixed-rate mortgages. For example, ARMs may be especially attractive if they allow homebuyers to have lower initial payments in areas where housing prices have appreciated rapidly (Merry, 2006). Buyers may also be attracted to an ARM if they don't expect to live in the house for a very long time frame. The buyer may take advantage of the low teaser interest rate, hope that home values increase in the short term, and then sell the house and cash out the increase in equity before the teaser rate is increased after the initial two or three-year period.

Lenders like the ARM because it puts the interest rate risk squarely on the borrower. This is a cost advantage to lenders who can then offer lower rates to borrowers who accept a limited period of payment stability either because they don't plan to live in the house for long time or because they are comfortable bearing the interest rate risk (Ambrose Lacour-Little, 2005). Because of the interest rate risk borne by borrowers in the face of rising interest rates, one would expect that an increase in ARMs relative to fixed rate mortgages would increase foreclosures.

In addition, record gas prices may be having a negative impact on individuals' ability to pay mortgage payments. In recent years, national gas price averages have shot skyward due to unrest in the Middle East, hurricanes, and increased global demand. This has caused a decrease in discretionary income. Due to American's inelasticity with respect to gasoline in the short-run, individuals may face the choice of fueling up their vehicles and heating their houses or paying their mortgage payments on time. Some individuals may opt for putting off the mortgage payment, hoping and betting that the bank won't foreclose on their home. This study hypothesizes that as national gas prices increase, the number of foreclosure will also increase.

Finally, past research has indicated the presence of several other possible determinants. The most direct measure of equity in a home is the loan-to-value (LTV) ratio, which measures the amount of the loan divided by the value of the property (Elmer, 2007). Theory would indicate that as LTV decreases, that is as the amount of the loan decreases relative to the market value of the home, foreclosure rates decrease. Homeowner equity is also affected by the rate of appreciation in house prices. High home appreciation accelerates the buildup of equity by reducing the current LTV (Elmer, 2007). However, while the national housing price index may be increasing to show positive growth in house value, some borrowers may be still at risk of losing their homes due to regional housing market price declines (Henderschott, 1993). Overall, as the rate of home appreciation increases, foreclosures should decrease,

ceteris paribus.

Some supply and demand theory is also involved in the current foreclosure crisis. With so many houses available on the market, builders and potential sellers have to slash prices. These lower aggregate prices are causing problems for borrowers who have home equity loans or were hoping to "flip" the home, renovate it quickly and sell for a profit. Nationally, house prices have fallen by 3% and the amount of unsold homes has risen to the equivalent of a 10-month supply, so selling one's home to cover the loss is nearly impossible. It is easy to see and acknowledge the enormous problems that are rampant in the economy currently and understand how they could become even worse in the near future ("The Hammer", 2007).

Figure 2: % of ARM
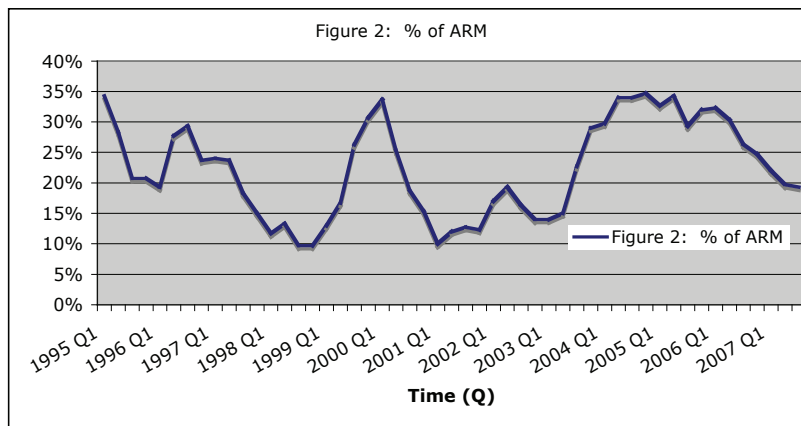
Most of recent literature on foreclosures focuses specifically on the subprime mortgage market. The subprime market has rapidly expanded during the last 20 years. The most typical impairment of these borrowers is a poor credit history; others have limited or no documentation on their income or provide no down payment (Danis, 2005). Specifically, Capozza and Thompson find that subprime loans delinquent for 90 days are more than twice as likely to be foreclosed on as prime loans (2006). Recent research on the subprime market and the increased lending to this area has been extensive and complex. Due to the complexity of the issue and the cost of accessing data related to subprime lending, this study will not focus on this segment of the problem.

