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Seyed Hesam Ghodsi
University of Wisconsin-Milwaukee

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Seyed Hesam Ghodsi

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ABSTRACT

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Seyed Hesam Ghodsi

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This study investigates the existence of linear cointegration, nonlinear cointegration or no cointegration between house prices and fundamentals in the U.S. states over the period of 1975Q1-2014Q3. I employ Autoregressive Distributed Lag (ARDL) model by Pesaran *et al.* (2001) to test for linear cointegration and Nonlinear Autoregressive Distributed Lag (NARDL) model by Shin *et al*. (2014) to test for nonlinear cointegration between house prices and fundamentals. Decomposing fundamentals into positive and negative components in the nonlinear ARDL model allows me to study the nature of impacts of income and/or mortgage rates on house prices. By using these methods (ARDL and NARDL), I can also estimate both short-run and long-run impacts of fundamentals on house prices. Moreover, estimating a bivariate model that captures the sole impact of income on house prices lets me check not only causality but also asymmetric causality from income to house prices. My main findings show that fundamentals have short-run effects on house prices in all states. Moreover, cointegration between house prices, and income and/or mortgage rate exists in 34 states. Investigating the sole impact of income on house prices determines that not only is there a long-run equilibrium relationship between house prices and income but also income Granger causes house prices in 46 states. The Granger causality turns out to be asymmetric in 18 states of the United States.

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I. Introduction

The central element in the recent financial crisis is unexpected decline in house prices. In the previous decade, the existence of a bubble in house prices received considerable attention. House prices in the United States recorded unusually large increases both in nominal and real terms. Between 1975 and the third quarter of 2006 real house prices in the U.S. doubled. From 2000 to 2006, the Case Shiller/Standard and Poor's Housing Price Index increased by more than 70 percent in real terms. The behavior of house prices seemed to be disconnected from fundamentals or moved apart from their economic determinants such as income, mortgage rates and construction costs.

The influence of the swings of house prices on economy is comparable to the stock prices except the fact that because of a more even distribution of housing wealth than stock wealth, collapse in the housing market will have a larger impact than collapse in the stock market. Housing construction comprises approximately 5 percent of the U.S. GDP and so any fall back in this business would affect growth and employment. There are many areas of the country in which house prices have not diverged from their historic patterns, increasing only slightly more than the rate of inflation. However, some regions experienced house prices increase more than 60 percent after adjusting for inflation which was large enough to have a major impact on the national economy. Prices, in some individual cities, such as Los Angeles and Tampa increased by 130 and 97 percent over 2000 to 2006, respectively and then collapsed from 2007 to 2009. Federal Reserve Board report shows that an additional dollar in housing wealth leads to 4 to 6 cents of annual consumption. Therefore, decrease in construction not only directly affects GDP but also through the wealth effect and decrease in consumption, reduces GDP. This may lead to a drastic change in employment. That is why identifying the short- and the long-term behavior of this market is incredibly important for central banks and fiscal regulators.

Characteristics of the housing market make it different than other financial markets. Lack of adequate and high quality information, insufficient market infrastructure, high transaction costs, less liquidity, low transparency, heterogeneity of final goods in characteristic and location, very rigid supply side and impossibility of short-trading make this market unique and distinct form other financial markets (Herring *et al*., 2002). Housing market does not clear immediately after shocks. It takes time for buyers and sellers to find each other and for the suppliers to construct new buildings and meet the demand. In this market, final good serves as both an investment and consuming goods. High transaction costs and lack of short-trading cause few arbitrage opportunities when there are large deviations between house prices and fundamentals (Rosenthal, 1989).

One of the main concerns in the housing market literature is finding bubbles in this market. Stiglitz (1990) defines bubble as "If the reason that the prices is high today is only because investors believe that the selling price is high tomorrow, when 'fundamental' factors do not seem to justify such a price, then a bubble exists." In other words, a situation when change in fundamentals does not support house prices growth. To find bubble, determinants of house prices and how they are related to house prices should be discovered. Many argue that house prices and fundamentals such as income and mortgage rate have a long-run equilibrium relationship, but many other studies do not support this view. Some other studies discuss that if no linear equilibrium relationship exists, existence of nonlinear cointegration should be tested. If house prices and the fundamentals are cointegrated, they may diverge from each other temporarily, but they return to their equilibrium relationship in the long-run. Therefore, a gap between house prices and its determinants may be an indicator of house prices misalignment (above or below their equilibrium) and this can be used as a predictor of future changes in house prices. If enough evidence for the existence of cointegration between them was not found, then there is no reason for house prices to fall just because they have surged quicker than has income or other fundamentals. Therefore, the error-correction specifications that have been used in the literature are not suitable.

The present study investigates house price dynamics to determine whether total personal income and mortgage rate can explain variation of house prices in the short- and the long-run in 50 states and District of Columbia from 1975Q1 to 2014Q3, using Linear ARDL and Nonlinear ARDL approaches proposed by Pesaran *et al*. (2001) and Shin *et al*. (2014), respectively. The Linear ARDL approach enables me to examine the linear short- and long-run relationships between house prices, income and mortgage rate. In the Nonlinear ARDL, movements of income and mortgage rate have been decomposed into their negative and positive partial sums. This allows me to test whether income and mortgage rate have symmetric or asymmetric effects on house prices in the short- and the long-run. Additionally, I estimate a bivariate model in which income is the only regressor in the model to study the impact of one of the main fundamentals, income, on house prices and also test for causality.

The plan of the dissertation is as follows. Chapter II contains the relevant literature on house price modeling. Chapter III focuses on the models and the methodology. Chapter IV describes data, Chapter V explains the result, and Chapter VI concludes.

II. Literature Review

The long-run relationship between house prices and income has been studied in the literature. Many researchers such as Abraham and Hendershott (1996), Capozza *et al*. (2002) explicitly and Poterba (1984, 1991) implicitly assume there is a long-run equilibrium between house prices and fundamentals that result in a stable house price-to-income ratio. The error-correction specifications for house prices and fundamentals that are used in the studies would be applicable if we can find enough evidence to reject the no conintegration hypothesis. In other words, if there is no cointegration, it is not appropriate to expect decline in house prices after its surge and divergence from income. Chen and Patel (1998) apply Granger Causality tests, variance decomposition and impulse response functions based on the vector error-correction model to examine dynamic causal relationships between house prices and household income, short-run interest rates, stock price index, construction costs, and housing completions in Taipei new dwelling market for the period of 1973Q2 to1994Q4. They find that all the above fundamentals Granger cause house prices. The variance decomposition shows that current house prices' disturbances result in greatest variability in future prices and the remaining is explained by the five fundamentals.

Malpezzi (1999) states that in a well-functioning market, an increase in demand is followed by an increase in supply which results in stable prices. Therefore, a simple measure of how well housing market works is the ratio of typical prices to typical incomes and a simple model of a market with elastic supply side and unitary long-run income and stock-price elasticities would yield a constant ratio. He employs a dynamic model that tells something about the likely time path of prices given an initial house price to income ratio and then he adopts a simple error-correction model. He expects that in the model, if the house price to income ratio exceeds the equilibrium, prices tend to fall and if the ratio is less than the equilibrium, prices will likely rise. He uses annual house prices, income, population and regulatory environment data of

133 MSAs of the U.S., from 1979 through 1996. Additionally, his model contains geographic variables which are simple dummy variables for whether a metropolitan area is located on a major coastline, adjacent to a large national park, military base or another major constraint on expansion. He also calculates house price to per capita income ratios by dividing the price level by the corresponding per capita income figure for each metropolitan area and year. Although he can reject the hypothesis of a unit root for price changes, he cannot reject this hypothesis for the house price to income ratio. Using a panel unit root test to find cointegration between house prices and per capita incomes in the sample, he rejects the null of no cointegration for the estimated error in the house price to income cointegrating vector at 1% level.

Meen (2002) tests for cointegration relationship between price and real per household income, real interest rates, real wealth, population and housing stock supply using quarterly national-level data from 1969 to 1998. Engle-Granger estimates of the cointegration vectors are subject to small sample biases, therefore, he derives the estimates of the parameters from the long-run solution to an Autoregressive Distributed Lag (ARDL) using these variables. His reported ADF cointegration statistics are close to their critical values. Sutton (2002) studies the dynamic impacts of GNP growth rate, real interest rates and equity prices on house prices using a vector autoregressive (VAR) model introduced by Sims (1980) for the United States, the United Kingdom, Canada, Ireland, the Netherlands and Australia from 1995Q1 to 2002Q1. He finds that a 1% increase in the GNP growth rate increases house prices in the range of 1-4% in three years, a 100 basis point decrease in the real short-term interest rate increases house prices in the rage of 0.5-1.5 percentage points in a year and a 10% rise in equity prices increases house prices in the United States, Canada and Ireland by 1%, in Australia and the Netherlands by about 2% and in the United Kingdom by 5% after three years.

Case and Shiller (2003) study U.S. state-level data on house prices and personal income per capita including other fundamentals from 1985Q1 to 2002Q3. Using OLS, only income per capita can explain up to 96% of the variation in the states with least volatile house prices mostly located in the Midwest and up to 45% in the states with most volatile house prices mostly located in the coasts. They conclude that except eight states, income alone almost completely explains house prices' variations. Adding mortgage rates, housing starts, employment, and unemployment to the model increases its explanatory power by a little. However, for the most volatile states, adding population, change in employment, mortgage rate, unemployment, the ratio of income to mortgage payment per $1000 borrowed and housing starts increases explanatory power of the model significantly. Apergis and Rezitiz (2003) used an error correction vector autoregressive (ECVAR) to examine the dynamic effects of fundamentals such as average rate of housing loans maturing in 15 years, consumer price index, employment index and money supply (M1) on house price index of new one-family houses sold in Greece from 1981 to 1999. The results of the impulse response functions indicate that a shock in consumer prices, money supply and employment boosts house prices and a shock in the mortgage rate decreases house prices. Also, based on the variance decompositions, mortgage rate explains most of the variations of house prices.

Apergis (2003) applies an error correction vector autoregressive (ECVAR) model to analyze the dynamic effects of mortgage rate, inflation and employment on new house prices in Greece over 1981-1999 periods. Based on the Johansen and Juselius (1990), he finds evidence of a single cointegration vector. The results show that real house prices respond to the above macro variables. Variance decompositions indicate that mortgage rate and inflation have the highest and the second highest explanatory power over the variation in real house prices.

Gallin (2006) contribution is applying Pedroni (1999) and Maddala and Wu (1999) methods to test for cointegration relationship between per capita personal income and OFHEO's weighted repeat-sales house price index in a panel of 95 MSAs from 1975Q1 to 2002Q2. He finds that the data do not show any evidence of cointegration between house prices and per capita income. He states that the error-correction specification for house prices and income found in the literature may be inappropriate. Chen *et al*. (2007) investigate the presence of cointegration between house price and household income in Taiwan for 1973Q3 to 2002Q4. Using the traditional cointegration test, they do not find any evidence of cointegration but the stochastic break (STOPBREAK) test shows an equilibrium relationship between house prices and income. Moreover, the Perron test shows house price to income ratio has shifted. They also use Vector Autoregression (VECM) model to examine the causes of the deviation and find out if money supply mainly cause deviations of house prices from income and thus shifts in house price to income ratio. Egert and Mihaljek (2007) employ mean group panel dynamic OLS (DOLS) estimator, which takes into account the cross-country heterogeneity in the short-run and the long-run elasticities of house prices with respect to fundamentals such as per capita GDP, real interest rates, credit growth, demographic factors, institutional development of housing markets and housing finance in eight economies of central and eastern Europe (CEE) and 19 OECD countries. They find a strong and positive relationship between house prices and per capita income. Also, the results indicate significant impacts of interest rates, housing credit and demographic factors on house prices in both CEE and OECD countries. Finally, housing finance institutions and development of housing markets have a significant effect on house prices in CEE.

McQuinn and O'Reilly (2008) propose a theoretical model that demand for housing depends on how much individuals can borrow which is derived by the levels of disposable income and current interest rates. They apply the model to the Irish housing market from 1980Q1 to 2005Q4. They employ Johansen's (1995) systems approach and find one cointegrating vector for the actual price and the amount that can be borrowed. They also reject the no cointegration hypothesis based on the Engel and Granger (1987). Moreover, they investigate for cointegration by using Philips and Hansen's (1990) FM-OLS and results are very close to the previous tests.

Mikhed and Zemcik (2009) construct a panel that contains series for house prices, rents, construction costs, income, population, stock index and mortgage rates. Two datasets have been used for this study, the first is the U.S. aggregate quarterly data from 1980Q2 to 2008Q2 and the second is an annual on 22 MSAs of the U.S. over 1978-2007. They employ Pesaran (2004) test and find the presence of cross-sectional dependence in their data. Then they use Pesaran (2007) updated version of panel unit root test which is robust to cross-sectional dependence. Finally, they apply Pedroni (1999, 2004) statistic to test for panel data cointegration. The results show that the house price series has a unit root for the sample prior to 2006 and the panel data unit root tests are more powerful than univariate methodology. Moreover, they cannot find any evidence of cointegration between house prices and any variables with the same order of integration. Overall, they conclude that based on their methodology and datasets there is no cointegration between house prices and the fundamentals.

Rapach and Strauss (2009) evaluate forecasts of state-level real housing price growth for 1995Q1-2006Q4 from an autoregressive model and models based on a host of state, regional, and national economic variables. Their results show important differences in the forecastability of real house prices growth across US states. They find that forecasts from individual ARDL models are often perform better than AR benchmark model for some states. However, all forecasting models tend to perform weakly for a group of primarily coastal states that experienced especially significant house prices growth during the boom, implying a “disconnect” between house prices and the fundamentals for these states. Forecast biases and Mean Square Forecast Error (MSFE) values for AR benchmark model for costal states that experienced high price growth are typically higher, and models that include information from a host of economic variables provides limited forecast accuracy relative to the AR benchmark model. Their results show that reasonably accurate forecasting models can be used for a number of interior states.

Holly *et al*. (2010) employ econometric techniques for the analysis of heterogeneous panels subject to cross-sectional dependence to investigate the effect of real per capita disposable income and common shocks on the real house prices in a panel of 49 US states from 1975 to 2003. After taking into account both heterogeneity and cross-sectional dependence, they find an error correction model with a cointegrating relationship between real house prices and real income. Besides that, their results do not reject the hypothesis that real house prices are in line with real incomes. However, there are few states such as California, New York, Massachusetts, Connecticut, Rhode Island, Oregon and Washington State that real house prices are not aligned with the fundamentals. Adams and Fuss (2010) use data on house prices, economic activity, long-term interest rate and construction costs from 15 OECD countries for 1975Q1-2007Q2 and apply the panel cointegration approach by Pedroni (1999, 2004). The empirical results show a 1% increase in economic activity increases house prices by 0.6% in the long-run. Also, construction costs and the long-run interest rate indicate average long-run impacts of 0.6% and -0.3% on house prices, respectively.

Madsen (2012) introduces a repayment model in which determinants of prices are the level at which the nominal mortgage expenditure is a fixed proportion of the after-tax income of house buyers based on the banks regulation in the short-run and the replacement costs of houses in which there is an incentive by buyers to build new homes if prices go beyond these costs. Using data for 18 OECD countries over 1995-2007, he finds that nominal real user cost of capital is a relevant cost of capital variable, housing prices are mainly independent of rent, income elasticity of house prices is almost one, the relevant scaling variable is total nominal GDP and not per capita GDP and acquisition costs derives house prices in the long-run. Panagiotidis and Printzis (2015) use a two stage Vector Error Correction Model (VECM) to study the impact of consumer price index, industrial production index, volume of retail trade, loan interest rate, annual growth rate of mortgage, growth rate of M1, and the unemployment rate on house prices in Greece for 1997M1 to 2013M12. In addition to finding an equilibrium relationship between house prices and fundamentals, they determine that in the long-run mortgage and retail trade Granger-cause house prices. However, mortgage, CPI, and retail trade Granger-cause house prices in the short-run. Finally, variance decompositions show that house prices are affected mainly by mortgage, retail trade, and CPI shocks.

All the above research modeling have been set up in linear frameworks and none have addressed an important fundamental concern that whether house prices long-run equilibrium relationship with the fundamentals is linear or nonlinear. There are some studies that reveal nonlinear behaviors in macroeconomic variables, particularly in the area of business cycles such as Neftci (1984), Falk (1986), Hsieh (1991) and Sarantis (2001). If nonlinear behavior exists, imposing a linear relationship would be restrictive and may not be appropriate. A few number of studies take nonlinearity into consideration and examine long-run nonlinear relationships between house prices and the fundamentals. Kim and Bhattacharya (2009) study the nonlinearity of house price growth rates by using Smooth Transition Autoregressive (STAR) model based tests over the 1969-2004 for the U.S. and the four regions of Northeast, Midwest, West, and South. Moreover, they investigate for the presence of pairwise nonlinear Granger causality between house price growth rates and its two key determinants, employment and mortgage rates. They find enough evidence to reject linearity for the entire U.S. and the regions of the Northeast, West, and the South, but not for the Midwest. Northeast and West show strong nonlinear behavior. They find strong support for Granger causality in the nonlinear case from mortgage rate to house prices. Particularly, mortgage rates effect on house prices is stronger when the market is surging.

Zhou (2010) states that when data is nonlinear, tests for linear cointegration are mis-specified and tend to reject the existence of cointegration. In this case, it is suitable to test for nonlinear cointegration. He suggests a three-step procedure; first, testing for linear cointegration.

If we can reject the existence of linear cointegration, it is appropriate to test for nonlinear cointegration. If this test does not satisfy nonlinear cointegration, we conclude that no cointegration can be found between house prices and fundamentals. Most of the empirical research studies suffer from lack of test for nonlinear cointegration. He employs the augmented Engle-Granger (AEG) and Johansen tests for the first step, testing for the linear cointegration. AEG and Johansen tests are only appropriate for linear functional forms, therefore, two-step testing procedure proposed by Granger and Hallman (1991) and Granger (1991) has been applied. Based on this testing procedure, first, a nonparametric algorithm called the Alternating Conditional Expectations (ACE) is used to convert the nonlinear functional form into a linear form. Then AEG and Johansen tests are applicable to the linear form to test for linear cointegration. They argue that presence of cointegration among ACE-converted variables can be inferred as nonlinear cointegration among the original variables. ACE is discussed to be a suitable method for housing market, because house prices and the fundamentals relationship is unobservable and ACE is able to uncover it. His empirical study includes data from 1978Q1 to 2007Q4 on house prices and fundamentals such as incomes, mortgage rates and construction costs at both national and city levels. Boston, Chicago, Cleveland, Dallas, Los Angeles, New York, Philadelphia, Richmond, Seattle and St. Louis were selected for this study. He finds evidence of linear cointegration only in Cleveland. Using the two-step testing procedure, he finds evidence of nonlinear cointegration for the entire U.S. and six cities of Chicago, Dallas, Philadelphia, Richmond, Seattle and St. Louis. No evidence of nonlinear cointegration exists in Boston, Los Angeles and New York.

Katrakilidis and Trachanas (2012) use asymmetric Autoregressive Distributed Lag (ARDL) cointegration technique by Shin, Yu and Greenwood-Nimmo (2011) which allows the investigation of possible asymmetric effects in both the long- and the short-run time horizon to test for nonlinear relationship between Greek house prices and selected macroeconomic fundamentals such as consumer prices and the industrial production index as a proxy of income over the period from January 1999 to May 2011. They find asymmetric long-run effects among house prices and consumer price index and industrial production index. In the short-run, house prices respond to positive or negative changes of the explanatory variables significantly and differently which indicates asymmetric short-run behaviors. Therefore, imposing a linear symmetric model could be misleading for Greek housing market and taking nonlinearity into account results in a more efficient model with a higher forecasting power.

All the above studies, applying different methodologies, either linear or nonlinear frame works, using different time series or panel datasets result in different findings. Therefore, there is no consensus on existence of a long-run relationship between house prices and fundamentals. Some find enough evidence to reject the null of no cointegration among house prices and fundamentals and some others do not. In this study, in addition to linear ARDL, I employ the new method of nonlinear ARDL to investigate cointegration between house prices, income, and mortgage rate. This method allows me to not only estimate the short- and the long-run relationships simultaneously, but also capture the asymmetric effects of fundamentals on house prices. Additionally, I expand the study by estimating a model with income as the only regressor to check for Granger causality from income to house prices.

III. Model Specification and Methodology

As mentioned in the previous section, theoretical background for the use of various determinants of house prices can be found in numerous studies. For instance, among the studies that have used income as one of the determinants of house prices, Case and Shiller (2003) use personal income per capita, mortgage rates and some other fundamentals. They conclude that income alone explains patterns of home price changes since 1985 in most states of the United States. Sutton (2002) finds a positive and significant impact of national income and a negative impact of interest rates on house prices in the sample of six advanced economies. Gallin (2006) investigates existence of a long-run equilibrium relationship between house prices and per capita personal income for a panel of 95 metro areas of the U.S. over 23 years, but he does not find enough evidence for the existence of this relationship. Chen *et al*. (2007) find that some methods show the existence of long-run relationship between house prices and income in Taiwan and some do not. Almost all housing literature includes income and interest rate or mortgage rate as main determinants of demand and thus determinants of prices in the housing market. On the other hand, Case and Shiller (2003) state that a fundamental issue in judging the plausibility of bubble theories is the stability of the relationship between fundamentals and house prices over time and space. Therefore, using ratio of house price to income to detect bubbles in the housing markets is valid if the ratio has a stable behavior or, in other words, these two series (house prices and income) have a long-run equilibrium relationship.

To investigate this relationship and see how much income and mortgage rate can explain the pattern of house price changes in each state of the United States, I introduce equation (1):

$$LnHPI_t = \alpha_0 + \alpha_1 LnIncome_t + \alpha_2 LnMortRate_t + e_t \quad (1)$$

$$e_t \sim \text{n.i.i.d}\,(0, \sigma^2)$$

Where *HPI* is House Price Index, *Income* is Total Personal Income, *MortRate* is 30-Year Conventional Mortgage Rate and e_t is an error term. It is expected that an estimation of α_1 which measures income elasticity of house prices, to be positive and α_2 which measures the effect of mortgage rate on house prices, to be negative. Models such as (1) are long-run models and if cointegration among the variables is established, their estimates will yield long-run coefficient estimates and only show the long-run impact of income and mortgage rate on house prices. In addition to the long-run effects, short-run effects can be investigated through an error correction model, equation (2).

$$\Delta LnHPI_t = \beta_0 + \sum_{i=1}^{n1} \beta_{1i} \Delta LnHPI_{t-i} + \sum_{i=0}^{n2} \beta_{2i} \Delta LnIncome_{t-i} + \sum_{i=0}^{n3} \beta_{3i} \Delta LnMortRate_{t-i} + \lambda e_{t-1} + \varepsilon_t \quad (2)$$

If there is a long-run equilibrium relationship between the above series (income, mortgage rate and house prices), we expect that any short-run deviation from the equilibrium will be adjusted in the long-run and thus we can observe co-movement of these variables in the long-run. In other words, λ should be negative and significant which implies existence of cointegration between income, mortgage rate and house prices. Equations (1) and (2) follow Engle and Granger (1987) approach when an alternative method of establishing cointegration is to initially make sure all three variables are I(1) but e_t is I(0).

In case some variables are I(1) and some I(0), Pesaran *et al*. (2001) suggest an ARDL method that can estimate both short- and long-run relationships between the series in one step and simultaneously. The two principal and mostly used approaches of testing for the existence of relationships between variables in levels are the two-step residual-based procedure introduced by

Engle and Granger (1987), and system-based reduced rank regression by Johansen (1991, 1995). The above methods and all other subsequent methods concentrate on cases in which the variables are all I(1). Therefore, in order to apply those methods, we have to first pre-test the variables and make sure they are all I(1). Unlike commonly used tests of cointegration, in Pesaran *et al*. (2001) method, there is no need to test for stationarity. The approach can be used when all the variables are I(0) or I(1) or even there is a combination of I(0) and I(1) variables. In other words, as long as the series are not I(2) which is true for the most macroeconomic series, we can employ this method.

Pesaran *et al*. (2001) replace e_{t-1} in equation (2) by the linear combination of lagged level variables of the model. Following their approach, I can write equation (3):

$$\begin{aligned}\Delta LnHPI_t = \rho_0 + \sum_{i=1}^{n1}\rho_{1i}\Delta LnHPI_{t-i} + \sum_{i=0}^{n2}\rho_{2i}\Delta LnIncome_{t-i} + \sum_{i=0}^{n3}\rho_{3i}\Delta LnMortRate_t + \\ \rho_4 LnHPI_{t-1} + \rho_5 LnIncome_{t-1} + \rho_6 LnMortRate_{t-1} + \varepsilon_t\end{aligned} \quad (3)$$

Coefficients of the first differenced variables, ρ_{2i} and ρ_{3i}, represent short-run effects of income and mortgage rates on house prices, respectively and long-run effects can be obtained by estimating coefficients of the lagged level of income and mortgage rate, ρ_5 and ρ_6, normalized on ρ_4. Akaike's Information Criterion (AIC) has been used to assign the optimum number of lags in the model. However, long-run coefficients are valid if we can find cointegration in the model. Pesaran *et al*. (2001) suggest using the standard F test to check joint significance of the level variables, $\rho_4 - \rho_6$, in equation (3) as a sign of cointegration. The distribution and critical values of this test is different from conventional F test and are provided by Pesaran *et al*. (2001). The table of critical values has been provided in the Appendix A. Two sets of asymptotic critical values are provided, one when all explanatory variables are purely I(1) and the other when all are purely I(0). These two critical values provide a band containing all classifications of the variables into purely I(0), purely I(1) or mutually cointegrated. They discuss that an upper bound critical value can be found, assuming all variables in a model to be I(1) and a lower bound critical value can be found, assuming all variables in a model to be I(0). The Upper bound critical values can also be used if there is a combination of I(0) and I(1) variables. The null hypothesis of no cointegration can be rejected if the F statistic value exceeds the upper bound critical value. Similarly, the null hypothesis of no cointegration cannot be rejected if the F statistic value is less than the lower bond. If the F statistic value lies between the upper and lower bonds' critical values no specific statistical inference can be made. That said, I first ensure that the variables are not I(2) which is true in most cases.

Majority of the previous studies in the housing market assume that changes in fundamentals have symmetric effects on house prices. For instance, they assume that if income increases by 10%, house prices increases by 6% and if income decreases by 10%, house prices will decrease by 6%. Similarly, they assume mortgage rate changes have symmetric impacts on house prices. Considering the characteristics of the housing markets such as high transaction costs, very rigid or sometimes inelastic supply side and home buyers' expectations about the future of the market; symmetric assumption seems to be counterfactual as house prices may respond to economic expansions and contractions differently. To examine if this assumption is valid and detect asymmetric effects of income and mortgage rate on house prices in both short- and long-run, following Shin *et al.* (2014), I decompose fluctuations of *LnIncome* and *LnMortRate* into its positive and negative partial sums:

$$
\begin{aligned}
LnIncome_t^+ &= \sum_{j=1}^{t} \Delta LnIncome_j^+ = \sum_{j=1}^{t} \max(\Delta LnIncome_j, 0) \\
LnIncome_t^- &= \sum_{j=1}^{t} \Delta LnIncome_j^- = \sum_{j=1}^{t} \min(\Delta LnIncome_j, 0) \\
LnMortRate_t^+ &= \sum_{j=1}^{t} \Delta LnMortRate_j^+ = \sum_{j=1}^{t} \max(\Delta LnMortRate_j, 0) \\
LnMortRate_t^- &= \sum_{j=1}^{t} \Delta LnMortRate_j^- = \sum_{j=1}^{t} \min(\Delta LnMortRate_j, 0)
\end{aligned} \tag{4}
$$

$LnIncome_t$ has been decomposed into $LnIncome_t^+$ and $LnIncome_t^-$, each of these two partial sums is a series that contains only increases or decreases in $LnIncome_t$, respectively. Granger *et al*. (2002) state that if two time series' positive and negative components are cointegrated, they have hidden cointegration and linear cointegration is a particular case of this hidden cointegration which is a simple case of nonlinear cointegration. Shin *et al*. (2014) develop a nonlinear ARDL by replacing *LnIncome and LnMortRate* in (3) by the above decomposed partial sum components (4). Changing the linear model into a nonlinear model and using Pesaran *et al*. (2001) bounds testing approach enables me to test asymmetric impacts of income on house prices as in equation (5):

$$
\begin{aligned}
\Delta LnHPI_t &= \gamma_0 + \sum_{i=1}^{n1} \gamma_{1i} \Delta LnHPI_{t-i} + \sum_{i=0}^{n2} \gamma_{2i} \Delta LnIncome_{t-i}^+ + \sum_{i=0}^{n3} \gamma_{3i} \Delta LnIncome_{t-i}^- \\
&+ \sum_{i=0}^{n4} \gamma_{4i} \Delta LnMortRate_{t-i}^+ + \sum_{i=0}^{n5} \gamma_{5i} \Delta LnMortRate_{t-i}^- \\
&+ \gamma_6 LnHPI_{t-1} + \gamma_7 LnIncome_{t-1}^+ + \gamma_8 LnIncome_{t-1}^- \\
&+ \gamma_9 LnMortRate_{t-1}^+ + \gamma_{10} LnMortRate_{t-1}^- + u_t
\end{aligned} \tag{5}
$$

The above equation is a nonlinear ARDL model in which nonlinearity is introduced by creating partial sum components. This model can capture effects of income and mortgage rates in a more flexible structure. Assumptions and estimation procedure of this equation, (5), are similar to linear ARDL introduced earlier, equation (3). First, I estimate equation (5) using standard

OLS. Then by using the modified F test and the bounds testing approach, I investigate the long-run relationship between level variables of *LnHPI*, *LnIncome*$^{+}$, *LnIncome*$^{-}$, *LnMortRate*$^{+}$, and *LnMortRate*$^{-}$. By employing both linear and nonlinear ARDL methodologies, I can detect existence of linear cointegration, nonlinear cointegration, or no cointegration in these models. In other words, I can determine if there is a long-run equilibrium relationship between house prices, income and mortgage rate; and if there is one, I can investigate how income and mortgage rate are affecting the prices (symmetric or asymmetric effects). Furthermore, the model allows me to test for asymmetric impacts of income and mortgage rate on prices and also asymmetric adjustments of prices to any short-run deviations from the equilibrium.

Obtaining different lag length for positive and negative partial sum components indicates asymmetric adjustments in the housing market. Moreover, statistically different sum of short-run coefficients of increase and decrease in income or mortgage rate imply asymmetric impacts of these fundamentals on house prices. In other words, $\sum_{i=0}^{n2}\hat{\gamma}_{2i} \neq \sum_{i=0}^{n3}\hat{\gamma}_{3i}$ implies that income impacts on house prices are asymmetric in the short-run. Specifically, $\hat{\gamma}_{2i} \neq \hat{\gamma}_{3i}$ shows asymmetric effects of income in quarter i_{th}. Similarly, if normalized $\hat{\gamma}_7 \neq \hat{\gamma}_8$, we conclude that income has asymmetric long-run impacts on house prices. Main reasons that I apply the above methodologies are their ease of use, estimating both short- and long-run effects simultaneously, flexibility, and can also be used regardless of the series order of integration, I(0) or I(1). Therefore, this approach allows testing a combination of level variables with different orders of integration which is impossible under other cointegration methods. However, it is not applicable to I(2) regressors.[1]

In order to investigate the sole impacts of the main determinant of house prices and income, I also employ another model, a bivariate specification, in which income is the only regressor of the model. Equations (6) and (7) show the symmetric and asymmetric models, respectively.

$$\Delta LnHPI_t = \lambda_0 + \sum_{i=1}^{n1} \lambda_{1i} \Delta LnHPI_{t-i} + \sum_{i=0}^{n2} \lambda_{2i} \Delta LnIncome_{t-i} + \lambda_4 LnHPI_{t-1} + \lambda_5 LnIncome_{t-1} + \omega_t \quad (6)$$

$$\Delta LnHPI_t = \gamma_0 + \sum_{i=1}^{n1} \gamma_{1i} \Delta LnHPI_{t-i} + \sum_{i=0}^{n2} \gamma_{2i} \Delta LnIncome^{+}_{t-i} + \sum_{i=0}^{n3} \gamma_{3i} \Delta LnIncome^{-}_{t-i} + \gamma_6 LnHPI_{t-1} + \gamma_7 LnIncome^{+}_{t-1} + \gamma_8 LnIncome^{-}_{t-1} + \upsilon_t \quad (7)$$

The above two models determine how much income is able to explain variations in house prices in each state of the United States. This specification is also suitable to examine Granger causality from income to house prices.

[1] For more on the application of this approach see Apergis and Miller (2006), Delatte and Lopez-Villavicencio (2012), Verheyen (2013), Bahmani-Oskooee and Fariditavana (2014, 2015), Bahmani-Oskooee and Bahmani (2015), and Bahmani-Oskooee and Saha (2016).

IV. Data

This study analyzes quarterly house prices (*HPI*), income (*Income*) and mortgage rate (*MortRate*) over the period of 1975Q1-2014Q3 in each state of the United States. House prices data is House Price Index (HPI) which is a weighted, repeat sales index; measuring average price changes, repeat sales, or refinancings on the same single-family house. This information is gained by studying repeat mortgage transactions on single-family properties whose mortgages have been securitized or purchased by Fannie Mae or Freddie Mac since 1975. The HPI provides an accurate indicator of house prices trends at different geographic levels. The breadth of its sample provides more information than other house prices indexes. This data is available for the nine Census Bureau divisions, the 50 states and District of Columbia, and for Metropolitan Statistical Areas and Divisions. Federal Housing Finance Agency publishes monthly and quarterly HPI data. The HPI is not adjusted for inflation. In this study, I use seasonally adjusted real HPI by adjusting the HPI by Consumer Price Index.

Income data is Total Personal Income published by the U.S. Bureau of Economic Analysis. Based on the BEA definition, Personal Income is the income received by all persons from all sources. It is the sum of net earnings by place of residence, property income, and personal current transfer receipts. State level Personal Income statistics can serve as a basis for decision making. For instance, they are used in forecasting models to project water and energy consumption, state governments use them to project the need for public services, and businesses use the statistics for market research. In the model, I use real Total Personal Income which is seasonally adjusted. The series has been deflated by Consumer Price Index.

Mortgage rate is 30-Year Conventional Mortgage Rate which is contract interest rates on commitments for fixed-rate first mortgages. Its source is Primary Mortgage Market Survey data provided by Freddie Mac. All the above series were collected from Federal Reserve Economic Data (FRED), St. Louis Fed.

V. Empirical Results

V.I. Multivariate Model

I first estimate the linear ARDL model outlined by equation (3) and then estimate the nonlinear ARDL model to find out how taking asymmetric behaviors into account would change the result and uncover existence of long-run equilibrium relationships between house prices and fundamentals. For demonstrative purposes, results for the nine states of the U.S. including California, Colorado, Florida, Georgia, Massachusetts, New York, Texas, Washington and Wisconsin as representatives of the West and East coast, West, Midwest, Southwest and Southeast regions of the United States will be explained in detail.

Initially, I impose a maximum of eight lags on each first differenced variable and then use Akaike's Information Criterion (AIC) to select the optimum number of lags. The table in Appendix B shows the results of the estimated multivariate model. For each state, the results have been reported in three panels. Panel A and B show the short- and the long-run normalized estimated coefficients, respectively, with their t-statistics in the parenthesis. Some diagnostic statistics are also reported in Panel C.

I first concentrate on the results of the symmetric (linear) model for Colorado. In Panel A, short-run coefficients of both income and mortgage rate are significant at least at the 10% level. For example, $\rho_{20} = .25$, $\rho_{30} = -.05$ (coefficients of $\Delta LnIncome_t$ and $\Delta LnMortRate_t$, respectively) and both of them are strongly significant. Turning to the long-run normalized coefficients, Panel B, it appears that only the impact of income lasts into the long-run, normalized $\rho_5 = .65$ (coefficients of $LnIncome_t$) and it is significant. This long-run relationship between house prices and income is valid only if cointegration between these variables is established.

Panel C shows that the variable addition F-test for joint significance of lagged level variables at optimum lags, 3.37, is between the 10% upper (4.14) and lower (3.17) bound critical values, implying that no statistical inference can be made based on this test. However, I can check if there is any convergence toward the long-run equilibrium by using estimated normalized long-run coefficients from Panel B and equation (1) to generate the error term, also known as error correction term (ECM). Replacing linear combination of lagged level variables in (3) by ECM_{t-1} and obtaining a negative and significant estimated coefficient for that supports convergence or cointegration toward the long-run. In Colorado, this coefficient is -0.02 and highly significant, implying that 2% of adjustment toward equilibrium takes place in one quarter.

Some other diagnostic statistics are also reported in Panel C. Lagrange Multiplier (LM) statistic with χ^2 distribution and four degrees of freedom is used to make sure that the residuals are autocorrelation free. The LM test is suitable to test for autocorrelation of any order and also for models with and without lagged dependent variables. Considering the critical value of this test, 9.48, LM statistics for Colorado, 3.00, is insignificant and supports autocorrelation free residuals. Following Pesaran *et al*. (2001), Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residual of Square (CUSUM Square) tests denoted by QS and QS^2, respectively, have been applied to the residuals of optimum model to check for the structural stability of the short- and the long-run coefficients. The results of both CUSUM and CUSUM Square show stability of coefficients for this state. Graphical presentation of the test is provided in the Appendix D. Coefficients are considered to be stable if the plot stays within the

5% critical upper and lower bounds for most of the sample period, otherwise they are unstable. Finally, to check the goodness of fit of the model, adjusted R^2 is presented which is 49% in Colorado.

In the linear specification and based on the significance of ECM_{t-1}, I conclude that there is cointegration between house prices and fundamentals in Colorado in this study period. However, the housing market may not respond to changes in the economy in a symmetric fashion. Therefore, symmetric or linear relationship assumption and model specification might be very restrictive. Graphs of HPI, income, and mortgage rate in Colorado are shown in Appendix F.

In order to have a more flexible model that captures the asymmetric behavior of the market, I use nonlinear ARDL approach explained in the previous section, equation (5). I estimate equation (5) by taking the same steps of imposing a maximum of eight lags on each first differenced variable and then using AIC criterion to find the optimal model. The results are reported in the Appendix B. In Colorado, short-run results in Panel A show variables representing positive and negative partial sums have significant effects on house prices except increase in mortgage rate that has no significant effect on prices. Considering coefficients of $\Delta LnIncome^{+}_{t-i}$ and $\Delta LnIncome^{-}_{t-i}$, they are both significant and also have different signs, numerical values and optimum number of lags that indicate house prices behaviors in responding to increase and decrease in income are different (or asymmetric). Turning to $\Delta LnMortRate^{+}_{t-i}$ and $\Delta LnMortRate^{-}_{t-i}$ coefficients, positive partial sum of mortgage rate has a negative but insignificant effect on house prices. However, its negative partial sum has significant effects that also last longer than the positive partial sum. This implies asymmetric adjustments of prices to changes in mortgage rate. Does this behavior last into the long-run?

Panel B shows that only $LnIncome_t^+$ carries a significant coefficient. Accordingly, the impacts of income on house prices changes through time. In other words, both increase and decrease in income affect prices in the short-run, however, only the impact of increase in income lasts into the long-run. Moving on to the mortgage rate partial sum coefficients, both $LnMortRate_t^+$ and $LnMortRate_t^-$ carry insignificant coefficients meaning that significant short-run impacts of negative partial sum of mortgage rate do not last into the long-run. These long-run results will be meaningful if we can establish cointegration between house prices and these variables.

Based on F-test at 10% significance level, the F statistics of Colorado, 2.5, stays between the upper (4.14) and the lower (3.17) bound critical values implying that the test is inconclusive. However, negative and significant coefficient of ECM_{t-1} can clearly establish cointegration in this state. LM diagnostic statistics of Colorado is also less than the critical value, 9.48, supporting autocorrelation free residuals in this model. Both QS and QS^2 indicate stability of estimated coefficients. Decomposition of income and mortgage rate into positive and negative partial sums and taking the asymmetric effects of their changes on house prices into account has increased the explanatory power of the model. Adjusted R^2 has improved by 7% and reached to 56% in this state. Graphs of HPI, partial sums of income, and mortgage rate in Colorado are shown in Appendix G.

In California, only mortgage rate has short-run significant effects on house prices (Panel A) in the linear model, however, Panel B shows that neither income nor mortgage rate has a long-run impact on prices. Model is stable, explains 75% of variations in prices, and does not suffer from residuals' serial correlation. Employing a more flexible nonlinear model and obtaining different short-run lag lengths for income and mortgage rates positive and negative partial sums, uncovers asymmetric adjustments of the model and short-run effects of income on prices. More interestingly, Panel B shows that although income had no significant effect in the linear model, in nonlinear model, decrease in income significantly affects house prices in this state. Both F test statistic and significantly negative coefficient of ECM_{t-1} support long-run equilibrium relationship between house prices and income. This model has also more explanatory power than the linear model and is able to explain 80% of the variations in house prices.

In Washington State, linear model shows short-run effects of mortgage rate but these effects do not last into the long-run. On the other hand, nonlinear model results determine asymmetric short-run adjustments of the market and long-run ineffectiveness of income and mortgage rate on house prices. Taking the asymmetric behavior of the market into account has increased the explanatory power of the model by 6% from 48% to 54%.

In Florida, linear model shows income and mortgage rate have significant impacts, however, only mortgage rate has a long-run impact on prices. Moving on to the nonlinear model, prices show asymmetric adjustments to fluctuations of income and mortgage rate. The model also determines that only increase in mortgage rate has a significant impact on prices. F test statistics of the both linear and nonlinear models exceeds the upper bond critical values and imply existence of a long-run relationship between house prices and mortgage rate. Explanatory power of the nonlinear model is 67%, 9% more than the linear model.

In New York, linear model results indicate short-run effects of fundamentals on house prices, but only income effects last into the long-run. Nonlinear model shows asymmetric adjustment of the housing market to changes in mortgage rates. Additionally, none of the partial sum components' long-run coefficients are significant in this model which implies housing market has more a symmetric behavior in this state. The model explains 40% of the variations in house prices.

