Unemployment Insurance Trust Fund Loans

What Factors Led States to Borrow During and After the Great Recession?

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Executive Summary

Unemployment Insurance (UI) figured prominently into policy makers' response to the Great Recession. However, high long-term unemployment drained reserves in 36 of 53 states' and territories' ("states") UI trust funds. Insolvent states relied heavily on federal loans to continue paying benefits. As of December, 2011, 26 of these "borrower" states had outstanding loan balances of over $36 billion. Under current law the loans must be paid back. Since retiring these obligations could displace spending in other areas of state budgets, understanding the causes of borrowing is very important.

Wayne Vroman, a UI policy specialist at the Urban Institute, attributes trust fund insolvency (and, by extension, the need to borrow) during and after the Great Recession to pre-recession underfunding and a confluence of cyclical factors, including the recession's timing, depth, duration, and residual impact on state UI tax revenues. The Government Accountability Office also attributes insolvency to state policies, especially low and persistently declining employer payroll taxes (UI's primary financing mechanism) and taxable wage bases that have not kept pace with wage growth.

In this capstone, I use Vroman's and GAO's work as a guide to formulate and test hypotheses about UI trust fund borrowing over the 2008-2011 time period, which captures the Great Recession and a substantial portion of the ensuing recovery. Controlling for average annual unemployment and select economic and fiscal variables, I find that states with higher pre-recession reserves were significantly less likely to be borrowers between 2008 and 2011. Among borrower states, higher reserves are also associated with lower net indebtedness, but it appears that this relationship is not linear; more reserves reduce debt for borrower states with very low pre-recession funding, but the effect tapers off as pre-recession funding approaches the Department of Labor's recommended level.

A higher share of real estate in state GDP is associated with a higher likelihood of borrowing, but this finding is probably an anomaly attributable to the industry's unique role in bringing on the Great Recession. Hence, its policy relevance is not clear. I do not find that higher tax rates and larger taxable wages bases reduce the likelihood of borrowing. Contrary to suggestions from Vroman and GAO, I also find that having an indexed wage base is unrelated to borrowing. This result may be the product of measurement error, but it calls into question claims about the relationship between indexation and solvency.

The primary policy recommendation from this research is that states should maintain adequate trust fund reserves, since adequate reserves are associated with both a lower borrowing probability and, conditional on borrowing, lower net indebtedness.

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Introduction

Unemployment Insurance (UI) is a major component of the U.S. safety net and played an important role in policymakers' response to the Great Recession. However, one of the recession's defining characteristics, high long-term unemployment, put unprecedented stress on the trust funds out of which states and territories ("states") pay unemployment compensation. Between 2008 and 2011, 36 of 53 states exhausted their funds' reserves and requested loans from the federal government to continue paying benefits (Vroman, 2011).[1] As of December, 2011, 26 of these "borrower states" had outstanding loans of over $36 billion (Dept. of Labor, 2011). In this capstone, I analyze the relationship between borrower state status and net indebtedness, tax policy, and trust funds' pre-recession reserve levels. I study these variables over the 2008-2011 time period, which captures both the Great Recession and a substantial portion of its aftermath.[2]

My empirical model proceeds in two stages. Stage one models the incidence of borrowing, stage two the size of borrower states' loan balances as of December 31, 2011. Controlling for average annual unemployment rates, shares of revenue from major sources, and concentration in select pro-cyclical industries, I find that states with higher pre-recession reserves were significantly less likely to need a trust fund loan between 2008 and 2011. Among borrower states, higher pre-recession reserves are also associated with lower 2011 year-end loan obligations, but the effect is not linear. Borrowing was significantly more likely among states with higher shares of real estate in gross domestic product (GDP), but not influenced by

[1] Two more states – Texas and Idaho – replenished their trust funds with proceeds from private bond sales. However, for the purposes of this analysis, am I concerned only with federal assistance. Thus, I do not treat either as a borrower state.

[2] According to the National Bureau of Economic Research (NBER), the Great Recession lasted from Dec. 2007 – June 2009 (peak to trough).

shares in other industries. Borrowing is not predicted by states' UI tax rates or the size of their taxable wage bases. Contrary to claims in the UI policy literature, I also find that borrowing is not predicted by whether a state indexes its base to wage cost growth, though this result may be the product of measurement error.