III. Data

The data used in this study are obtained from a variety of sources that cover the time period starting with the first quarter of 1995 and ending with the second quarter of 2007. LoanPerformance.com provides services detailing many mortgage statistics and provided the data on foreclosures used in this study. I will use a quarterly measure of the percentage of all loans in foreclosure at the end of the period for the United States Mortgage Banker's Association: National Delinquency Survey default.

One key determinant this study looks at is the effect of the type of mortgage on subsequent foreclosures. To measure this, I have gathered data on the percentage of loans originated during a quarter that are adjustable rate mortgages. Once a month, as part of the Weekly Primary Mortgage Market Survey, Freddie Mac collects the ARM share of applications, as reported by lenders who participate in the survey. It is assumed that the rest of the percentage originated can be considered fixed rate mortgages. I have composed these ARM share figures into quarterly measures.

Mortgage interest rates were also collected from Freddie Mac and include both 30-year fixed rates and 1-year adjustable rate mortgages. Freddie Mac's Primary Mortgage Market Survey also surveys lenders each week on the rates and points for their most popular 30-year fixed-rate, 15-year fixed-rate, 5/1 hybrid amortizing adjustable-rate, and 1-year amortizing adjustable rate mortgage products. The survey is based on first-lien, prime conventional conforming mortgages with a loan-to-value of 80 percent. The interest rate spread and ARM moving average used in this study were composed from this survey.

To measure the volatility of interest rates, I will use the standard deviation in the London Interbank Offered Rate (LIBOR index). The LIBOR is the rate of interest at which banks offer to

lend money to one another in the wholesale money markets in London. It is a standard financial index used in U.S. capital markets and is the index that is used to set the cost of various variable-rate loans. Lenders use such an index to adjust interest rates as economic conditions change. Changes in standard deviation of the LIBOR index will show any shocks and volatility in interest rates.

Other measures of data come from various sources. The measure of housing prices comes from the Office of Federal Housing Enterprise Oversight (OFHEO) that publishes a quarterly House Price Index (HPI). Data on national unemployment rate (Bureau of Labor), national savings rate (US Department of Commerce), and average retail gas prices (US Department of Energy) were obtained from various government bureaus. All of the above data was in weekly or monthly form and will be converted into quarterly measures for the purpose of this study.

Finally, a measure of loan-to-value will not be included because data on LTV ratios are difficult to obtain on the national level and is better suited for microanalysis. The use of the quarterly House Price Index should be an acceptable proxy for the measure of changes in the equity of American housing. Below, Table 1 provides descriptive statistics on the dependent and explanatory variables used in the model.

IV. Empirical Model

In order to best explain the determinants of foreclosure, I will use the following independent variables defined in Table 2: percentage share of mortgage originations that are ARM, interest rate spread, moving average of 1-year adjustable interest rate, ARM interest rate volatility, house price appreciation, national unemployment rate, national savings rate, national retail gas prices, and savings and unemployment rates interaction. The dependent variable in my study is the quarterly percentage of homes in the United States in the foreclosure process.

I expect to find a positive sign for ARM share because recent lending practices have created an environment where lenders offer relatively lower "teaser" rates on adjustable rate mortgages. These teaser rates are priced at below market interest rates for a period of two to three years. Then the rates reset to the market rate, which is undoubtedly higher, creating more costly mortgage payments. If the environment is such that interest

Table 1: Descriptive Statistics—1st Quarter 1995- 2nd Quarter 2007				
Variable	**Minimum**	**Maximum**	**Mean**	**STDev**
Dependent Variable				
Foreclosures (%)	0.86	1.51	1.16	0.17
Explanatory Variables				
ARM share (%)	0.11	0.38	0.23	0.09
Interest Rate Spread (%)	-2.30	-0.46	-1.58	0.49
ARM Interest Rate Average (%)	3.67	7.04	5.35	0.91
Interest Rate Volatility (%)	0.12	2.01	0.72	0.51
Unemployment (%)	3.80	7.80	5.45	0.97
House Price Appreciation (%) (HPI)	0.11	4.33	1.65	0.85
Savings Rate (%)	-2.3	9.4	3.62	2.30
Gas Price (in cents)	89.98	311.93	145.01	52.52
(Savings)(Unemployment)	-2.57	30.97	12.56	7.61

rates are rising overall, when the adjustable rate becomes fixed after the period of two or three years and is readjusted to a higher market rate, mortgage payments will shoot upward and the likelihood of default and eventually foreclosure will increase. This potential impact on foreclosures is most likely to be seen after a lag of two or three years. It is unlikely that many individuals will want to default on a mortgage