Interestingly, housing market behavior in Massachusetts is very similar to New York. In the linear model income and mortgage rate have short-run effects, however, only effect of income lasts into the long-run. In the nonlinear model, income and mortgage rate only have short-run effects on house prices and they do not have any significant asymmetric long-run relationships with house prices. Additionally, only short-run deviations in income will be adjusted asymmetrically. Symmetric and asymmetric models can explain 70% and 72% of the variations of house prices, respectively. Based on the results, the housing market in Massachusetts behaves in a symmetric fashion.

The last state with results discussed in detail is Wisconsin. In the linear model short-run coefficient estimates of income and mortgage rate are significant. These short-run effects last to the long-run, however, F test or coefficient of ECM_{t-1} does not support long-run equilibrium relationships between house prices and fundamentals. Similarly in the nonlinear model, although model determines asymmetric adjustments, mortgage rate and income have no long-run impacts on house prices. I conclude that based on the methodology and data sample, no evidence of long-run equilibrium relationships between fundamentals and house prices can be found in Wisconsin.

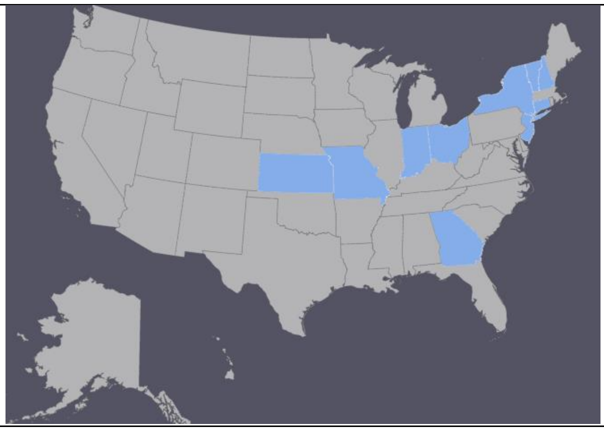
Based on what have been discussed so far, results of the multivariate model for all states of the United States can be summarized as:

1- Based on both linear and nonlinear models, fundamentals have short-run effects in all states of the U.S. The only exceptions are Pennsylvania and Minnesota in which income has no short-run impacts on house prices.

2- House prices adjustments to the equilibrium show asymmetric behavior in majority of states:

   - Adjustments to changes in income are symmetric in Connecticut, Georgia, Indiana, Kansas, Missouri, New Hampshire, New Jersey, New York, Ohio, and Vermont.

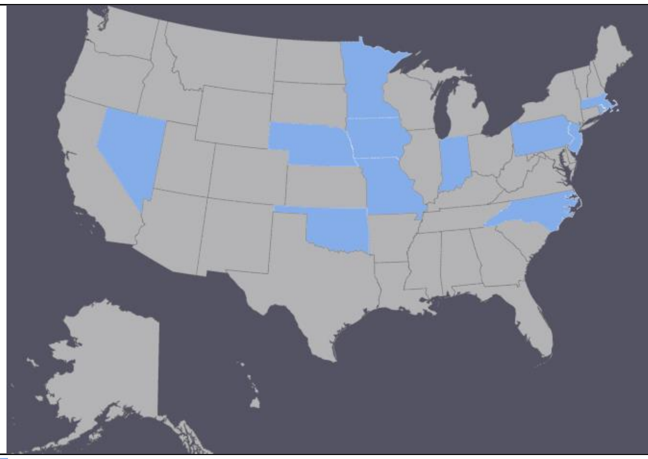
Map 5.1.16



States in which adjustments to changes in income are symmetric.

   - Adjustments to changes in mortgage rate are more symmetric in Iowa, Indiana, Massachusetts, Minnesota, Missouri, North Carolina, Nebraska, New Jersey, Nevada, Oklahoma, Pennsylvania, and Rhode Island.

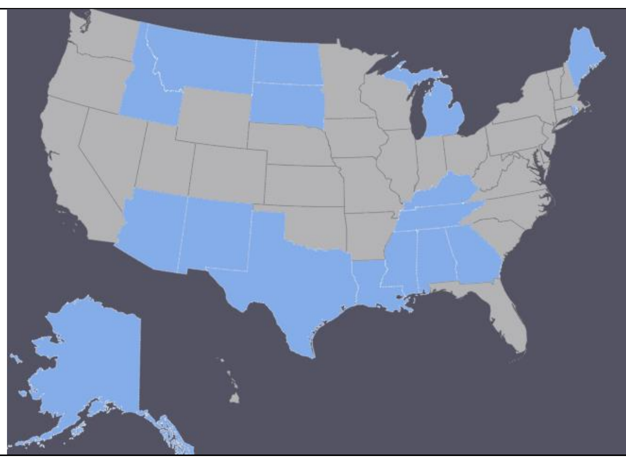
Map 5.1.17



States in which adjustments to changes in mortgage rate are symmetric.

3- Moving to the long-run, income and mortgage rate both have effects on house prices in Alaska, Alabama, Arizona, Georgia, Idaho, Kentucky, Louisiana, Main, Michigan, Mississippi, Montana, North Dakota, New Mexico, Rhode Island, South Dakota, Tennessee, and Texas. (Mostly, northern and southern states, excluding the East and the West coasts.)

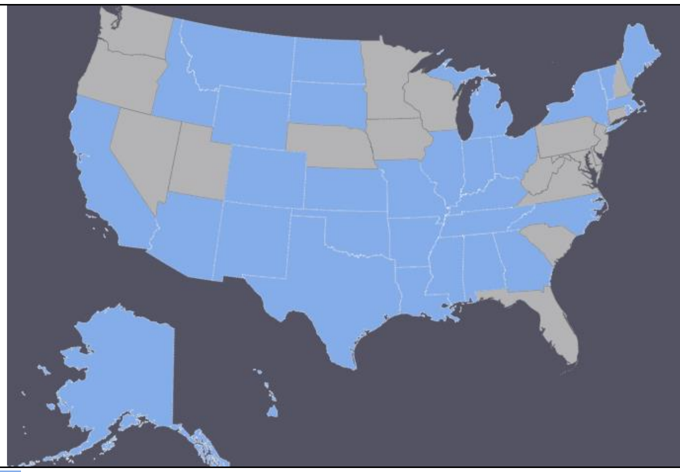
Map 5.1.18



States in which income and mortgage rate both have effects on house prices in long-run.

4- In the long-run, income impacts house prices in Alaska, Alabama, Arkansas, Arizona, California, Colorado, Georgia, Hawaii, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Main, Michigan, Missouri, Mississippi, Montana, North Carolina, North Dakota, New Mexico, New York, Ohio, Oklahoma, Rhode Island, South Dakota, Tennessee, Texas, Vermont, and Wyoming.[1]

Map 5.1.19

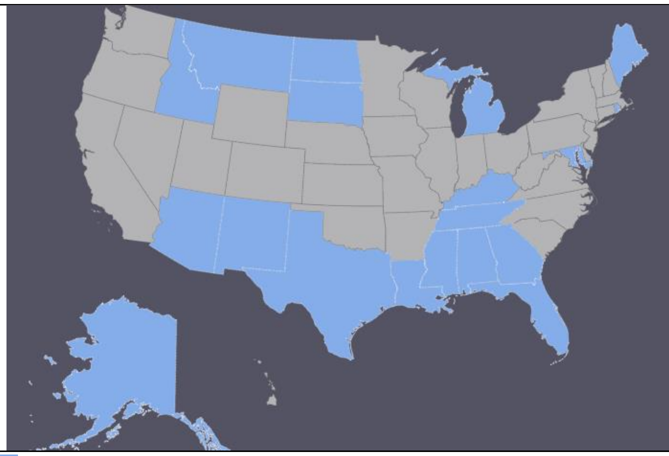


States in which income impacts house prices in the long-run.

5- In the long-run, mortgage rate impacts house prices in Alaska, Alabama, Arizona, Florida, Georgia, Idaho, Kentucky, Louisiana, Maryland, Main, Michigan, Mississippi, Montana, North Dakota, New Mexico, Rhode Island, South Dakota, Tennessee, and Texas.[2]

[1] Only income (not mortgage rate) impacts house prices in Arkansas, California, Colorado, Hawaii, Indiana, Illinois, Kansas, Massachusetts, Missouri, North Carolina, New York, Ohio, Oklahoma, Vermont, and Wyoming.
[2] Only mortgage rate (not income) impacts house prices in Florida, and Maryland.

Map 5.1.20



States in which mortgage rate impacts house prices in the long-run.

These long-run relationships are meaningful if we can find any evidence for existence of cointegration among these variables. Either F test or negative and significant coefficient of the ECM_{t-1} establishes long-run equilibrium relationships in these models.

6- No long-run effects of income and mortgage rate have been found in Connecticut, Delaware, Iowa, Minnesota, Nebraska, New Hampshire, New Jersey, Nevada, Oregon, Pennsylvania, South Carolina, Utah, Virginia, Washington, Wisconsin, West Virginia, and District of Columbia.

7- Findings show long-run equilibrium relationships between house prices and fundamentals in 34 states of the U.S.

8- Taking asymmetric behavior of the market into account has raised the adjusted R^2 and therefore, the explanatory power of the model in almost all states. Appendix E shows adjusted R^2 and contribution of nonlinear model to improve explanatory power of the model for all states of the U.S.

V.II. Bivariate Model

As I discussed earlier, I also estimate a bivariate ARDL model in which I can investigate the sole impact of income on house prices. To capture symmetric and asymmetric impacts of income, I employ both linear ARDL model, equation (6), and nonlinear ARDL model, equation (7). I will benefit from the findings of this study in several areas: first, I can investigate how much of variations in house prices are contributed by changes in income. Second, I can avoid the possibility of multicollinearity by having income as the only regressor of the model. Third, I can test for Granger causality. I also expand the study and test for overall short-run impacts of increase and decrease in income, and test for asymmetric impacts of income on house prices. The bivariate model takes the following form:

$$\Delta LnHPI_t = \gamma_0 + \sum_{i=1}^{n1} \gamma_{1i} \Delta LnHPI_{t-i} + \sum_{i=0}^{n2} \gamma_{2i} \Delta LnIncome^{+}_{t-i} + \sum_{i=0}^{n3} \gamma_{3i} \Delta LnIncome^{-}_{t-i} + \gamma_6 LnHPI_{t-1} + \gamma_7 LnIncome^{+}_{t-1} + \gamma_8 LnIncome^{-}_{t-1} + \upsilon_t$$

Appendix C contains table of results for the bivariate model. Similarly, table is divided into three panels: Panel A contains short-run estimated coefficients of income and its partial sum components, Panel B has long-run estimated coefficients, and Panel C shows diagnostics including Wald tests. I apply Wald test to examine the following hypothesis:

1- Overall short-run impacts of increase in income is not significant, $H_0 : \sum_{i=o}^{n2} \gamma_{2i} = 0$.

2- Overall short-run impacts of decrease in income is not significant, $H_0 : \sum_{i=o}^{n3} \gamma_{3i} = 0$.

3- Overall short-run impacts of increase and decrease in income are equal and therefore, income impacts on house prices are symmetric in the short-run, $H_0 : \sum_{i=o}^{n2} \gamma_{2i} = \sum_{i=o}^{n3} \gamma_{3i}$.

4- Long-run impacts of increase and decrease income are equal and therefore, income impacts on house prices are symmetric in the long-run, $H_0 : \gamma_7 = \gamma_8$.

In this bivariate model, 1 and 2 are also used to investigate asymmetric Granger causality from increase or decrease in income to house prices.

Initially, I discuss the findings of the bivariate model for the state of Colorado. In the linear ARDL model, Panel A shows income has a strongly significant coefficient, indicating the short-run effect of income on house prices is significant. Apparently, the short-run effect lasts into the long-run in Panel B. The long-run significant effect of income is further supported by negative and significant coefficient of ECM_{t-1} in Panel C. Its coefficient indicates that 2% of the deviations from equilibrium long-run relationship between income and house prices will be adjusted in each quarter. I can also take advantage of ECM_{t-1} coefficient and check for Granger causality. Significant coefficient of ECM_{t-1} implies income Granger causes house prices or income leads house prices in Colorado.

A few additional diagnostic statistics are also reported in Panel C. Lagrange Multiplier (LM) statistic is 2.39 and less than the critical value of 9.48 at 5% significance level which supports lack of autocorrelation. Both QS and QS^2 imply that estimated short- and long-run coefficients are stable. Finally, I report explanatory power of the model, adjusted R^2, which is 44%.

Moving on to the nonlinear ARDL model, Panel A shows coefficients of partial sum components of income. Increase and decrease in income both have significant short-run effects. Adjustments to changes in income are asymmetric and any increase in income has longer lasting effects on prices than a decrease in income which only impacts house prices for two quarters.

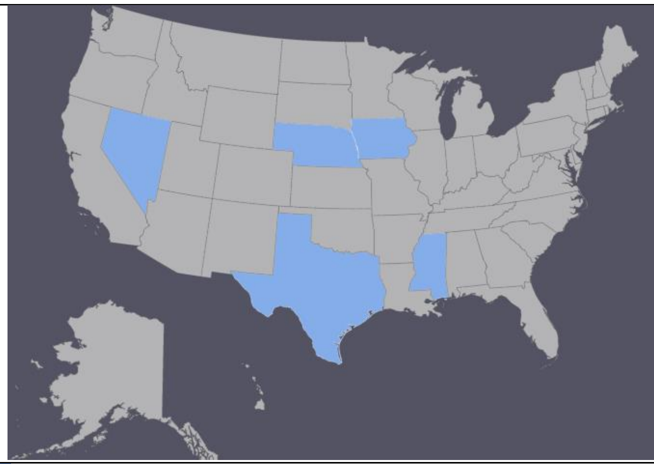
Considering short-run impacts of increase in income, eight coefficients have been obtained, seven of them are positive and the last one is negative. Similarly, for decrease in income, the first coefficient is positive and the second one is negative. A question may arise here as to what is the overall short-run impact of increase or decrease in income? To answer this question, I apply Wald test to examine overall impacts of income partial sum components, $H_0: \sum_{i=o}^{n2} \gamma_{2i} = 0$ for positive partial sum and $H_0: \sum_{i=o}^{n3} \gamma_{3i} = 0$ for negative partial sum of income. Additionally, I can use the same methodology and test for asymmetric short-run impacts of income on house prices by testing $H_0: \sum_{i=o}^{n2} \gamma_{2i} = \sum_{i=o}^{n3} \gamma_{3i}$. Test results reported in Panel C show decrease and increase in income have significant impacts on house prices and these impacts are statistically different. This shows asymmetric short-run impacts of income on house prices in Colorado. Additionally, it implies that both increase and decrease in income Granger cause house prices.

In this nonlinear model, it appears that short-run impacts of income last into the long-run. It seems only increase in income carries a significant coefficient and not decrease in income which can be a sign of asymmetric long-run impacts of income. In order to statistically test asymmetric long-run impacts, I employ Wald test and examine if long-run coefficients are equal, $H_0: \gamma_7 = \gamma_8$. Although positive and negative partial sum components of income carry coefficients with different numerical values and significance, the test result in Panel C shows there is not enough evidence to reject the null hypothesis. That said, the test cannot reject symmetric long-run impacts of income on house prices. If these long-run estimates are to be valid, I must establish cointegration between these series. Calculated F statistic is 3.86 and lower than its 10% critical value, therefore, no statistical inference can be made based on this test. Instead, I have to check coefficient of ECM_{t-1}. The coefficient is negative and significant and supports cointegration. Moreover, LM test is insignificant and residuals are not serially correlated. QS and QS^2 indicate that coefficients are stable and lastly, the nonlinear model has a better explanatory power and explains up to 46% of variations in house prices.

I can now summarize the findings of the linear and nonlinear models for all the states:

1- Considering both models, results support existence of long-run equilibrium relationships between income and house prices in 46 states. In this model, it also means in 46 states income Granger causes house prices. However, no relationships were found in Iowa, Mississippi, Nebraska, Nevada, and Texas. To be specific, linear and nonlinear models show cointegration in 34 and 42 states, respectively, which says taking the asymmetric behavior of the market into account helps to better capture these relationships.

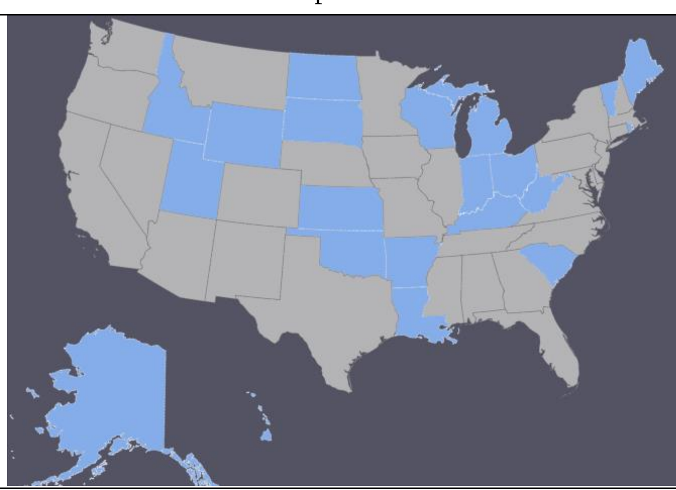
Map 5.2.15



States in which income and house prices have long-run equilibrium relationships.

2- Wald test show asymmetric long-run impacts of income on house prices in 21 states including Alaska, Arkansas, Hawaii, Idaho, Indiana, Kansas, Kentucky, Louisiana, Main, Michigan, North Dakota, Ohio, Oklahoma, Rhode Island, South Carolina, South Dakota, Utah, Vermont, Wisconsin, West Virginia, and Wyoming.

Map 5.2.16

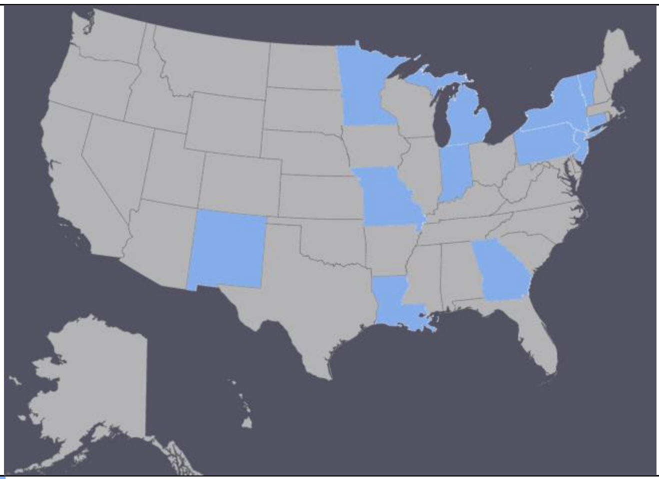


States in which long-run impacts of income on house prices are asymmetric.

3- In all states, income has at least a significant short-run estimated coefficient and therefore, it has short-run effects on house prices.

4- In majority of states, adjustments toward long-run equilibrium show asymmetric behaviors. In other words, increases in income compared to decreases in income have different optimum lag lengths in the estimated models. Exceptions are Connecticut, Georgia, Indiana, Louisiana, Michigan, Minnesota, Missouri, New Jersey, New Mexico, New York, Pennsylvania, and Vermont.

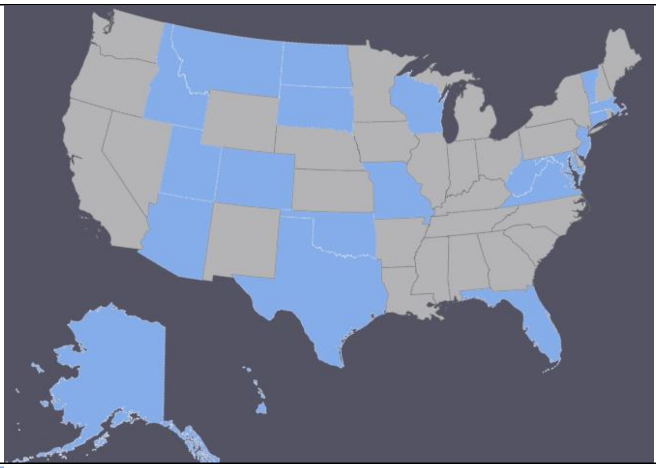
Map 5.2.17



States in which adjustments toward long-run equilibrium show symmetric behaviors.

5- Wald test supports significant overall impact of increase in income in 21 states of Alaska, Arizona, Colorado, Connecticut, Florida, Hawaii, Idaho, Massachusetts, Maryland, Missouri, Montana, North Dakota, New Jersey, Oklahoma, South Dakota, Texas, Utah, Virginia, Vermont, Wisconsin, and West Virginia.

Map 5.2.18

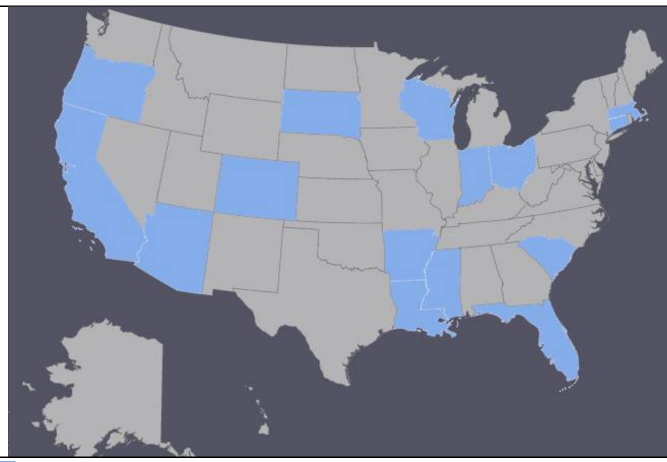


States in which overall short-run impacts of increase in income are significant.

The test also implies that in these states increase in income Granger cause house prices.

6- Wald test supports significant overall impact of decrease in income in 15 states of Arkansas, Arizona, California, Colorado, Connecticut, Florida, Indiana, Louisiana, Massachusetts, Mississippi, Ohio, Oregon, South Carolina, South Dakota, and Wisconsin.

Map 5.2.19

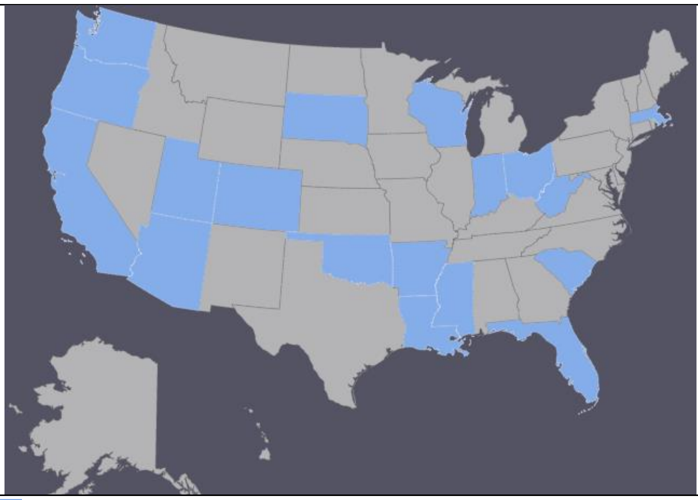


States in which overall short-run impacts of decrease in income are significant.

The test also implies that in these states decrease in income Granger cause house prices.

7- Wald test supports asymmetric overall impacts of income on house prices in 18 states of Arkansas, Arizona, California, Colorado, Florida, Indiana, Louisiana, Massachusetts, Mississippi, Ohio, Oklahoma, Oregon, South Carolina, South Dakota, Utah, Washington, Wisconsin, and West Virginia.

Map 5.2.20



States in which overall short-run impacts of income are asymmetric.

VI. Conclusion

The role of income and mortgage rate as primary determinants of house price variations are almost uncontested. However, econometric models have struggled to successfully uncover the long-run relationships between these fundamentals and house prices. Studies that have failed to find this relationship and used time-series models have been criticized for low power of time-series tests for cointegration. Others have tried to improve the study by using pooled data and panel tests for cointegration. Findings of both groups are inconclusive and not consistent.

The current literature, regardless of the models and sample of data, i.e., time-series or panel, mostly has assumed that fundamentals have symmetric impacts on house price. This symmetric assumption is not consistent with what we are experiencing in the real word housing market. The housing market may respond differently to increase or decrease in income or other fundamentals. In this dissertation, I propose a more flexible nonlinear model that enables me to incorporate the asymmetric relationships between fundamentals and house prices. Doing so, by using partial sum concept, four new measures are constructed and increase in income and mortgage rate has been separated from decrease in each of these time series. An ARDL model is applied to the constructed new measures to investigate asymmetric behavior of the market. This methodology is called nonlinear ARDL (NARDL). Moreover, I estimate linear ARDL model which is based on the assumption of symmetric impacts of fundamental on house prices. Estimating both these linear and nonlinear ARDL models enables me to test my main hypothesis which is whether a more flexible and asymmetric model can capture long-run relationships between fundamental and house prices better than common more restrictive symmetric models.

This approach has a number of attractions. First, it is applicable to any time series as long as it is not I(2). In other words, it can be applied to I(0) variables or I(1) variables or even a combination of I(0) and I(1) variables. Second, since majority of macroeconomic variables are either I(0) or I(1), there is no need for pre-unit root testing. Third, short-run and long-run impacts of fundamentals on house prices can be obtained in one step and simultaneously. Fourth, results of the symmetric and asymmetric model specifications can be compared to each other and see which one can better capture the true behavior of the market and is closer to the theory. Fifth, through error correction model coefficient, it can be gathered that what percent of deviations from long-run equilibrium will be adjusted in a quarter. Sixth, it enables me to check the asymmetric adjustment of house prices in response to any changes in the fundamentals. Seventh, I can test for Granger causality between house prices and income by estimating the bivariate model, having income as the only regressor in the model.

Our results in the multivariate model do indeed reveal short-run impacts of income and mortgage rate on house prices in virtually all the states. The short-run impacts of fundamentals last into long-run in 34 states and District of Columbia by either linear or nonlinear ARDL models. However, nonlinear asymmetric model performance in capturing the behavior of the market and explaining the movements of house prices is much better than the linear model. Moreover, findings show that mortgage rate has no long-run effects in 15 states including high volatile states such as California, New York, and Massachusets.

In the bivariate model in which income is the only regressor of the model, there no long-run relationships were found in Iowa, Mississippi, Nebraska, Nevada, and Texas. These long-run relationships turn out to be asymmetric in 21 states which are mainly in the center and the east coast. Interestingly, although income has long-run symmetric impacts on house prices in the west coast, these impacts are asymmetric in the short-run. In most cases, asymmetric adjustments to any change in fundamentals have been found.

In summary, my main finding that was not considered in most previous studies is taking the asymmetric relationships between fundamentals and house prices into account. Doing so, I am able to uncover long-run equilibrium relationships between house prices, income and mortgage rate which is consistent with the theory and what is experienced in the real world housing market. Moreover, the investigation shows that not only mortgage rate has asymmetric impacts in some states but it does not have any in a few other states. Given these results, having evidences supporting existence of long-run relationships between house prices, income and mortgage rate provides important policy implications. For instance, applying the reverse of the policy that has been used in economic growth periods, in recessions may not have the same corresponding impact on the housing market. Additionally, lowering mortgage rate by the Fed and applying expansionary monetary policy stimulates demand for housing but the effectiveness of the policy varies across states. Decrease in mortgage rate may have an impact in one state, but at the same state, increase in mortgage rate might be ineffective and applying another policy tool would be required. There are also few states in which the policy has no significant impacts at all. This scenario highlights that union central banking system such as Euro-zone policies over interest rates would impact the housing market differently in different regions, therefore, in addition to central bank policies, employing regional policies is required to reach the desired goal.

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Appendix A: Asymptotic Critical Value Bounds for the F-statistic

Table CI. Asymptotic Critical Value Bounds for the F-statistic
Testing for the Existence of a levels Relationship, Case III: Unrestricted Intercept and no Trend

	0.100		0.050		0.025		0.010		Mean		Variance	
k	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$
0	6.58	6.58	8.21	8.21	9.80	9.80	11.79	11.79	3.05	3.05	7.07	7.07
1	4.04	4.78	4.94	5.73	5.77	6.68	6.84	7.84	2.03	2.52	2.28	2.89
2	3.17	4.14	3.79	4.85	4.41	5.52	5.15	6.36	1.69	2.35	1.23	1.77
3	2.72	3.77	3.23	4.35	3.69	4.89	4.29	5.61	1.51	2.26	0.82	1.27
4	2.45	3.52	2.86	4.01	3.25	4.49	3.74	5.06	1.41	2.21	0.60	0.98
5	2.26	3.35	2.62	3.79	2.96	4.18	3.41	4.68	1.34	2.17	0.48	0.79
6	2.12	3.23	2.45	3.61	2.75	3.99	3.15	4.43	1.29	2.14	0.39	0.66
7	2.03	3.13	2.32	3.50	2.60	3.84	2.96	4.26	1.26	2.13	0.33	0.58
8	1.95	3.06	2.22	3.39	2.48	3.70	2.79	4.10	1.23	2.12	0.29	0.51
9	1.88	2.99	2.14	3.30	2.37	3.60	2.65	3.97	1.21	2.10	0.25	0.45
10	1.83	2.94	2.06	3.24	2.28	3.50	2.54	3.86	1.19	2.09	0.23	0.41

From Pesaran *et al*. (2001): Table CI(iii), Case III, pp. 300

Appendix B: Table of the Multivariate Model Specification Results (Note: Numbers inside parenthesis are t-ratios.)

	Alaska		Alabama		Arkansas	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.48 (1.70)**		**.54 (3.29)**		**.16 (1.78)**	
$\Delta LnIncome_{t-1}$	.69 (2.28)		.16 (.96)		-.22 (-2.45)	
$\Delta LnIncome_{t-2}$	.54 (1.88)		-.19 (-1.15)			
$\Delta LnIncome_{t-3}$	.19 (.72)		.19 (1.12)			
$\Delta LnIncome_{t-4}$	-.13 (-.49)		-.31 (-1.81)			
$\Delta LnIncome_{t-5}$	.76 (3.01)					
$\Delta LnIncome_{t-6}$	-.42 (-1.71)					
$\Delta LnIncome_{t-7}$	.34 (1.40)					
$\Delta LnMortRate_t$	**.07 (.95)**		**-.10 (-3.93)**		**-.08 (-4.01)**	
$\Delta LnMortRate_{t-1}$			-.08 (-3.08)		-.04 (-2.23)	
$\Delta LnMortRate_{t-2}$						
$\Delta LnMortRate_{t-3}$						
$\Delta LnMortRate_{t-4}$						
$\Delta LnMortRate_{t-5}$						
$\Delta LnMortRate_{t-6}$						
$\Delta LnMortRate_{t-7}$						
$\Delta LnIncome(+)_t$		**.11 (.91)**		**.20 (.82)**		**-.23 (-1.68)**
$\Delta LnIncome(+)_{t-1}$				.14 (.57)		
$\Delta LnIncome(+)_{t-2}$				.57 (2.29)		
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.20 (1.78)**		**1.07 (3.15)**		**.85 (4.64)**
$\Delta LnIncome(-)_{t-1}$		-.61 (-.90)		-.16 (-.45)		-.66 (-3.64)
$\Delta LnIncome(-)_{t-2}$		.31 (.66)		-1.27 (-3.43)		
$\Delta LnIncome(-)_{t-3}$		-.23 (-.50)		.63 (1.89)		
$\Delta LnIncome(-)_{t-4}$		-1.25 (-2.69)		-.55 (-1.59)		
$\Delta LnIncome(-)_{t-5}$		.84 (1.81)				
$\Delta LnIncome(-)_{t-6}$		-1.20 (-2.72)				
$\Delta LnIncome(-)_{t-7}$						
$\Delta LnMortRate(+)_t$		**.23 (2.05)**		**-.02 (-.62)**		**-.001 (-.13)**
$\Delta LnMortRate(+)_{t-1}$		-.16 (-1.34)				
$\Delta LnMortRate(+)_{t-2}$		-.26 (-2.26)				
$\Delta LnMortRate(+)_{t-3}$						
$\Delta LnMortRate(+)_{t-4}$						
$\Delta LnMortRate(+)_{t-5}$						
$\Delta LnMortRate(+)_{t-6}$						
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**.03 (.96)**		**-.20 (-4.10)**		**-.15 (-4.35)**
$\Delta LnMortRate(-)_{t-1}$				-.12 (-2.60)		-.06(-1.82)
$\Delta LnMortRate(-)_{t-2}$						
$\Delta LnMortRate(-)_{t-3}$						
$\Delta LnMortRate(-)_{t-4}$						
$\Delta LnMortRate(-)_{t-5}$						
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	64.20 (.63)	6.10 (34.66)	2.61 (.33)	5.76 (43.52)	13.37 (1.31)	5.77 (24.49)
$LnIncome_t$	-3.24 (-.57)		.15 (.39)		-.40 (-.77)	
$LnMortRate_t$	-1.97 (-.61)		-.001(-.006)		-.27 (-.74)	
$LnIncome(+)_t$		.40 (.99)		-1.45(-2.22)		-.42 (-.30)
$LnIncome(-)_t$		4.27 (9.98)		5.08 (4.26)		2.73 (2.34)
$LnMortRate(+)_t$		.61 (3.58)		.32 (2.15)		-.03 (-.13)
$LnMortRate(-)_t$		.10 (1.00)		-.42 (-2.49)		-.31 (-.83)
Panel C: Diagnostic						
F	1.70	4.20	1.43	2.96	1.64	2.25
ECM_{t-1}	-.02 (-2.27)	-.27 (-4.64)	-0.04(-2.09)	-.11 (-3.91)	-.02 (-2.24)	-.04 (-3.40)
LM	5.07	2.63	1.32	3.61	4.09	6.20
QS (QS^2)	S (U)	S (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.20	.30	.39	.49	.32	.42

	Arizona		California		Colorado	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.51 (2.93)**		**.009 (.50)**		**.25 (2.87)**	
$\Delta LnIncome_{t-1}$	-.10 (-.59)				-.14(-1.51)	
$\Delta LnIncome_{t-2}$	-.31 (-1.75)				-.02(-.29)	
$\Delta LnIncome_{t-3}$	.003 (.01)				.02(.30)	
$\Delta LnIncome_{t-4}$	-.15 (-.93)				.22(2.41)	
$\Delta LnIncome_{t-5}$	.37 (2.25)				.05(.56)	
$\Delta LnIncome_{t-6}$	.43 (2.72)				.15(1.74)	
$\Delta LnIncome_{t-7}$	-.33 (-1.98)				-.20(-2.10)	
$\Delta LnMortRate_t$	**-.12 (-4.16)**		**-.06 (-2.8)**		**-.05 (-3.02)**	
$\Delta LnMortRate_{t-1}$			.05 (2.32)		.009 (.48)	
$\Delta LnMortRate_{t-2}$					.04 (2.56)	
$\Delta LnMortRate_{t-3}$						
$\Delta LnMortRate_{t-4}$						
$\Delta LnMortRate_{t-5}$						
$\Delta LnMortRate_{t-6}$						
$\Delta LnMortRate_{t-7}$						
$\Delta LnIncome(+)_t$		**.51 (2.36)**		**.39 (2.38)**		**.35 (3.11)**
$\Delta LnIncome(+)_{t-1}$		.28 (1.26)		.43 (2.52)		.01 (.12)
$\Delta LnIncome(+)_{t-2}$		.05 (.25)				.001 (.01)
$\Delta LnIncome(+)_{t-3}$		-.08 (-.37)				-.04 (-.37)
$\Delta LnIncome(+)_{t-4}$		-.15 (-.75)				.18 (1.65)
$\Delta LnIncome(+)_{t-5}$		.27 (1.39)				.17 (1.56)
$\Delta LnIncome(+)_{t-6}$		.62(3.19)				.22 (2.07)
$\Delta LnIncome(+)_{t-7}$						-.20(-1.85)
$\Delta LnIncome(-)_t$		**.37 (.85)**		**-.14 (-.49)**		**-.08 (-.40)**
$\Delta LnIncome(-)_{t-1}$		-1.20 (-2.89)		-1.07 (-3.71)		-.48 (-2.16)
$\Delta LnIncome(-)_{t-2}$		-1.36 (-2.87)		-.77 (-2.68)		
$\Delta LnIncome(-)_{t-3}$				-.43(-1.41)		
$\Delta LnIncome(-)_{t-4}$				-.64(-2.15)		
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
$\Delta LnMortRate(+)_t$		**-.07 (-1.31)**		**-.04 (-1.11)**		**-.009(-.72)**
$\Delta LnMortRate(+)_{t-1}$				.09 (2.24)		
$\Delta LnMortRate(+)_{t-2}$				-.01 (-.28)		
$\Delta LnMortRate(+)_{t-3}$				.08 (2.20)		
$\Delta LnMortRate(+)_{t-4}$				.10 (2.52)		
$\Delta LnMortRate(+)_{t-5}$				.05(1.21)		
$\Delta LnMortRate(+)_{t-6}$				.07(1.68)		
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.21 (-3.83)**		**-.19 (-4.57)**		**-.11 (-3.84)**
$\Delta LnMortRate(-)_{t-1}$		.04 (.79)		.03 (.66)		.04 (1.31)
$\Delta LnMortRate(-)_{t-2}$		0.10(1.88)		-.005 (-.10)		.07(2.42)
$\Delta LnMortRate(-)_{t-3}$		.07 (1.39)		-.03 (-.86)		
$\Delta LnMortRate(-)_{t-4}$				-.08 (-1.86)		
$\Delta LnMortRate(-)_{t-5}$				-.11 (-2.60)		
$\Delta LnMortRate(-)_{t-6}$				-.01(-.29)		
$\Delta LnMortRate(-)_{t-7}$				-.09(-2.49)		
Panel B: Long-Run						
Constant	4.89 (.37)	5.84 (9.97)	-1.57 (-.10)	5.08 (8.08)	-6.84(-1.11)	5.12 (27.18)
$LnIncome_t$	.06 (.09)		.38 (.55)		.65 (2.20)	
$LnMortRate_t$	-.29 (-.42)		-.30 (-.64)		.04 (.14)	
$LnIncome(+)_t$		-4.10 (-1.84)		1.94 (.80)		1.49 (2.76)
$LnIncome(-)_t$		11.67 (2.49)		13.26 (2.28)		-1.08 (-.63)
$LnMortRate(+)_t$		.23 (.32)		-2.22 (-1.54)		-.24 (-.81)
$LnMortRate(-)_t$		-2.26 (-1.86)		-1.61 (-1.47)		.30 (1.34)
Panel C: Diagnostic						
F	3.61	6.13	4.25	4.93	3.37	2.50
ECM_{t-1}	-.02 (-3.32)	-.04 (-5.63)	-.02 (-3.60)	-.02 (-5.06)	-.02 (-3.20)	-.04 (-3.59)
LM	3.52	3.83	1.75	4.18	3.00	6.01
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.59	.63	.75	.80	.49	.56

	Connecticut		Delaware		Florida	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**.35 (3.30)**		**.009 (.49)**		**.22 (1.65)**	
ΔLnIncome$_{t-1}$						
ΔLnIncome$_{t-2}$						
ΔLnIncome$_{t-3}$						
ΔLnIncome$_{t-4}$						
ΔLnIncome$_{t-5}$						
ΔLnIncome$_{t-6}$						
ΔLnIncome$_{t-7}$						
ΔLnMortRate$_t$	**-.10 (-4.38)**		**-.10 (-2.88)**		**-.12 (-5.25)**	
ΔLnMortRate$_{t-1}$	-.03 (-1.67)		.01(.49)			
ΔLnMortRate$_{t-2}$	.02 (.83)		-.05(-1.62)			
ΔLnMortRate$_{t-3}$	-.01 (-.79)		.08(2.48)			
ΔLnMortRate$_{t-4}$	-.02 (-.98)		-.09(-2.70)			
ΔLnMortRate$_{t-5}$	-.06 (-2.47)		.05(1.36)			
ΔLnMortRate$_{t-6}$						
ΔLnMortRate$_{t-7}$						
ΔLnIncome(+)$_t$		**.57 (3.46)**		**.04 (.44)**		**.47 (2.72)**
ΔLnIncome(+)$_{t-1}$						.04 (.27)
ΔLnIncome(+)$_{t-2}$						.53 (3.23)
ΔLnIncome(+)$_{t-3}$						-.20(-1.29)
ΔLnIncome(+)$_{t-4}$						
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**.12 (1.35)**		**.46 (1.08)**		**-.20 (-.64)**
ΔLnIncome(-)$_{t-1}$				.21 (.49)		-.37 (-1.22)
ΔLnIncome(-)$_{t-2}$				-.66 (-1.61)		-1.34 (-4.08)
ΔLnIncome(-)$_{t-3}$				.13 (.33)		
ΔLnIncome(-)$_{t-4}$				.01 (.04)		
ΔLnIncome(-)$_{t-5}$				-.94 (-2.34)		
ΔLnIncome(-)$_{t-6}$				.92 (2.32)		
ΔLnIncome(-)$_{t-7}$				.81 (1.95)		
ΔLnMortRate(+)$_t$		**-.009 (-.89)**		**-.10 (-1.70)**		**-.11 (-2.68)**
ΔLnMortRate(+)$_{t-1}$						.001 (.02)
ΔLnMortRate(+)$_{t-2}$						.01 (.28)
ΔLnMortRate(+)$_{t-3}$						.08 (1.95)
ΔLnMortRate(+)$_{t-4}$						.07(1.78)
ΔLnMortRate(+)$_{t-5}$						.06(1.26)
ΔLnMortRate(+)$_{t-6}$						.07(1.70)
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_t$		**-.17 (-4.35)**		**-.14 (-2.08)**		**-.18 (-4.13)**
ΔLnMortRate(-)$_{t-1}$		-.08 (-1.87)		.03 (.62)		-.006 (-.14)
ΔLnMortRate(-)$_{t-2}$		.05 (1.47)		-.09 (-1.48)		.06 (1.33)
ΔLnMortRate(-)$_{t-3}$				.17 (2.79)		-.02(-.49)
ΔLnMortRate(-)$_{t-4}$				-.13 (-2.19)		-.02(-.46)
ΔLnMortRate(-)$_{t-5}$						-.16(-3.45)
ΔLnMortRate(-)$_{t-6}$						
ΔLnMortRate(-)$_{t-7}$						
Panel B: Long-Run						
Constant	.34 (.05)	5.55 (28.59)	3.32 (.53)	5.85 (21.35)	12.99 (1.68)	5.29 (22.39)
LnIncome$_t$	.29 (.93)		.17 (.53)		-.30 (-.87)	
LnMortRate$_t$	-.04 (-.20)		-.23 (-.90)		-.59 (-1.67)	
LnIncome(+)$_t$		-.19 (-.09)		.74 (.48)		.54 (.40)
LnIncome(-)$_t$		3.89 (1.29)		1.16 (.30)		1.09 (.51)
LnMortRate(+)$_t$		-.30 (-.89)		-.34 (-.88)		-.91 (-2.00)
LnMortRate(-)$_t$		-.70 (-.86)		-.17 (-.29)		-.51 (-1.26)
Panel C: Diagnostic						
F	6.11	2.74	3.58	2.17	5.96	7.06
ECM$_{t-1}$	-.03 (-4.31)	-.03 (-3.69)	-.05 (-3.30)	-.05 (-3.35)	-.02 (-4.25)	-.04 (-5.99)
LM	14.91	3.96	2.03	3.13	3.28	1.52
QS (QS^2)	S (S)	S (S)	S (U)	S (S)	S (S)	S (S)
Adjusted R^2	.61	.55	.44	.46	.58	.67