In total, my findings suggest the key to solvency (or, in the event of insolvency, to minimizing net indebtedness) is maintaining adequate trust fund reserves. While real estate's effect on borrower status is quite strong, its policy implications are unclear. Indeed, the finding probably cannot be extrapolated to other time periods; it is more likely an anomaly attributable to the industry's collapse and subsequent drag on macroeconomic conditions over the 2008-2011 time period.

Background

What is UI and how is it financed?

Congress created UI with the Social Security Act of 1935. Its objectives are to (i) provide temporary, partial wage replacement to eligible workers unemployed through no fault of their own (and who meet other state eligibility requirements) and (ii) stabilize the economy during recessions. The program is financed with state and federal employer payroll taxes. These taxes are assessed to the employer on employee wages. The Federal Unemployment Tax Act (FUTA) set the federal taxable wage base at $7,000. State wage bases vary; the only limitation is that they meet the FUTA minimum. Table 1 in Appendix A reports wage bases by state for the years 2008-2011.

The current FUTA tax rate is 6.0 percent.[3] Employers are afforded a 5.4 percent credit if their states' UI programs comply with federal standards. Assuming compliance, the effective FUTA rate is therefore 0.6 percent, or $42 per employee. FUTA proceeds finance federal and state UI administrative costs, the federal share of the Extended Benefits (EB) program, and loans to insolvent state UI programs. Each state's FUTA proceeds are held in its account in the Unemployment Trust Fund (UTF), which is managed by the Treasury Department. Payouts occur annually for administrative costs and periodically for other purposes.

Congress grants states considerable flexibility in setting their own tax rates (for instance, unlike the taxable wage base, state rates are not subject to a floor). In general, states set their rates using a system called *experience rating*. The idea behind this system is that employers whose layoffs consume more UI benefits should pay higher taxes, up to a statutory maximum

[3] Prior to June 30, 2011, the FUTA tax included a 0.2 percent surcharge, making the statutory rate 6.2 percent and the effective rate 0.8 percent ($56 per employee).

rate. There is also a statutory minimum rate (which in handful of states is zero percent), and in some cases a special rate for new employers. Tables 2 and 3 in Appendix A report statutory minimum and maximum rates by state for the years 2008-2011.

States' UI tax proceeds accumulate as reserves in their UTF accounts. These reserves finance regular UI benefits and the state portion of the EB program. There is no minimum reserve requirement, though the Department of Labor (DOL) recommends holding enough to pay benefits at historically high rates for a year. A commonly accepted measure of reserve adequacy is the high cost multiple (HCM). This measure divides a state's periodic reserve balance as a percentage of total wages (also called its "Reserve Ratio," or RR) by its highest recorded annual benefit-cost rate, which is annual benefits paid as a percentage of total taxable wages. A related measure is the average high cost multiple (AHCM), which divides the reserve ratio by the average of the three highest annual benefit-cost rates in the last 20 years (or a period including three recessions, if longer). Both measures are ratio scaled. Thus, a multiple of 1.0 indicates a state has enough reserves to pay record-level benefits for year, a multiple of 0.5 for a half-year, etc. Table 4 in Appendix A reports HCMs, AHCMs, and dollars of reserves by state for the most recent pre-recession reporting period – Q32007.[4]

Terms and conditions of UI trust fund loans

Upon exhausting their reserves, states may suspend benefits or borrow to continue payment. Since suspension entails full loss of employers' FUTA credit, the incentive to seek lending assistance is strong.

[4] For the remainder of the paper, I refer to AHCM when discussing reserve adequacy. However, the choice of one measure vs. the other does not materially alter the paper's results or conclusions.

Federal lending to state UI funds is authorized under Title XII of the Social Security Act. Loans are extended from the Federal Unemployment Account (FUA), a dedicated special purpose account in the UTF. To secure a loan, a state governor or his or her designee petitions the Secretary of Labor, who may approve or deny the request. Pending approval, Labor directs Treasury to transfer funds from the FUA to the state's UTF account. Lending occurs in three month increments, with transfers occurring monthly up to the requested loan amount. If a state needs additional loans, it repeats the process. In theory, no loan or combination of loans can exceed the FUA's available funds. However, during the Great Recession, extraordinary demand for loans depleted the FUA's resources, forcing Treasury to divert money from other accounts to ensure continued availability of credit.