Table 2: Empirical Model		
Variable	**Definition**	**Expected**
Dependent Variable		
Foreclosures	% of loans in foreclosure at end of period	
Explanatory Variables		
ARM share	% share of mortgage originations that are ARM	+
Interest Rate Spread	% difference between 1-year ARM rate and 30-year Fixed rate	+
Interest Rate Average	Moving average in 1-year ARM rate	+
Interest Rate Volatility	Standard deviation in 6-month LIBOR rate for previous 8 quarters	N/A
Unemployment	% of workers unemployed, seasonally adjusted	+
House Price Appreciation	% change in average national house prices	-
Savings Rate	% of national income saved, seasonally adjusted	-
Gas Price	US retail regular conventional gasoline, measured in cents	+
(Savings)(Unemployment)	Interaction between current savings and current unemployment rates	N/A

priced at a discount, but will be more likely to default when the interest rate on their loans becomes much higher after the introductory, low teaser rate period.

   To look at the effect of interest rates on foreclosure, I will examine three components: the interest rate spread, adjustable mortgage interest rate average, and the volatility of ARM rates. In my model, I will include the interest rate spread between the prevailing 1-year ARM rate and the 30-year fixed rate to proxy for the benefits of switching from one type to the other. To measure the effects of interest rates, I will simply use a moving average of the ARM interest rate encompassing the last four quarters. Moving averages are a good tool to smooth out short-term fluctuations, thus highlighting longer-term trends or cycles. Using the last 4 quarters should allow a large enough passage of time to account for readjustments of ARM into the changing market rates. Finally, I will test the impact volatility of interest rates has on foreclosures by using the standard deviation of the LIBOR rate over the period.

   The percent of unemployed workers as provided by the Bureau of Labor is used as a proxy for the impact of trigger events. I would expect the sign on this variable to be positive indicating that higher national levels of employment are correlated with higher rates of foreclosure. This relationship should be seen after a lag in time because one would expect that individuals have some savings to continue to make mortgage payments for a period of time after incurring job loss. In theory, banks would not necessarily foreclose immediately, but would instead wait and hope the unemployed individual could rejoin the work force and resume making mortgage payments. For that reason, I will lag the unemployment variable one quarter.

   I expect the signs on both the national savings rate and house price appreciation measure to be negative. As national savings increases, people should have more in reserve if a trigger event does occur or their mortgage payment does increase. However, as consumption increases relative to saving, the likelihood of a trigger event or increased mortgage payments having a detrimental effect increases. Like the unemployment rate, I expect the national savings rate to have a lagged effect on foreclosures, so the variable will be lagged by one quarter.

   Likewise, as the national House Price Index (HPI) increases, the relative value of Ameri-

cans' homes increase. This increases the equity in homes and lowers the relative value of the mortgage and should lower the propensity to default and have one's mortgage foreclosed. However, exceptions can occur with both savings and house price variable on a regional level as home prices and savings rate do vary based on location and preferences. Again, the impact of the HPI may be significant after a lag as it takes a while for homeowners to realize significant changes in home equity.

Finally, the sign on the gas price variable is expected to be positive. As national gas prices increase, less money is available for individuals to spend in other areas, including mortgage payments. This is due to Americans' current inelasticity of demand on gasoline. Because so many Americans rely on their vehicle for transportation to and from work, school, family, events, etc., it is not easy to just lower gasoline consumption when prices increase. The added cost to buy gasoline and related products could adversely lead families into foreclosure.

This study will test the hypotheses below by using the equation:

Foreclosure rate = f(ARM share, Unemployment rate, Interest Rate Spread, Interest Rate Moving Average, Interest Rate Volatility, House Price Appreciation, National Savings Rate, National Retail Gas Price)

1. As the ratio of ARM to FRM loans increases (ARM share), foreclosures will increase.
2. An increase in unemployment rates (lagged) will increase the number of foreclosures.
3. An increase in national savings rate (lagged) will decrease the number of foreclosures.
4. As housing appreciates nationally, the number of foreclosures will decrease.
5. As national retail gas prices increase, foreclosures will increase.