	Georgia		Hawaii		Iowa	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**.21 (2.13)**		**3.86 (7.86)**		**.06 (.69)**	
ΔLnIncome$_{t-1}$			.19 (.33)		.18 (1.83)	
ΔLnIncome$_{t-2}$			-.57 (-.94)		-.04 (-.40)	
ΔLnIncome$_{t-3}$			-.41 (-.73)		.17 (1.89)	
ΔLnIncome$_{t-4}$			.86 (1.56)		.11 (1.22)	
ΔLnIncome$_{t-5}$			.62 (1.11)		.28 (3.02)	
ΔLnIncome$_{t-6}$			1.48 (2.69)		-.20 (-2.09)	
ΔLnIncome$_{t-7}$						
ΔLnMortRate$_t$	**-.06 (-3.83)**		**-.009 (-.09)**		**-.10 (-3.46)**	
ΔLnMortRate$_{t-1}$			-.09 (-.97)			
ΔLnMortRate$_{t-2}$			.05 (.57)			
ΔLnMortRate$_{t-3}$			.01 (.14)			
ΔLnMortRate$_{t-4}$			-.02 (-.27)			
ΔLnMortRate$_{t-5}$			.41 (4.24)			
ΔLnMortRate$_{t-6}$						
ΔLnMortRate$_{t-7}$						
ΔLnIncome(+)$_t$		**.19 (1.46)**		**1.19 (1.83)**		**.05 (.36)**
ΔLnIncome(+)$_{t-1}$				.90 (1.40)		.30 (2.09)
ΔLnIncome(+)$_{t-2}$				.76 (1.23)		-.55 (-3.74)
ΔLnIncome(+)$_{t-3}$				.78 (1.28)		
ΔLnIncome(+)$_{t-4}$				1.32 (2.15)		
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**.19 (2.21)**		**7.39 (6.77)**		**.14 (.74)**
ΔLnIncome(-)$_{t-1}$				-3.31 (-2.57)		-.11 (-.59)
ΔLnIncome(-)$_{t-2}$				-6.10 (-4.70)		.75 (3.90)
ΔLnIncome(-)$_{t-3}$				-1.62 (-1.22)		.22 (1.17)
ΔLnIncome(-)$_{t-4}$				-.96 (-.74)		.31 (1.65)
ΔLnIncome(-)$_{t-5}$				1.07 (.89)		.64 (3.37)
ΔLnIncome(-)$_{t-6}$				4.81 (4.40)		-1.16 (-5.91)
ΔLnIncome(-)$_{t-7}$				-4.11 (-4.31)		
ΔLnMortRate(+)$_t$		**-.0004(-.04)**		**-.07 (-1.29)**		**-.03 (-1.48)**
ΔLnMortRate(+)$_{t-1}$						
ΔLnMortRate(+)$_{t-2}$						
ΔLnMortRate(+)$_{t-3}$						
ΔLnMortRate(+)$_{t-4}$						
ΔLnMortRate(+)$_{t-5}$						
ΔLnMortRate(+)$_{t-6}$						
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_t$		**-.15 (-5.33)**		**.17 (1.33)**		**-.12 (-2.57)**
ΔLnMortRate(-)$_{t-1}$		.04 (1.36)		-.10 (-.81)		
ΔLnMortRate(-)$_{t-2}$				.07 (.53)		
ΔLnMortRate(-)$_{t-3}$				.01 (.10)		
ΔLnMortRate(-)$_{t-4}$				.14 (1.11)		
ΔLnMortRate(-)$_{t-5}$				.60 (4.61)		
ΔLnMortRate(-)$_{t-6}$						
ΔLnMortRate(-)$_{t-7}$						
Panel B: Long-Run						
Constant	8.90 (1.60)	5.69 (44.16)	-1.56 (-.11)	5.31 (70.34)	19.98 (.88)	5.87 (7.15)
LnIncome$_t$	-.14 (-.54)		.46 (.64)		-.73 (-.63)	
LnMortRate$_t$	-.26 (-1.06)		-.49 (-1.07)		-.53 (-.89)	
LnIncome(+)$_t$		-1.02 (-1.69)		2.47 (5.66)		.48 (.11)
LnIncome(-)$_t$		3.54 (2.53)		2.80 (2.05)		-2.54 (-.28)
LnMortRate(+)$_t$		-.008 (-.04)		-.29 (-1.15)		-1.95 (-.49)
LnMortRate(-)$_t$		-.57 (-2.09)		.03 (.23)		-.85 (-.41)
Panel C: Diagnostic						
F	5.21	3.51	4.80	5.68	2.86	1.28
ECM$_{t-1}$	-.04 (-3.98)	-.05 (-4.25)	-.11 (-3.82)	-.25 (-5.38)	-.03 (-2.93)	-.01 (-2.55)
LM	5.46	9.62	6.74	.97	5.89	15.97
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (U)	S (S)
Adjusted R^2	.43	.48	.51	.71	.38	.52

	Idaho		Illinois		Indiana	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.03 (1.47)**		**.19 (1.81)**		**.18 (2.52)**	
$\Delta LnIncome_{t-1}$			-.11 (-1.04)		.12(1.66)	
$\Delta LnIncome_{t-2}$			.12 (1.18)			
$\Delta LnIncome_{t-3}$			-.19 (-1.91)			
$\Delta LnIncome_{t-4}$			-.16 (-1.55)			
$\Delta LnIncome_{t-5}$			-.18 (-1.79)			
$\Delta LnIncome_{t-6}$			-.09(-.87)			
$\Delta LnIncome_{t-7}$			-.24(-2.20)			
$\Delta LnMortRate_t$	**-.09 (-2.30)**		**-.03(-2.13)**		**-.09 (-6.22)**	
$\Delta LnMortRate_{t-1}$			.03 (2.02)			
$\Delta LnMortRate_{t-2}$			.0007 (.03)			
$\Delta LnMortRate_{t-3}$			-.01 (-.83)			
$\Delta LnMortRate_{t-4}$			-.03(-1.71)			
$\Delta LnMortRate_{t-5}$			-.01 (-1.00)			
$\Delta LnMortRate_{t-6}$			.01(1.01)			
$\Delta LnMortRate_{t-7}$			.03(1.74)			
$\Delta LnIncome(+)_t$		**.52 (2.46)**		**.05 (1.12)**		**.05 (1.82)**
$\Delta LnIncome(+)_{t-1}$		.41 (1.98)				
$\Delta LnIncome(+)_{t-2}$		.10(.49)				
$\Delta LnIncome(+)_{t-3}$		.25(1.21)				
$\Delta LnIncome(+)_{t-4}$		.02(.10)				
$\Delta LnIncome(+)_{t-5}$		-.04(-.20)				
$\Delta LnIncome(+)_{t-6}$		.59(2.94)				
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**-.08 (-.20)**		**.29 (1.28)**		**.51 (3.86)**
$\Delta LnIncome(-)_{t-1}$		-.73 (-1.87)		-.15 (-.70)		
$\Delta LnIncome(-)_{t-2}$		.04 (.10)		.60 (2.99)		
$\Delta LnIncome(-)_{t-3}$		-1.53 (-3.73)		-.29 (-1.52)		
$\Delta LnIncome(-)_{t-4}$		.14 (.36)		-.39 (-2.06)		
$\Delta LnIncome(-)_{t-5}$		.39 (1.02)		-.44 (-2.32)		
$\Delta LnIncome(-)_{t-6}$		-1.00 (-2.67)				
$\Delta LnIncome(-)_{t-7}$		1.56 (4.21)				
$\Delta LnMortRate(+)_t$		**.01 (.14)**		**.004 (.30)**		**-.03 (-1.52)**
$\Delta LnMortRate(+)_{t-1}$		-.15(-2.19)				
$\Delta LnMortRate(+)_{t-2}$		-.11(-1.62)				
$\Delta LnMortRate(+)_{t-3}$						
$\Delta LnMortRate(+)_{t-4}$						
$\Delta LnMortRate(+)_{t-5}$						
$\Delta LnMortRate(+)_{t-6}$						
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.31 (-4.32)**		**-.10 (-3.31)**		**-.15 (-5.77)**
$\Delta LnMortRate(-)_{t-1}$		-.04 (-.64)		.03 (.89)		
$\Delta LnMortRate(-)_{t-2}$		.01(.22)		-.03 (-1.04)		
$\Delta LnMortRate(-)_{t-3}$		-.04(-.58)		-.03 (-.99)		
$\Delta LnMortRate(-)_{t-4}$		.02(.32)		-.08 (-2.65)		
$\Delta LnMortRate(-)_{t-5}$		-.15(-2.20)		-.07 (-2.32)		
$\Delta LnMortRate(-)_{t-6}$		-.02(-.35)				
$\Delta LnMortRate(-)_{t-7}$		-.19(-2.82)				
Panel B: Long-Run						
Constant	-2.22 (-.49)	5.35 (36.97)	-5.59(-.92)	5.31 (18.34)	18.31 (.54)	5.69 (92.57)
$LnIncome_t$	.43 (1.84)		.56 (1.97)		-.64 (-.38)	
$LnMortRate_t$	.11 (.56)		.003 (.02)		-.37 (-.42)	
$LnIncome(+)_t$		.01 (.02)		1.12 (1.08)		.63 (2.01)
$LnIncome(-)_t$		5.05 (3.23)		1.50 (.59)		3.09 (5.25)
$LnMortRate(+)_t$		.59 (1.69)		.09 (.30)		-.03 (-.34)
$LnMortRate(-)_t$		-.04 (-.24)		.14 (.36)		-.11 (-1.32)
Panel C: Diagnostic						
F	5.06	3.89	8.17	2.78	.52	4.39
ECM_{t-1}	-.08 (-3.90)	-.11 (-4.49)	-.06 (-4.99)	-.04 (-3.80)	-.009 (-1.26)	-.07 (-4.68)
LM	9.76	7.12	36.81	25.61	6.59	5.73
QS (QS^2)	U (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.43	.60	.53	.59	.43	.51

	Kansas		Kentucky		Louisiana	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.03 (.59)**		**.32 (4.07)**		**.27 (3.00)**	
$\Delta LnIncome_{t-1}$	.01(.25)		-.07 (-.77)		.13 (1.41)	
$\Delta LnIncome_{t-2}$	-.02(-.41)		-.14 (-1.64)		-.05 (-.52)	
$\Delta LnIncome_{t-3}$	.16(2.43)		-.09 (-1.15)		.01 (.21)	
$\Delta LnIncome_{t-4}$	.10(1.62)		-.11 (-1.42)		.12 (1.42)	
$\Delta LnIncome_{t-5}$			.17 (2.13)		.07 (.82)	
$\Delta LnIncome_{t-6}$			.09 (1.09)		.21 (2.35)	
$\Delta LnIncome_{t-7}$			-.20(-2.52)		.23 (2.56)	
$\Delta LnMortRate_t$	**-.05 (-3.49)**		**-.06 (-4.34)**		**-.05 (-.45)**	
$\Delta LnMortRate_{t-1}$	-.02 (-1.44)				-.008(-1.20)	
$\Delta LnMortRate_{t-2}$	.04 (2.96)				.05 (2.87)	
$\Delta LnMortRate_{t-3}$	-.02 (-1.23)				.01(.59)	
$\Delta LnMortRate_{t-4}$	-.002 (-.15)				.004(.27)	
$\Delta LnMortRate_{t-5}$	-.03(-2.13)				-.02(-1.42)	
$\Delta LnMortRate_{t-6}$	.05(3.08)				.004(.28)	
$\Delta LnMortRate_{t-7}$					.03(2.26)	
$\Delta LnIncome(+)_t$		**-.004 (-.10)**		**.20 (1.83)**		**.09 (.83)**
$\Delta LnIncome(+)_{t-1}$						.12 (.91)
$\Delta LnIncome(+)_{t-2}$						-.05 (-.42)
$\Delta LnIncome(+)_{t-3}$						-.24 (-1.95)
$\Delta LnIncome(+)_{t-4}$						.03 (.30)
$\Delta LnIncome(+)_{t-5}$						-.0003(-.002)
$\Delta LnIncome(+)_{t-6}$						.18 (1.57)
$\Delta LnIncome(+)_{t-7}$						.24 (2.03)
$\Delta LnIncome(-)_t$		**.11 (2.01)**		**.95 (5.23)**		**.81 (3.29)**
$\Delta LnIncome(-)_{t-1}$				-.63 (-3.18)		-.31(-1.33)
$\Delta LnIncome(-)_{t-2}$				-.69 (-3.64)		-.41(-1.58)
$\Delta LnIncome(-)_{t-3}$				.02 (.11)		
$\Delta LnIncome(-)_{t-4}$				-.42 (-2.24)		
$\Delta LnIncome(-)_{t-5}$				.30 (1.72)		
$\Delta LnIncome(-)_{t-6}$				.15 (.87)		
$\Delta LnIncome(-)_{t-7}$				-.76 (-4.20)		
$\Delta LnMortRate(+)_t$		**-.008 (-.92)**		**.0002 (.009)**		**-.01 (-.40)**
$\Delta LnMortRate(+)_{t-1}$				-.02(-1.00)		-.01 (-.64)
$\Delta LnMortRate(+)_{t-2}$				-.05(-2.24)		.03 (1.31)
$\Delta LnMortRate(+)_{t-3}$						.02 (.71)
$\Delta LnMortRate(+)_{t-4}$						.05 (1.97)
$\Delta LnMortRate(+)_{t-5}$						-.02 (-.74)
$\Delta LnMortRate(+)_{t-6}$						-.002 (-.07)
$\Delta LnMortRate(+)_{t-7}$						.08 (3.28)
$\Delta LnMortRate(-)_t$		**-.11 (-3.93)**		**-.10(-4.13)**		**-.10 (-3.21)**
$\Delta LnMortRate(-)_{t-1}$		-.02 (-.90)		-.009(-.35)		.04 (1.30)
$\Delta LnMortRate(-)_{t-2}$		.07 (2.61)		.04 (1.70)		.09 (2.81)
$\Delta LnMortRate(-)_{t-3}$				-.04(-1.68)		.04 (1.42)
$\Delta LnMortRate(-)_{t-4}$				.03(1.41)		
$\Delta LnMortRate(-)_{t-5}$						
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	14.85 (1.27)	5.82 (23.34)	-3.05 (-.55)	5.74 (69.70)	208.8(.19)	5.86 (14.81)
$LnIncome_t$	-.47 (-.79)		.45 (1.63)		-10.29(-.19)	
$LnMortRate_t$	-.38 (-1.04)		.07 (.46)		-6.27(-.20)	
$LnIncome(+)_t$		-.14 (-.10)		.01 (.06)		1.47 (1.41)
$LnIncome(-)_t$		3.57 (2.31)		3.57 (9.10)		8.22 (3.68)
$LnMortRate(+)_t$		-.25 (-.96)		.12 (1.90)		-1.29 (-2.09)
$LnMortRate(-)_t$		-.46 (-1.32)		-.12 (-1.88)		-.98 (-1.58)
Panel C: Diagnostic						
F	2.35	2.73	2.01	3.27	3.88	4.88
ECM_{t-1}	-.01 (-2.67)	-.03 (-3.71)	-.04 (-2.48)	-.16 (-4.12)	-.003(-3.44)	-.04 (-5.04)
LM	1.28	3.99	4.99	5.07	9.89	2.91
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.39	.36	.41	.58	.50	.58

	Massachusetts		Maryland		Maine	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**.22 (2.52)**		**.23 (1.67)**		**.55 (2.04)**	
ΔLnIncome$_{t-1}$			.21 (1.50)			
ΔLnIncome$_{t-2}$						
ΔLnIncome$_{t-3}$						
ΔLnIncome$_{t-4}$						
ΔLnIncome$_{t-5}$						
ΔLnIncome$_{t-6}$						
ΔLnIncome$_{t-7}$						
ΔLnMortRate$_t$	**-.07 (-4.56)**		**-.08 (-4.09)**		**-.11 (-2.22)**	
ΔLnMortRate$_{t-1}$					-.04(-.78)	
ΔLnMortRate$_{t-2}$					-.10(-2.04)	
ΔLnMortRate$_{t-3}$					.01(.22)	
ΔLnMortRate$_{t-4}$					-.005(-.10)	
ΔLnMortRate$_{t-5}$					-.06(-1.15)	
ΔLnMortRate$_{t-6}$					.04(.84)	
ΔLnMortRate$_{t-7}$					-.15(-2.92)	
ΔLnIncome(+)$_t$		**.40 (2.92)**		**.09 (.52)**		**.06 (.91)**
ΔLnIncome(+)$_{t-1}$				.54 (2.99)		
ΔLnIncome(+)$_{t-2}$						
ΔLnIncome(+)$_{t-3}$						
ΔLnIncome(+)$_{t-4}$						
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**-.08 (-.34)**		**.82 (2.11)**		**1.95 (3.10)**
ΔLnIncome(-)$_{t-1}$		-.50 (-2.27)		-.81 (-2.14)		-.10 (-.16)
ΔLnIncome(-)$_{t-2}$				-.76 (-1.95)		-1.65 (-2.70)
ΔLnIncome(-)$_{t-3}$				-.43(-1.19)		
ΔLnIncome(-)$_{t-4}$				-.76(-2.03)		
ΔLnIncome(-)$_{t-5}$						
ΔLnIncome(-)$_{t-6}$						
ΔLnIncome(-)$_{t-7}$						
ΔLnMortRate(+)$_t$		**-.07 (-2.33)**		**-.09 (-2.60)**		**-.19 (-2.12)**
ΔLnMortRate(+)$_{t-1}$						
ΔLnMortRate(+)$_{t-2}$						
ΔLnMortRate(+)$_{t-3}$						
ΔLnMortRate(+)$_{t-4}$						
ΔLnMortRate(+)$_{t-5}$						
ΔLnMortRate(+)$_{t-6}$						
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_t$		**-.08 (-2.66)**		**-.08 (-2.22)**		**-.13 (-1.41)**
ΔLnMortRate(-)$_{t-1}$				-.05 (-1.47)		-.01(-.16)
ΔLnMortRate(-)$_{t-2}$				-.03 (-.98)		-.18(-2.24)
ΔLnMortRate(-)$_{t-3}$				-.05 (-1.41)		-.03(-.38)
ΔLnMortRate(-)$_{t-4}$				-.02 (-.68)		-.13(-1.57)
ΔLnMortRate(-)$_{t-5}$				-.09 (-2.80)		-.14(-1.71)
ΔLnMortRate(-)$_{t-6}$						.02(.25)
ΔLnMortRate(-)$_{t-7}$						-.28(-3.49)
Panel B: Long-Run						
Constant	-7.56 (-.93)	5.65 (35.24)	13.24 (1.24)	5.56 (48.61)	-6.12 (-.63)	5.84 (23.68)
LnIncome$_t$	.71 (1.82)		-.31 (-.61)		.67 (1.31)	
LnMortRate$_t$	-.07 (-.30)		-.72 (-1.80)		.07 (.25)	
LnIncome(+)$_t$		1.45 (.97)		-.02 (-.02)		.65 (1.01)
LnIncome(-)$_t$		-.31 (-.06)		3.41 (1.07)		12.52 (3.40)
LnMortRate(+)$_t$		-.24 (-.57)		-.34 (-1.11)		.09 (.36)
LnMortRate(-)$_t$		.10 (.19)		-.48 (-1.98)		-.76 (-2.12)
Panel C: Diagnostic						
F	5.52	3.40	5.60	5.69	2.65	4.15
ECM$_{t-1}$	-.02 (-3.95)	-.02 (-4.07)	-.02 (-4.08)	-.04 (-5.42)	-.06 (-2.84)	-.09 (-4.60)
LM	11.96	6.38	5.01	1.13	8.32	1.52
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (U)	S (U)
Adjusted R^2	.70	.72	.55	.61	.38	.69

	Michigan		Minnesota		Missouri	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**.07 (1.97)**		**.01 (.94)**		**.25 (3.14)**	
ΔLnIncome$_{t-1}$						
ΔLnIncome$_{t-2}$						
ΔLnIncome$_{t-3}$						
ΔLnIncome$_{t-4}$						
ΔLnIncome$_{t-5}$						
ΔLnIncome$_{t-6}$						
ΔLnIncome$_{t-7}$						
ΔLnMortRate$_t$	**-.01 (-.68)**		**-.07 (-3.63)**		**-.03 (-2.66)**	
ΔLnMortRate$_{t-1}$	-.03 (-1.15)					
ΔLnMortRate$_{t-2}$	.02 (.97)					
ΔLnMortRate$_{t-3}$	-.02 (-1.07)					
ΔLnMortRate$_{t-4}$	-.06 (-2.35)					
ΔLnMortRate$_{t-5}$	-.05 (-2.04)					
ΔLnMortRate$_{t-6}$						
ΔLnMortRate$_{t-7}$						
ΔLnIncome(+)$_t$		**.14 (2.60)**		**.02 (.46)**		**.29 (2.72)**
ΔLnIncome(+)$_{t-1}$						
ΔLnIncome(+)$_{t-2}$						
ΔLnIncome(+)$_{t-3}$						
ΔLnIncome(+)$_{t-4}$						
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**.30 (1.25)**		**.10 (.86)**		**.10 (2.03)**
ΔLnIncome(-)$_{t-1}$		-.14 (-.62)				
ΔLnIncome(-)$_{t-2}$		-.23 (-.95)				
ΔLnIncome(-)$_{t-3}$		.28 (1.15)				
ΔLnIncome(-)$_{t-4}$		-.31 (-1.42)				
ΔLnIncome(-)$_{t-5}$		-.45 (-2.10)				
ΔLnIncome(-)$_{t-6}$		-.55 (-2.65)				
ΔLnIncome(-)$_{t-7}$						
ΔLnMortRate(+)$_t$		**-.02 (-.43)**		**-.001 (-.07)**		**.01 (1.09)**
ΔLnMortRate(+)$_{t-1}$		.11(2.47)				
ΔLnMortRate(+)$_{t-2}$		.09(2.37)				
ΔLnMortRate(+)$_{t-3}$		.06(1.62)				
ΔLnMortRate(+)$_{t-4}$						
ΔLnMortRate(+)$_{t-5}$						
ΔLnMortRate(+)$_{t-6}$						
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_t$		**-.09 (-2.02)**		**-.14 (-3.99)**		**-.08 (-3.70)**
ΔLnMortRate(-)$_{t-1}$		-.10 (-2.09)				
ΔLnMortRate(-)$_{t-2}$						
ΔLnMortRate(-)$_{t-3}$						
ΔLnMortRate(-)$_{t-4}$						
ΔLnMortRate(-)$_{t-5}$						
ΔLnMortRate(-)$_{t-6}$						
ΔLnMortRate(-)$_{t-7}$						
Panel B: Long-Run						
Constant	-22.29(-2.54)	5.91 (36.29)	-1.61 (-.21)	5.39 (25.84)	-5.73 (-.66)	5.52 (25.93)
LnIncome$_t$	1.39 (3.21)		.38 (1.06)		.57 (1.33)	
LnMortRate$_t$	.29 (1.86)		-.06 (-.25)		.19 (.90)	
LnIncome(+)$_t$		1.12 (2.71)		.65 (.46)		-1.16 (-.85)
LnIncome(-)$_t$		6.14 (8.56)		2.87 (.93)		2.99 (2.28)
LnMortRate(+)$_t$		-.40 (-1.83)		-.03 (-.07)		.34 (1.14)
LnMortRate(-)$_t$		-.72 (-3.67)		-.12 (-.28)		-.25 (-.80)
Panel C: Diagnostic						
F	4.08	11.63	3.49	2.42	3.04	2.71
ECM$_{t-1}$	-.05 (-3.52)	-.12 (-7.75)	-.02 (-3.24)	-.03 (-3.51)	-.03 (-2.95)	-.04 (-3.61)
LM	7.42	5.52	6.39	6.36	9.19	8.08
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.39	.47	.44	.45	.54	.56

	Mississippi		Montana		North Carolina	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_{t}$	**.48 (2.56)**		**.66 (5.12)**		**.23 (3.04)**	
ΔLnIncome$_{t-1}$	.03 (.17)		-.14 (-.95)			
ΔLnIncome$_{t-2}$	-.22 (-1.16)		.33 (2.25)			
ΔLnIncome$_{t-3}$	.37 (1.89)		.12 (.80)			
ΔLnIncome$_{t-4}$	-.05 (-.29)		.34 (2.33)			
ΔLnIncome$_{t-5}$	-.34 (-1.89)		.18 (1.19)			
ΔLnIncome$_{t-6}$	.28 (1.54)		.24 (1.72)			
ΔLnIncome$_{t-7}$	.71 (3.87)		-.21 (-1.50)			
ΔLnMortRate$_{t}$	**-.04 (-1.25)**		**-.05 (-1.14)**		**-.05 (-3.82)**	
ΔLnMortRate$_{t-1}$	-.09(-2.60)		-.006(-.14)			
ΔLnMortRate$_{t-2}$	.06(1.67)		.04(1.00)			
ΔLnMortRate$_{t-3}$	-.09(-2.50)		.05(1.20)			
ΔLnMortRate$_{t-4}$			-.11(-2.44)			
ΔLnMortRate$_{t-5}$						
ΔLnMortRate$_{t-6}$						
ΔLnMortRate$_{t-7}$						
ΔLnIncome(+)$_{t}$		**.28 (2.50)**		**.55 (3.32)**		**.22 (2.12)**
ΔLnIncome(+)$_{t-1}$				-.46 (-2.26)		.03(.35)
ΔLnIncome(+)$_{t-2}$				.63 (3.19)		.19(2.02)
ΔLnIncome(+)$_{t-3}$				.07 (.38)		
ΔLnIncome(+)$_{t-4}$				.31 (1.65)		
ΔLnIncome(+)$_{t-5}$				.55 (3.03)		
ΔLnIncome(+)$_{t-6}$				-.22 (-1.20)		
ΔLnIncome(+)$_{t-7}$				-.51 (-2.98)		
ΔLnIncome(-)$_{t}$		**1.00 (2.90)**		**.56 (2.39)**		**.30(1.49)**
ΔLnIncome(-)$_{t-1}$		.49 (1.26)		.39 (1.69)		-.46(-2.27)
ΔLnIncome(-)$_{t-2}$		-.67 (-1.73)		-.56 (-2.42)		
ΔLnIncome(-)$_{t-3}$		.75 (1.94)		-.35 (-1.46)		
ΔLnIncome(-)$_{t-4}$		.04 (.11)		.17 (.71)		
ΔLnIncome(-)$_{t-5}$		-.29 (-.77)		-1.08 (-4.75)		
ΔLnIncome(-)$_{t-6}$		1.22 (3.15)		.92 (4.05)		
ΔLnIncome(-)$_{t-7}$		1.83 (4.55)				
ΔLnMortRate(+)$_{t}$		**-.12 (-1.67)**		**.01 (.21)**		**.01 (1.55)**
ΔLnMortRate(+)$_{t-1}$		-.03(-.54)		-.14(-1.91)		
ΔLnMortRate(+)$_{t-2}$		09(1.52)		-.14(-1.87)		
ΔLnMortRate(+)$_{t-3}$		-.06(-.92)				
ΔLnMortRate(+)$_{t-4}$		-.009(-.14)				
ΔLnMortRate(+)$_{t-5}$		.02(.39)				
ΔLnMortRate(+)$_{t-6}$		.17(2.65)				
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_{t}$		**.05 (.79)**		**-.14 (-1.84)**		**-.11 (-5.10)**
ΔLnMortRate(-)$_{t-1}$		-.12(-1.65)		.03 (.37)		
ΔLnMortRate(-)$_{t-2}$		.06(.90)		.17 (2.22)		
ΔLnMortRate(-)$_{t-3}$		-.11(-1.55)		-.10(-1.41)		
ΔLnMortRate(-)$_{t-4}$		.10(1.37)		-.12(-1.70)		
ΔLnMortRate(-)$_{t-5}$		-.10(-1.48)		-.17(-2.39)		
ΔLnMortRate(-)$_{t-6}$				-.09(-1.30)		
ΔLnMortRate(-)$_{t-7}$						
Panel B: Long-Run						
Constant	-17.93 (-1.74)	4.28 (5.32)	-11.69 (-1.29)	5.40 (46.68)	-.33 (-.14)	5.38 (58.91)
LnIncome$_{t}$	1.21 (2.28)		.98 (1.99)		.30 (2.70)	
LnMortRate$_{t}$	.67 (2.22)		.16 (.52)		.07 (.71)	
LnIncome(+)$_{t}$		6.34 (1.28)		-.003 (-.002)		.005 (.01)
LnIncome(-)$_{t}$		-4.91 (-.86)		2.03 (5.03)		2.59 (1.59)
LnMortRate(+)$_{t}$		-.45 (-.45)		.76 (1.97)		.22 (1.56)
LnMortRate(-)$_{t}$		1.70 (1.42)		.11 (.61)		-.03 (-.24)
Panel C: Diagnostic						
F	2.47	1.91	2.16	3.97	5.25	3.98
ECM$_{t-1}$	-.06 (-2.74)	-.04 (-3.14)	-.06 (-2.56)	-.05 (-3.99)	-0.04(-3.22)	-.06 (-4.51)
LM	9.32	9.84	14.25	1.92	1.62	12.12
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.46	.54	.49	.48	0.46	.52

	North Dakota		Nebraska		New Hampshire	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_{t}$	**.08 (.98)**		**-.08 (-1.19)**		**.30 (2.53)**	
ΔLnIncome$_{t-1}$	.01 (.12)		.17(2.53)		.16(1.38)	
ΔLnIncome$_{t-2}$	.20 (2.28)		-.07 (-1.00)			
ΔLnIncome$_{t-3}$			.10 (1.51)			
ΔLnIncome$_{t-4}$			-.03 (-.48)			
ΔLnIncome$_{t-5}$			.26 (3.63)			
ΔLnIncome$_{t-6}$			.14(1.81)			
ΔLnIncome$_{t-7}$						
ΔLnMortRate$_{t}$	**-.04 (-.69)**		**-.06 (-3.01)**		**-.05 (-2.25)**	
ΔLnMortRate$_{t-1}$	.11(1.71)				-.07 (-2.58)	
ΔLnMortRate$_{t-2}$	-.001(-.02)				.03(1.23)	
ΔLnMortRate$_{t-3}$	-.04(-.68)				-.03(-1.41)	
ΔLnMortRate$_{t-4}$	-.15(-2.43)				.05(2.14)	
ΔLnMortRate$_{t-5}$					-.07(-2.92)	
ΔLnMortRate$_{t-6}$						
ΔLnMortRate$_{t-7}$						
ΔLnIncome(+)$_{t}$		**.08 (1.47)**		**-.002 (-.04)**		**.30 (1.92)**
ΔLnIncome(+)$_{t-1}$						
ΔLnIncome(+)$_{t-2}$						
ΔLnIncome(+)$_{t-3}$						
ΔLnIncome(+)$_{t-4}$						
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_{t}$		**.20 (1.37)**		**-.36 (-2.62)**		**.01 (.09)**
ΔLnIncome(-)$_{t-1}$		-.44 (-2.92)		.34 (2.49)		
ΔLnIncome(-)$_{t-2}$		.32 (2.13)		-.28 (-1.92)		
ΔLnIncome(-)$_{t-3}$		-.44 (-3.13)		.37 (2.41)		
ΔLnIncome(-)$_{t-4}$		-.22 (-1.55)		.08 (.54)		
ΔLnIncome(-)$_{t-5}$		-.34 (-2.40)		.40 (2.60)		
ΔLnIncome(-)$_{t-6}$		-.29 (-2.03)		.44 (2.94)		
ΔLnIncome(-)$_{t-7}$		.42 (2.67)		-.42 (-2.77)		
ΔLnMortRate(+)$_{t}$		**.04 (.87)**		**-.006 (-.34)**		**.02 (1.36)**
ΔLnMortRate(+)$_{t-1}$						
ΔLnMortRate(+)$_{t-2}$						
ΔLnMortRate(+)$_{t-3}$						
ΔLnMortRate(+)$_{t-4}$						
ΔLnMortRate(+)$_{t-5}$						
ΔLnMortRate(+)$_{t-6}$						
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_{t}$		**-.03 (-1.72)**		**-.08 (-2.54)**		**-.13 (-2.86)**
ΔLnMortRate(-)$_{t-1}$						-.12 (-2.47)
ΔLnMortRate(-)$_{t-2}$						.04 (.98)
ΔLnMortRate(-)$_{t-3}$						-.07(-1.45)
ΔLnMortRate(-)$_{t-4}$						.04(.90)
ΔLnMortRate(-)$_{t-5}$						-.14(-3.19)
ΔLnMortRate(-)$_{t-6}$						
ΔLnMortRate(-)$_{t-7}$						
Panel B: Long-Run						
Constant	.23 (.26)	5.76 (62.29)	10.34 (.86)	5.55 (13.13)	-9.25 (-.89)	4.86 (11.12)
LnIncome$_{t}$	-.63 (-.66)		-.24 (-.39)		.81 (1.50)	
LnMortRate$_{t}$	-0.74(-0.81)		-.27 (-.68)		.30 (.78)	
LnIncome(+)$_{t}$		.29 (1.38)		-.13 (-.04)		.55 (.63)
LnIncome(-)$_{t}$		1.13 (8.97)		-.09 (-.02)		.29 (.09)
LnMortRate(+)$_{t}$		.16 (.96)		-.28 (-.27)		.63 (1.39)
LnMortRate(-)$_{t}$		-.13 (-1.75)		-.24 (-.28)		.45 (.83)
Panel C: Diagnostic						
F	2.13	4.45	2.16	.62	4.69	3.62
ECM$_{t-1}$	-.03 (-2.47)	-.28 (-4.79)	-.02 (-2.56)	-.02 (-1.77)	-.03 (-3.78)	-.04 (-4.31)
LM	9.10	3.55	16.80	7.66	5.80	6.10
QS (QS^2)	S (U)	S (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.22	.30	.31	.40	.62	.63

	New Jersey		New Mexico		Nevada	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.18 (1.91)**		**.01 (.67)**		**.01 (.93)**	
$\Delta LnIncome_{t-1}$						
$\Delta LnIncome_{t-2}$						
$\Delta LnIncome_{t-3}$						
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnMortRate_t$	**-.05 (-3.32)**		**-.02 (-1.03)**		**-.06 (-1.90)**	
$\Delta LnMortRate_{t-1}$			-.02 (-.94)			
$\Delta LnMortRate_{t-2}$			.09 (3.46)			
$\Delta LnMortRate_{t-3}$						
$\Delta LnMortRate_{t-4}$						
$\Delta LnMortRate_{t-5}$						
$\Delta LnMortRate_{t-6}$						
$\Delta LnMortRate_{t-7}$						
$\Delta LnIncome(+)_t$		**.34 (2.53)**		**.26 (3.57)**		**.34 (1.56)**
$\Delta LnIncome(+)_{t-1}$						.43(1.93)
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**-.12 (-1.43)**		**.09 (.23)**		**-.04 (-.56)**
$\Delta LnIncome(-)_{t-1}$				-.57 (-1.38)		-.10 (-.25)
$\Delta LnIncome(-)_{t-2}$				-.97 (-2.04)		-.10 (-.29)
$\Delta LnIncome(-)_{t-3}$						-.50 (-1.34)
$\Delta LnIncome(-)_{t-4}$						-.97 (-2.77)
$\Delta LnIncome(-)_{t-5}$						.77 (2.16)
$\Delta LnIncome(-)_{t-6}$						.95 (2.11)
$\Delta LnIncome(-)_{t-7}$						
$\Delta LnMortRate(+)_t$		**-.02 (-1.55)**		**-.11 (-2.02)**		**-.01 (-.35)**
$\Delta LnMortRate(+)_{t-1}$				.04 (.86)		
$\Delta LnMortRate(+)_{t-2}$				.05 (1.24)		
$\Delta LnMortRate(+)_{t-3}$				.01 (.26)		
$\Delta LnMortRate(+)_{t-4}$				.10 (2.30)		
$\Delta LnMortRate(+)_{t-5}$				.10 (2.13)		
$\Delta LnMortRate(+)_{t-6}$				.12(2.72)		
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.06 (-2.14)**		**.04 (.93)**		**-.18 (-2.99)**
$\Delta LnMortRate(-)_{t-1}$				-.01 (-.30)		
$\Delta LnMortRate(-)_{t-2}$				.18 (3.68)		
$\Delta LnMortRate(-)_{t-3}$				.05 (1.04)		
$\Delta LnMortRate(-)_{t-4}$				.01 (.21)		
$\Delta LnMortRate(-)_{t-5}$				-.09 (-1.87)		
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	3.40 (.30)	5.90 (19.50)	-.62 (-.07)	5.72 (15.90)	.64 (.14)	5.11 (13.22)
$LnIncome_t$	.16 (.30)		.33 (.81)		.24 (1.12)	
$LnMortRate_t$	-.33 (-1.14)		.11 (.38)		.22 (.76)	
$LnIncome(+)_t$		2.20 (1.60)		3.77 (2.95)		1.46 (1.37)
$LnIncome(-)_t$		-4.35 (-1.41)		-2.04 (-1.00)		-2.90 (-1.00)
$LnMortRate(+)_t$		-.85 (-1.55)		-1.67 (-1.82)		-.25 (-.34)
$LnMortRate(-)_t$		.26 (.59)		.14 (.50)		.77 (1.49)
Panel C: Diagnostic						
F	5.49	3.42	2.20	5.82	5.75	4.16
ECM_{t-1}	-.02 (-4.07)	-.02 (-4.16)	-.04 (-2.59)	-.07 (-5.48)	-.04 (-4.14)	-.04 (-4.63)
LM	2.62	4.37	19.52	22.79	3.58	3.64
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (U)
Adjusted R^2	.71	.71	.30	.42	.57	.63

	New York		Ohio		Oklahoma	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.06 (2.38)**		**.22 (2.50)**		**.30(3.78)**	
$\Delta LnIncome_{t-1}$					-.07(-1.01)	
$\Delta LnIncome_{t-2}$					.09(1.35)	
$\Delta LnIncome_{t-3}$					.19(2.76)	
$\Delta LnIncome_{t-4}$					.10(1.44)	
$\Delta LnIncome_{t-5}$					.09(1.39)	
$\Delta LnIncome_{t-6}$					.13(1.87)	
$\Delta LnIncome_{t-7}$						
$\Delta LnMortRate_t$	**-.10 (-3.22)**		**-.06(-4.26)**		**-.06(-3.61)**	
$\Delta LnMortRate_{t-1}$	-.001(-.03)		-.02(-1.84)			
$\Delta LnMortRate_{t-2}$	-.02(-.88)					
$\Delta LnMortRate_{t-3}$	.04(1.36)					
$\Delta LnMortRate_{t-4}$	-.08(-2.69)					
$\Delta LnMortRate_{t-5}$	.003(.11)					
$\Delta LnMortRate_{t-6}$	-.08(-2.39)					
$\Delta LnMortRate_{t-7}$						
$\Delta LnIncome(+)_t$		**.02 (.21)**		**.06(1.39)**		**.13(1.21)**
$\Delta LnIncome(+)_{t-1}$						-.008(-.07)
$\Delta LnIncome(+)_{t-2}$						.0008(.008)
$\Delta LnIncome(+)_{t-3}$						.15(1.4)
$\Delta LnIncome(+)_{t-4}$						.24(2.22)
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**.05 (.55)**		**.52(2.90)**		**.57(3.04)**
$\Delta LnIncome(-)_{t-1}$						-.29(-1.82)
$\Delta LnIncome(-)_{t-2}$						.13(.80)
$\Delta LnIncome(-)_{t-3}$						-.004(-.02)
$\Delta LnIncome(-)_{t-4}$						-.38(-2.53)
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
$\Delta LnMortRate(+)_t$		**-.08 (-1.44)**		**-.001(-.18)**		**.05(1.54)**
$\Delta LnMortRate(+)_{t-1}$						
$\Delta LnMortRate(+)_{t-2}$						
$\Delta LnMortRate(+)_{t-3}$						
$\Delta LnMortRate(+)_{t-4}$						
$\Delta LnMortRate(+)_{t-5}$						
$\Delta LnMortRate(+)_{t-6}$						
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.12 (-1.95)**		**-.12(-4.83)**		**-.18(-5.40)**
$\Delta LnMortRate(-)_{t-1}$		.006 (.11)		-.04(-1.38)		
$\Delta LnMortRate(-)_{t-2}$		-.005 (-.09)				
$\Delta LnMortRate(-)_{t-3}$		.06(1.09)				
$\Delta LnMortRate(-)_{t-4}$		-.14(-2.35)				
$\Delta LnMortRate(-)_{t-5}$		-.005(-.09)				
$\Delta LnMortRate(-)_{t-6}$		-.14(-2.40)				
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	-13.10 (-2.13)	5.66 (49.09)	-9.68(-.72)	5.53 (33.82)	9.64 (.60)	5.25 (42.68)
$LnIncome_t$	.93 (3.26)		.74 (1.13)		-.24(-.29)	
$LnMortRate_t$	.05 (.31)		.22 (.85)		-.11(-.22)	
$LnIncome(+)_t$		.33 (.21)		1.33 (1.48)		1.00(2.08)
$LnIncome(-)_t$		.83 (.58)		3.80 (3.06)		2.67(3.48)
$LnMortRate(+)_t$		.05 (.24)		-.04 (-.18)		-.02(-.12)
$LnMortRate(-)_t$		-.12 (-.24)		-.03(-.16)		.09(.61)
Panel C: Diagnostic						
F	8.31	4.62	1.18	1.86	2.23	4.12
ECM_{t-1}	-.06 (-5.03)	-.06 (-4.87)	-.01(-1.89)	-.04(-3.09)	-.01(-2.36)	-.06(-4.43)
LM	3.23	3.24	2.47	3.78	3.83	9.03
QS (QS^2)	S (U)	S (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.40	.40	.49	.52	.41	.50