Under current law, states must pay back their loans. Before 1982, repayment pertained to principal only (i.e. lending occurred on a cash flow basis). After 1982, Congress required interest for loans not paid back in the same fiscal year they were originated.[5] Interest rates are set equal to the rate the federal government paid on state UTF reserves as of December 31 in the year prior to delinquency. The maximum chargeable rate is 10 percent. Failure to pay interest results in complete loss of the FUTA credit.[6]

Failure to pay principal can also result in partial FUTA credit reductions. If a state does not pay its principal in full by November 10 of the second year after receiving a loan, its effective FUTA rate increases 0.3 percent ($21 per worker). Further delinquency entails

[5] The decision to charge interest resulted from a recommendation made by the 1980-81 National Commission on Unemployment Insurance, which Congress created in response to trust fund solvency issues arising from recessions in 1973 and 1978.

[6] The American Recovery and Reinvestment Act (ARRA) waived interest payments from the date of its enactment (February 13, 2009) to December 31, 2010. In February, 2010, Representative Peter Welch (D – VT) sponsored legislation to extend the interest rate holiday through 2012. However, Members did not put the measure to a vote; interest charges therefore resumed on January 1, 2011.

additional 0.3 percent increases, which are assessed retroactively for each year the delinquency is not cured. Labor projects borrower states' effective FUTA rates will increase anywhere from 0.3 to 0.9 percent in 2012 (Dept. of Labor, 2012).

Trust fund loans and the Great Recession: Perfect storm?

Concern over UI trust fund solvency stretches back several decades. Starting in the 1970s, insolvent states relied heavily on federal assistance to get through a string of recessions. This called into question states' UI financing models and prompted Congress to commission two formal reviews of the UI system (one in 1980-81, the other in 1994-1996). The reviews led to a few changes in federal-state UI financing policy (e.g. recommendations from the 1980-81 National Commission on Unemployment Compensation led Congress to require interest on FUA loans), but trust funds have in general been underfunded in the years leading up to the last several recessions; their reserve levels have not improved much in the ensuing recoveries.[7]

As shown by Figure 1 in Appendix B, underfunding was especially problematic in the period between the dot-com bubble and the Great Recession (roughly 2001-2007). In fact, in a report written for the Urban Institute, Wayne Vroman (2011) claims low pre-recession reserves, along with the recession's timing, depth, duration, and residual impact on UI tax revenues created a "perfect storm" for trust funds.

Pre-Recession Underfunding. Figure 1 clearly shows that states did not possess adequate reserves in the years leading up to the Great Recession. In Q32007, aggregate reserves were high enough to pay record benefits for just six months (aggregate AHCM=0.51),

[7] See, for example, GAO's 1988 assessment of UI financing trends (*Unemployment Insurance: Trust Fund Reserves Inadequate*. GAO/HRD-88-55, Washington, D.C. (September, 1988)) and its 1993 report on the relationship between underfunding, tax policy, and the UI program's ability to meet its objectives (*Unemployment Insurance: Program's Ability to Meet Objectives Jeopardized*. GAO/HRD-93-107, Washington, D.C. (September 1993)).

and only 16 of 53 UI programs had AHCMs ≥ 1.0 (i.e. enough reserves to pay record benefits for a year or more).

Recession's Timing and Severity. Even though the recession's official starting date is December, 2007, Vroman notes that "increased recession-related benefit payouts did not begin until the last half of 2008" (p. 2). Since states use year-ending reserves to reset their UI tax rates – and most operate according to a June 30 fiscal year-end – the FY2009 (i.e. July 1, 2008) reset did not account for the coming reductions in reserve balances. Therefore, tax revenues did not begin to replenish declining reserves until rates could be raised in July, 2009 – the recession's official ending point.

Even with the recession over, high unemployment persisted. As Figure 2 in Appendix B shows, the national unemployment rate increased significantly between 2007 and 2009, and only started to come down in 2011. With so many people out of work, demand for jobless benefits (and resulting stress on trust funds) remained high well after the economy began to recover.