V. Results

The regression results, presented in Table 3, show mixed results in relation to my testable hypotheses. Table 3 presents the effects of the explanatory variables on the dependent variable (foreclosures).

Models A and B show the results from my two best regressions. The results show that foreclosures are dependent on the lagged share of adjustable rate mortgages originated, current unemployment, moving average of adjustable mortgage rates, and the house price appreciation index lagged one year. Personal savings rate, interest rate spread, and ARM interest rate volatility were not found to be significant determinants of foreclosures by my model. Gas price was found to be significant in a few of the regressions, but its results were anything but robust. Therefore, all of the above variables were removed from Models A and B.

All of the coefficients in Table 3 have the predicted sign and

Table 3: Regression Results: Dependent Variable = Foreclosures		
	Model A **ARM share lagged 2 years	**Model B** **ARM share lagged 3 years
Independent Variables		
ARM share	.317 * (1.762)	.465 ** (2.584)
Interest Rate Moving Average	.139 *** (5.915)	.150 *** (7.485)
Unemployment	.287 *** (8.647)	.301 *** (10.502)
House Price Appreciation	-.044 ** (-2.460)	-.047 *** (-2.822)
Adjusted R²	.680	.780
Sample Size	39	36

Values in parentheses are absolute t-statistics
*** Indicates significance at the .01 level
** Indicates significance at the .05 level
* Indicates significance at the .1 level

are significant at least to x=0.1. The difference in lag time of the ARM share is what makes up the difference in Model A versus Model B. Model A contains an ARM share lag of two years, while B uses a lag time of three years. Model A yields an adjusted R-squared value of 0.680, indicating that 68.0% of the variation in foreclosures is explained by the model. Model B explains 78.0% of the variation in foreclosures. The variable coefficients in Model B are slightly stronger than in Model A and the adjusted R-squared is significantly higher, both of which further the argument that a three-year lag in ARM share origination explains a greater number of foreclosures.

Through the results shown by the coefficient on the interest rate moving average variable, one can see that an increase in the interest rate increases the number of foreclosures. At first glance, this result appears to be in conflict with the hypothesis generated by option theory that states borrowers will want to default when interest rates are falling not rising. However, option theory assumes a fixed-rate mortgage, which would give buyers incentive to default when interest rates are declining, much the same as a company has the incentive to call bonds back when interest rates fall below the coupon rate. However, my empirical model is set up so mortgages are assumed to be adjustable-rate. Therefore, the borrower does not hope for rising interest rates because that will only result in higher mortgage payments.

However, the ability-to-pay model and more specifically, the impact of trigger events on foreclosures were supported by the results of this study. As current unemployment rates increase, more people are unable to meet their mortgage payments and subsequently have their homes foreclosed. Also, my results agree with the work done by Elmer who found that when home prices are appreciating, less people have their homes foreclosed due to increased equity build-up.

One potential problem with my data series is the possibility of autocorrelation occurring in the models. Autocorrelation will often arise when time-series data is used, as is the case in this study. The Durbin-Watson test is the most common way to test for autocorrelation. After running the Durbin-Watson test on Model B, it shows that this model is narrowly within the test limits, and autocorrelation is not present. However, the test showed that autocorrelation is present in Model A. When the Prais-Winsten test was used to correct Model A for autocorrelation, both the ARM share and House Price Appreciation variables were no longer significant. Because the only difference between Models A and B is the difference in ARM share lag time, Model B with the three-year ARM share lag continues to look like the best representative model for the determinants of foreclosure.

In relation to my five testable hypotheses, I have found mixed results. The results involving ARM share, unemployment, and house price appreciation variables came out virtually as predicted.
1.) An increase in the ARM share originated will cause foreclosures to significantly increase in three years.
2.) An increase in the national unemployment rate will have an immediate, significant impact on foreclosures.
3.) An increase in the HPI index will cause foreclosures to decline.