	Oregon		Pennsylvania		Rhode Island	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.46(2.47)**		**.006(.40)**		**.05(2.27)**	
$\Delta LnIncome_{t-1}$	-.19(-1.04)					
$\Delta LnIncome_{t-2}$	-.19(-1.03)					
$\Delta LnIncome_{t-3}$	-.30(-1.61)					
$\Delta LnIncome_{t-4}$	-.28(-1.62)					
$\Delta LnIncome_{t-5}$	.30(1.74)					
$\Delta LnIncome_{t-6}$	.38(2.15)					
$\Delta LnIncome_{t-7}$	-.30(-1.69)					
$\Delta LnMortRate_t$	**-.05(-1.93)**		**-.07(-5.45)**		**-.07(-2.57)**	
$\Delta LnMortRate_{t-1}$	-.01(-.43)				-.03(-1.32)	
$\Delta LnMortRate_{t-2}$	.04(1.54)				-.02(-.89)	
$\Delta LnMortRate_{t-3}$	.08(2.85)				-.05(-1.94)	
$\Delta LnMortRate_{t-4}$	-.02(-.99)					
$\Delta LnMortRate_{t-5}$	.07(2.45)					
$\Delta LnMortRate_{t-6}$	-.05(-1.97)					
$\Delta LnMortRate_{t-7}$	.06(2.04)					
$\Delta LnIncome(+)_t$		**.21(.91)**		**.008 (.27)**		**.28(1.10)**
$\Delta LnIncome(+)_{t-1}$		.56(2.44)				-.03(-.13)
$\Delta LnIncome(+)_{t-2}$		-.47(-2.02)				.62(2.51)
$\Delta LnIncome(+)_{t-3}$						-.17(-.75)
$\Delta LnIncome(+)_{t-4}$						-.40(-1.73)
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.02(2.07)**		**.01(.29)**		**.49(1.26)**
$\Delta LnIncome(-)_{t-1}$		-1.92(-4.10)				.40(1.07)
$\Delta LnIncome(-)_{t-2}$		.40(.72)				-1.28(-3.21)
$\Delta LnIncome(-)_{t-3}$		-.23(-.50)				
$\Delta LnIncome(-)_{t-4}$		-1.26(-3.21)				
$\Delta LnIncome(-)_{t-5}$		.91(2.44)				
$\Delta LnIncome(-)_{t-6}$		1.31(3.76)				
$\Delta LnIncome(-)_{t-7}$		-1.64(-4.56)				
$\Delta LnMortRate(+)_t$		**.004(.09)**		**-.007(-.66)**		**-.10(-2.23)**
$\Delta LnMortRate(+)_{t-1}$		-.02(-.44)				
$\Delta LnMortRate(+)_{t-2}$		-.04(-.81)				
$\Delta LnMortRate(+)_{t-3}$		.01(.28)				
$\Delta LnMortRate(+)_{t-4}$		.05(1.04)				
$\Delta LnMortRate(+)_{t-5}$		.14(3.12)				
$\Delta LnMortRate(+)_{t-6}$		-.04(-.99)				
$\Delta LnMortRate(+)_{t-7}$		.06(1.43)				
$\Delta LnMortRate(-)_t$		**-.15(-3.06)**		**-.13(-5.68)**		**-.05(-1.98)**
$\Delta LnMortRate(-)_{t-1}$		.08(1.57)				
$\Delta LnMortRate(-)_{t-2}$		.05(1.02)				
$\Delta LnMortRate(-)_{t-3}$		.22(4.24)				
$\Delta LnMortRate(-)_{t-4}$		-.12(-2.16)				
$\Delta LnMortRate(-)_{t-5}$						
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	-5.53(-.41)	2.28 (5.47)	2.99(.37)	5.59(21.74)	-12.26(-1.80)	5.87(24.94)
$LnIncome_t$	.63(.96)		.16(.42)		1.03(2.81)	
$LnMortRate_t$	-.24(-.51)		-.21(-1.22)		.06(.33)	
$LnIncome(+)_t$		-.23(-.10)		.22(.28)		-.36(-.23)
$LnIncome(-)_t$		8.32(.96)		.38(.29)		10.68(2.49)
$LnMortRate(+)_t$		-1.10(-.79)		-.20(-.65)		.006(.01)
$LnMortRate(-)_t$		-1.38(-1.12)		-.20(-.80)		-1.06(-1.72)
Panel C: Diagnostic						
F	3.60	3.26	5.33	2.72	7.18	3.38
ECM_{t-1}	-.04(-3.31)	-.03(-4.11)	-.04(-4.03)	-.03(-3.75)	-.05(-4.67)	-.04(-4.16)
LM	2.28	3.46	2.43	2.39	9.74	5.43
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.51	.65	.63	.64	.59	.62

	South Carolina		South Dakota		Tennessee	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**.32(3.22)**		**.09(.63)**		**.20(1.33)**	
ΔLnIncome$_{t-1}$			.39(2.56)			
ΔLnIncome$_{t-2}$			.07(.49)			
ΔLnIncome$_{t-3}$			.15(1.04)			
ΔLnIncome$_{t-4}$			.05(.36)			
ΔLnIncome$_{t-5}$			.07(.50)			
ΔLnIncome$_{t-6}$			.34(2.43)			
ΔLnIncome$_{t-7}$			.80(5.65)			
ΔLnMortRate$_t$	**-.07(-4.14)**		**-.04(-1.35)**		**-.02(-1.21)**	
ΔLnMortRate$_{t-1}$	-.01(-.89)				-.01(-.41)	
ΔLnMortRate$_{t-2}$	.03(1.64)				.05(2.34)	
ΔLnMortRate$_{t-3}$	.02(1.36)				.01(.47)	
ΔLnMortRate$_{t-4}$	-.02(-1.18)				-.02(-1.04)	
ΔLnMortRate$_{t-5}$	.03(1.57)				.04(1.70)	
ΔLnMortRate$_{t-6}$	.04(2.47)				.04(1.87)	
ΔLnMortRate$_{t-7}$					.05(2.14)	
ΔLnIncome(+)$_t$		**.07(.56)**		**.69(3.09)**		**.06(.32)**
ΔLnIncome(+)$_{t-1}$		.30(2.23)		-.04(-.18)		.25(1.36)
ΔLnIncome(+)$_{t-2}$				-.24(-1.02)		.30(1.66)
ΔLnIncome(+)$_{t-3}$				-.09(-.40)		
ΔLnIncome(+)$_{t-4}$				-.68(-2.98)		
ΔLnIncome(+)$_{t-5}$						
ΔLnIncome(+)$_{t-6}$						
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**.95(3.70)**		**.008(.03)**		**.96(2.46)**
ΔLnIncome(-)$_{t-1}$		-.42(-1.61)		.21(.76)		-1.18(-2.83)
ΔLnIncome(-)$_{t-2}$				-.29(-1.09)		-1.39(-3.30)
ΔLnIncome(-)$_{t-3}$				-.27(-1.04)		-.18(-.48)
ΔLnIncome(-)$_{t-4}$				.05(.21)		-1.22(-3.96)
ΔLnIncome(-)$_{t-5}$				-.29(-1.18)		-1.14(-3.63)
ΔLnIncome(-)$_{t-6}$				.23(1.00)		
ΔLnIncome(-)$_{t-7}$				1.39(6.33)		
ΔLnMortRate(+)$_t$		**-.01(-.37)**		**-.12(-1.01)**		**.04(1.97)**
ΔLnMortRate(+)$_{t-1}$		-.02(-1.10)				
ΔLnMortRate(+)$_{t-2}$		.03(1.40)				
ΔLnMortRate(+)$_{t-3}$		.03(1.27)				
ΔLnMortRate(+)$_{t-4}$		-.02(-.94)				
ΔLnMortRate(+)$_{t-5}$		.05(1.90)				
ΔLnMortRate(+)$_{t-6}$		.07(2.51)				
ΔLnMortRate(+)$_{t-7}$						
ΔLnMortRate(-)$_t$		**-.13(-3.97)**		**-.16(-1.29)**		**-.13(-3.30)**
ΔLnMortRate(-)$_{t-1}$				-.02(-.17)		-.07(-1.81)
ΔLnMortRate(-)$_{t-2}$				-.04(-.35)		
ΔLnMortRate(-)$_{t-3}$				.06(.58)		
ΔLnMortRate(-)$_{t-4}$				-.12(-1.09)		
ΔLnMortRate(-)$_{t-5}$				-.08(-.75)		
ΔLnMortRate(-)$_{t-6}$				.01(.16)		
ΔLnMortRate(-)$_{t-7}$				-.36(-3.37)		
Panel B: Long-Run						
Constant	8.34(1.37)	5.52(45.93)	19.45(.80)	5.93(37.35)	10.86(1.10)	5.91(28.11)
LnIncome$_t$	-.11(-.37)		-.73(-.55)		-.24(-.50)	
LnMortRate$_t$	-.32(-1.27)		-.79(-.80)		-.33(-.93)	
LnIncome(+)$_t$		.22(.43)		1.28(2.61)		-1.08(-2.25)
LnIncome(-)$_t$		3.04(1.54)		2.64(6.06)		8.81(3.45)
LnMortRate(+)$_t$		-.23(-1.01)		.28(1.14)		.36(2.28)
LnMortRate(-)$_t$		-.27(-1.41)		.28(2.35)		-.44(-2.18)
Panel C: Diagnostic						
F	4.13	2.81	1.18	4.97	3.65	5.00
ECM$_{t-1}$	-.03(-3.54)	-.05(-3.80)	-.04(-1.90)	-.30(-5.07)	-.05(-3.34)	-.11(-5.09)
LM	2.69	3.44	4.20	28.20	18.44	13.69
QS (QS^2)	S (S)	S (S)	S (U)	S (U)	S (S)	S (S)
Adjusted R^2	.41	.47	.41	.56	.27	.42

	Texas		Utah		Virginia	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.11(1.40)**		**.45(3.43)**		**.21(1.65)**	
$\Delta LnIncome_{t-1}$	-.09(-1.15)				-.05(-.40)	
$\Delta LnIncome_{t-2}$	.06(.78)				-.16(-1.22)	
$\Delta LnIncome_{t-3}$	.18(2.23)				.37(2.89)	
$\Delta LnIncome_{t-4}$					-.29(-2.19)	
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnMortRate_t$	**-.04(-2.31)**		**-.08(-3.37)**		**-.10(-4.85)**	
$\Delta LnMortRate_{t-1}$	.01(.64)		.004(.18)			
$\Delta LnMortRate_{t-2}$	.05(3.28)		.07(3.32)			
$\Delta LnMortRate_{t-3}$	-.02(-1.50)					
$\Delta LnMortRate_{t-4}$	.02(1.64)					
$\Delta LnMortRate_{t-5}$	-.01(-.84)					
$\Delta LnMortRate_{t-6}$	.02(1.20)					
$\Delta LnMortRate_{t-7}$	.03(1.79)					
$\Delta LnIncome(+)_t$		**.12(1.15)**		**.54(3.35)**		**.48(2.82)**
$\Delta LnIncome(+)_{t-1}$		-.11(-.97)		.26(1.54)		
$\Delta LnIncome(+)_{t-2}$		.009(.08)		.28(1.75)		
$\Delta LnIncome(+)_{t-3}$		.09(.82)				
$\Delta LnIncome(+)_{t-4}$		.31(2.64)				
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**.22(1.02)**		**.12(.33)**		**-.33(-1.09)**
$\Delta LnIncome(-)_{t-1}$		-.17(-.83)		-.74(-2.03)		-.41(-1.43)
$\Delta LnIncome(-)_{t-2}$		.31(1.47)				-.38(-1.25)
$\Delta LnIncome(-)_{t-3}$		.38(1.79)				.63(2.16)
$\Delta LnIncome(-)_{t-4}$		-.53(-2.39)				-1.20(-4.05)
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
$\Delta LnMortRate(+)_t$		**-.0004(-.04)**		**-.03(-1.34)**		**-.01(-.42)**
$\Delta LnMortRate(+)_{t-1}$						.08(2.39)
$\Delta LnMortRate(+)_{t-2}$						-.06(-1.76)
$\Delta LnMortRate(+)_{t-3}$						
$\Delta LnMortRate(+)_{t-4}$						
$\Delta LnMortRate(+)_{t-5}$						
$\Delta LnMortRate(+)_{t-6}$						
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.06(-2.14)**		**-.14(-3.80)**		**-.23(-5.76)**
$\Delta LnMortRate(-)_{t-1}$		.006(.23)		.008(.19)		
$\Delta LnMortRate(-)_{t-2}$		.09(3.15)		.16(3.86)		
$\Delta LnMortRate(-)_{t-3}$		-.06(-2.24)				
$\Delta LnMortRate(-)_{t-4}$						
$\Delta LnMortRate(-)_{t-5}$						
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	-4.22(-.34)	4.89(16.30)	.86(.06)	5.44(13.20)	4.51(.38)	5.45(14.32)
$LnIncome_t$	.46(.82)		.28(.40)		.09(.17)	
$LnMortRate_t$	.05(.09)		-.24(-.31)		-.32(-.77)	
$LnIncome(+)_t$		1.74(1.80)		1.66(1.50)		.17(.12)
$LnIncome(-)_t$		-.26(-.11)		1.69(.63)		2.17(.50)
$LnMortRate(+)_t$		-.01(-.04)		-.92(-1.10)		-.54(-.88)
$LnMortRate(-)_t$		.63(1.88)		-.10(-.19)		-.51(-.86)
Panel C: Diagnostic						
F	3.23	1.54	2.29	2.47	3.60	2.79
ECM_{t-1}	-.01(-3.14)	-.02(-2.82)	-.02(-2.58)	-.03(-3.51)	-.03(-3.31)	-.03(-3.70)
LM	11.11	6.19	3.84	7.18	4.65	5.65
QS (QS^2)	S (S)	S (S)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.44	.48	.48	.58	.50	.58

	Vermont		Washington		Wisconsin	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.99(2.02)**		**.02(1.09)**		**.40(2.51)**	
$\Delta LnIncome_{t-1}$	.27(.54)				-.13(-.83)	
$\Delta LnIncome_{t-2}$	.27(.55)				-.11(-.72)	
$\Delta LnIncome_{t-3}$	-.15(-.31)				.26(1.75)	
$\Delta LnIncome_{t-4}$	-.64(-1.37)				-.12(-.81)	
$\Delta LnIncome_{t-5}$	-.48(-1.02)				-.20(-1.41)	
$\Delta LnIncome_{t-6}$	1.36(2.90)				.30(2.12)	
$\Delta LnIncome_{t-7}$					.35(2.36)	
$\Delta LnMortRate_t$	**-.06(-.70)**		**-.04(-2.07)**		**-.07(-2.62)**	
$\Delta LnMortRate_{t-1}$	-.22(-2.44)		.03(1.56)		-.007(-.27)	
$\Delta LnMortRate_{t-2}$	-.07(-.76)				-.04(-1.68)	
$\Delta LnMortRate_{t-3}$	.01(.11)				.001(.06)	
$\Delta LnMortRate_{t-4}$	-.08(-.89)				-.03(-1.19)	
$\Delta LnMortRate_{t-5}$	.29(3.02)				-.009(-.34)	
$\Delta LnMortRate_{t-6}$	-.20(-2.13)				.02(1.05)	
$\Delta LnMortRate_{t-7}$					-.08(-3.14)	
$\Delta LnIncome(+)_t$		**1.03(1.62)**		**.17(1.59)**		**.20(.92)**
$\Delta LnIncome(+)_{t-1}$				.33(2.35)		-.42(-1.94)
$\Delta LnIncome(+)_{t-2}$				-.27(-1.98)		.12(.57)
$\Delta LnIncome(+)_{t-3}$						-.43(-2.04)
$\Delta LnIncome(+)_{t-4}$						-.44(-2.08)
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.51(2.76)**		**.25(1.28)**		**.55(1.46)**
$\Delta LnIncome(-)_{t-1}$				-.67(-3.41)		.28(.77)
$\Delta LnIncome(-)_{t-2}$						-.58(-1.62)
$\Delta LnIncome(-)_{t-3}$						1.10(3.03)
$\Delta LnIncome(-)_{t-4}$						.43(1.35)
$\Delta LnIncome(-)_{t-5}$						-.74(-2.61)
$\Delta LnIncome(-)_{t-6}$						.90 (3.10)
$\Delta LnIncome(-)_{t-7}$						.60(1.92)
$\Delta LnMortRate(+)_t$		**.02(.41)**		**-.009(-.43)**		**-.01(-.45)**
$\Delta LnMortRate(+)_{t-1}$						
$\Delta LnMortRate(+)_{t-2}$						
$\Delta LnMortRate(+)_{t-3}$						
$\Delta LnMortRate(+)_{t-4}$						
$\Delta LnMortRate(+)_{t-5}$						
$\Delta LnMortRate(+)_{t-6}$						
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**-.32(-1.96)**		**-.13(-3.39)**		**-.12(-3.09)**
$\Delta LnMortRate(-)_{t-1}$		-.26(-1.62)		.07(1.73)		
$\Delta LnMortRate(-)_{t-2}$		-.16(-1.00)				
$\Delta LnMortRate(-)_{t-3}$		.004(.02)				
$\Delta LnMortRate(-)_{t-4}$		-.06(-.38)				
$\Delta LnMortRate(-)_{t-5}$		.42(2.66)				
$\Delta LnMortRate(-)_{t-6}$		-.37(-2.31)				
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	-11.36(-1.06)	5.66(9.43)	-5.35(-.67)	5.30(19.19)	-28.11(-2.56)	5.47(25.11)
$LnIncome_t$	.99(1.69)		.59(1.54)		1.70(3.12)	
$LnMortRate_t$	.20(.50)		-.08(-.27)		.63(2.01)	
$LnIncome(+)_t$		-.31(-.13)		1.07(1.23)		1.79(1.21)
$LnIncome(-)_t$		19.82(1.11)		.53(.62)		1.53(.60)
$LnMortRate(+)_t$		.27(.36)		-.21(-.44)		-.16(-.40)
$LnMortRate(-)_t$		-1.43(-.94)		.04(.15)		.16(.46)
Panel C: Diagnostic						
F	1.73	3.14	3.11	2.05	.84	1.72
ECM_{t-1}	-.10(-2.29)	-.08(-4.02)	-.03(-3.08)	-.04(-3.24)	-.04(-1.60)	-.06(-2.98)
LM	4.28	1.20	14.06	4.85	5.89	7.76
QS (QS^2)	S (U)	S (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.43	.43	.48	.54	.30	.45

	West Virginia		Wyoming		District of Columbia	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**.58(2.81)**		**.06(.59)**		**.15(1.16)**	
$\Delta LnIncome_{t-1}$	.47(2.23)		.28(2.82)		.30(2.23)	
$\Delta LnIncome_{t-2}$			.0008(.007)			
$\Delta LnIncome_{t-3}$			.10(.95)			
$\Delta LnIncome_{t-4}$			.28(2.67)			
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnMortRate_t$	**-.01(-.32)**		**-.05(-1.82)**		**-.02(-1.69)**	
$\Delta LnMortRate_{t-1}$	-.07(-1.26)					
$\Delta LnMortRate_{t-2}$	.05(.85)					
$\Delta LnMortRate_{t-3}$	.13(2.27)					
$\Delta LnMortRate_{t-4}$						
$\Delta LnMortRate_{t-5}$						
$\Delta LnMortRate_{t-6}$						
$\Delta LnMortRate_{t-7}$						
$\Delta LnIncome(+)_t$		**-.52(-1.35)**		**-.01(-.11)**		**.07(1.21)**
$\Delta LnIncome(+)_{t-1}$		-.19(-.48)		.25(1.50)		
$\Delta LnIncome(+)_{t-2}$		-.85(-2.19)				
$\Delta LnIncome(+)_{t-3}$		.81(2.30)				
$\Delta LnIncome(+)_{t-4}$		-.65(-1.79)				
$\Delta LnIncome(+)_{t-5}$		-.41(-1.11)				
$\Delta LnIncome(+)_{t-6}$		-.76(-2.13)				
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.30(3.45)**		**.27(1.30)**		**-.43(-1.35)**
$\Delta LnIncome(-)_{t-1}$		-.36(-.67)		.09(.47)		1.35(4.42)
$\Delta LnIncome(-)_{t-2}$		-.36(-.71)		-.32(-1.53)		-.61(-1.99)
$\Delta LnIncome(-)_{t-3}$		-1.32(-2.59)		.02(.11)		-.07(-.26)
$\Delta LnIncome(-)_{t-4}$		1.36(2.79)		.37(1.82)		.37(1.31)
$\Delta LnIncome(-)_{t-5}$		.92(1.81)		-.29(-1.44)		-.94(-3.31)
$\Delta LnIncome(-)_{t-6}$		.41(.81)		.19(.91)		.86(2.98)
$\Delta LnIncome(-)_{t-7}$		-.99(-2.12)		-.46(-2.13)		
$\Delta LnMortRate(+)_t$		**-.09(-2.33)**		**-.03(-.65)**		**-.01(-.43)**
$\Delta LnMortRate(+)_{t-1}$				.01(.20)		
$\Delta LnMortRate(+)_{t-2}$				.01(.31)		
$\Delta LnMortRate(+)_{t-3}$				-.02(-.40)		
$\Delta LnMortRate(+)_{t-4}$				.05(1.04)		
$\Delta LnMortRate(+)_{t-5}$				.16(2.82)		
$\Delta LnMortRate(+)_{t-6}$				.11(2.10)		
$\Delta LnMortRate(+)_{t-7}$						
$\Delta LnMortRate(-)_t$		**.03(.40)**		**-.06(-1.17)**		**-.07(-1.08)**
$\Delta LnMortRate(-)_{t-1}$		-.12(-1.29)		-.03(-.59)		-.09(-1.35)
$\Delta LnMortRate(-)_{t-2}$		.14(1.50)		.08(1.37)		.04(.62)
$\Delta LnMortRate(-)_{t-3}$		.22(2.31)		.05(.84)		-.17(-2.70)
$\Delta LnMortRate(-)_{t-4}$				-.02(-.42)		
$\Delta LnMortRate(-)_{t-5}$				-.14(-2.39)		
$\Delta LnMortRate(-)_{t-6}$						
$\Delta LnMortRate(-)_{t-7}$						
Panel B: Long-Run						
Constant	226.07(.71)	7.35(2.76)	-8.43(-1.91)	5.20(28.58)	-4.73(-.40)	5.28(17.43)
$LnIncome_t$	-11.87(-.70)		.79(3.26)		.67(1.05)	
$LnMortRate_t$	-5.26(-.70)		.18(1.01)		-.51(-1.28)	
$LnIncome(+)_t$		-3.84(-.46)		.79(4.09)		1.67(1.37)
$LnIncome(-)_t$		.04(.01)		2.12(6.65)		-.25(-.07)
$LnMortRate(+)_t$		-1.54(-.62)		-.15(-.61)		-.41(-.42)
$LnMortRate(-)_t$		-1.90(-.63)		-.17(-.95)		-.03(-.09)
Panel C: Diagnostic						
F	5.16	4.46	3.79	4.27	5.88	2.49
ECM_{t-1}	-.02(-3.96)	-.06(-4.80)	-.05(-3.40)	-.14(-4.72)	-.05(-4.22)	-.04(-3.49)
LM	4.89	6.38	2.30	9.00	3.37	3.11
QS (QS^2)	S (U)	S (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	.56	.67	.45	.53	.44	.52

Appendix C: Table of the Bivariate Model Specification Results (Note: Numbers inside parenthesis are t-ratios.)

	Alaska		**Alabama**		**Arkansas**	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.44(1.72)**		**0.68(3.93)**		**0.35(3.70)**	
$\Delta LnIncome_{t-1}$	0.27(1.05)		0.07(0.38)		-0.13(-1.37)	
$\Delta LnIncome_{t-2}$	0.24(0.92)		-0.15(-.84)		-0.01(-0.12)	
$\Delta LnIncome_{t-3}$	0.03(0.11)		0.35(2.01)		-0.08(-0.82)	
$\Delta LnIncome_{t-4}$	-0.32(-1.32)				0.14(1.48)	
$\Delta LnIncome_{t-5}$	0.71 (2.96)				-0.01(-.07)	
$\Delta LnIncome_{t-6}$	-0.36(-1.48)				0.31(3.42)	
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.66(1.64)**		**0.03(1.63)**		**0.02(1.58)**
$\Delta LnIncome(+)_{t-1}$		0.54(1.35)				
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.18(1.58)**		**1.27(3.74)**		**0.84(4.78)**
$\Delta LnIncome(-)_{t-1}$		-0.37(-0.51)		-0.13(-0.34)		-0.64(-3.44)
$\Delta LnIncome(-)_{t-2}$		0.49(1.03)		-0.95(-2.67)		-0.16(-0.86)
$\Delta LnIncome(-)_{t-3}$		0.10(0.21)		1.09(2.99)		-0.02(-0.11)
$\Delta LnIncome(-)_{t-4}$		-0.96(-2.05)				0.39(2.00)
$\Delta LnIncome(-)_{t-5}$		1.11(2.38)				-0.01(-0.05)
$\Delta LnIncome(-)_{t-6}$		-1.12(-2.54)				0.40(2.22)
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	3.07(0.45)	5.94(42.99)	0.98(0.30)	5.56(90.53)	4.22(1.17)	5.67(51.96)
$LnIncome_t$	0.14(0.35)		0.24(1.40)		0.06(0.31)	
$LnIncome(+)_t$		1.24(6.49)		0.41(2.09)		0.53(1.84)
$LnIncome(-)_t$		3.66(6.02)		1.60(1.36)		2.67(2.05)
Panel C: Diagnostic						
F	1.48	4.20	3.06	2.50	1.38	1.13
ECM_{t-1}	-0.05(-1.73)	-0.20(-3.58)	-0.04(-2.48)	-0.07(-2.75)	-0.02(-1.67)	-0.03(-1.83)
LM	5.22	1.79	0.91	2.20	13.67	12.22
QS (QS^2)	U (U)	U (U)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.19	0.25	0.22	0.33	0.24	0.34
Wald Tests:						
$\sum\gamma_{2i} = 0$		6.0939*		1.4659		.35402
$\sum\gamma_{3i} = 0$		.15502		2.1497		3.5857*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.32377		.94146		3.7517*
$\gamma_7 = \gamma_8$		7.8243*		1.1540		2.9528*

	Arizona		California		Colorado	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.55(3.16)**		**0.02(3.32)**		**0.30(3.36)**	
$\Delta LnIncome_{t-1}$	0.09(0.56)					
$\Delta LnIncome_{t-2}$	-0.34(-1.96)					
$\Delta LnIncome_{t-3}$						
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.61(2.70)**		**0.02(2.27)**		**0.33(2.65)**
$\Delta LnIncome(+)_{t-1}$						0.02(0.15)
$\Delta LnIncome(+)_{t-2}$						0.03(0.28)
$\Delta LnIncome(+)_{t-3}$						0.00(0.00)
$\Delta LnIncome(+)_{t-4}$						0.23(1.96)
$\Delta LnIncome(+)_{t-5}$						0.18(1.52)
$\Delta LnIncome(+)_{t-6}$						0.25(2.09)
$\Delta LnIncome(+)_{t-7}$						-0.17(-1.36)
$\Delta LnIncome(-)_t$		**0.24(0.52)**		**-0.09(-0.34)**		**0.08(0.34)**
$\Delta LnIncome(-)_{t-1}$		-0.82(-1.90)		-0.49(-1.85)		-0.71(-3.02)
$\Delta LnIncome(-)_{t-2}$		-1.09(-2.34)		-0.45(-1.70)		
$\Delta LnIncome(-)_{t-3}$						
$\Delta LnIncome(-)_{t-4}$						
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	1.73(0.88)	5.19(49.54)	-10.90(-3.96)	5.33(45.92)	-3.88(-1.58)	4.94(24.38)
$LnIncome_t$	0.20(1.98)		0.80(6.09)		0.51(3.89)	
$LnIncome(+)_t$		0.37(3.04)		0.91(2.91)		0.66(2.59)
$LnIncome(-)_t$		1.75(1.55)		1.95(1.17)		1.21(0.62)
Panel C: Diagnostic						
F	6.04	6.07	8.78	5.11	2.90	3.86
ECM_{t-1}	-0.04(-3.49)	-0.05(-4.30)	-0.03(-4.20)	-0.03(-3.95)	-0.02(-2.39)	-0.02(-3.43)
LM	3.19	5.63	2.03	1.08	2.39	2.65
QS (QS^2)	S (U)	U (U)	S (S)	S (S)	S (S)	S (S)
Adjusted R^2	0.50	0.54	0.75	0.75	0.44	0.46
Wald Tests:						
$\sum\gamma_{2i} = 0$		6.3955*		.67933		13.1203*
$\sum\gamma_{3i} = 0$		4.7729*		5.1441*		4.0547*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		7.3935*		5.0354*		13.1352*
$\gamma_7 = \gamma_8$		1.2873		.56194		.099549

	Connecticut		Delaware		Florida	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.43(3.51)**		**0.26(1.47)**		**0.29(1.90)**	
$\Delta LnIncome_{t-1}$			0.31(1.81)			
$\Delta LnIncome_{t-2}$						
$\Delta LnIncome_{t-3}$						
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.63(3.91)**		**0.04(1.63)**		**0.54(2.91)**
$\Delta LnIncome(+)_{t-1}$						-0.08(-0.40)
$\Delta LnIncome(+)_{t-2}$						0.48(2.55)
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.06(1.25)**		**0.40(0.95)**		**-0.30(-0.84)**
$\Delta LnIncome(-)_{t-1}$				0.33(0.76)		-0.12(-0.35)
$\Delta LnIncome(-)_{t-2}$				-0.58(-1.46)		-0.88(-2.50)
$\Delta LnIncome(-)_{t-3}$				0.15(0.38)		
$\Delta LnIncome(-)_{t-4}$				0.47(1.18)		
$\Delta LnIncome(-)_{t-5}$				-0.86(2.12)		
$\Delta LnIncome(-)_{t-6}$				0.77(1.92)		
$\Delta LnIncome(-)_{t-7}$				0.72(1.72)		
Panel B: Long-Run						
Constant	-1.80(-0.47)	5.46(49.79)	-2.59(-1.10)	5.76(50.13)	-0.80(-0.28)	5.21(39.43)
$LnIncome_t$	0.40(2.02)		0.49(3.57)		0.31(2.21)	
$LnIncome(+)_t$		0.87(2.27)		0.69(2.21)		0.21(1.56)
$LnIncome(-)_t$		1.88(1.47)		1.54(1.01)		-0.58(-0.47)
Panel C: Diagnostic						
F	4.47	3.74	2.98	2.56	4.63	7.27
ECM_{t-1}	-0.03(-2.86)	-0.04(-3.37)	-0.04(-2.45)	-0.05(-2.79)	-0.03(-3.05)	-0.04(-4.69)
LM	6.49	4.01	0.32	1.59	0.50	1.87
QS (QS^2)	S (U)	S (U)	U (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.47	0.49	0.41	0.40	0.51	0.54
Wald Tests:						
$\sum\gamma_{2i} = 0$		11.8314*		.32073		4.2112*
$\sum\gamma_{3i} = 0$		.025469*		1.0272		4.3185*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		2.3499		.73983		6.7442*
$\gamma_7 = \gamma_8$		1.0873		.48381		.57829

	Georgia		Hawaii		Iowa	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.22(1.87)**		**4.03(7.96)**		**0.12(1.29)**	
$\Delta LnIncome_{t-1}$					0.06(0.65)	
$\Delta LnIncome_{t-2}$					-0.06(-0.63)	
$\Delta LnIncome_{t-3}$					0.18(1.95)	
$\Delta LnIncome_{t-4}$					0.14(1.40)	
$\Delta LnIncome_{t-5}$					0.31(3.22)	
$\Delta LnIncome_{t-6}$					-0.24(-2.33)	
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.25(1.88)**		**1.05(1.57)**		**0.10(0.66)**
$\Delta LnIncome(+)_{t-1}$				1.38(2.09)		0.29(2.01)
$\Delta LnIncome(+)_{t-2}$						-0.55(-3.69)
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.04(0.80)**		**8.64(8.48)**		**0.20(1.02)**
$\Delta LnIncome(-)_{t-1}$				-4.02(-3.12)		-0.28(-1.42)
$\Delta LnIncome(-)_{t-2}$				-4.88(-3.95)		0.69(3.56)
$\Delta LnIncome(-)_{t-3}$				-0.35(-0.28)		0.19(1.02)
$\Delta LnIncome(-)_{t-4}$				-0.74(-0.59)		0.33(1.74)
$\Delta LnIncome(-)_{t-5}$				0.45(0.37)		0.73(3.75)
$\Delta LnIncome(-)_{t-6}$				4.90(4.33)		-1.11(-5.48)
$\Delta LnIncome(-)_{t-7}$				-4.44(-4.72)		
Panel B: Long-Run						
Constant	3.06(3.08)	5.51(104.9)	-14.02(-3.91)	5.34(88.82)	0.34(0.09)	5.54(42.69)
$LnIncome_t$	0.13(2.60)		1.12(5.49)		0.27(1.39)	
$LnIncome(+)_t$		0.20(2.21)		2.15(9.48)		0.54(1.22)
$LnIncome(-)_t$		0.75(0.88)		4.97(6.03)		0.96(0.96)
Panel C: Diagnostic						
F	8.24	4.61	3.14	5.82	4.54	1.98
ECM_{t-1}	-0.06(-4.07)	-0.05(-3.75)	-0.11(-2.51)	-0.22(-4.21)	-0.04(-3.02)	-0.04(-2.46)
LM	2.84	7.14	2.32	1.44	8.96	14.79
QS (QS^2)	S (S)	S (S)	S (U)	S (U)	U (U)	S (U)
Adjusted R^2	0.31	0.37	0.44	0.67	0.33	0.49
Wald Tests:						
$\sum\gamma_{2i} = 0$		2.4189		7.9860*		.37981
$\sum\gamma_{3i} = 0$		.81443		.032648		1.6331
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.00017		1.1745		2.2999
$\gamma_7 = \gamma_8$		.26614		9.4791*		.32853

	Idaho		Illinois		Indiana	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.31(1.92)**		**0.31(2.55)**		**0.22(2.63)**	
$\Delta LnIncome_{t-1}$			-0.13(-1.04)			
$\Delta LnIncome_{t-2}$			0.16(1.34)			
$\Delta LnIncome_{t-3}$			-0.16(-1.29)			
$\Delta LnIncome_{t-4}$			-0.08(-0.63)			
$\Delta LnIncome_{t-5}$			-0.28(-2.22)			
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.09(3.22)**		**0.04(1.85)**		**0.09(4.54)**
$\Delta LnIncome(+)_{t-1}$						
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.35(0.89)**		**0.17(0.77)**		**0.52(3.48)**
$\Delta LnIncome(-)_{t-1}$		-0.42(-1.10)		-0.13(-0.62)		
$\Delta LnIncome(-)_{t-2}$		0.02(0.06)		0.59(2.82)		
$\Delta LnIncome(-)_{t-3}$		-0.91(-2.40)		-0.33(-1.66)		
$\Delta LnIncome(-)_{t-4}$		-0.09(-0.23)		-0.30(-1.55)		
$\Delta LnIncome(-)_{t-5}$		-0.06(-0.17)		-0.51(-2.54)		
$\Delta LnIncome(-)_{t-6}$		-1.12(-3.08)				
$\Delta LnIncome(-)_{t-7}$		1.09(2.81)				
Panel B: Long-Run						
Constant	0.96(0.52)	5.48(76.03)	-6.34(-3.53)	5.52(104.1)	3.21(1.32)	5.63(240.1)
$LnIncome_t$	0.26(2.48)		0.60(6.70)		0.12(0.93)	
$LnIncome(+)_t$		0.62(6.09)		0.74(2.79)		0.79(8.47)
$LnIncome(-)_t$		2.09(3.77)		1.35(1.36)		2.51(8.40)
Panel C: Diagnostic						
F	5.01	3.07	10.54	6.59	3.14	7.53
ECM_{t-1}	-0.06(-3.18)	-0.12(-2.99)	-0.06(-4.61)	-0.06(-4.49)	-0.03(-2.51)	-0.10(-4.78)
LM	1.54	6.78	12.60	39.76	6.21	4.34
QS (QS^2)	S (U)	S (U)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.38	0.51	0.42	0.51	0.28	0.35
Wald Tests:						
$\sum\gamma_{2i} = 0$		2.6817*		.52049		.27334
$\sum\gamma_{3i} = 0$		.79628		1.1971		10.7558*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		1.3281		1.4207		3.7128*
$\gamma_7 = \gamma_8$		4.3471*		.50388		18.9022*

	Kansas		Kentucky		Louisiana	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.07(0.92)**		**0.42(5.05)**		**0.38(3.79)**	
$\Delta LnIncome_{t-1}$	-0.08(-1.16)		0.07(0.74)		0.07(0.63)	
$\Delta LnIncome_{t-2}$	-0.03(-0.35)		-0.03(-0.39)		0.10(0.94)	
$\Delta LnIncome_{t-3}$	0.16(2.19)		0.05(0.63)		0.09(0.92)	
$\Delta LnIncome_{t-4}$	0.14(1.98)		-0.01(-0.07)		0.23(2.22)	
$\Delta LnIncome_{t-5}$			0.32(4.05)		0.05(0.48)	
$\Delta LnIncome_{t-6}$			0.24(2.80)		0.15(1.49)	
$\Delta LnIncome_{t-7}$					0.34(3.31)	
$\Delta LnIncome(+)_t$		**0.03(1.92)**		**0.07(2.51)**		**0.07(3.74)**
$\Delta LnIncome(+)_{t-1}$				0.91(5.33)		
$\Delta LnIncome(+)_{t-2}$				-0.60(-3.14)		
$\Delta LnIncome(+)_{t-3}$				-0.56(-3.01)		
$\Delta LnIncome(+)_{t-4}$				0.24(1.49)		
$\Delta LnIncome(+)_{t-5}$				-0.01(-0.06)		
$\Delta LnIncome(+)_{t-6}$				0.59(3.50)		
$\Delta LnIncome(+)_{t-7}$				0.29(1.70)		
$\Delta LnIncome(-)_t$		**0.11(0.83)**				**0.68(3.22)**
$\Delta LnIncome(-)_{t-1}$		-0.15(-1.11)				
$\Delta LnIncome(-)_{t-2}$		-0.23(-1.70)				
$\Delta LnIncome(-)_{t-3}$		0.28(2.05)				
$\Delta LnIncome(-)_{t-4}$						
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	3.02(0.76)	5.53(60.98)	-2.17(-0.35)	5.63(144.4)	0.62(0.13)	5.13(82.57)
$LnIncome_t$	0.13(0.59)		0.40(1.23)		0.23(0.90)	
$LnIncome(+)_t$		0.87(2.63)		0.70(10.72)		1.56(6.45)
$LnIncome(-)_t$		3.11(2.53)		2.79(7.08)		5.42(5.67)
Panel C: Diagnostic						
F	2.57	2.93	0.91	2.47	3.44	4.75
ECM_{t-1}	-0.02(-2.26)	-0.03(-2.98)	-0.01(-1.36)	-0.10(-2.74)	-0.02(-2.63)	-0.03(-3.78)
LM	2.25	4.04	0.83	4.43	2.12	5.13
QS (QS^2)	S (U)	S (U)	S (U)	S (U)	U (U)	S (U)
Adjusted R^2	0.26	0.28	0.30	0.46	0.40	0.41
Wald Tests:						
$\sum\gamma_{2i} = 0$		1.5619		.30177		2.2996
$\sum\gamma_{3i} = 0$		.00046		.43751		9.5780*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.22360		.28609		3.0764*
$\gamma_7 = \gamma_8$		3.0476*		5.5622*		9.5243*

	Massachusetts		Maryland		Maine	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.23(2.45)**		**0.27(1.87)**		**0.56(2.05)**	
$\Delta LnIncome_{t-1}$						
$\Delta LnIncome_{t-2}$						
$\Delta LnIncome_{t-3}$						
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.38(2.81)**		**0.04(0.24)**		**0.15(2.47)**
$\Delta LnIncome(+)_{t-1}$				0.51(2.66)		
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**-0.06(-0.24)**		**0.76(1.93)**		**1.37(2.16)**
$\Delta LnIncome(-)_{t-1}$		-0.54(-2.38)		-0.97(-2.47)		0.31(0.48)
$\Delta LnIncome(-)_{t-2}$						-1.17(-1.81)
$\Delta LnIncome(-)_{t-3}$						
$\Delta LnIncome(-)_{t-4}$						
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	-12.03(-4.29)	5.59(55.37)	-5.90(-3.04)	5.47(44.57)	-6.21(-2.58)	5.54(69.92)
$LnIncome_t$	0.94(6.49)		0.61(6.03)		0.73(4.79)	
$LnIncome(+)_t$		0.96(1.94)		0.83(3.50)		1.48(3.55)
$LnIncome(-)_t$		1.15(0.52)		2.64(1.15)		3.87(2.29)
Panel C: Diagnostic						
F	7.45	4.22	7.09	4.45	3.55	3.27
ECM_{t-1}	-0.03(-3.87)	-0.02(-3.56)	-0.03(-3.78)	-0.03(-3.68)	-0.07(-2.66)	-0.10(-3.15)
LM	11.41	2.21	9.96	4.01	12.33	3.86
QS (QS^2)	S (S)	S (S)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.68	0.70	0.51	0.54	0.38	0.34
Wald Tests:						
$\sum\gamma_{2i} = 0$		8.4992*		5.9712*		1.7967
$\sum\gamma_{3i} = 0$		3.8386*		.15083		.14661
$\sum\gamma_{2i} = \sum\gamma_{3i}$		6.9501*		1.5487		.00361
$\gamma_7 = \gamma_8$		.00399		.48234		2.9861*