Low Post-Recession Tax Revenues. Following the July 2009 reset, statutory minimum and maximum rates rose in all 53 state programs. Figures 3 and 4 in Appendix B show that both absolute revenues and revenues as a share of total wages rose in response. According to Vroman, however, between 2009 and 2011 relatively depressed UI-taxable employment (i.e. the labor force subject to state UI taxes) caused states to forgo revenue they would otherwise

have collected. Thus, even though rates went up, lower taxable employment (and therefore lower total taxable wages) put a drag on revenue collections.[8]

Trust fund loans and the Great Recession: Policy problems?

High benefit outflows and low revenue inflows likely explain much of states' need to borrow during and after the Great Recession. In an April, 2010 report, the Government Accountability Office also attributed borrowing to state policies. In particular, GAO cited low and persistently declining employer payroll tax rates, along with taxable wage bases that have not kept pace with wage growth, as primary policy-related drivers of insolvency (GAO, 2010). GAO's analysts also echoed Vroman by noting that average funding levels were lower prior to the Great Recession than in like periods prior to the last three recessions. Hence, low pre-recession funding may have also contributed to trust funds' subsequent financing issues.

Hypotheses

The reports from Vroman and GAO are part of a small literature which, at least to the author's knowledge, does not include any econometric analyses of states' Great Recession-era borrowing behavior.[9] Given both the prevalence and magnitude of borrowing during this time, the opportunity seems ripe for such a project.

Since existing research (i.e. Vroman's and GAO's work) points to pre-recession reserves and tax policy as potential predictors of insolvency, a logical starting point may be to test the following two hypotheses (each of which corresponds to the years 2008-2011).

[8] Based on UI-taxable employment's divergence from pre-2009 trend growth (approximately 1 percent per year), Vroman estimated states' forwent about $3 billion per year in tax revenue between 2009 and 2011.

[9] Wenger and Smith (2011) use panel estimation to test whether UI trust fund solvency influences benefit generosity, but further scans of the literature did not turn up a single analysis that treats solvency as the dependent variable.

Hypothesis 1 - Pre-Recession Reserves

Lower pre-recession reserves increase the likelihood of borrowing. Conditional on borrowing, lower pre-recession reserves lead to larger 2011 year-end net indebtedness.

Hypothesis 2 – Tax Policy

Lower statutory minimum and maximum tax rates, smaller taxable wage bases, and bases not indexed to wage cost growth increase the likelihood of borrowing.

I do not suggest a relationship exists between tax policy and net indebtedness because it is not clear that features of the UI tax system have any bearing on loan size. Indeed, while the literature suggests tax policies influence states' *need* to borrow, it does not indicate that these decisions influence *the magnitude of borrowing* (and by extension, states' net debt positions). I therefore assume tax policy (along with a set of state-specific economic and fiscal controls) is unrelated to 2011-year end net indebtedness.

Data and Empirical Approach

The data set here consists of annual data for the 48 contiguous states for the period 2008-2011.[10] The dependent variables are borrower state status between the years 2008 and 2011 and net indebtedness as of December 31, 2011. Since I only observe borrower status between the beginning and ending points of the time period in question, and only observe debt levels at the end of the period (that is, I do not observe borrower status and net debt each year), my data do not meet the prerequisites for panel estimation.

[10] As is common with many state-level empirical analyses, I exclude Hawaii, Alaska, Washington D.C., the Virgin Islands, and Puerto Rico due to lack of comparability. Note that this may create a discrepancy between the summary statistics and figures mentioned in the Background section (which, unless otherwise noted, pertain to all 53 UI programs).

My explanatory variables include annual observations of select economic, financial and tax policy measures for the 48 contiguous states for the period 2008-2011. Since I do not have the data necessary for a panel, I take four-year averages of the annual observations for each variable for each state. In general, the four-year average period is 2008-2011, unless the variable is not available over that time, in which case I take the average of the most recent four years for which I have data. Table 1 in Appendix C provides the name, abbreviation, definition, and time period for each of my dependent and explanatory variables. Table 2 provides summary statistics.