This study predicted that the increase in foreclosures would be seen after a lag in the increase in the unemployment rate. However, the increase is seen immediately as the current rate increases. This suggests the immediate devastation a recession could cause on the housing market and the lives of those who do lose their income due to job reductions. Finally, the impact of a change in the HPI index on foreclosures was not as immediate as predicted, but significant after a one-year lag. This result makes sense because it takes time to realize gains in equity.

On the other hand, the two other hypotheses did not turn out as predicted.
1.) The national, personal savings rate does not have a significant impact on the number of foreclosures.
2.) Retail gas prices do not have a significant im-

Table 4: Regression Results: Dependent Variable = Foreclosures	
	Model C **ARM share lagged 2 years
Independent Variables	
ARM share	.367 ** (2.120)
Interest Rate Moving Average	.136 *** (5.915)
Unemployment	.258 *** (7.967)
House Price Appreciation	-.061 ** (-3.687)
(Savings)(Unemployment)	-.007 ** (-2.376)
Adjusted R^2	.808
Sample Size	36

pact on the number of foreclosures.

While my study hypothesized that the impact of unemployment on foreclosures would be lagged, the impact of unemployment was significant immediately, suggesting a possible interaction between unemployment and the low current national savings rate. Because the national savings rate is so low, Americans do not have an adequate supply of funds to fall back on when they lose their jobs. Therefore, I tried to model this possibility by creating Model C which contains all the variables previously found significant and adds in (Savings)(Unemployment), which is an interaction term that multiples the current unemployment rate with the current national personal savings rate. Table 4 shows the results when Model C was run using an OLS regression.

As Table 4 shows, all variables are still significant at the 0.05 level and all coefficients are similar to previous models. Model C explains an impressive 81% of the variation in foreclosures and is not influenced by autocorrelation. The new (Savings)(Unemployment) interaction variable is negative and significant. This suggests that unemployment's positive influence on foreclosures is mitigated when unemployment is interacted with an increase in national savings rates. This supports the theory of financial risk posture that says a trigger event, namely job loss, will have a much smaller effect on an individual's financial health if they have a relatively greater amount in reserves such as savings.

While the national savings rate alone did not turn out to be a significant determinant in housing foreclosures in this study, I would not discount its possible impact on the economy in the future. Unless future savings rates differ greatly from the current trend, they could have a significant impact on the housing market and entire economy in the near future due to the possible interaction with unemployment shown in Model C. The same can be said for retail gas prices. Again, while not found to be significant in this study, current prices almost daily reach all-time inflation adjusted highs. If this trend continues, the impact could hamper the economy, specifically the housing market in the near future.

VI. Conclusions

The findings of this study extend the previous research done on the determinants of foreclosures, specifically with the result of ARM share. The results indicate the significant, negative impact that adjustable rate mortgages can have on the housing market and economy. Many market analysts have described these adjustable interest rate lending tools as "predatory." The results of this study would tend to support that claim. Future regulation needs to address the problems with adjustable-rate mortgages including the low teaser rates and balloon payments. Adjustable rate mortgages have and will continue to cause problems for homeowners unless they are addressed by government regulation.

In addition, this study found that unemployment has a significant, positive effect on foreclosures. This result goes along with theory and natural intuition but against the results found by a previous study done by Danis and Pennington-Cross. This study also found a potential interaction effect between savings and unemployment rates on foreclosures. The result of this interaction would indicate that in a country such as the United States with low savings rates, a recession could have more devastating effects on the econ-

omy, especially in the area of home foreclosures, than in a country with relatively higher savings rates.

Future research dealing with the problems associated with adjustable-rate mortgages is vital. This study did not even touch on the current problems in the subprime housing market. Both of these areas contain infinite possibilities for research. Possible work comparing and contrasting the housing markets of different regions in the United States or the determinants of foreclosure between rural and urban areas could bring about interesting results.

Finally, the sample size of data used in this study was relatively small. Results could be enhanced using monthly as opposed to quarterly data to increase the number of observations. This could be fairly easy to accomplish if one has access to monthly foreclosure data as that was the one variable in this study that was exclusively available in quarterly form.

Foreclosures have become an enormous problem not just for individual families but also for the entire well being of the United States economy. Understanding the determinants of foreclosures is vital to protect both individuals and the economy from the negative consequences this issue triggers. Today, a recession looms due in large part because of the housing crisis. The emergence of a recession in the United States would exacerbate problems in the housing market that in turn could initiate a vicious, circular pattern.

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