	Michigan		Minnesota		Missouri	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.15(1.25)**		**0.01(2.54)**		**0.15(1.54)**	
$\Delta LnIncome_{t-1}$	0.23(1.91)					
$\Delta LnIncome_{t-2}$	0.16(1.30)					
$\Delta LnIncome_{t-3}$	0.31(2.47)					
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.13(3.54)**		**0.04(2.03)**		**0.35(3.11)**
$\Delta LnIncome(+)_{t-1}$						
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.23(3.26)**		**0.10(1.34)**		**0.06(1.45)**
$\Delta LnIncome(-)_{t-1}$						
$\Delta LnIncome(-)_{t-2}$						
$\Delta LnIncome(-)_{t-3}$						
$\Delta LnIncome(-)_{t-4}$						
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	-10.81(-1.38)	5.42(109.6)	-2.86(-1.20)	5.42(68.05)	2.43(1.04)	5.49(74.87)
$LnIncome_t$	0.83(2.09)		0.45(3.57)		0.17(1.34)	
$LnIncome(+)_t$		1.58(6.53)		0.91(2.67)		0.53(2.35)
$LnIncome(-)_t$		2.85(5.32)		2.45(1.55)		1.94(1.85)
Panel C: Diagnostic						
F	2.01	6.39	5.44	4.38	4.33	3.74
ECM_{t-1}	-0.02(-2.01)	-0.08(-4.41)	-0.03(-3.31)	-0.04(-3.65)	-0.03(-2.94)	-0.041(-3.27)
LM	3.90	0.95	1.79	5.92	5.60	14.52
QS (QS^2)	S (U)	U (U)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.38	0.38	0.39	0.39	0.36	0.51
Wald Tests:						
$\sum\gamma_{2i} = 0$		1.9419		1.4958		10.3282*
$\sum\gamma_{3i} = 0$		.00144		.01429		.15116
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.61573		.25578		1.4148
$\gamma_7 = \gamma_8$		6.5663*		1.1989		2.3106

	Mississippi		Montana		North Carolina	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**0.60(2.94)**		**0.70(5.24)**		**0.30(3.47)**	
ΔLnIncome$_{t-1}$	0.12(0.58)		-0.17(-1.10)			
ΔLnIncome$_{t-2}$	-0.01(-0.03)		0.32(2.17)			
ΔLnIncome$_{t-3}$	0.48(2.46)		0.10(0.68)			
ΔLnIncome$_{t-4}$	0.09(0.45)		0.28(1.88)			
ΔLnIncome$_{t-5}$	-0.13(-0.64)		0.13(0.83)			
ΔLnIncome$_{t-6}$	0.24(1.27)		0.24(1.64)			
ΔLnIncome$_{t-7}$	0.93(4.78)		-0.21(-1.40)			
ΔLnIncome(+)$_t$		**0.02(1.23)**		**0.74(4.66)**		**0.20(1.74)**
ΔLnIncome(+)$_{t-1}$				-0.54(-3.08)		0.04(0.32)
ΔLnIncome(+)$_{t-2}$				0.51(2.88)		0.19(1.81)
ΔLnIncome(+)$_{t-3}$				0.08(0.46)		0.04(0.32)
ΔLnIncome(+)$_{t-4}$				0.46(2.73)		-0.21(-1.95)
ΔLnIncome(+)$_{t-5}$				0.66(4.06)		
ΔLnIncome(+)$_{t-6}$				-0.14(-0.83)		
ΔLnIncome(+)$_{t-7}$				-0.34(-2.02)		
ΔLnIncome(-)$_t$		**1.32(3.73)**		**0.51(2.05)**		**0.35(1.64)**
ΔLnIncome(-)$_{t-1}$		0.12(0.33)		0.42(1.76)		-0.40(-1.85)
ΔLnIncome(-)$_{t-2}$		-0.74(-2.04)		-0.27(-1.19)		
ΔLnIncome(-)$_{t-3}$		0.72(2.01)		-0.13(-0.61)		
ΔLnIncome(-)$_{t-4}$		-0.12(-0.34)		0.22(0.96)		
ΔLnIncome(-)$_{t-5}$		-0.55(-1.58)		-1.11(-4.79)		
ΔLnIncome(-)$_{t-6}$		0.99(2.78)		0.91(3.95)		
ΔLnIncome(-)$_{t-7}$		1.61(4.44)				
Panel B: Long-Run						
Constant	-4.49(-0.37)	5.51(26.07)	-5.39(-1.44)	5.28(28.62)	1.67(1.74)	5.47(99.04)
LnIncome$_t$	0.51(0.81)		0.63(2.89)		0.20(4.12)	
LnIncome(+)$_t$		0.77(1.01)		0.93(5.51)		0.29(2.94)
LnIncome(-)$_t$		2.62(0.84)		1.15(2.27)		0.71(0.80)
Panel C: Diagnostic						
F	2.06	0.98	2.75	4.85	4.73	6.72
ECM$_{t-1}$	-0.02(-2.04)	-0.03(-1.73)	-0.05(-2.36)	-0.10(-3.85)	-0.04(-3.08)	-0.07(-4.52)
LM	6.34	23.51	15.89	9.14	0.74	4.31
QS (QS^2)	U (U)	U (U)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.30	0.45	0.43	0.62	0.37	0.44
Wald Tests:						
$\sum\gamma_{2i} = 0$		.00783		3.9108*		1.2733
$\sum\gamma_{3i} = 0$		10.2275*		.98594		.016347
$\sum\gamma_{2i} = \sum\gamma_{3i}$		9.2551*		1.6923		.47142
$\gamma_7 = \gamma_8$		.48611		.27664		.29801

	North Dakota		Nebraska		New Hampshire	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.10(1.11)**		**-0.12(-1.61)**		**0.39(2.98)**	
$\Delta LnIncome_{t-1}$	-0.01(-0.07)		0.14(1.92)			
$\Delta LnIncome_{t-2}$	0.25(2.77)		-0.10(-1.30)			
$\Delta LnIncome_{t-3}$	-0.15(-1.60)		0.11(1.41)			
$\Delta LnIncome_{t-4}$	-0.03(-0.28)		-0.06(-0.73)			
$\Delta LnIncome_{t-5}$	-0.11(-1.22)		0.24(3.17)			
$\Delta LnIncome_{t-6}$	-0.10(-1.10)					
$\Delta LnIncome_{t-7}$	0.22(2.39)					
$\Delta LnIncome(+)_t$		**0.17(4.61)**		**0.01(0.40)**		**0.35(2.16)**
$\Delta LnIncome(+)_{t-1}$						0.17(1.10)
$\Delta LnIncome(+)_{t-2}$						0.11(0.71)
$\Delta LnIncome(+)_{t-3}$						-0.31(-1.97)
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.17(1.15)**		**-0.33(-2.37)**		**-0.01(-0.27)**
$\Delta LnIncome(-)_{t-1}$		-0.40(-2.69)		0.27(2.00)		
$\Delta LnIncome(-)_{t-2}$		0.38(2.49)		-0.38(-2.74)		
$\Delta LnIncome(-)_{t-3}$		-0.44(-3.07)		0.41(2.78)		
$\Delta LnIncome(-)_{t-4}$		-0.15(-1.08)		0.10(0.66)		
$\Delta LnIncome(-)_{t-5}$		-0.29(-2.05)		0.41(2.78)		
$\Delta LnIncome(-)_{t-6}$		-0.23(-1.64)		0.43(2.91)		
$\Delta LnIncome(-)_{t-7}$		0.49(3.14)		-0.37(-2.48)		
Panel B: Long-Run						
Constant	-8.32(-1.21)	0.08(68.48)	2.75(1.00)	5.52(25.67)	-3.92(-2.11)	5.57(23.28)
$LnIncome_t$	0.82(2.00)		0.15(0.98)		0.55(5.26)	
$LnMortRate_t$						
$LnIncome(+)_t$		0.79(9.05)		0.23(0.52)		0.17(0.36)
$LnIncome(-)_t$		1.12 (8.06)		0.44(0.30)		-0.52(-0.27)
Panel C: Diagnostic						
F	3.44	6.47	3.10	1.21	8.51	4.44
ECM_{t-1}	-0.06(-2.63)	-0.21(-4.43)	-0.03(-2.50)	-0.03(-1.92)	-0.05(-4.14)	-0.03(-3.68)
LM	4.21	4.17	1.71	6.19	6.69	1.60
QS (QS^2)	S (U)	S (U)	S (U)	S (U)	S (U)	S (U)
Adjusted R^2	0.20	0.29	0.24	0.37	0.52	0.59
Wald Tests:						
$\sum\gamma_{2i} = 0$		3.0462*		.00049		.49335
$\sum\gamma_{3i} = 0$		1.0248		1.7985		1.4377
$\sum\gamma_{2i} = \sum\gamma_{3i}$		2.1437		1.6850		.09380
$\gamma_7 = \gamma_8$		9.0860*		.03885		.32852

	New Jersey		New Mexico		Nevada	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.27(2.73)**		**0.32(2.06)**		**0.08(1.57)**	
$\Delta LnIncome_{t-1}$			0.15(0.97)			
$\Delta LnIncome_{t-2}$			-0.09(-0.58)			
$\Delta LnIncome_{t-3}$			0.30(1.92)			
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.26(1.97)**		**0.01(0.90)**		**0.01(1.08)**
$\Delta LnIncome(+)_{t-1}$						
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**-0.03(-0.77)**		**0.04(0.37)**		**0.002(0.03)**
$\Delta LnIncome(-)_{t-1}$						0.04(0.67)
$\Delta LnIncome(-)_{t-2}$						-0.11(-0.28)
$\Delta LnIncome(-)_{t-3}$						-0.76(-2.03)
$\Delta LnIncome(-)_{t-4}$						-0.82(-2.29)
$\Delta LnIncome(-)_{t-5}$						0.86(2.38)
$\Delta LnIncome(-)_{t-6}$						0.67(1.53)
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	-10.92(-4.00)	5.61(47.55)	1.42(0.69)	5.48(57.74)	4.07(3.70)	5.45(53.51)
$LnIncome_t$	0.86(6.17)		0.22(1.99)		0.08(1.34)	
$LnIncome(+)_t$		0.26(0.63)		0.23(0.92)		0.12(1.23)
$LnIncome(-)_t$		-1.16(-0.72)		0.86(0.36)		0.65(0.63)
Panel C: Diagnostic						
F	7.53	4.99	3.23	1.96	10.55	6.50
ECM_{t-1}	-0.03(-3.88)	-0.03(-3.86)	-0.04(-2.55)	-0.04(-2.43)	-0.05(-4.61)	-0.05(-4.44)
LM	9.10	6.00	16.08	42.38	0.34	4.14
QS (QS^2)	S (U)	S (S)	U (U)	U (S)	S (U)	S (U)
Adjusted R^2	0.58	0.69	0.26	0.22	0.54	0.60
Wald Tests:						
$\sum\gamma_{2i} = 0$		5.1162*		.30469		.72828
$\sum\gamma_{3i} = 0$		.06723		.49504		.00926
$\sum\gamma_{2i} = \sum\gamma_{3i}$		1.5196		.13831		.01033
$\gamma_7 = \gamma_8$		1.0392		.01580		.60769

	New York		Ohio		Oklahoma	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.07(3.39)**		**0.26(2.83)**		**0.24(3.10)**	
$\Delta LnIncome_{t-1}$					-0.01(-0.21)	
$\Delta LnIncome_{t-2}$					0.10(1.31)	
$\Delta LnIncome_{t-3}$					0.20(2.71)	
$\Delta LnIncome_{t-4}$						
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.34(1.58)**		**0.11(0.63)**		**0.25(2.02)**
$\Delta LnIncome(+)_{t-1}$				0.10(0.63)		-0.18(-1.56)
$\Delta LnIncome(+)_{t-2}$				-0.23(-1.49)		0.08(0.80)
$\Delta LnIncome(+)_{t-3}$				-0.41(-2.61)		0.24(2.41)
$\Delta LnIncome(+)_{t-4}$						0.25(2.38)
$\Delta LnIncome(+)_{t-5}$						0.13(1.28)
$\Delta LnIncome(+)_{t-6}$						0.14(1.35)
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.002(0.03)**		**0.66(3.25)**		**0.39(2.00)**
$\Delta LnIncome(-)_{t-1}$						
$\Delta LnIncome(-)_{t-2}$						
$\Delta LnIncome(-)_{t-3}$						
$\Delta LnIncome(-)_{t-4}$						
$\Delta LnIncome(-)_{t-5}$						
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	-13.30(-5.27)	5.71(93.81)	1.66(0.34)	5.63(137.6)	8.05(1.95)	5.28(50.11)
$LnIncome_t$	0.95(7.70)		0.19(0.80)		-0.16(-0.73)	
$LnIncome(+)_t$		0.63(1.33)		1.24(6.20)		0.61(2.48)
$LnIncome(-)_t$		1.04(0.03)		3.39(5.88)		2.43(2.90)
Panel C: Diagnostic						
F	9.68	6.72	2.20(-2.10)	5.92	4.08	6.42
ECM_{t-1}	-0.06(-4.42)	-0.06(-4.52)	-0.02(-2.10)	-0.07(-4.25)	-0.02(-2.87)	-0.05(-4.33)
LM	4.65	2.30	2.12	6.33	10.81	2.10
QS (QS^2)	S (U)	S (U)	S (U)	S (U)	U (U)	U (U)
Adjusted R^2	0.32	0.33	0.41	0.45	0.38	0.38
Wald Tests:						
$\sum\gamma_{2i} = 0$		2.1228		2.3158		17.0875*
$\sum\gamma_{3i} = 0$		.00117		10.8189*		.00659
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.61703		8.0951*		11.0538*
$\gamma_7 = \gamma_8$		.63624		11.2470*		5.1656*

	Oregon		Pennsylvania		Rhode Island	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.65(3.64)**		**0.24(2.41)**		**0.05(3.86)**	
$\Delta LnIncome_{t-1}$	-0.46(-2.48)					
$\Delta LnIncome_{t-2}$	-0.05(-0.28)					
$\Delta LnIncome_{t-3}$	-0.16(-0.84)					
$\Delta LnIncome_{t-4}$	-0.10(-0.53)					
$\Delta LnIncome_{t-5}$	0.23(1.29)					
$\Delta LnIncome_{t-6}$	0.41(2.33)					
$\Delta LnIncome_{t-7}$	-0.38(-2.11)					
$\Delta LnIncome(+)_t$		**0.07(2.89)**		**0.02(1.50)**		**0.38(1.47)**
$\Delta LnIncome(+)_{t-1}$						0.02(0.09)
$\Delta LnIncome(+)_{t-2}$						0.58(2.28)
$\Delta LnIncome(+)_{t-3}$						-0.24(-0.99)
$\Delta LnIncome(+)_{t-4}$						-0.44(-1.84)
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.53(3.25)**		**-0.01(-0.10)**		**0.25(0.68)**
$\Delta LnIncome(-)_{t-1}$		-1.64(-3.47)				0.54(1.44)
$\Delta LnIncome(-)_{t-2}$		-0.46(-0.91)				-0.92(-2.36)
$\Delta LnIncome(-)_{t-3}$		-0.24(-0.49)				
$\Delta LnIncome(-)_{t-4}$		-0.77(-1.96)				
$\Delta LnIncome(-)_{t-5}$		0.78(2.07)				
$\Delta LnIncome(-)_{t-6}$		1.14(3.06)				
$\Delta LnIncome(-)_{t-7}$		-1.56(-4.00)				
Panel B: Long-Run						
Constant	-11.31(-3.88)	5.20(43.12)	-5.91(-3.29)	5.49(69.38)	-11.37(-4.89)	5.45(48.95)
$LnIncome_t$	0.92(5.85)		0.59(6.49)		0.10(7.44)	
$LnIncome(+)_t$		1.27(6.04)		0.44(1.68)		2.18(4.58)
$LnIncome(-)_t$		3.25(2.14)		-0.09(-0.10)		5.40(3.06)
Panel C: Diagnostic						
F	5.69	3.66	9.16	4.63	8.70	4.63
ECM_{t-1}	-0.04(-3.38)	-0.05(-3.34)	-0.06(-4.29)	-0.05(-3.76)	-0.05(-4.18)	-0.05(-3.76)
LM	3.28	3.34	6.06	8.57	4.10	2.45
QS (QS^2)	S (S)	S (U)	S (U)	S (S)	S (U)	S (U)
Adjusted R^2	0.47	0.54	0.37	0.55	0.54	0.60
Wald Tests:						
$\sum\gamma_{2i} = 0$		1.4210		.62880		.31709
$\sum\gamma_{3i} = 0$		2.9040*		.08936		.03929
$\sum\gamma_{2i} = \sum\gamma_{3i}$		3.4153*		.35814		.20329
$\gamma_7 = \gamma_8$		1.6678		.50372		5.0756*

	South Carolina		South Dakota		Tennessee	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.31(2.85)**		**0.17(1.11)**		**0.23(1.61)**	
$\Delta LnIncome_{t-1}$			0.35(2.27)		0.03(0.22)	
$\Delta LnIncome_{t-2}$			0.13(0.90)		0.02(0.16)	
$\Delta LnIncome_{t-3}$			0.13(0.92)		0.15(2.41)	
$\Delta LnIncome_{t-4}$			-0.04(-0.30)			
$\Delta LnIncome_{t-5}$			0.02(0.15)			
$\Delta LnIncome_{t-6}$			0.30(2.07)			
$\Delta LnIncome_{t-7}$			0.79(5.51)			
$\Delta LnIncome(+)_t$		**0.04(2.45)**		**0.49(2.30)**		**0.02(1.32)**
$\Delta LnIncome(+)_{t-1}$						
$\Delta LnIncome(+)_{t-2}$						
$\Delta LnIncome(+)_{t-3}$						
$\Delta LnIncome(+)_{t-4}$						
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.12(4.36)**		**-0.07(-0.30)**		**0.93(2.91)**
$\Delta LnIncome(-)_{t-1}$		-0.49(-1.82)		0.23(0.99)		-0.05(-0.16)
$\Delta LnIncome(-)_{t-2}$				-0.03(-0.16)		-0.35(-1.10)
$\Delta LnIncome(-)_{t-3}$				0.002(.013)		1.17(3.73)
$\Delta LnIncome(-)_{t-4}$				0.29(1.36)		-0.72(-2.27)
$\Delta LnIncome(-)_{t-5}$				-0.02(-0.12)		-0.65(-1.97)
$\Delta LnIncome(-)_{t-6}$				0.54(2.66)		0.52(1.60)
$\Delta LnIncome(-)_{t-7}$				1.45(7.06)		
Panel B: Long-Run						
Constant	1.75(1.05)	5.57(148.4)	1.32(0.34)	6.09(27.97)	1.38(0.77)	5.49(78.96)
$LnIncome_t$	0.21(2.33)		0.24(1.04)		0.22(2.34)	
$LnIncome(+)_t$		0.67(3.76)		0.90(5.43)		0.24(1.67)
$LnIncome(-)_t$		3.98(2.76)		2.23(4.20)		0.59(0.46)
Panel C: Diagnostic						
F	3.36	3.95	0.95	6.22	3.23	2.70
ECM_{t-1}	-0.04(-2.60)	-0.07(-3.47)	-0.06(-1.39)	-0.17(-4.35)	-0.05(-2.55)	-0.07(-2.87)
LM	3.26	3.01	10.14	30.89	1.52	15.52
QS (QS^2)	S (U)	S (U)	S (U)	U (U)	S (U)	S (U)
Adjusted R^2	0.27	0.34	0.38	0.52	0.18	0.32
Wald Tests:						
$\sum\gamma_{2i} = 0$		.03189		5.3064*		.36229
$\sum\gamma_{3i} = 0$		3.0886*		12.1536*		1.0747
$\sum\gamma_{2i} = \sum\gamma_{3i}$		2.5988*		7.4340*		1.2609
$\gamma_7 = \gamma_8$		4.1534*		17.6862*		.06771

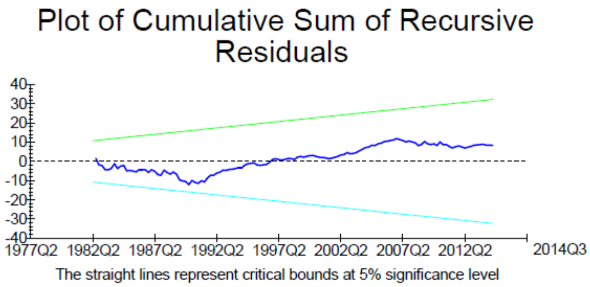
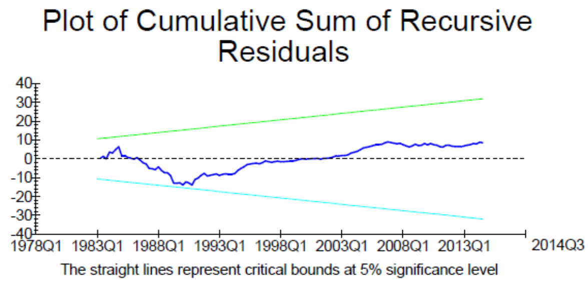
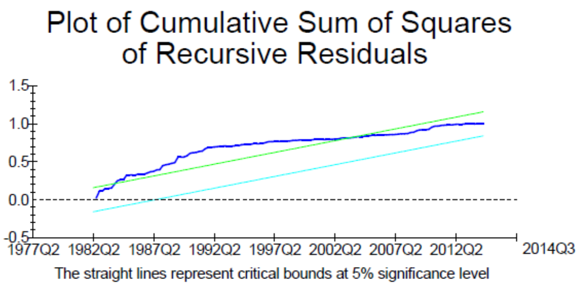
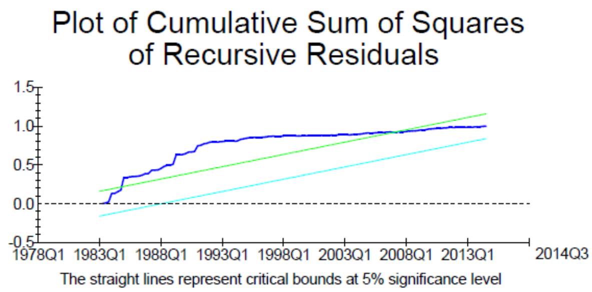
	Texas		Utah		Virginia	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.19(2.25)**		**0.55(3.77)**		**0.32(2.50)**	
$\Delta LnIncome_{t-1}$	-0.12(-1.39)				-0.04(-0.33)	
$\Delta LnIncome_{t-2}$	0.11(1.29)				-0.08(-0.63)	
$\Delta LnIncome_{t-3}$	0.25(2.94)				0.40(2.99)	
$\Delta LnIncome_{t-4}$	0.12(1.45)				-0.26(-1.93)	
$\Delta LnIncome_{t-5}$						
$\Delta LnIncome_{t-6}$						
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**0.06(0.54)**		**0.38(2.09)**		**0.47(2.46)**
$\Delta LnIncome(+)_{t-1}$		-0.16(-1.37)		0.22(1.20)		
$\Delta LnIncome(+)_{t-2}$		0.10(0.85)		0.42(2.52)		
$\Delta LnIncome(+)_{t-3}$		0.19(1.64)		0.27(1.55)		
$\Delta LnIncome(+)_{t-4}$		0.36(2.91)				
$\Delta LnIncome(+)_{t-5}$		0.19(1.46)				
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**0.32(1.34)**		**0.55(1.38)**		**-0.11(-0.34)**
$\Delta LnIncome(-)_{t-1}$		-0.17(-0.70)		-0.80(-1.95)		-0.14(-4.42)
$\Delta LnIncome(-)_{t-2}$		0.18(0.77)				-0.05(-0.16)
$\Delta LnIncome(-)_{t-3}$		0.52(2.18)				0.69(2.24)
$\Delta LnIncome(-)_{t-4}$		-0.44(-1.87)				-1.12(-3.55)
$\Delta LnIncome(-)_{t-5}$		-0.39(-1.63)				
$\Delta LnIncome(-)_{t-6}$						
$\Delta LnIncome(-)_{t-7}$						
Panel B: Long-Run						
Constant	1.13(0.16)	4.71(10.24)	-1.22(-0.71)	5.00(32.92)	-4.62(-2.01)	5.26(37.59)
$LnIncome_t$	0.19(0.56)		0.38(3.96)		0.54(4.55)	
$LnIncome(+)_t$		0.50(0.87)		0.64(4.61)		0.54(1.69)
$LnIncome(-)_t$		2.43(0.66)		3.39(1.99)		0.11(0.04)
Panel C: Diagnostic						
F	1.69	2.64	5.01	3.50	3.91	3.30
ECM_{t-1}	-0.01(-1.83)	-0.02(-2.84)	-0.04(-3.18)	-0.04(-3.24)	-0.03(-2.80)	-0.03(-3.17)
LM	11.22	6.10	3.01	3.74	4.06	2.93
QS (QS^2)	S (S)	S (U)	S (S)	S (U)	S (S)	S (S)
Adjusted R^2	0.40	0.40	0.38	0.44	0.40	0.44
Wald Tests:						
$\sum\gamma_{2i} = 0$		8.9412*		13.2764*		5.1839*
$\sum\gamma_{3i} = 0$		.00295		1.5062		1.0216
$\sum\gamma_{2i} = \sum\gamma_{3i}$		1.4905		8.3084*		2.2997
$\gamma_7 = \gamma_8$		.34687		2.9720*		.05824

	Vermont		Washington		Wisconsin	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
ΔLnIncome$_t$	**1.00(2.00)**		**0.03(3.50)**		**0.35(2.28)**	
ΔLnIncome$_{t-1}$					-0.03(-0.19)	
ΔLnIncome$_{t-2}$					0.05(0.33)	
ΔLnIncome$_{t-3}$					0.30(2.09)	
ΔLnIncome$_{t-4}$					0.01(0.04)	
ΔLnIncome$_{t-5}$					-0.20(-1.36)	
ΔLnIncome$_{t-6}$					0.40(2.77)	
ΔLnIncome$_{t-7}$					0.37(2.45)	
ΔLnIncome(+)$_t$		**1.18(1.85)**		**0.11(1.02)**		**0.08(0.37)**
ΔLnIncome(+)$_{t-1}$				0.32(2.25)		-0.62(-2.81)
ΔLnIncome(+)$_{t-2}$				-0.21(-1.49)		0.12(0.54)
ΔLnIncome(+)$_{t-3}$						-0.50(-2.31)
ΔLnIncome(+)$_{t-4}$						-0.44(-1.99)
ΔLnIncome(+)$_{t-5}$						-0.09(-0.40)
ΔLnIncome(+)$_{t-6}$						-0.53(-2.43)
ΔLnIncome(+)$_{t-7}$						
ΔLnIncome(-)$_t$		**0.71(2.26)**		**0.24(1.17)**		**0.76(2.03)**
ΔLnIncome(-)$_{t-1}$				-0.58(-2.87)		0.52(1.41)
ΔLnIncome(-)$_{t-2}$						-0.47(-1.26)
ΔLnIncome(-)$_{t-3}$						1.54(4.07)
ΔLnIncome(-)$_{t-4}$						0.69(2.05)
ΔLnIncome(-)$_{t-5}$						-0.69(-2.11)
ΔLnIncome(-)$_{t-6}$						1.12(3.35)
ΔLnIncome(-)$_{t-7}$						
Panel B: Long-Run						
Constant	-5.53(-2.14)	5.31(44.25)	-7.13(-5.31)	5.25(60.83)	-6.97(-1.14)	5.59(71.44)
LnIncome$_t$	0.67(4.40)		0.68(9.61)		0.65(2.05)	
LnIncome(+)$_t$		1.66(2.43)		0.66(3.41)		0.98(6.68)
LnIncome(-)$_t$		5.24(1.67)		0.69(0.81)		2.53(3.17)
Panel C: Diagnostic						
F	3.32	4.30	6.38	3.43	1.42	3.24
ECM$_{t-1}$	-0.12(-2.59)	-0.13(-3.62)	-0.04(-3.58)	-0.04(-3.24)	-0.02(-1.69)	-0.08(-3.06)
LM	4.31	4.12	3.55	10.48	4.29	13.62
QS (QS^2)	S (U)	U (U)	S (S)	S (S)	S (U)	U (S)
Adjusted R^2	0.34	0.37	0.49	0.50	0.26	0.40
Wald Tests:						
$\sum\gamma_{2i} = 0$		2.6746*		1.0190		10.0943*
$\sum\gamma_{3i} = 0$		.29361		1.8001		12.4751*
$\sum\gamma_{2i} = \sum\gamma_{3i}$		.02956		4.5046*		16.4647*
$\gamma_7 = \gamma_8$		3.6476*		.00097		2.6117*

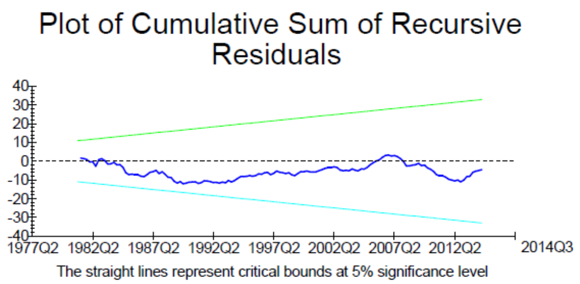
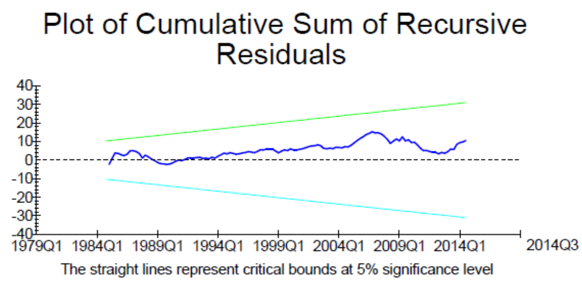
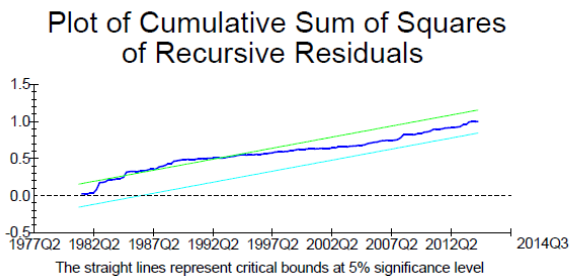
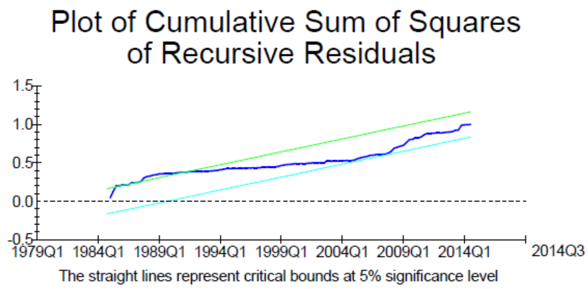
	West Virginia		Wyoming		District of Columbia	
Panel A: Short-Run	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**	**Linear ARDL**	**Nonlinear ARDL**
$\Delta LnIncome_t$	**0.81(3.79)**		**0.02(0.17)**		**0.19(1.38)**	
$\Delta LnIncome_{t-1}$	0.35(1.49)		0.24(2.09)		0.27(1.98)	
$\Delta LnIncome_{t-2}$	0.11(0.47)		0.27(2.33)			
$\Delta LnIncome_{t-3}$	0.02(0.09)		0.24(2.04)			
$\Delta LnIncome_{t-4}$	0.05(0.22)		0.30(2.57)			
$\Delta LnIncome_{t-5}$	0.58(2.65)		-0.10(-0.82)			
$\Delta LnIncome_{t-6}$	0.46(2.18)		0.23(2.00)			
$\Delta LnIncome_{t-7}$						
$\Delta LnIncome(+)_t$		**-0.05(-0.13)**		**0.11(3.11)**		**0.06(2.38)**
$\Delta LnIncome(+)_{t-1}$		-0.35(-0.96)				
$\Delta LnIncome(+)_{t-2}$		-0.80(-2.20)				
$\Delta LnIncome(+)_{t-3}$		0.88(2.46)				
$\Delta LnIncome(+)_{t-4}$		-0.96(-3.36)				
$\Delta LnIncome(+)_{t-5}$						
$\Delta LnIncome(+)_{t-6}$						
$\Delta LnIncome(+)_{t-7}$						
$\Delta LnIncome(-)_t$		**1.64(4.31)**		**0.13(0.68)**		**-0.37(-1.17)**
$\Delta LnIncome(-)_{t-1}$		-0.26(-0.48)		0.37(1.89)		1.26(4.21)
$\Delta LnIncome(-)_{t-2}$		-0.43(-0.87)		-0.19(-0.94)		-0.67(-2.15)
$\Delta LnIncome(-)_{t-3}$		-1.28(-2.61)		0.03(0.13)		-0.003(-0.01)
$\Delta LnIncome(-)_{t-4}$		1.28(2.55)		0.47(2.41)		0.40(1.35)
$\Delta LnIncome(-)_{t-5}$				-0.22(-1.08)		-0.93(-3.24)
$\Delta LnIncome(-)_{t-6}$				0.29(1.45)		0.99(3.41)
$\Delta LnIncome(-)_{t-7}$				-0.54(-2.53)		
Panel B: Long-Run						
Constant	2.23(0.23)	5.72(68.78)	-2.86(-0.94)	5.14(116.6)	-19.48(-8.75)	5.43(24.47)
$LnIncome_t$	0.16(0.29)		0.48(2.64)		1.47(11.34)	
$LnIncome(+)_t$		1.09(6.43)		0.95(14.35)		1.23(4.22)
$LnIncome(-)_t$		2.76(7.35)		1.90(7.98)		0.63(0.72)
Panel C: Diagnostic						
F	1.62	4.19	5.21	5.09	5.86	4.07
ECM_{t-1}	-0.04(-1.80)	-0.20(-3.57)	-0.03(-3.24)	-0.12(-3.94)	-0.07(-4.10)	-0.05(-3.46)
LM	14.05	7.03	4.12	10.95	3.89	2.74
QS (QS^2)	S (U)	S (U)	U (U)	U (S)	S (U)	U (S)
Adjusted R^2	0.52	0.62	0.31	0.48	0.43	0.49
Wald Tests:						
$\sum\gamma_{2i} = 0$		3.0192*		.00281		.93387
$\sum\gamma_{3i} = 0$		.81059		.36031		2.2609
$\sum\gamma_{2i} = \sum\gamma_{3i}$		4.1153*		.32953		.96676
$\gamma_7 = \gamma_8$		12.1085*		5.6330*		.17827

Appendix D: CUSUM and CUSUM Square Graphs of the Multivariate Model Specification

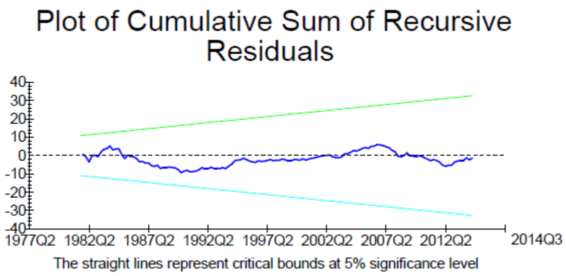
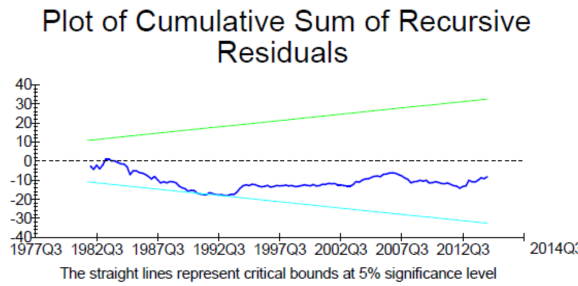
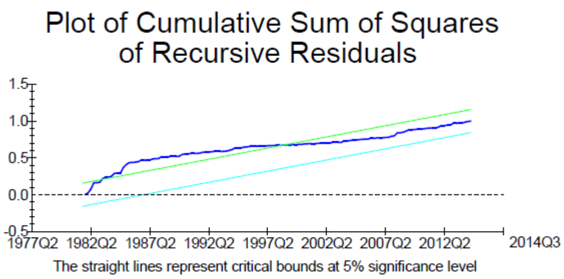
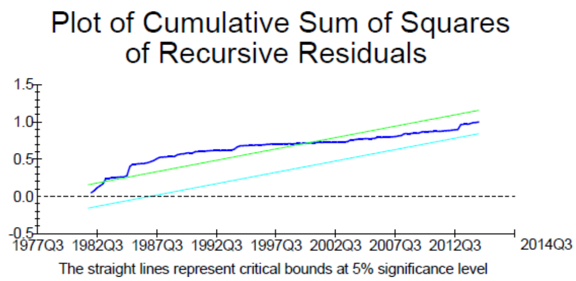
Alaskak

ARDL Model	Nonlinear ARDL Model
	
	

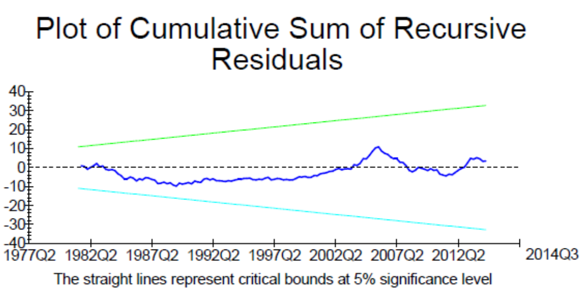
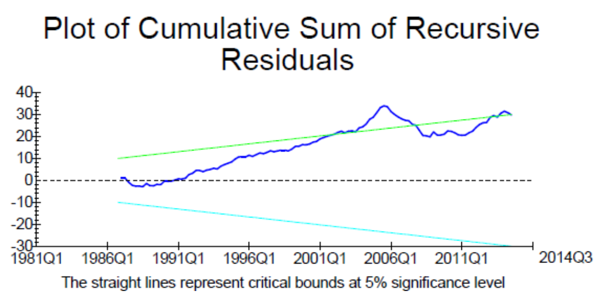
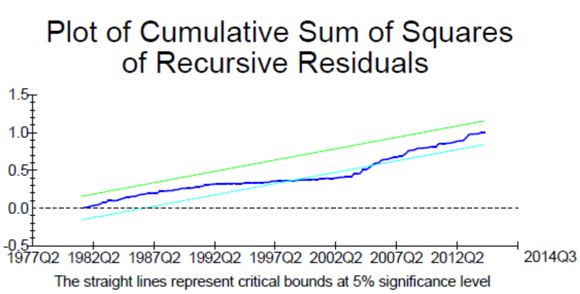
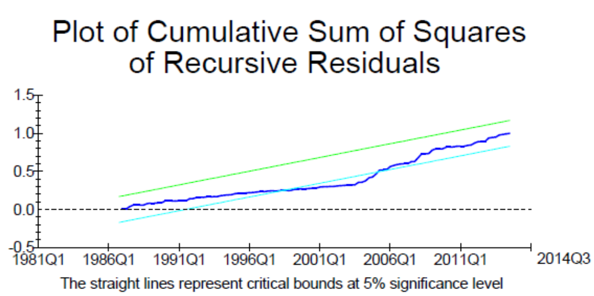
Alabama

ARDL Model	Nonlinear ARDL Model
	
	

Arkansas

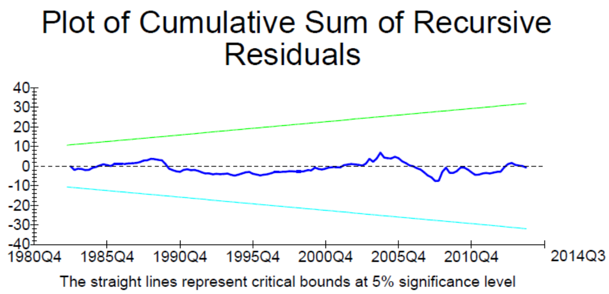
ARDL Model	Nonlinear ARDL Model
	
	

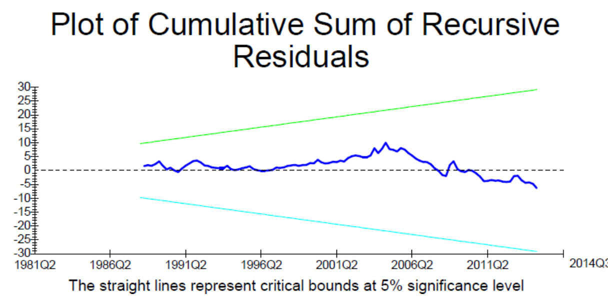
Arizona

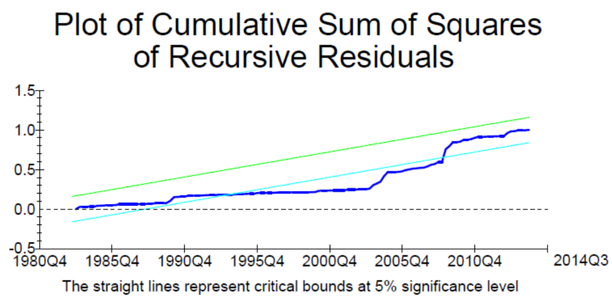
ARDL Model	Nonlinear ARDL Model
	
	