My empirical analysis proceeds in two stages. I model borrower state status in stage one and 2011 year-end net indebtedness in stage two.[11] Binary variables like borrower status are best (i.e. most efficiently) estimated using a class of models called limited dependent variable models (LDVs). The mechanics of these models vary, but their logic is the same. Each begins with the assumption that there is an underlying propensity toward some behavior. This propensity, Y*, is unobserved. Only the behavior itself, Y, is visible in the data. Formally,

$$Y^* = \underline{X}'\underline{\beta} + \varepsilon$$

where X is a vector of explanatory variables, β is a coefficient vector, and ε is a generic error term. In the data, Y* is transformed into the discrete outcome Y. In the case of a binary outcome, $Y \in \{0,1\}$ where

$$Y = \begin{cases} 1 \; Y* > 0 \\ 0 \; Y* \leq 0 \end{cases}$$

[11] A multi-stage approach is necessary to guard against selection effects, which could bias estimates of the coefficients in the net indebtedness equation. In essence, my model is analogous to a hedonic model of wages, which researchers commonly estimate in two stages (stage one=work or don't work, stage two=wage level) to ensure unbiased estimates of the effects of education, experience, and other relevant variables on individuals' wage levels.

It is common to use either of two types of LDVs to model binary outcomes – logits and probits. I initially modeled borrower status using a probit. Probit models fit the propensity which, as noted, does not correspond to any observable variable; instead, the binary outcome relates only to the sign of the propensity, greater than or less than zero. It is possible for a probit model to fit perfectly if one or more variables create an apparent propensity which matches the positive and negative values. A regression cannot do this because it is constrained to match the scale and range of the dependent variable. That is, a probit can fit too well, resulting not in a "high r square" but in infinite propensities, which cannot really be true in life, but could be in a small data set. This is especially likely if the process is rather predictable. It turns out that state UI trust fund borrowing is such a process. In fact, in initial estimations, pre-recession reserves, statutory minimum and maximum tax rates, and real estate's share in state GDP predicted borrowing perfectly. Perfect prediction renders the probit model uninterpretable, with no standard errors and no coherent meaning (the logit failed in the same way, with the same problem).

Since both the probit and logit failed, I estimated results for stage one (borrower status) using a linear probability model (LPM), or the OLS approach to limited dependent variables.[12] Stage two is also estimated using OLS, but the dependent variable (net indebtedness) is continuous, so none of the technical concerns of the LPM apply. Given that both stages use least squares, I am in effect using Olsen's (1980) least squares selectivity bias approach to

[12] In general, logits and probits are preferable to the LPM, since it is always heteroscedastic and can predict probabilities outside the zero-one range. However, the LPM requires no assumption about the distribution of the error term, and its heteroscedasticity can be corrected using robust standard errors. Furthermore, since most applied policy research is concerned with estimating marginal impacts, the choice between LPM and probit (or logit) is not overly important; since the LPM coefficients are a very close approximation of the probit's marginal effects.

complete my estimation. The Olsen approach estimates stage one, predicts fitted values on the basis of the results, and uses these values as an explanatory variable in stage two. Like LPM itself, the advantage of the Olsen approach is that it makes no assumptions about the error term (i.e. it is robust to alternative assumptions of the error term's distribution). A drawback is that it absolutely requires unique identification in the form of one or more variables in the first stage that are not used in the second stage.[13] However, since I assumed that tax policy variables (along with the other controls) only influence the decision to borrow – and do not influence net indebtedness – stage one is uniquely identified. Thus, I can proceed using Olsen's approach.

Estimation Results and Discussion

Stage One – Borrower Status

Table 1 in Appendix D presents estimation results from stage one of the Olsen Model. In general, signs on the coefficients make sense, though only two variables – pre-recession reserves and real estate's share in GDP – influence borrowing at a 5 percent significance level. Both explain a substantial portion of the variation between borrower and non-borrower status ($R^2 = 0.67$), and each one's effect size is economically significant. For example, a one standard deviation increase (approx. 2.5 percent) in real estate's share of GDP increases the probability of borrowing by about 23 percent, while a similar increase (i.e. one standard deviation, or approx. 0.5) in the Q32007 AHCM *reduces* the probability of borrowing by about 30 percent. A two standard deviation increase in AHCM (i.e. 1.0, or a reserve level commensurate with Labor's recommendation) reduces the probability of borrowing by *60 percent*. The policy

[13] Similar techniques, such as those developed by Heckman, are not constrained in this fashion.

implications of this result are clear: if a state wishes to minimize its need for federal UI assistance during a recession, it needs to maintain adequate trust fund reserves in the pre-recession period.