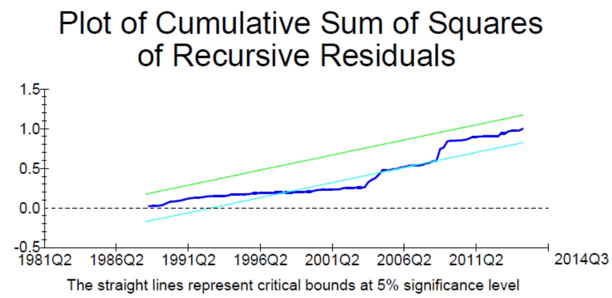
California

ARDL Model	Nonlinear ARDL Model



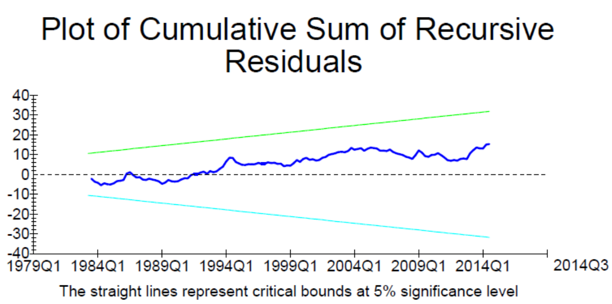


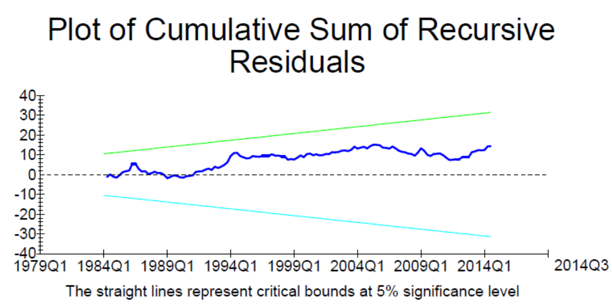


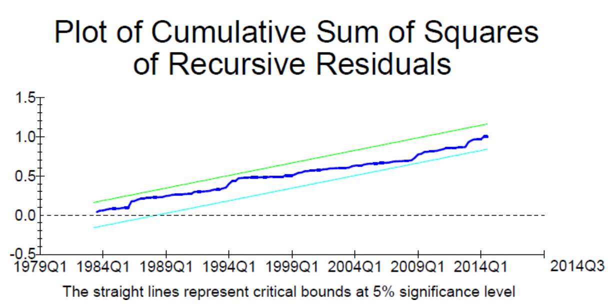


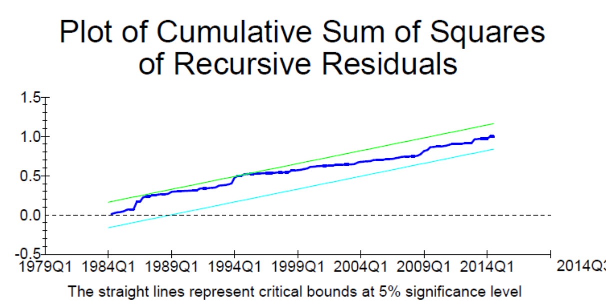
Colorado

ARDL Model	Nonlinear ARDL Model



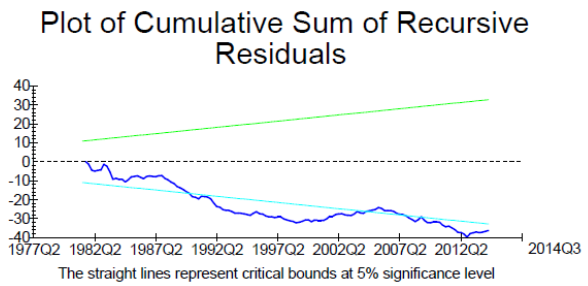


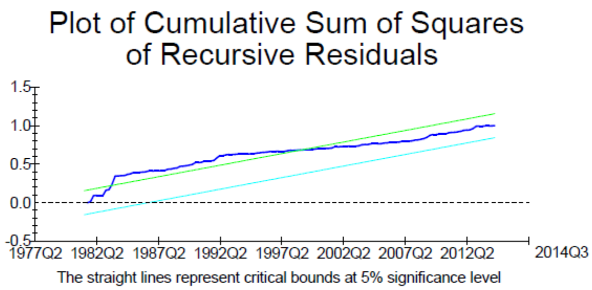




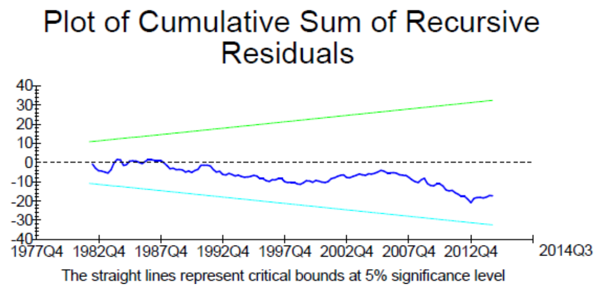
Connecticut

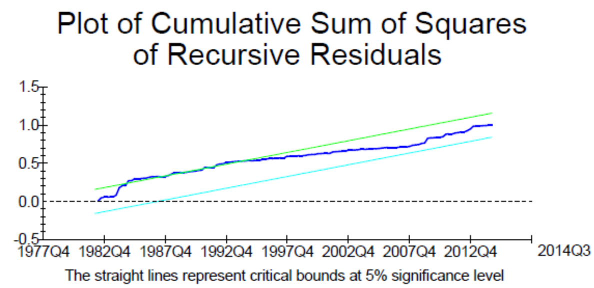
ARDL Model





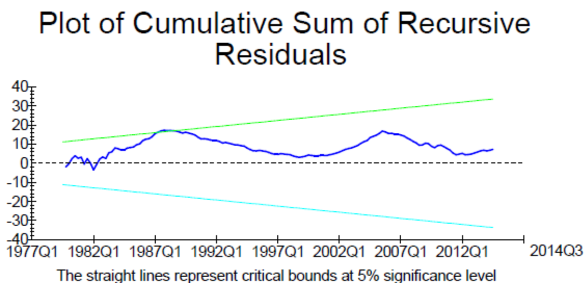
Nonlinear ARDL Model

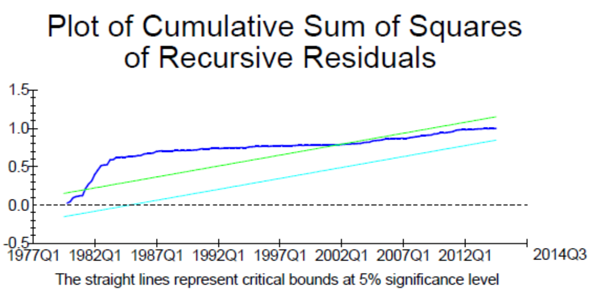




Delaware

ARDL Model





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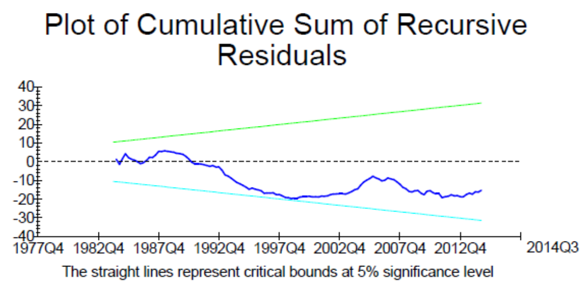
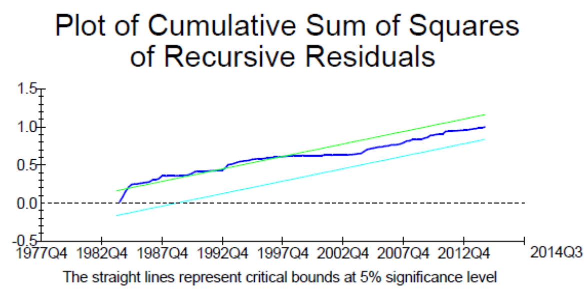
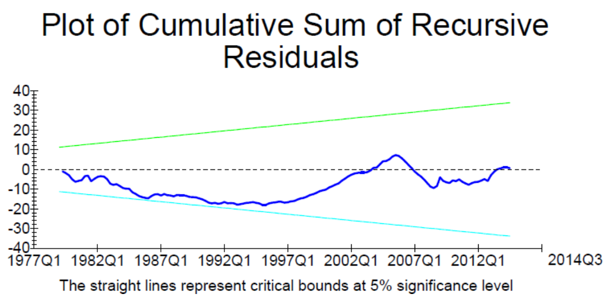
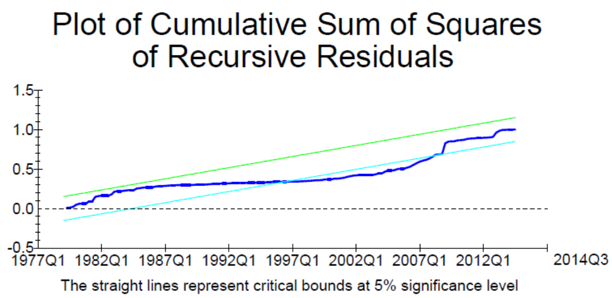




Florida

ARDL Model





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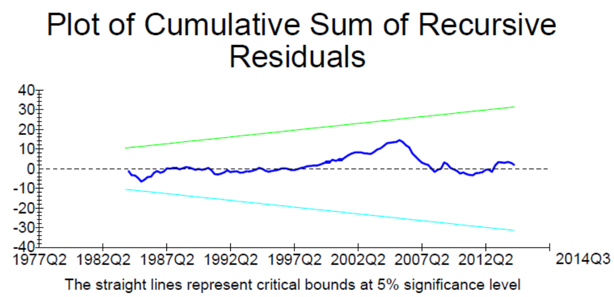
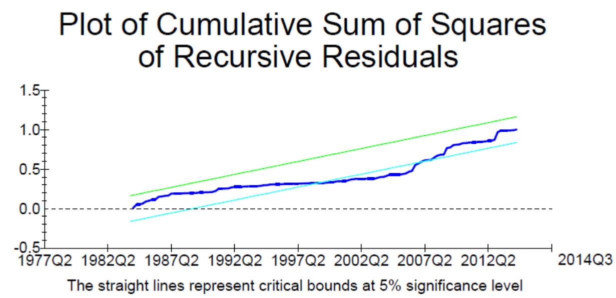
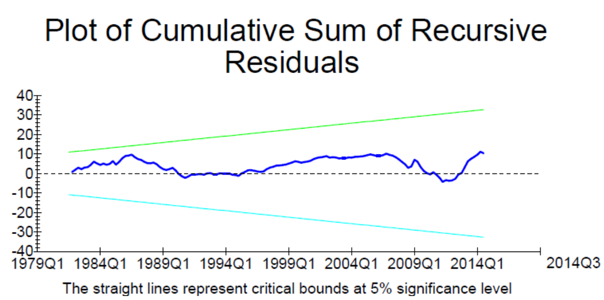
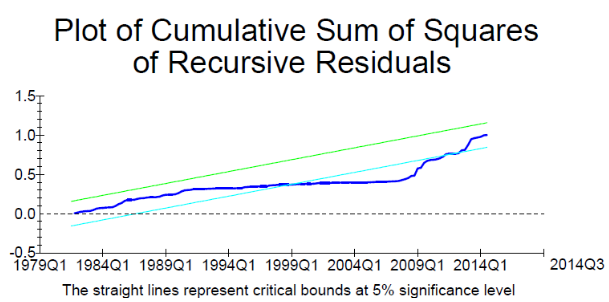




Georgia

ARDL Model





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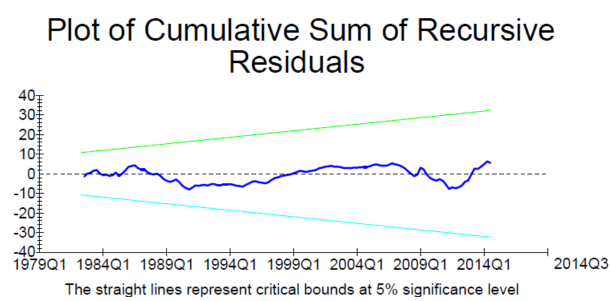
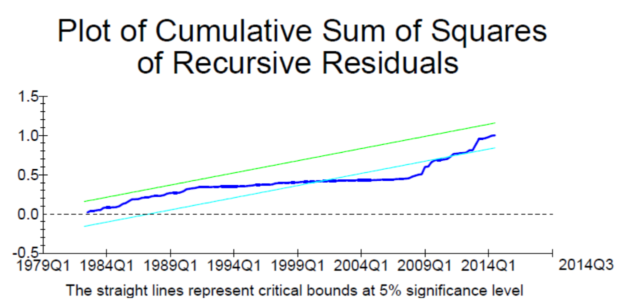
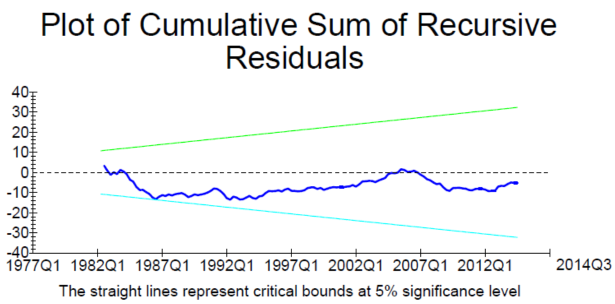


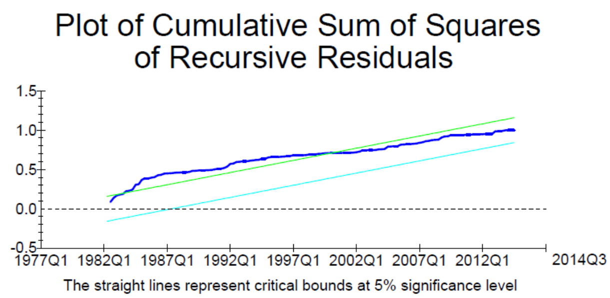


Hawaii

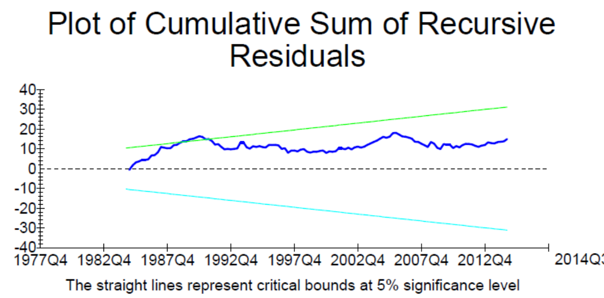
ARDL Model	Nonlinear ARDL Model

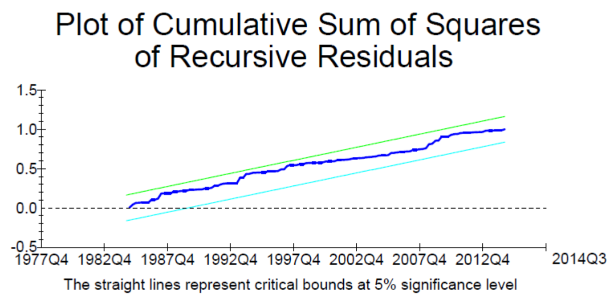
ARDL Model





Nonlinear ARDL Model

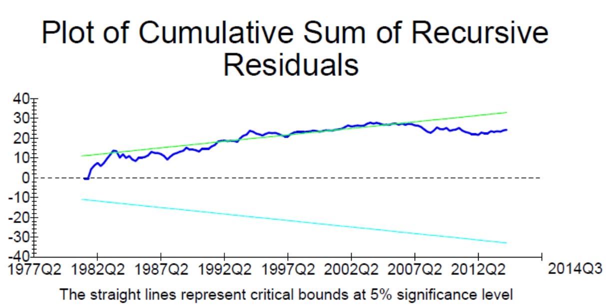


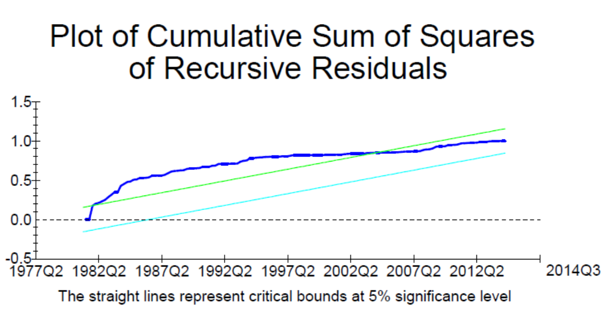


Iowa

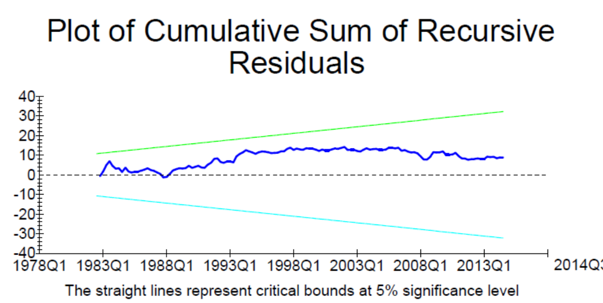
ARDL Model	Nonlinear ARDL Model

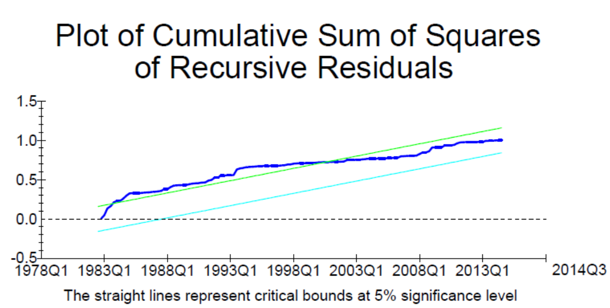
ARDL Model



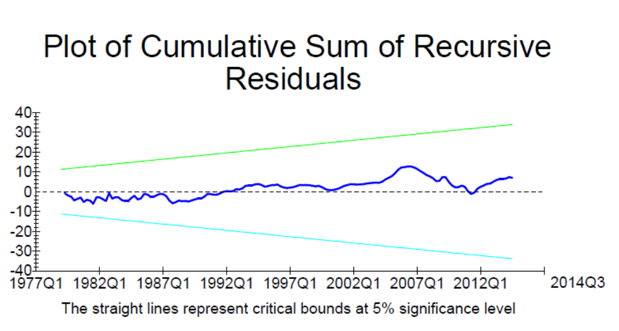
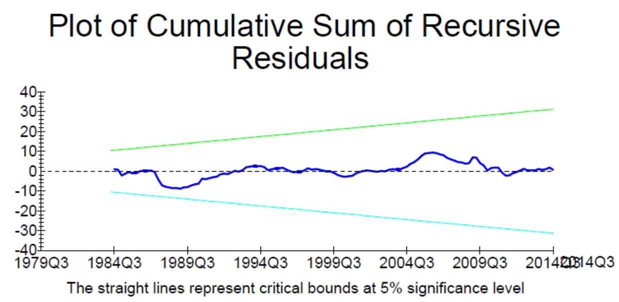
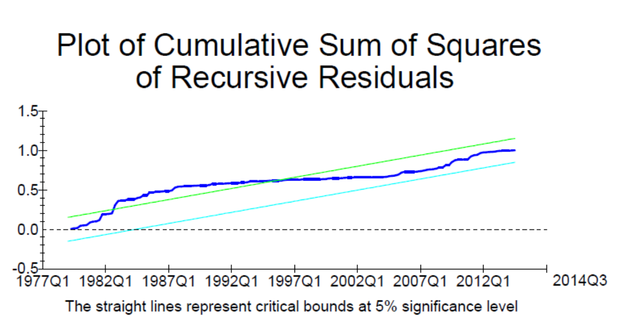
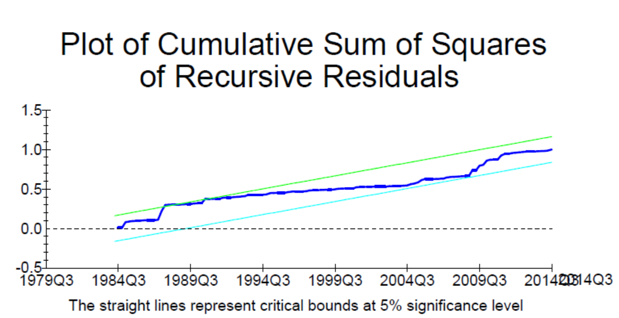


Nonlinear ARDL Model

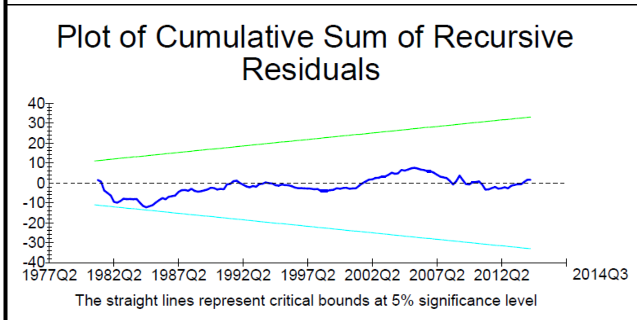
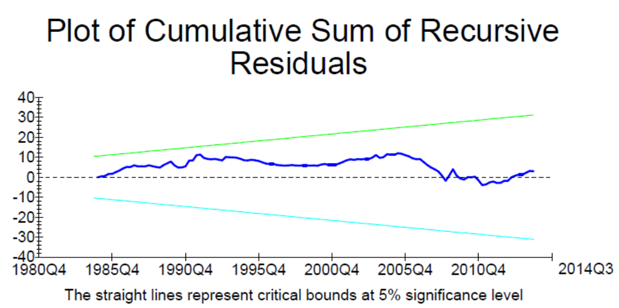
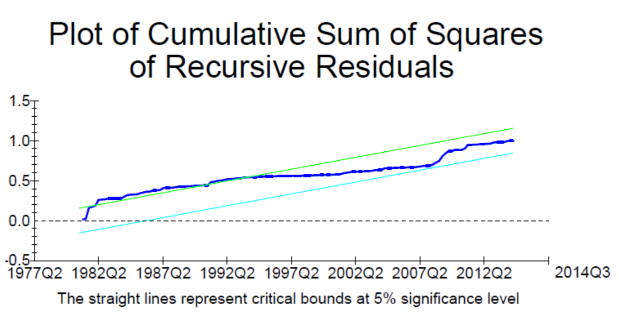
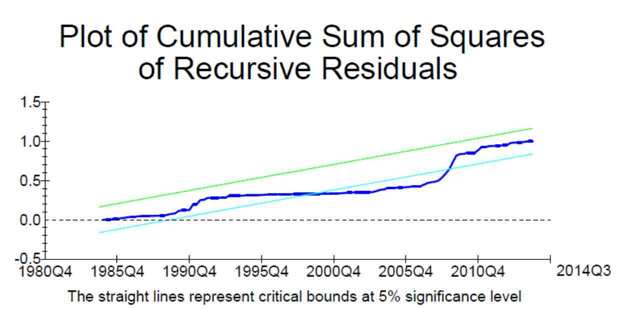




Idaho

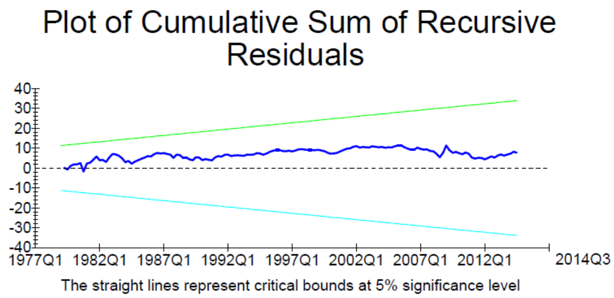
ARDL Model	Nonlinear ARDL Model
	
	

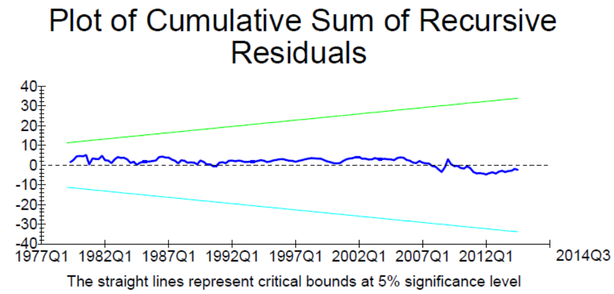
Illinois

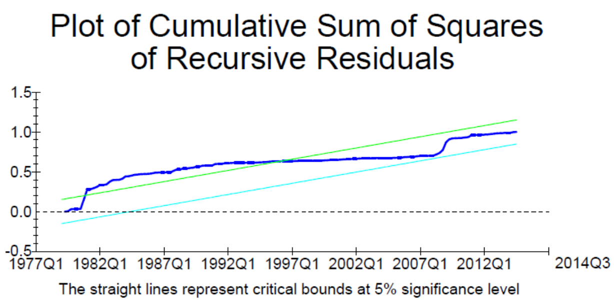
ARDL Model	Nonlinear ARDL Model
	
	

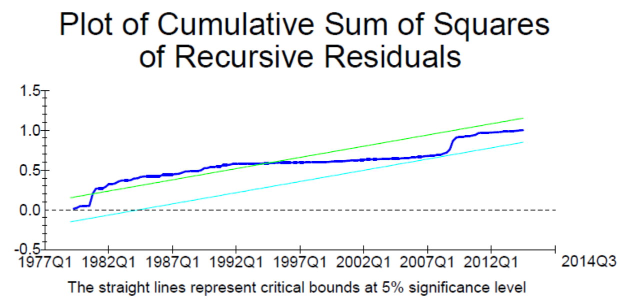
Indiana

ARDL Model	Nonlinear ARDL Model



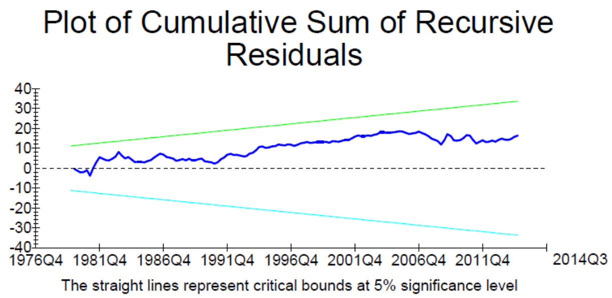


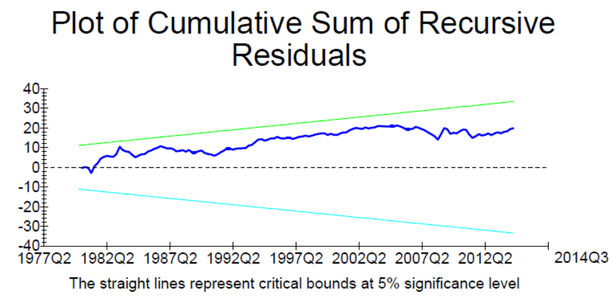


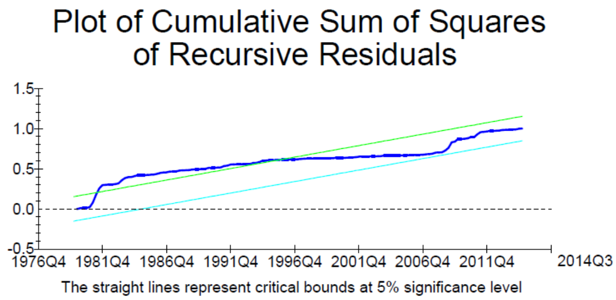


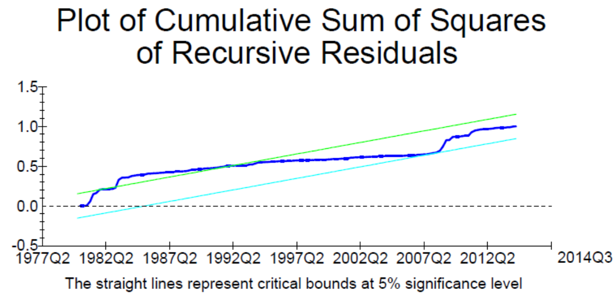
Kansas

ARDL Model	Nonlinear ARDL Model

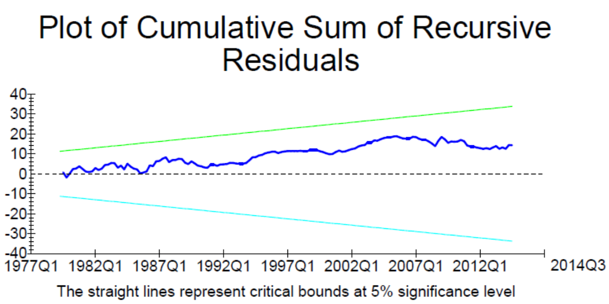
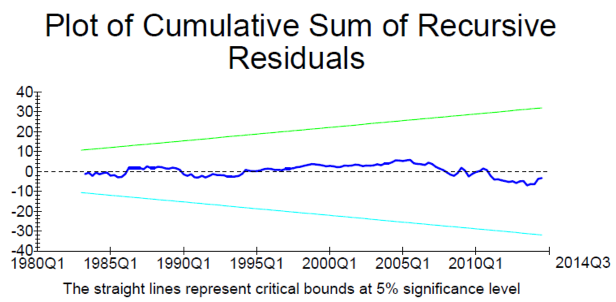
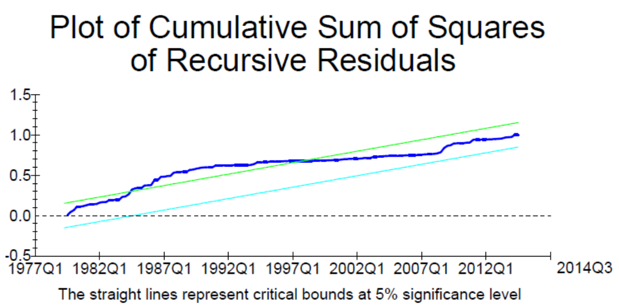
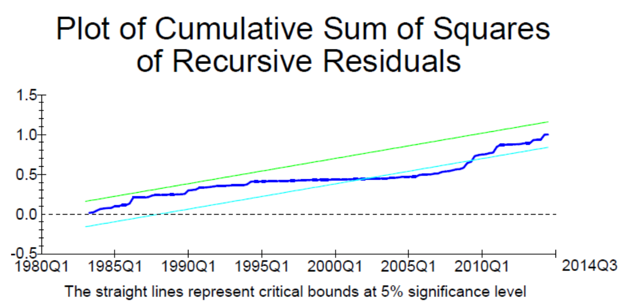




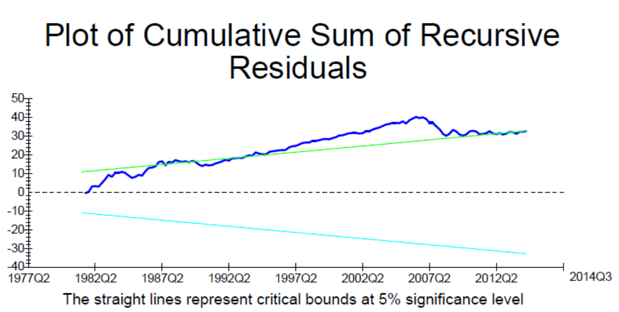
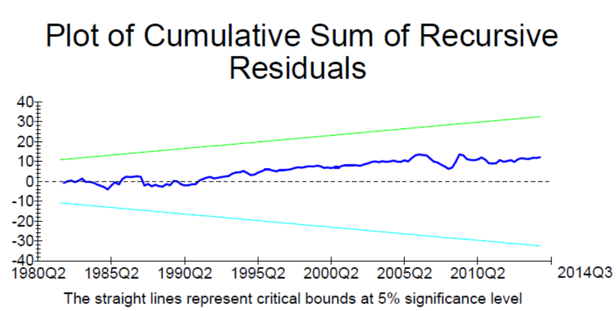
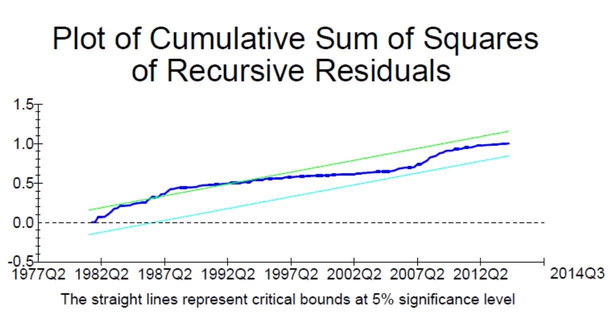
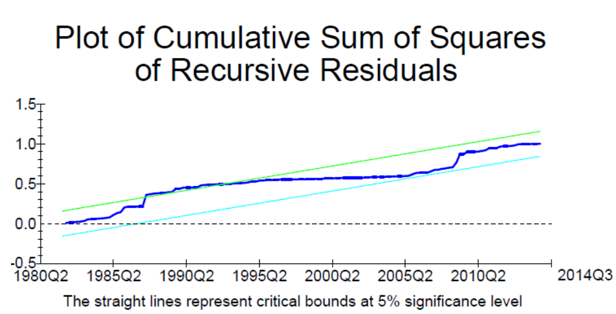




Kentucky

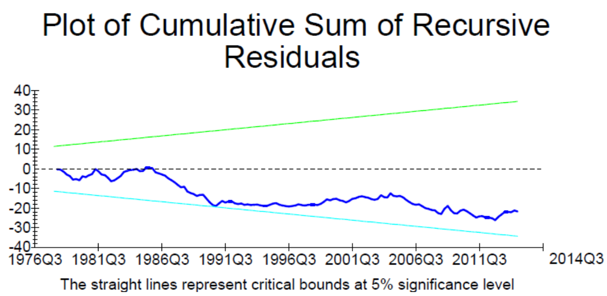
ARDL Model	Nonlinear ARDL Model
	
	

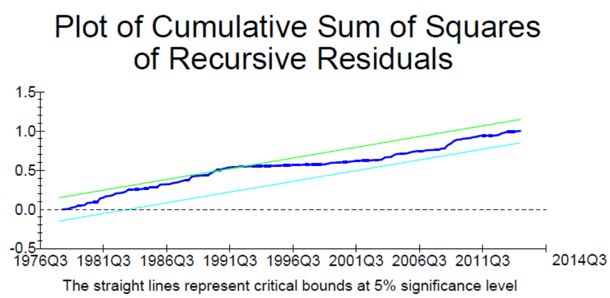
Louisiana

ARDL Model	Nonlinear ARDL Model
	
	

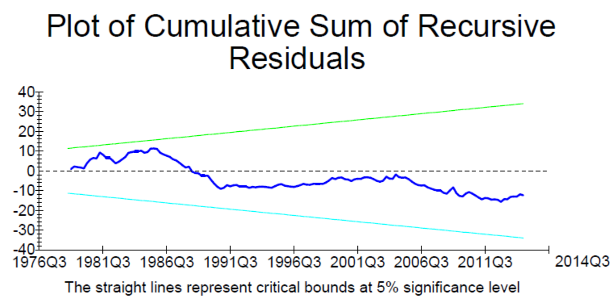
Massachusetts

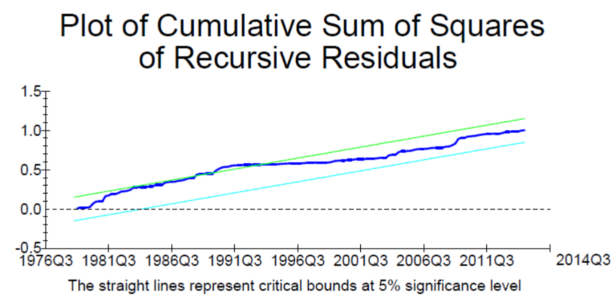
ARDL Model





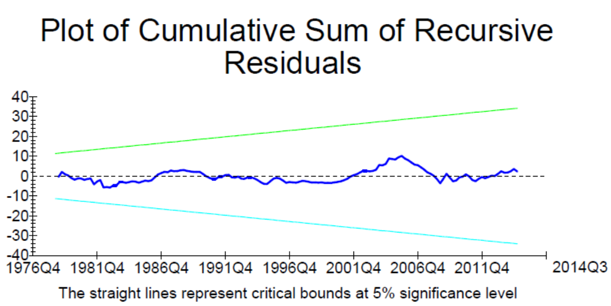
Nonlinear ARDL Model

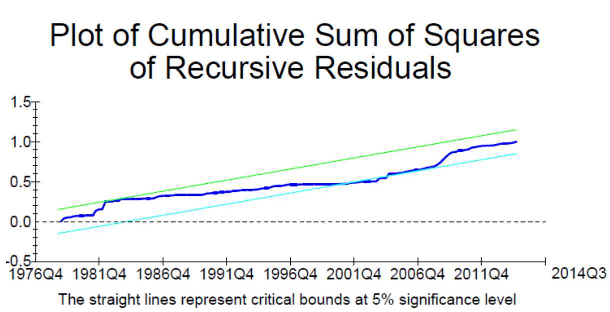




Maryland

ARDL Model





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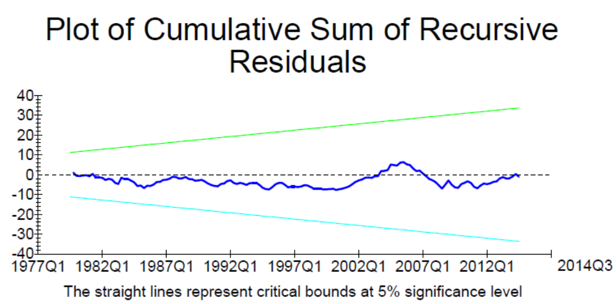
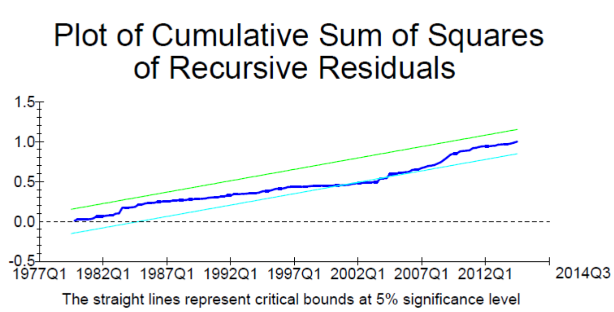
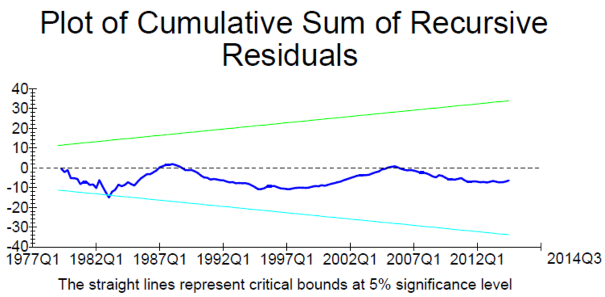
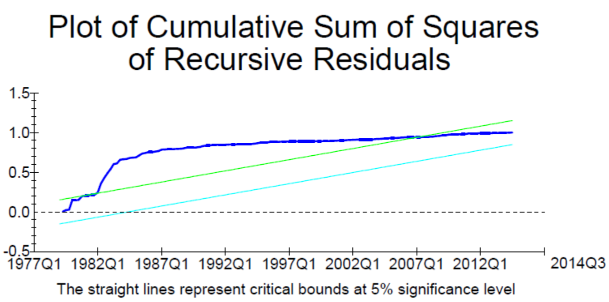