The policy implications of the real estate effect are less clear, though it is unsurprising that a higher concentration in this industry is associated with a higher likelihood of borrowing over the 2008-2011 time period. It is surprising that tax policy variables do not influence borrowing over this period, especially since the UI policy literature references tax policy as a driver of insolvency. As just one example, I do not find that higher statutory tax rates or tax base indexation have a significant influence on borrowing, despite the fact that GAO suggested a relationship existed between these variables and insolvency in its April, 2010 report. It may be that a single indicator for indexation suffers from measurement error, since different states peg their bases to different measures of wage cost growth. However, I did not consider alternative specifications of this variable.

Stage Two – Net Indebtedness

Table 2 in Appendix D presents results of the stage two estimation. As discussed above, this estimation does not control explicitly for tax policy or the other control variables from stage one. Rather, the specification includes only ACHMQ307 and FITTEDVALUES, which are the predicted probabilities from the stage one model.[14] Though both variables signs' make sense (higher reserves = lower net indebtedness and higher borrowing probability = higher net indebtedness), neither is significant at a 5 percent level. The insignificance of FITTEDVALUES implies that UI trust fund borrowing has no selection bias – a somewhat surprising but

[14] FITTEDVALUES is a linear approximation of the selection correction term (commonly referred to as "lambda") in the Heckman approach.

otherwise innocuous result. AHCMQ307's insignificance is more puzzling, since it would seem that if states' with higher pre-recession reserves are less likely to borrow, they ought also to need smaller loans *if borrowers*. It could be that this is not the case. Or, it could be that a linear relationship between pre-recession reserve levels and net indebtedness is not the correct specification. Perhaps additional reserves reduce net indebtedness at smaller values of AHCMQ307, but at larger values the effect is less pronounced.

In Table 3 in Appendix D, I re-estimate stage two assuming pre-recession reserves are quadratically related to net indebtedness. This appears to be the correct specification, since both AHCMQ307 and $AHCMQ307^2$ are significant and have signs that suggest a quadratic relationship of the kind just described. In this model, a standard deviation increase in AHCM (approx. 0.5) is associated with a decrease in net debt of approximately $1.484 billion. Given that mean 2011 year-end net indebtedness is approximately $758 million, this is a very economically significant effect, and suggests adequate reserves are of prime importance to minimizing borrower states' net debts.

Limitations and Suggestions for Future Research

This analysis has several limitations. One pertains to the dependent variables. Because I did not observe the evolution of these variables over time, I was unable to use a panel design. Panels are good because they include more data, and therefore allow for more precise estimation. Panels also allow for estimating time-invariant fixed effects, which could incorporate many elements of UI trust fund financing and state economic/fiscal conditions for which I do not have data. If the Department of Labor makes the appropriate time-specific

information available, it may be valuable to reassess borrowing during and after the Great Recession using a panel approach.

It may also be valuable to assess borrowing (using either a cross-sectional or panel approach) in other time periods, since the unique nature of the Great Recession means some of the findings, e.g. real estate's effect on borrower status, probably cannot be extrapolated to other recessions. Indeed, this result is likely an anomaly attributable to the real estate industry's collapse and subsequent drag on macroeconomic conditions over the 2008-2011 time period. Furthermore, since real estate concentration is in essence a structural feature of state economies, it is not clear how policy makers could manipulate this variable to improve their trust funds' fiscal conditions in the near term. Analyses of other borrowing episodes which do not include a real estate meltdown may produce more policy-relevant findings.