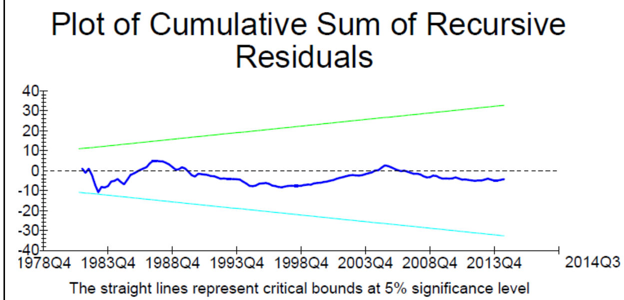
Maine

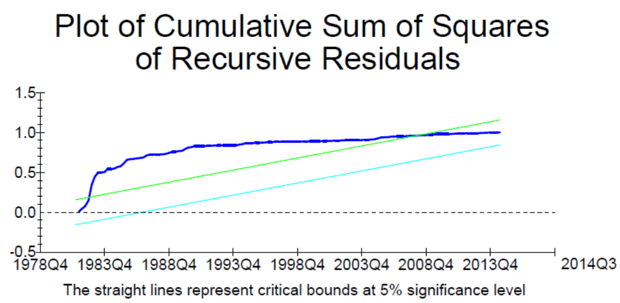
ARDL Model





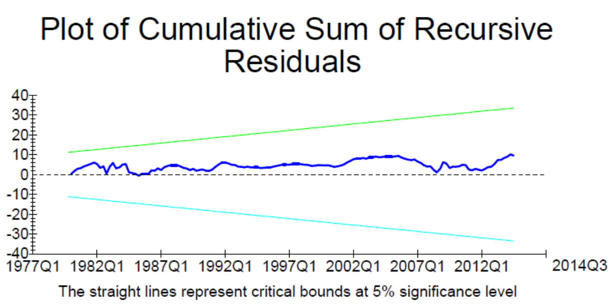
Nonlinear ARDL Model

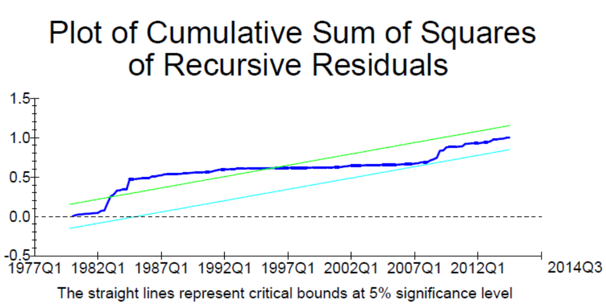




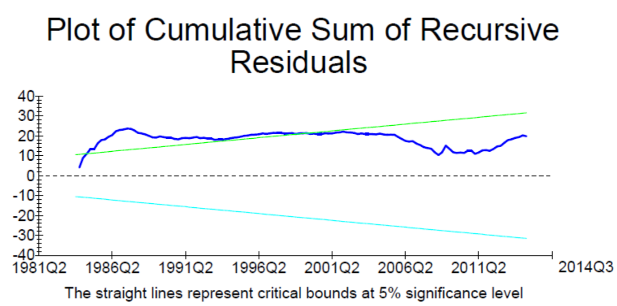
Michigan

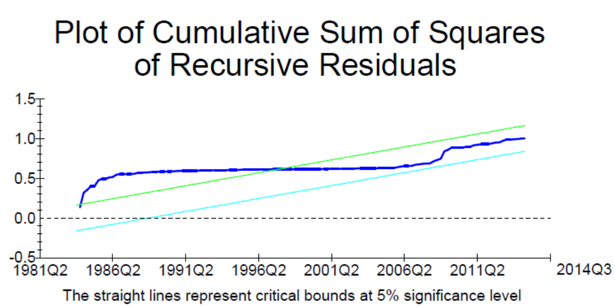
ARDL Model





Nonlinear ARDL Model

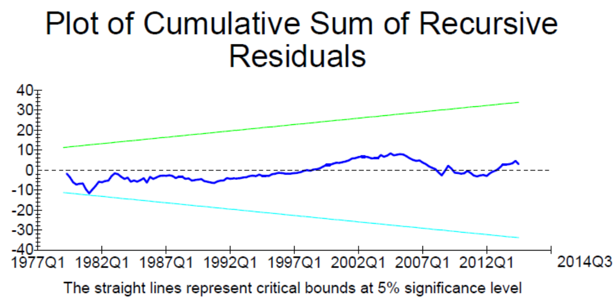


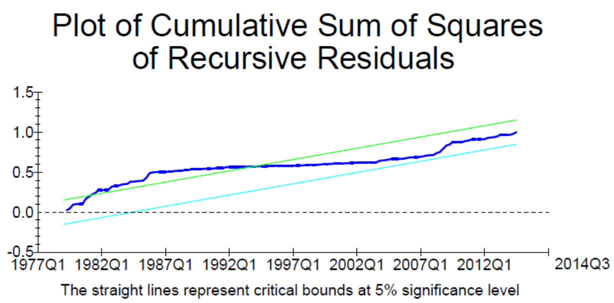


Minnesota

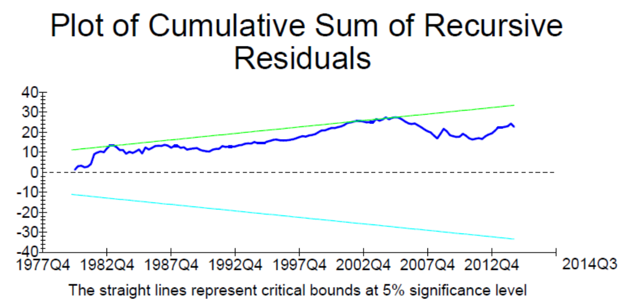
ARDL Model	Nonlinear ARDL Model

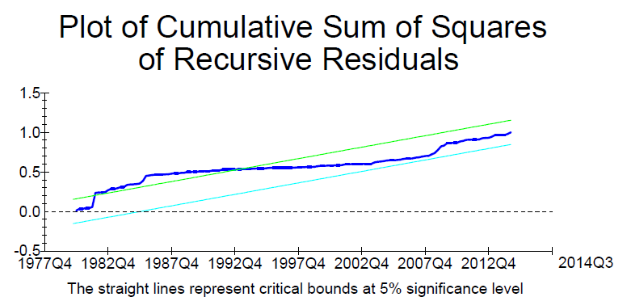
ARDL Model





Nonlinear ARDL Model

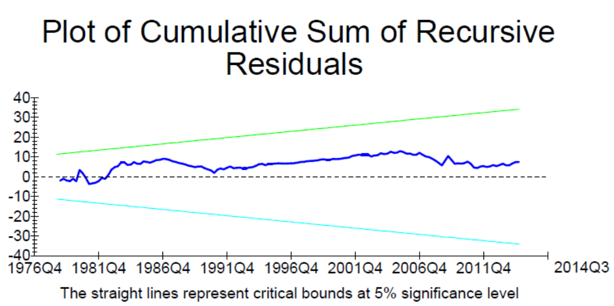


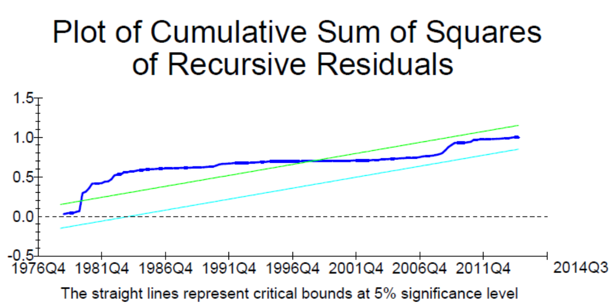


Missouri

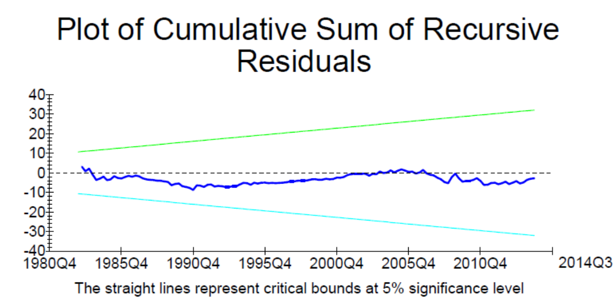
ARDL Model	Nonlinear ARDL Model

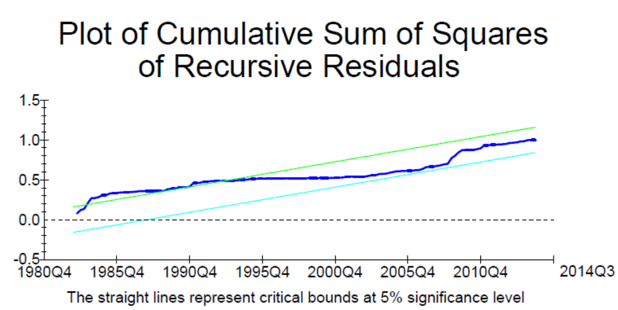
ARDL Model





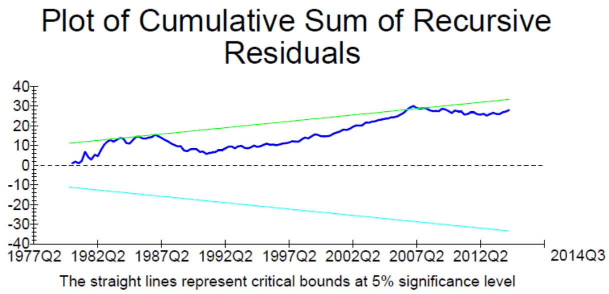
Nonlinear ARDL Model

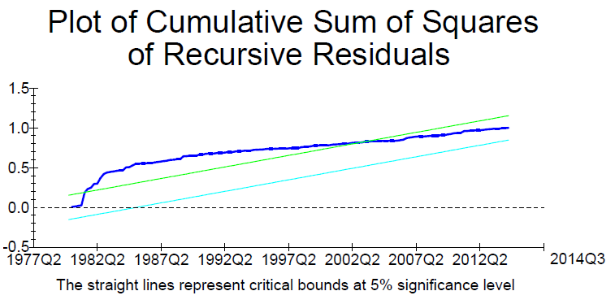




Mississippi

ARDL Model





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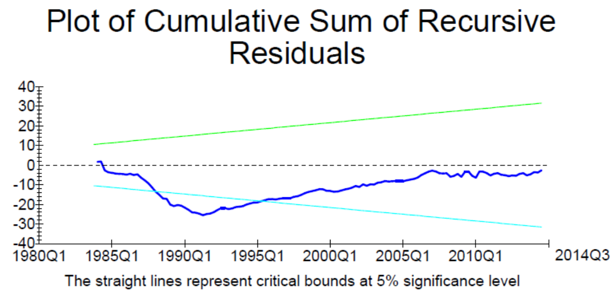
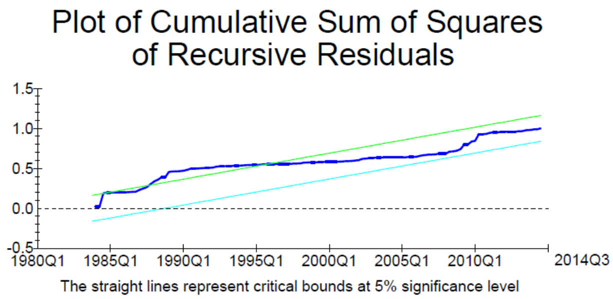
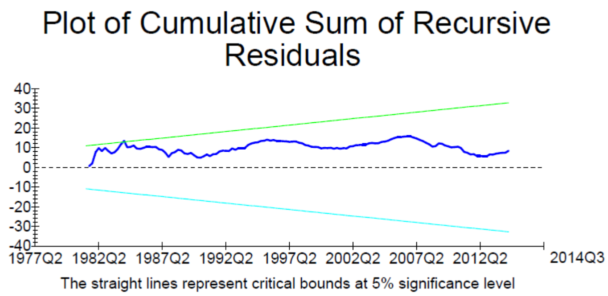
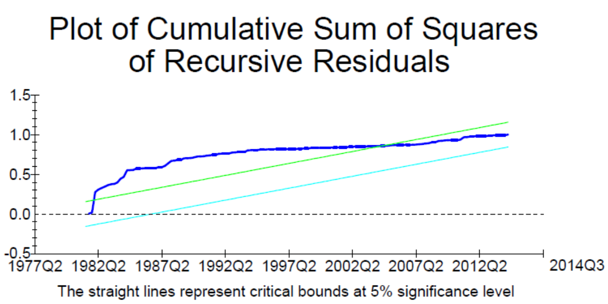




Montana

ARDL Model





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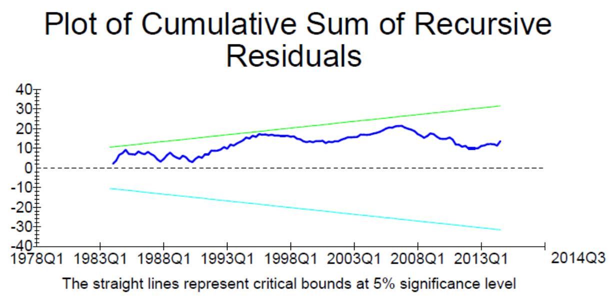
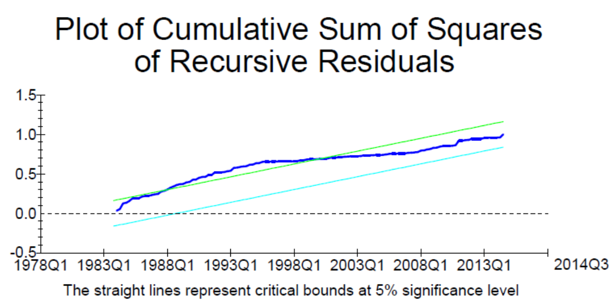
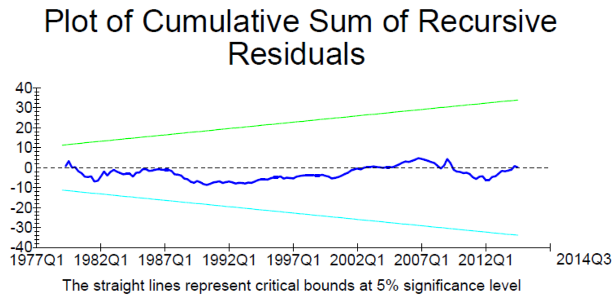
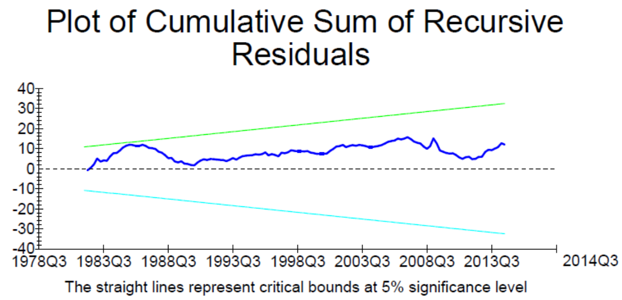
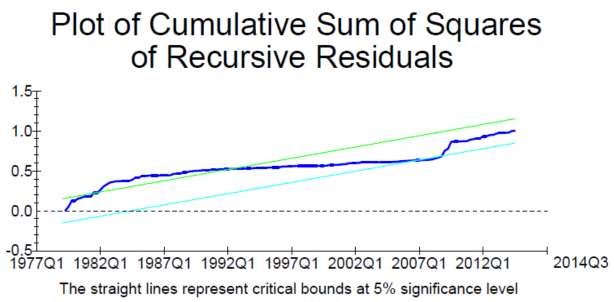
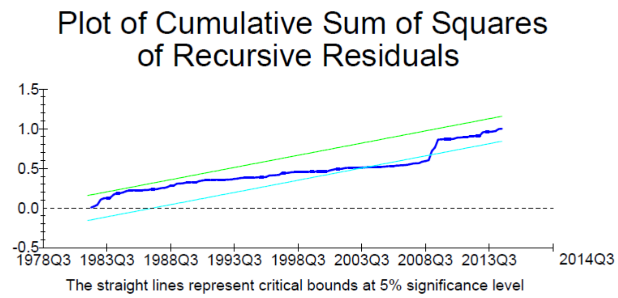
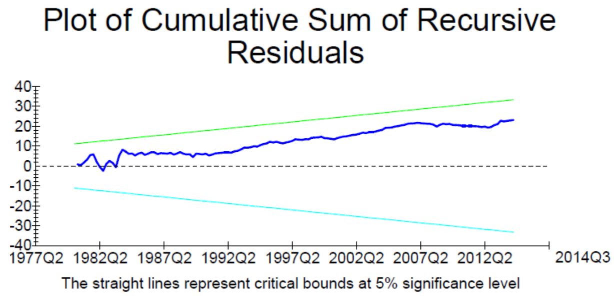
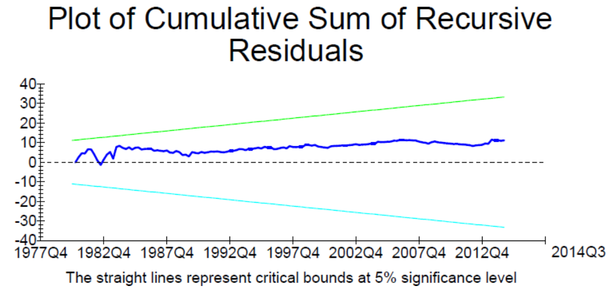
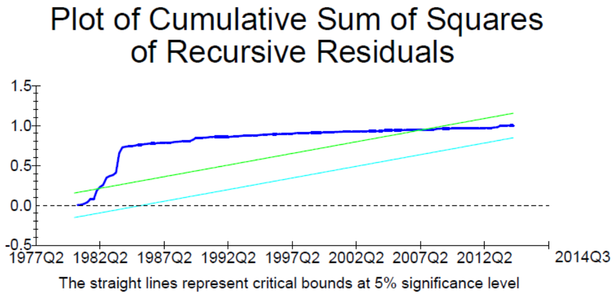
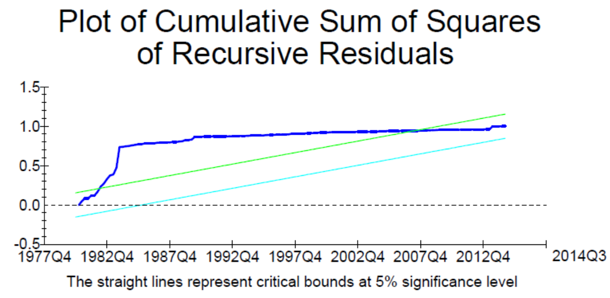




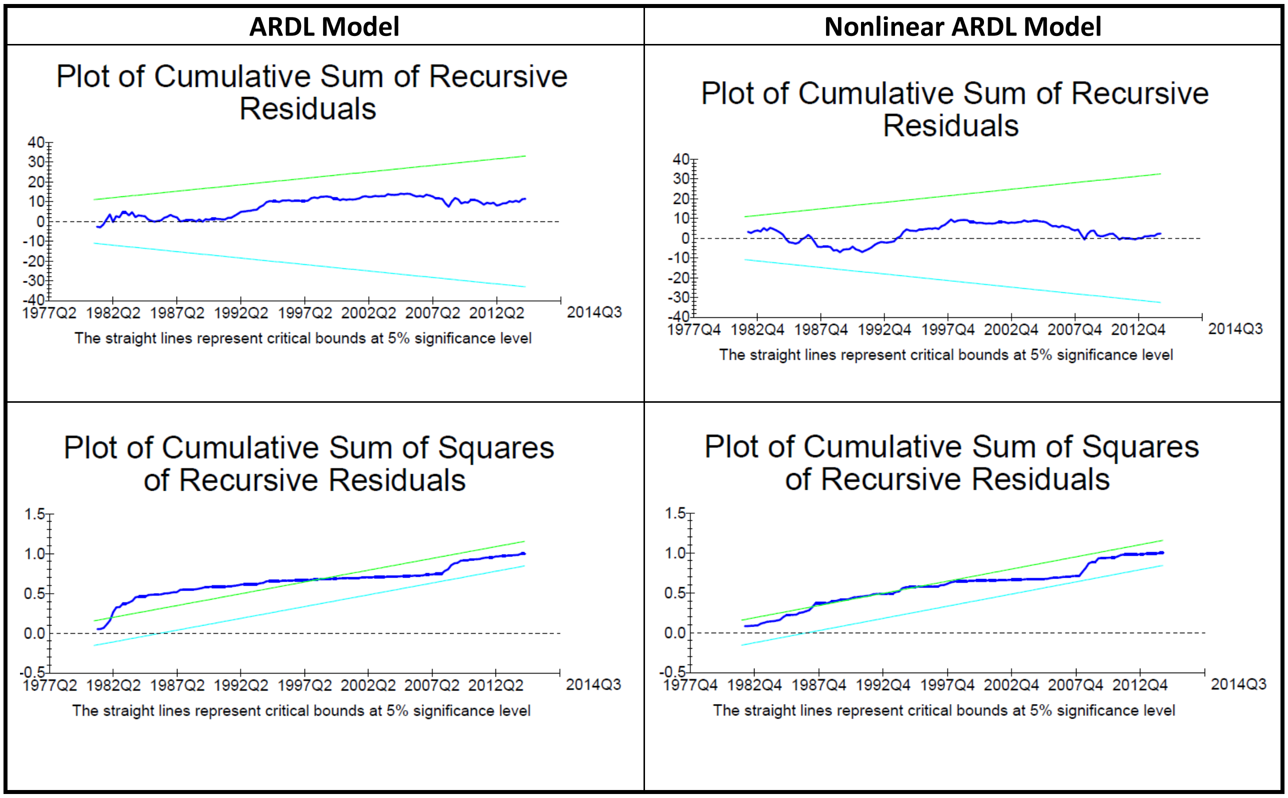
North Carolina

ARDL Model	Nonlinear ARDL Model
	
	

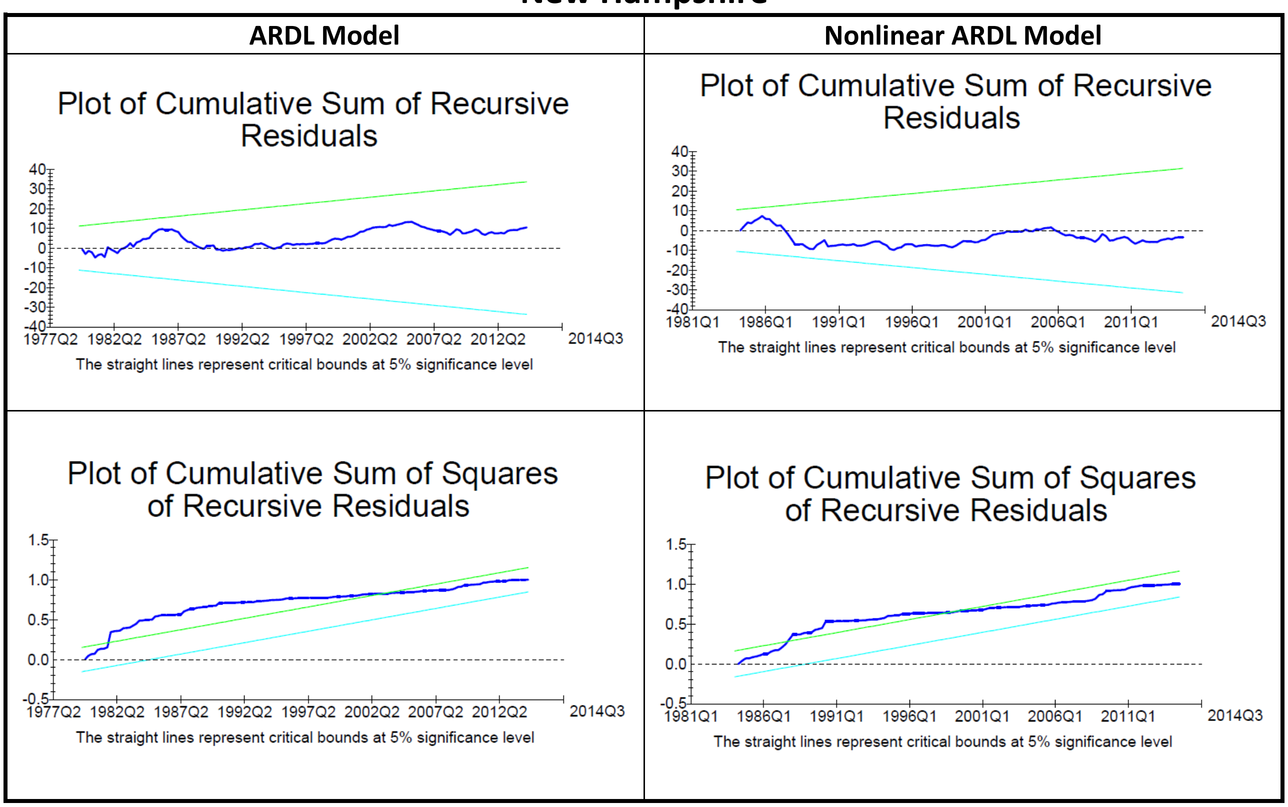
North Dakota

ARDL Model	Nonlinear ARDL Model
	
	

Nebraska

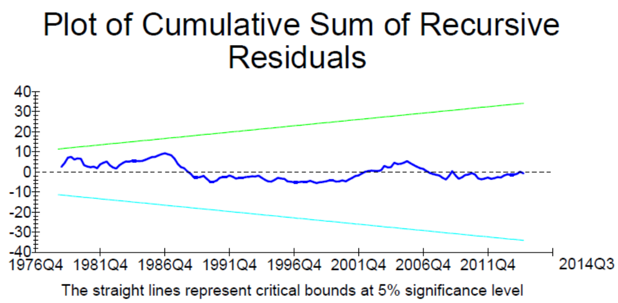


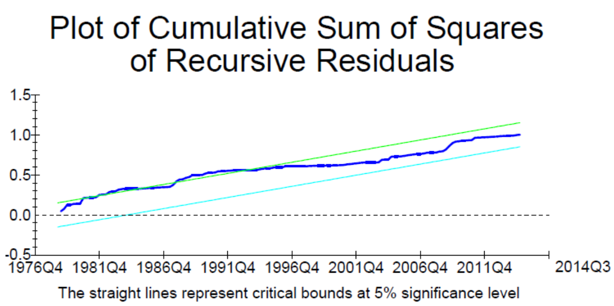
New Hampshire



New Jersey

ARDL Model





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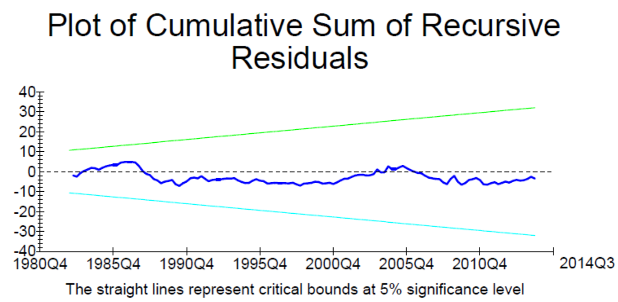
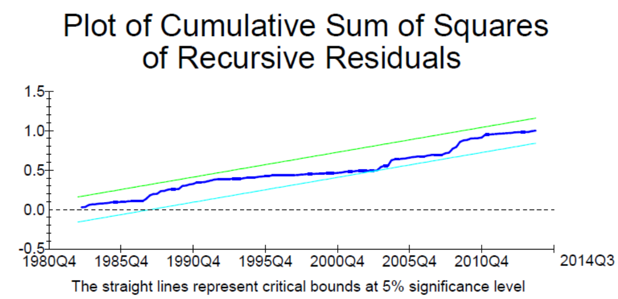
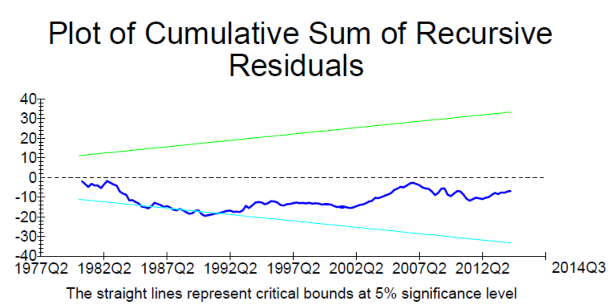
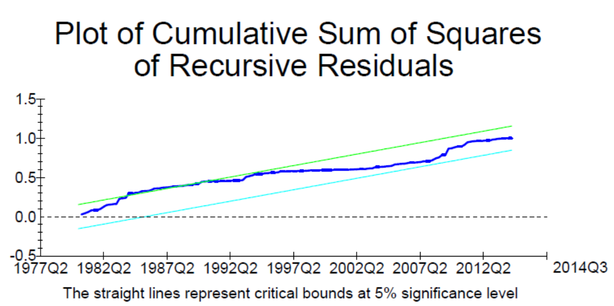




New Mexico

ARDL Model





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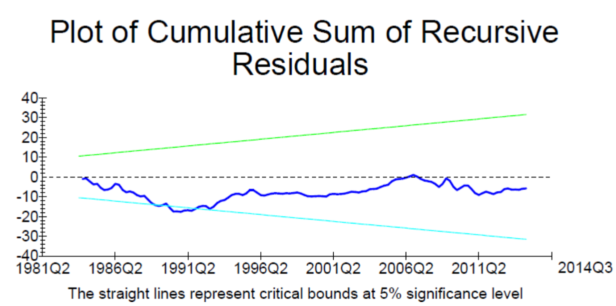
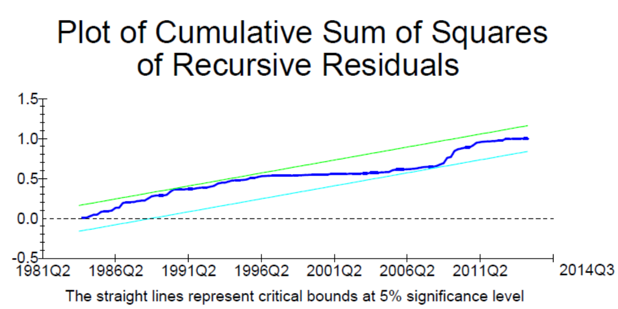
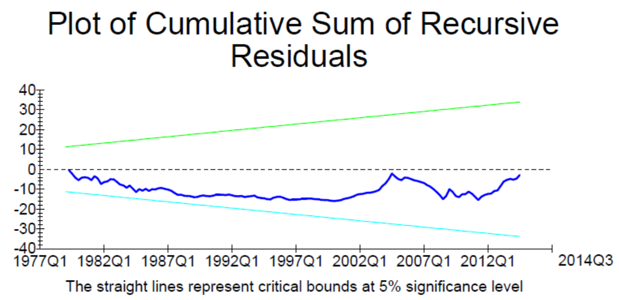
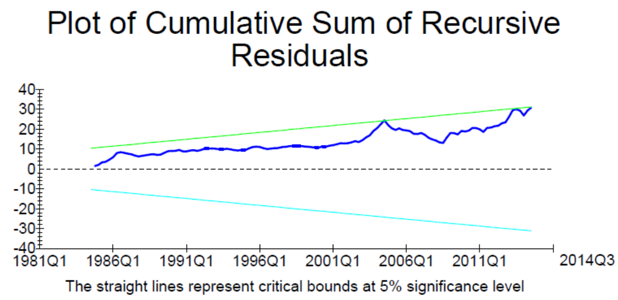


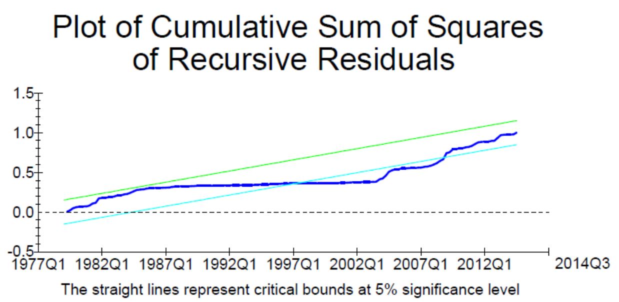


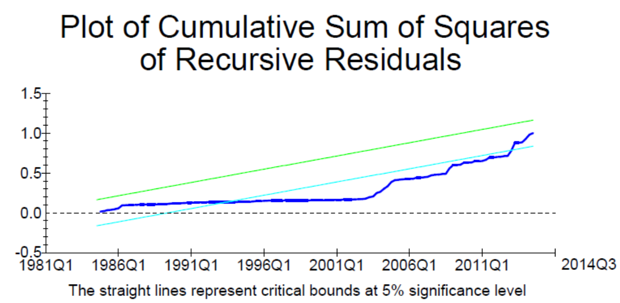
Nevada

ARDL Model | **Nonlinear ARDL Model**



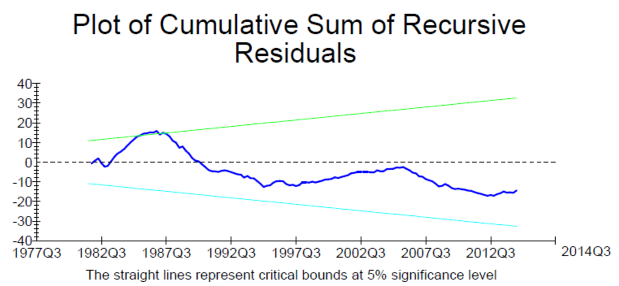


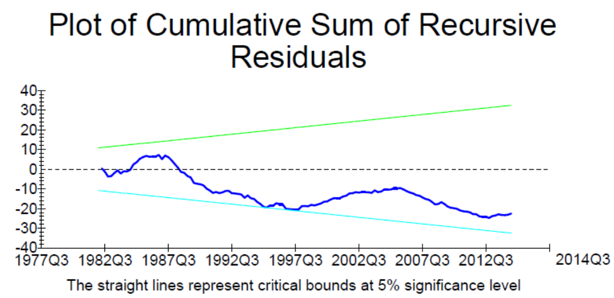


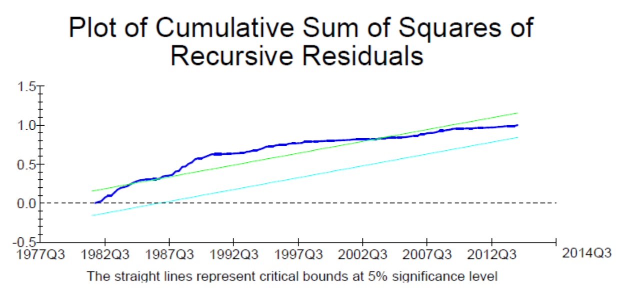


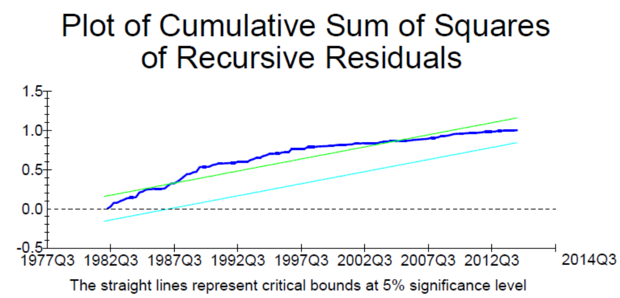
New York

ARDL Model | **Nonlinear ARDL Model**



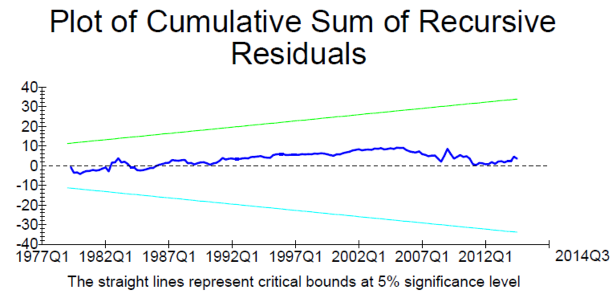


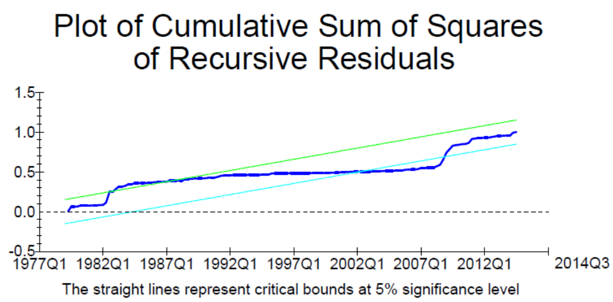




Ohio

ARDL Model





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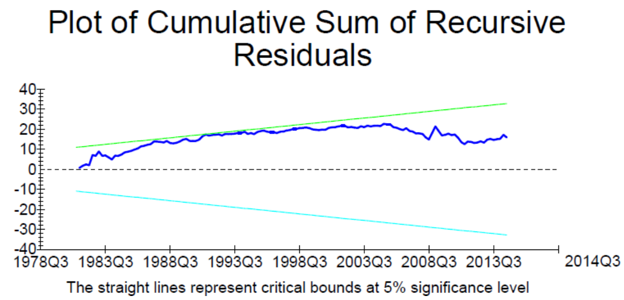
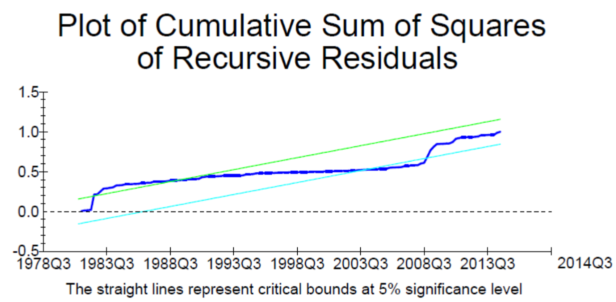
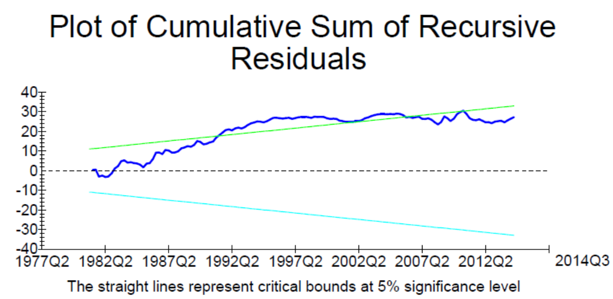
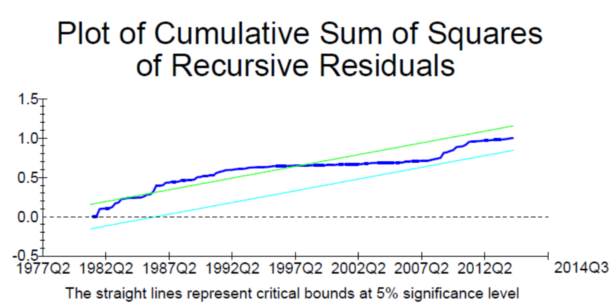




Oklahoma

ARDL Model





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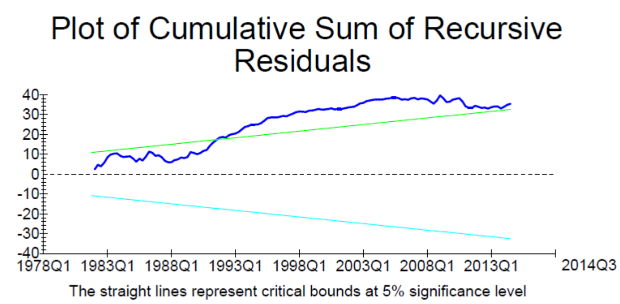
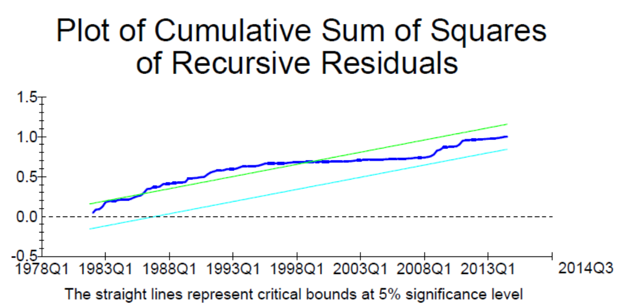
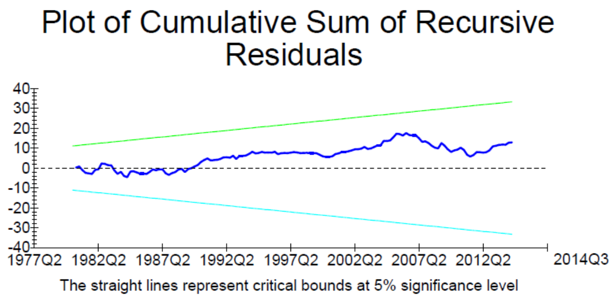
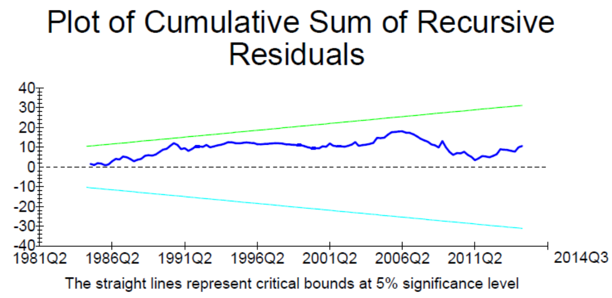


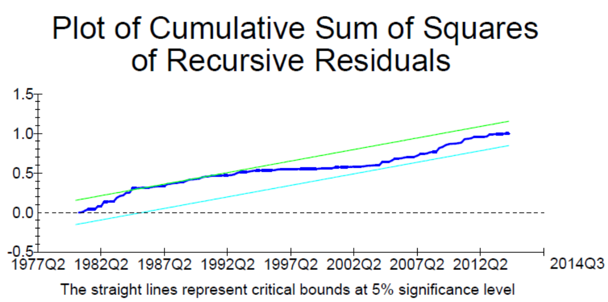


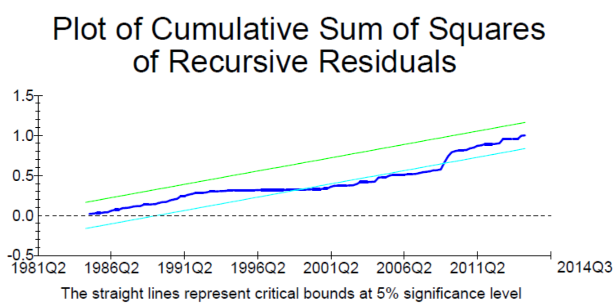
Oregon

ARDL Model	Nonlinear ARDL Model



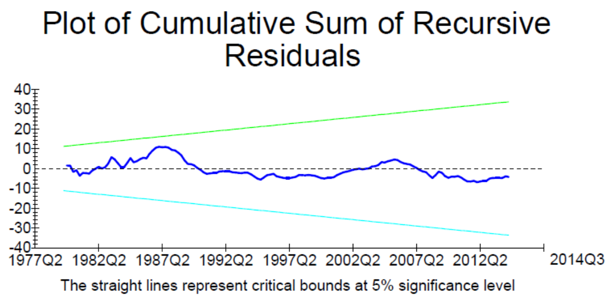


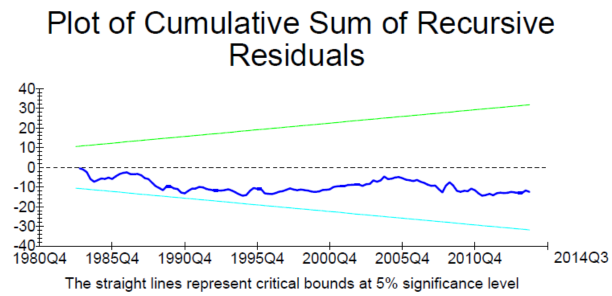


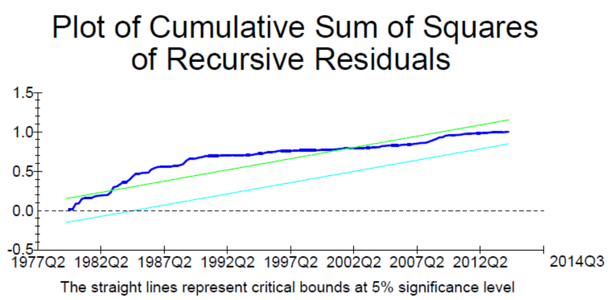


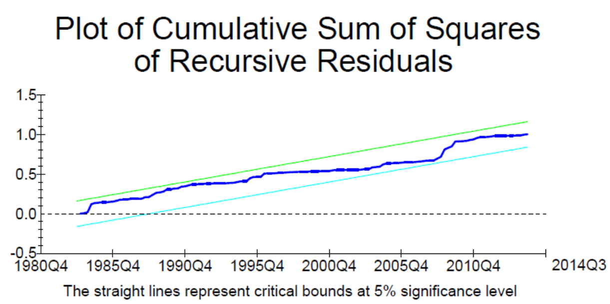
Pennsylvania

ARDL Model	Nonlinear ARDL Model



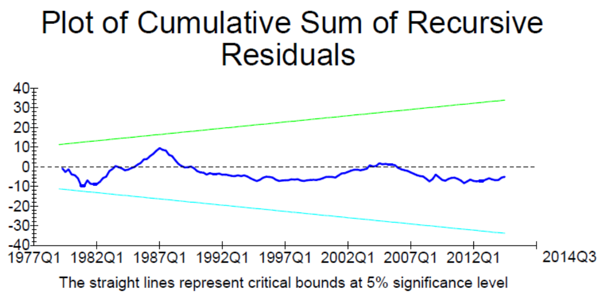


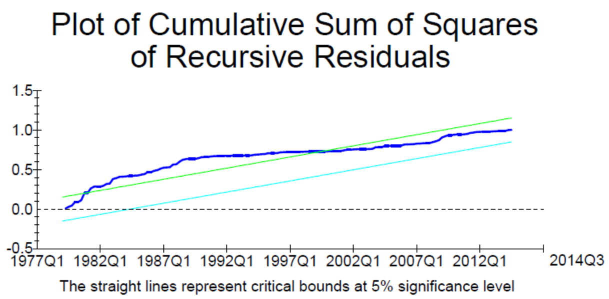




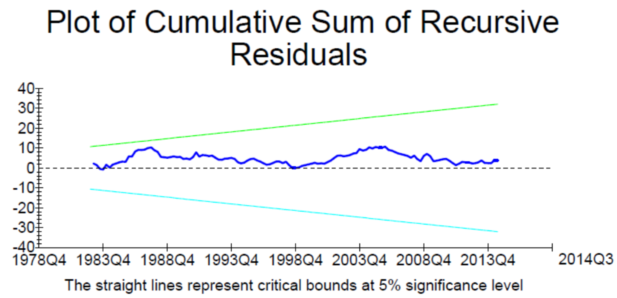
Rhode Island

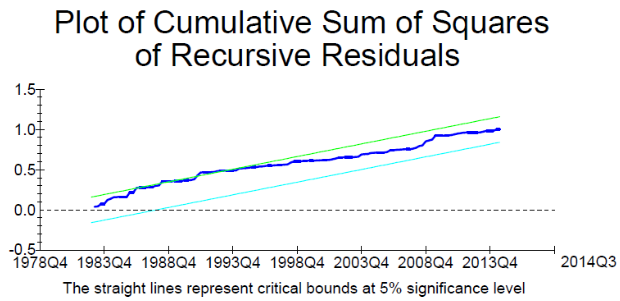
ARDL Model





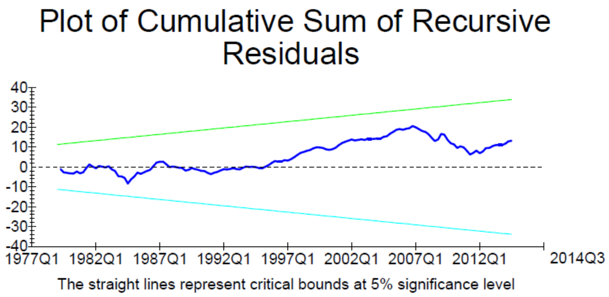
Nonlinear ARDL Model

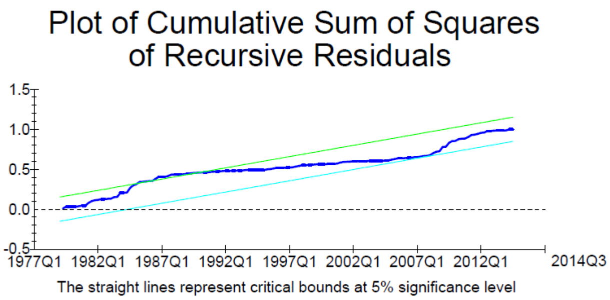




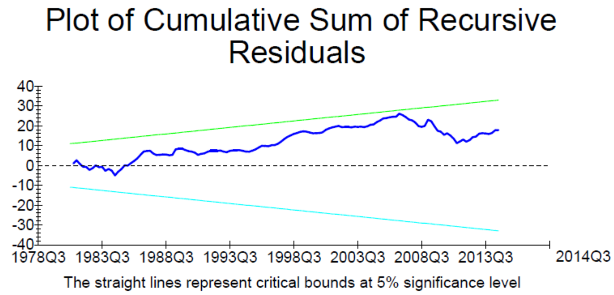
South Carolina

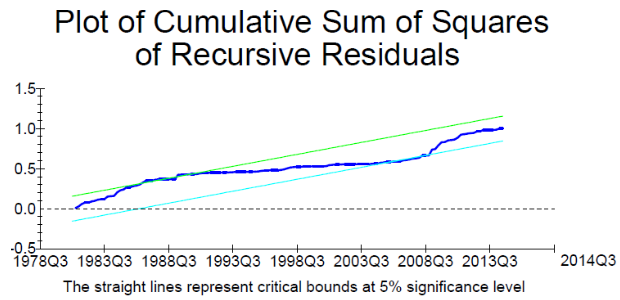
ARDL Model





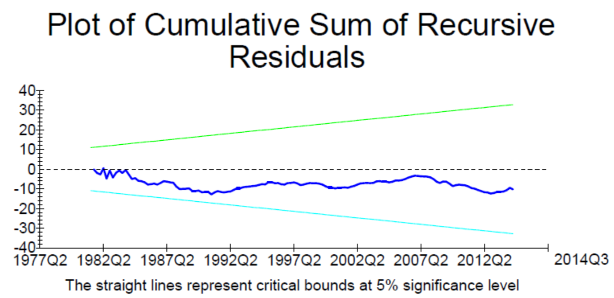
Nonlinear ARDL Model

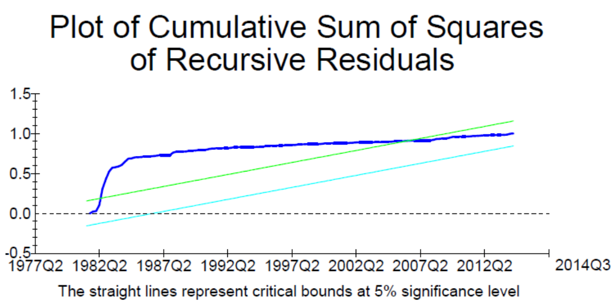




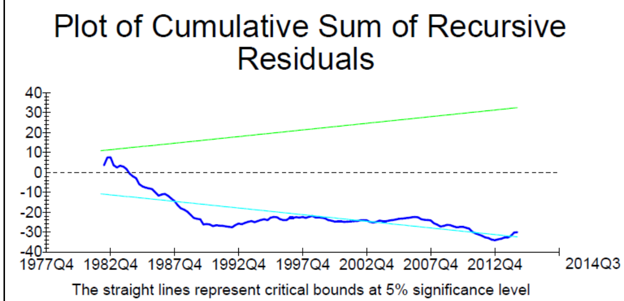
South Dakota

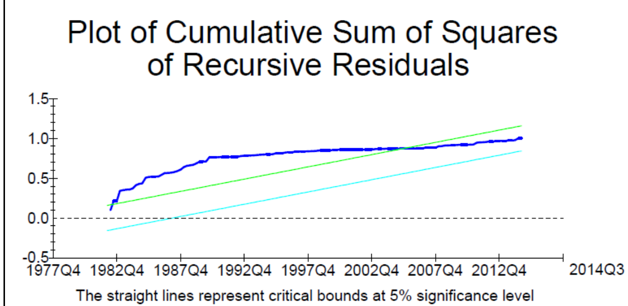
ARDL Model





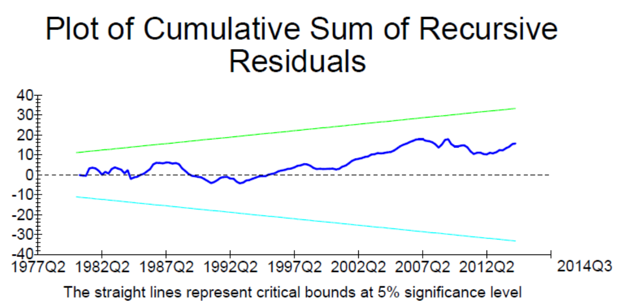
Nonlinear ARDL Model

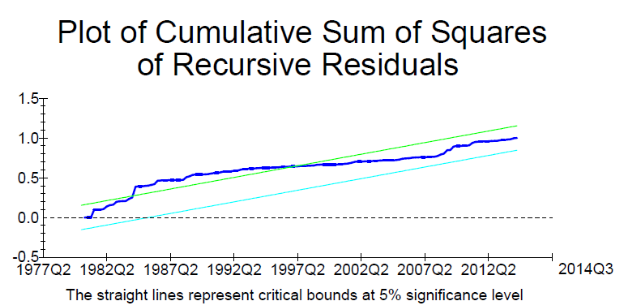




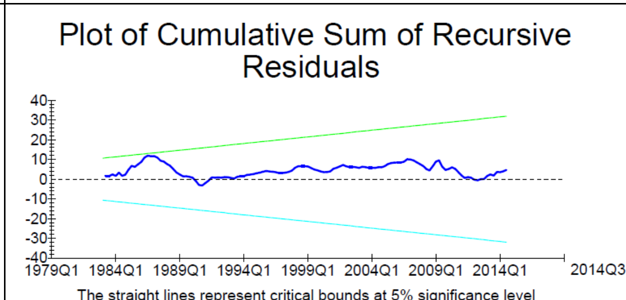
Tennessee

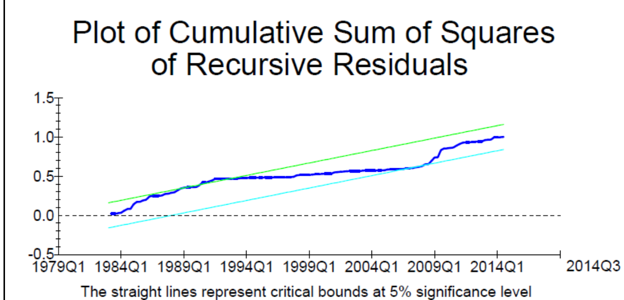
ARDL Model



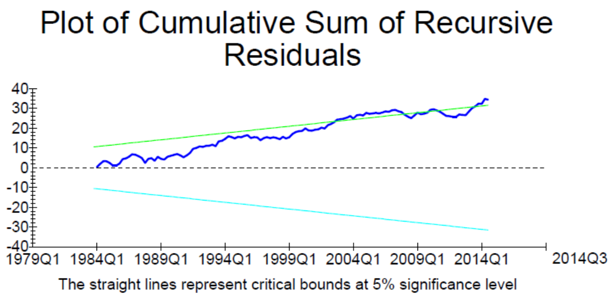
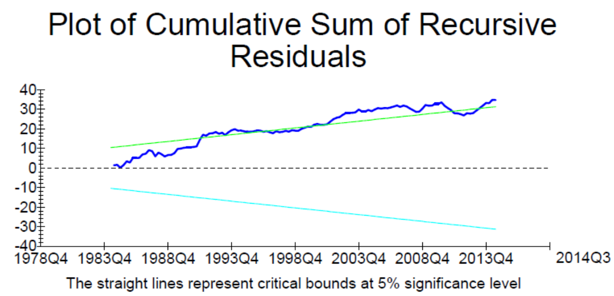
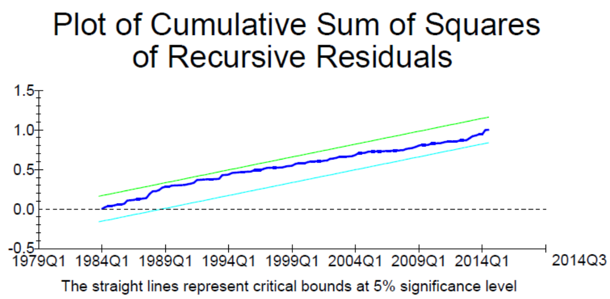
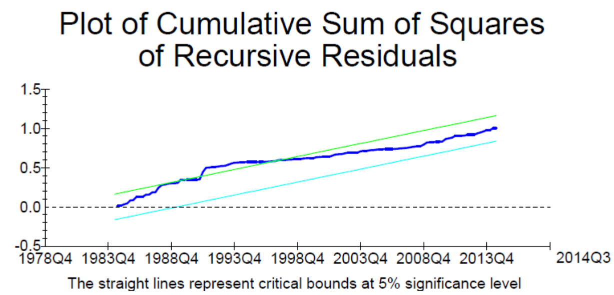


Nonlinear ARDL Model

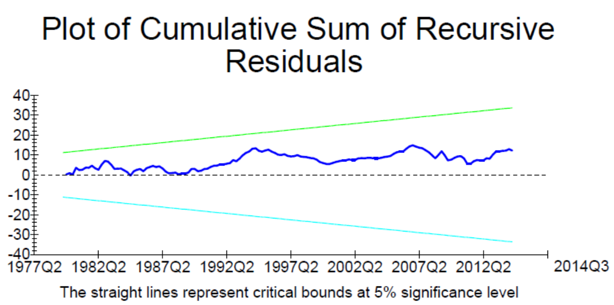
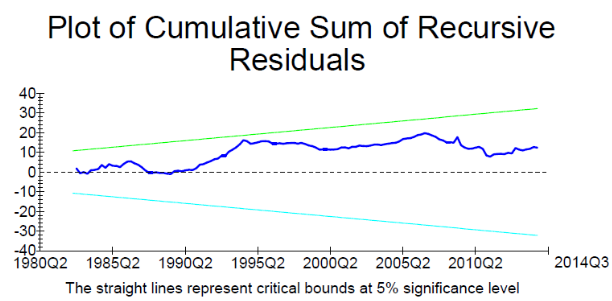
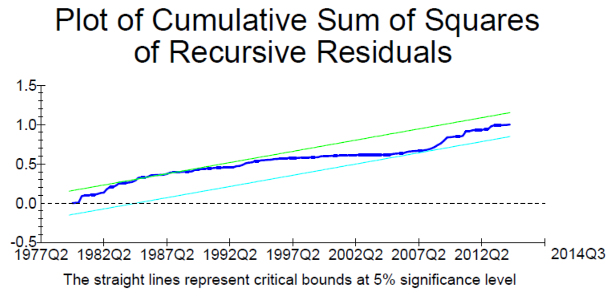
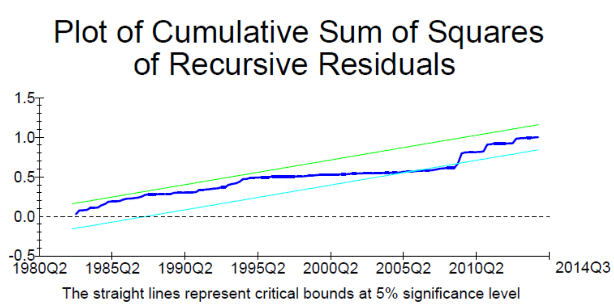




Texas

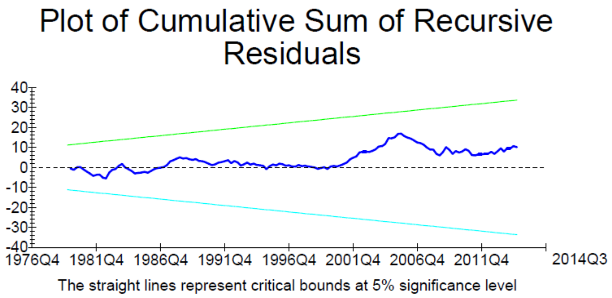
ARDL Model	Nonlinear ARDL Model
	
	

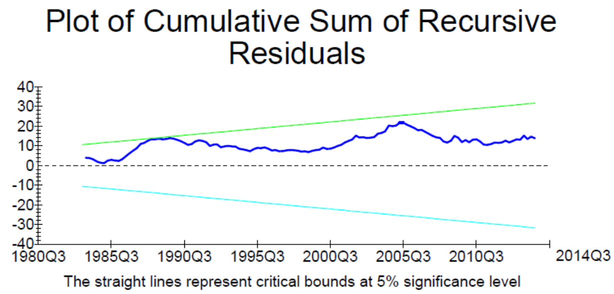
Utah

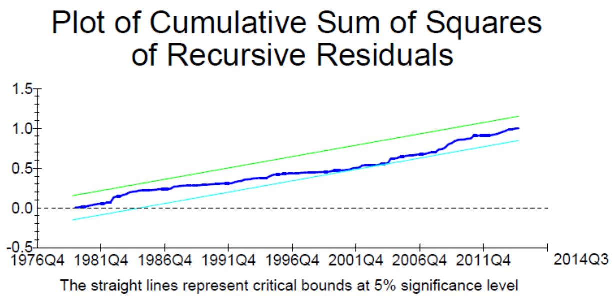
ARDL Model	Nonlinear ARDL Model
	
	

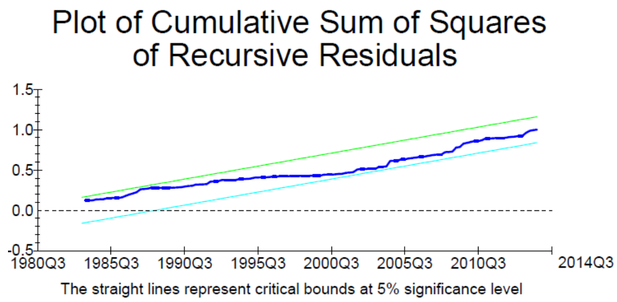
Virginia

ARDL Model	Nonlinear ARDL Model



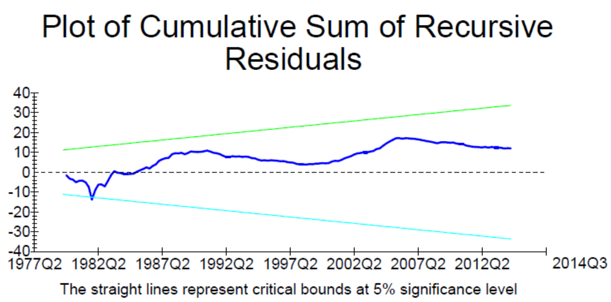


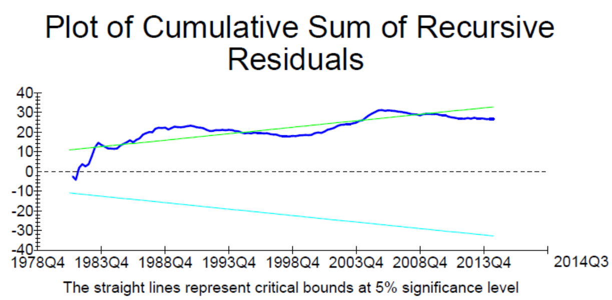


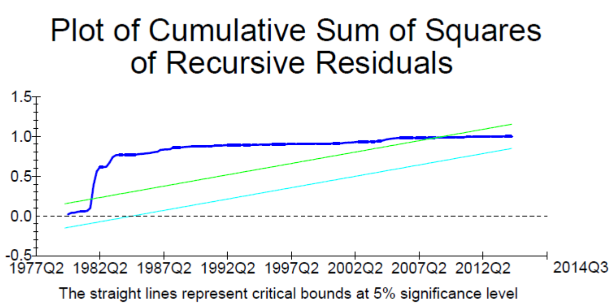


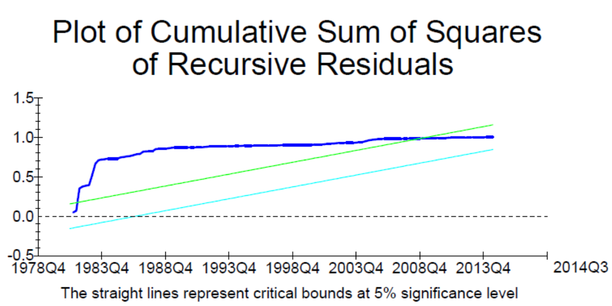
Vermont

ARDL Model	Nonlinear ARDL Model



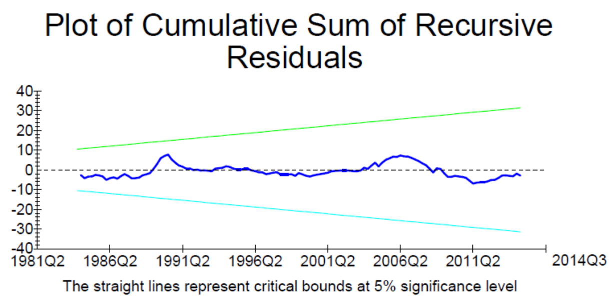


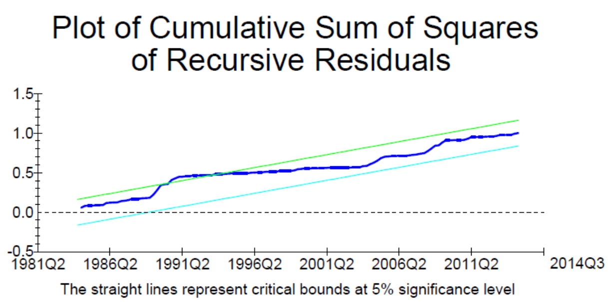




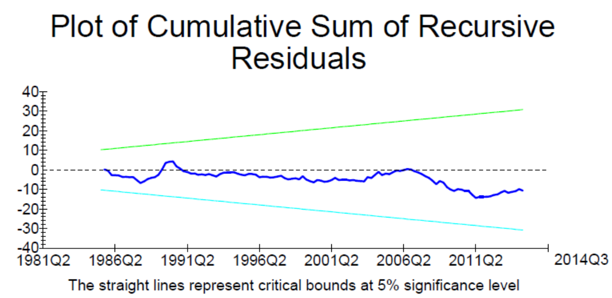
Washington

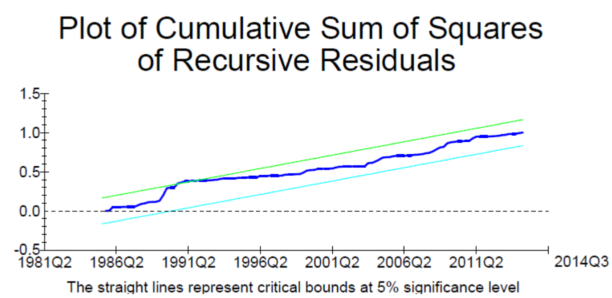
ARDL Model





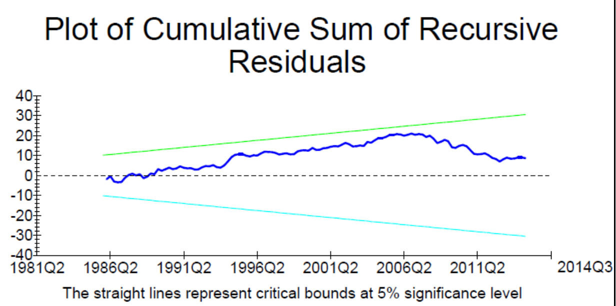
Nonlinear ARDL Model

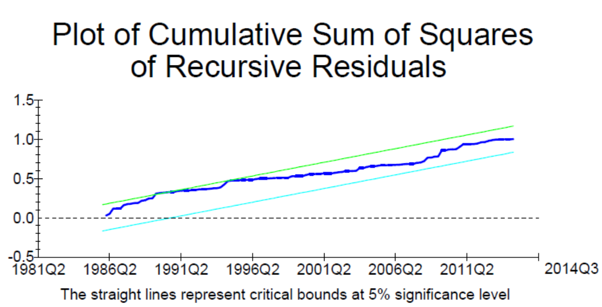




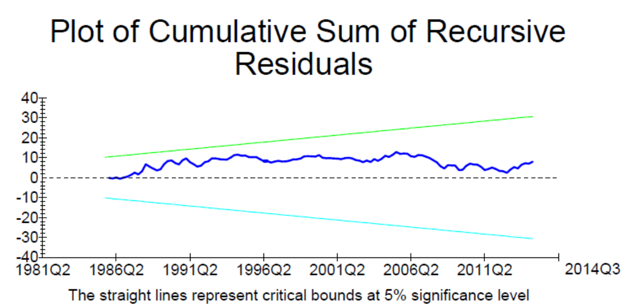
Wisconsin

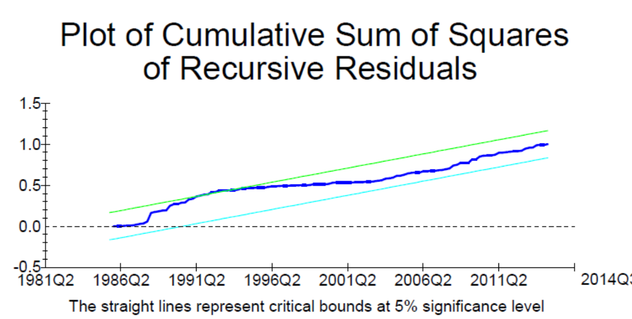
ARDL Model





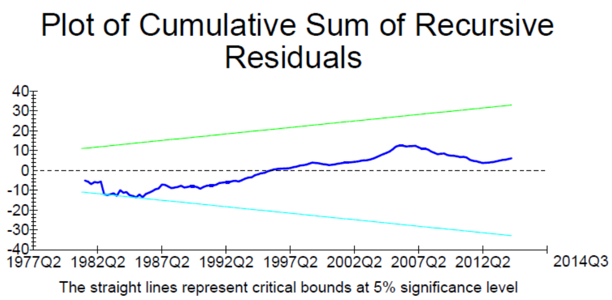
Nonlinear ARDL Model

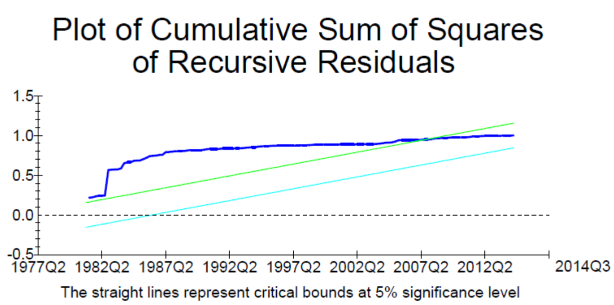




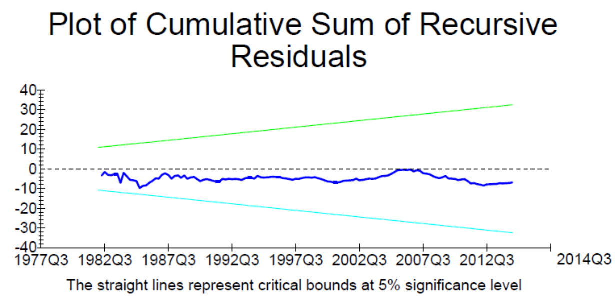
West Virginia

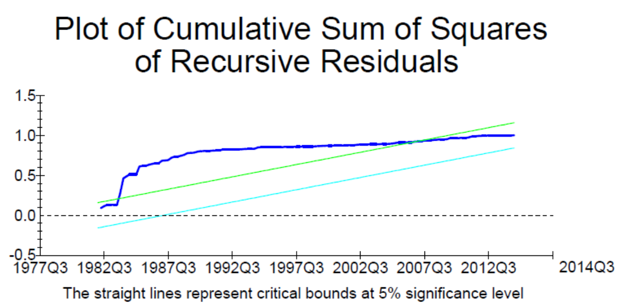
ARDL Model





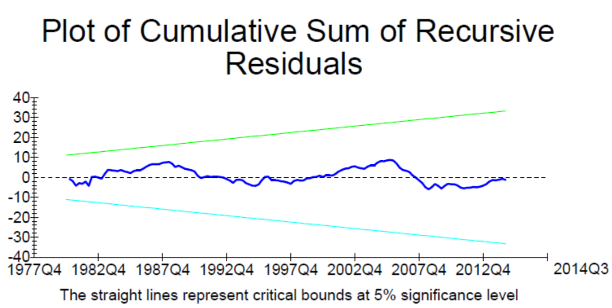
Nonlinear ARDL Model

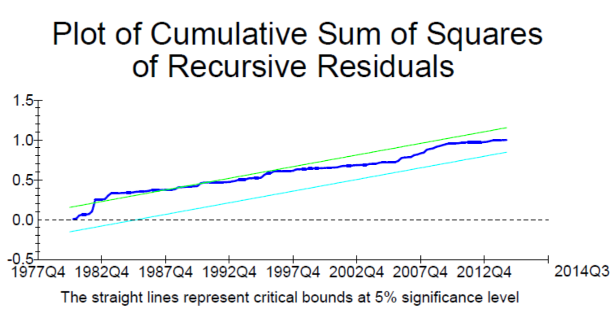




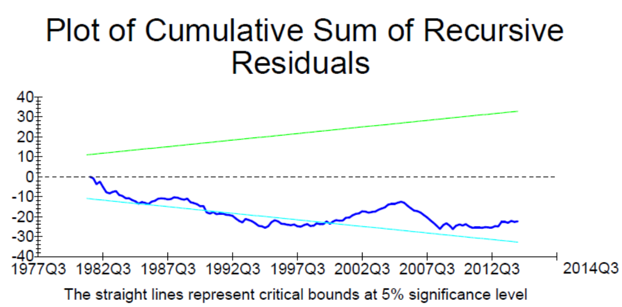
District of Columbia

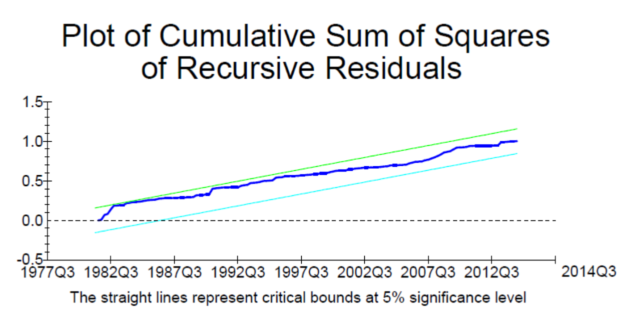
ARDL Model





Nonlinear ARDL Model





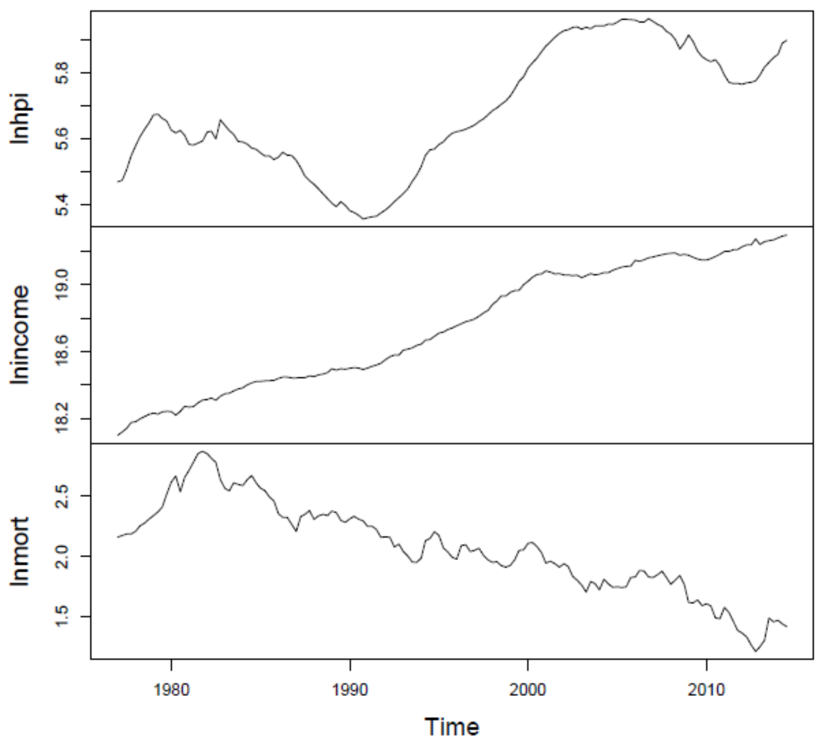
Appendix E: Adjusted R^2 and the Impact of Taking Asymmetric Behaviors into Account on Adjusted R^2

		Linear ARDL	Nonlinear ARDL	R^2 Ranking in Nonlinear Model	Nonlinearity Contribution to R^2
1	**Alaska**	0.2	0.3	30	0.1
2	**Alabama**	0.39	0.49	21	0.1
3	**Arkansas**	0.32	0.42	27	0.1
4	**Arizona**	0.59	0.63	8	0.04
5	**California**	0.75	0.8	1	0.05
6	**Colorado**	0.49	0.56	14	0.07
7	**Connecticut**	0.61	0.55	15	-0.06
8	**Delaware**	0.44	0.46	25	0.02
9	**Florida**	0.58	0.67	5	0.09
10	**Georgia**	0.43	0.48	22	0.05
11	**Hawaii**	0.51	0.71	3	0.2
12	**Iowa**	0.38	0.52	18	0.14
13	**Idaho**	0.43	0.6	11	0.17
14	**Illinois**	0.53	0.59	12	0.06
15	**Indiana**	0.43	0.51	19	0.08
16	**Kansas**	0.39	0.36	29	-0.03
17	**Kentucky**	0.41	0.58	13	0.17
18	**Louisiana**	0.5	0.58	13	0.08
19	**Massachusetts**	0.7	0.72	2	0.02
20	**Maryland**	0.55	0.61	10	0.06
21	**Main**	0.38	0.69	4	0.31
22	**Michigan**	0.39	0.47	23	0.08
23	**Minnesota**	0.44	0.45	25	0.01
24	**Missouri**	0.54	0.56	14	0.02
25	**Mississippi**	0.46	0.54	16	0.08
26	**Montana**	0.49	0.48	22	-0.01
27	**North Carolina**	0.46	0.52	18	0.06
28	**North Dakota**	0.22	0.3	30	0.08
29	**Nebraska**	0.31	0.4	28	0.09
30	**New Hampshire**	0.62	0.63	8	0.01
31	**New Jersey**	0.71	0.71	3	0
32	**New Mexico**	0.3	0.42	27	0.12
33	**Nevada**	0.57	0.63	8	0.06
34	**New York**	0.4	0.4	28	0
35	**Ohio**	0.49	0.52	18	0.03
36	**Oklahoma**	0.41	0.5	20	0.09
37	**Oregon**	0.51	0.65	6	0.14
38	**Pennsylvania**	0.63	0.64	7	0.01
39	**Rhode Island**	0.59	0.62	9	0.03
40	**South Carolina**	0.41	0.47	23	0.06
41	**South Dakota**	0.41	0.56	14	0.15
42	**Tennessee**	0.27	0.42	27	0.15
43	**Texas**	0.44	0.48	22	0.04
44	**Utah**	0.48	0.58	13	0.1
45	**Virginia**	0.5	0.58	13	0.08
46	**Vermont**	0.43	0.43	26	0
47	**Washington**	0.48	0.54	16	0.06
48	**Wisconsin**	0.3	0.45	25	0.15
49	**West Virginia**	0.56	0.67	5	0.11
50	**Wyoming**	0.45	0.53	17	0.08
51	**District of Columbia**	0.44	0.52	18	0.08

Appendix F: Natural Log of HPI, Income and Mortgage Rate Graphs

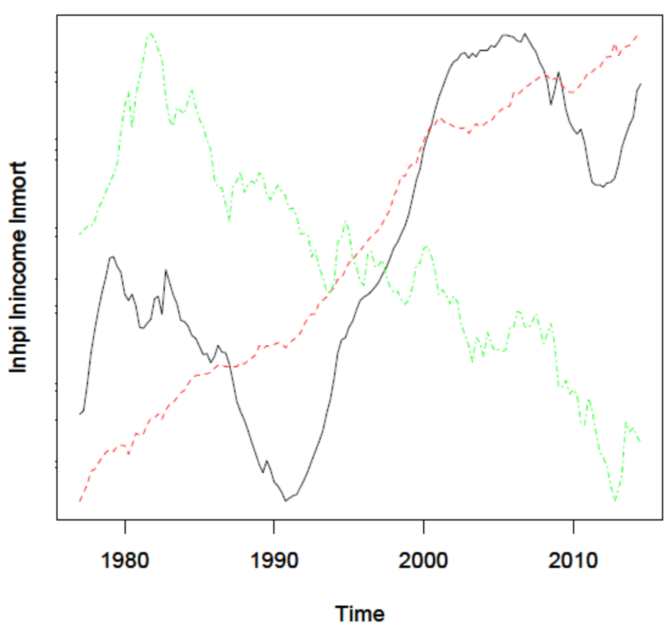
Colorado

Graph of Ln(HPI):lnhpi, Ln(Income): lnincome and Ln(MortRate): Lnmort



Colorado

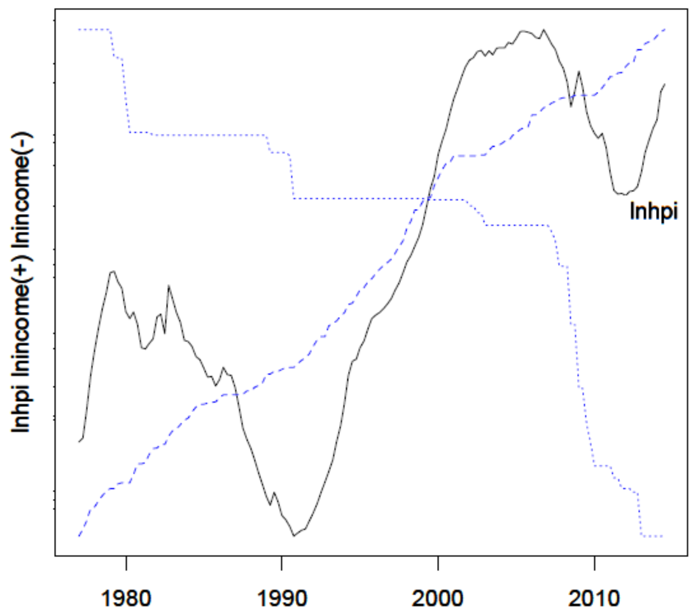
Graph of Ln(HPI):lnhpi, Ln(Income): lnincome and Ln(Mortgage Rate): lnmort



Appendix G: Natural Log of HPI, Income and Mortgage Rate Partial Sums Graphs

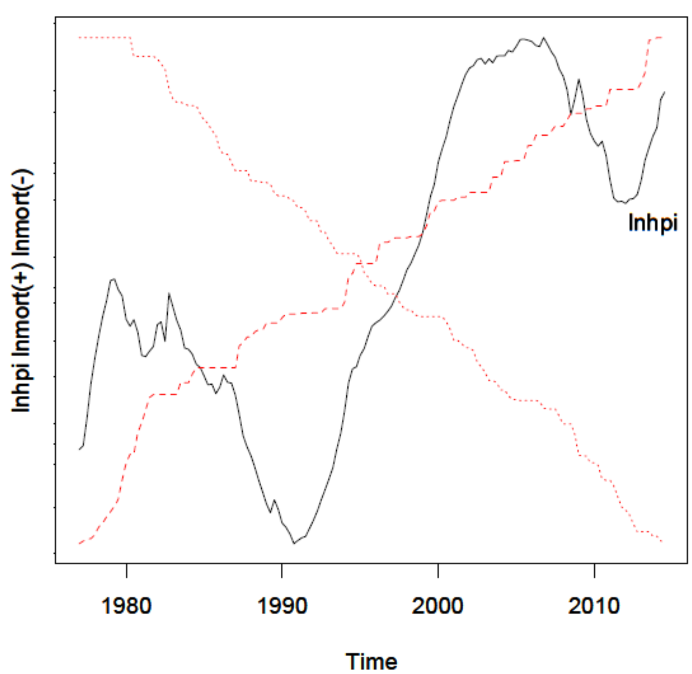
Colorado

Graph of Ln(HPI):lnhpi, Increase in Ln(Income): lnincome(+) and Decrease in Ln(Income): lnincome(-)



Colorado

Graph of Ln(HPI):lnhpi, Increase in Ln(Mortgage Rate): lnmort(+) and Decrease in Ln(Mortgage Rate): lnmort(-)



Seyed Hesam Ghodsi

Department of Economics
University of Wisconsin-Milwaukee
P.O. Box 413, Milwaukee, WI 53211

EDUCATION

University of Wisconsin-Milwaukee Milwaukee, WI
Ph.D., Economics, 2012-2017

Dissertation title: "Do Economic Fundamentals Have Symmetric or Asymmetric Effects on House Prices"

University of Tehran Tehran, Iran
M.A., Economics and Electronic Commerce, (Ranked First) 2006-2008

Thesis title: "Impact of IT on Firm Productivity -- case study of commercial banks"

M.A., Environmental Economics, (Non-degree) 2005-2006

B.A., Economics, (Graduated with Honors in 3 years as Exceptional Talent of the University of Tehran) 2001-2004

RESEARCH EXPERIENCE

University of Wisconsin-Milwaukee Milwaukee, WI
PhD Researcher 2013-2017

- Investigated the short- and the long-run impacts of fundamentals and policy uncertainty on house prices
- Studied asymmetric effects of fundamentals on house prices using Nonlinear ARDL approach
- Employed Phillips, Wu and Yu test of finding bubbles in the United States state-level house prices

PUBLICATION

- "Do Changes in the Fundamentals have Symmetric or Asymmetric Effects on House Prices? Evidence from 52 States of the U.S." ***Applied Economics,*** Vol. 48 (2016, No. 31), pp. 2912-2936, (with M. Bahmani-Oskooee).
- "Asymmetric Causality and Asymmetric Cointegration between Income and House Prices in the USA" ***International Real Estate Review***, Vol. 20 (2017, No.2), pp. 127-165, (with M. Bahmani-Oskooee).
- "Policy Uncertainty and House Prices in the United States of America" ***Journal of Real Estate Portfolio Management***, Vol. 23 (2017, No.1), pp. 73-85, (with M. Bahmani-Oskooee).

SELECTED WORKING PAPERS

- Ghodsi, S. H. "Explosive Behavior in House Prices" 2014.
- Ghodsi, S. H. "To Be or Not to Be, a Natural Monopoly" 2014.
- Ghodsi, S. H. "Impact of IT on Firm Productivity -- case study of commercial banks" 2008.
- Ghodsi, S. H. "Intellectual Property and Cyber Law Adoption in Iran" 2007.

ACADEMIC EXPERIENCE

University of Wisconsin-Milwaukee, Department of Economics Milwaukee, WI
Instructor 2013-2016

- Principles of Macroeconomics, 7 Classes
- Economic Development, 2 Classes

Teaching Assistant 2013-2016

- Principles of Macroeconomics , 6 Classes & 2 Online Classes

Supplemental Instruction Leader 2012

- Principles of Macroeconomics, Large class of about 400 students

University of Tehran, Department of Economics Tehran, Iran
Instructor 2006

- Mathematical Economics

Teaching Assistant 2003-2010

- Financial Economics (Graduate & Undergraduate levels), 5 Classes
- Production Management
- Mathematical Economics, 3 Classes
- Mathematics I and II, 8 Classes
- Statistics II