Future research might also generate more policy findings by using different measures of the tax variables. For example, in lieu of a single indicator for tax base indexation, a future study might consider separate variables indicating the states' different wage base pegs. Likewise, future studies might benefit from incorporating alternative measures of tax rates, such as the average effective tax rate or the average effective rate compared to the adequate financing rate (which measures the distance between a state's average effective rate and the rate required to raise enough revenue to retire outstanding loan debts as of the beginning of a calendar year).[15]

Finally, future research might consider other aspects of UI borrowing behavior and federal-state UI financing relations. For example, why do states tend to prefer federal

[15] In essence, it captures the degree of misalignment between a state's current tax policy and the policy commensurate with solvency.

(or "public") assistance to private assistance, and what factors influence the public vs. private decision? Has federal assistance, particularly since the 1970s, created a moral hazard problem in state UI financing? How might this be demonstrated?

Conclusion

The Great Recession put unprecedented stress on state UI trust funds, exhausting reserves in a majority of states and requiring large amounts of federal assistance to ensure continued payment of unemployment compensation. The UI policy literature, comprised primarily of descriptive and case research, suggests a confluence of cyclical factors and state policies contributed to widespread insolvency during and after the recession.

In this study, I used econometric techniques to test a few hypotheses garnered from the existing literature. I used Olsen's two-stage selectivity bias approach, an OLS approach to selection correction, to estimate the effect of pre-recession reserves and tax policy variables on state borrower status and net indebtedness between 2008 and 2011.

Controlling for average annual unemployment rates and state-specific economic and fiscal variables (e.g. concentration in select pro-cyclical industries), I found that borrower status is significantly related to pre-recession reserves and real estate's share in the state economy. Net indebtedness is also related to pre-recession reserves, but the relationship is nonlinear. Additional reserves reduce net indebtedness at low pre-recession funding levels, but the effect tapers off as pre-recession reserves approach the Department of Labor's recommended level. Borrowing is not related to state tax rates or the size of taxable wage bases. Contrary to suggestions made in the UI policy literature, I do not find that indexing the base to wage growth reduces the likelihood of borrowing, though my indexation variable may suffer from

measurement error. Future research could use alternative measures of indexation (i.e. multiple indicator variables) and tax rates to explore further the relationship between tax policy and insolvency.

The primary policy recommendation from this analysis is that states should keep adequate reserves in their trust funds, since higher reserves reduce both the likelihood of borrowing and net indebtedness among borrowers. Pending release of appropriate time-specific information, panel data analysis of Great Recession-era borrowing behavior would be valuable. There is also room for analysis of borrowing in other time periods. This research could provide decision makers with much needed insights as they wrestle with what will likely be a challenging fiscal policy issue for the next several years.

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Appendix A – Select UI Tax Policy and Financing Measures

Table 1 - State UI Taxable Wage Bases ($), 2008-2011

State Name	2008	2009	2010	2011	Index?
Alabama	8000	8000	8000	8000	No
Arizona	7000	7000	7000	7000	No
Arkansas	10000	10000	12000	12000	No
California	7000	7000	7000	7000	No
Colorado	10000	10000	10000	10000	No
Connecticut	15000	15000	15000	15000	No
Delaware	10500	10500	10500	10500	No
Florida	7000	7000	7000	7000	No
Georgia	8500	8500	8500	8500	No
Idaho	32300	33200	33300	33300	Yes
Illinois	12000	12300	12520	12740	No
Indiana	7000	7000	7000	9500	No
Iowa	22800	23700	24500	24700	Yes
Kansas	8000	8000	8000	8000	No
Kentucky	8000	8000	8000	8000	No
Louisiana	7000	7000	7000	7700	No
Maine	12000	12000	12000	12000	No
Maryland	8500	8500	8500	8500	No
Massachusetts	14000	14000	14000	14000	No
Michigan	9000	9000	9000	9000	No
Minnesota	25000	26000	27000	27000	Yes
Mississippi	7000	7000	7000	14000	No
Missouri	12000	12500	13000	13000	No
Montana	23800	25100	26000	26300	Yes
Nebraska	9000	9000	9000	9000	No
Nevada	24600	26600	27000	26600	Yes
New Hampshire	8000	8000	10000	12000	No
New Jersey	27700	28900	29700	29600	Yes
New Mexico	19900	20900	20800	21900	Yes
New York	8500	8500	8500	8500	No
North Carolina	18600	19300	19700	19700	Yes
North Dakota	22100	23700	24700	25500	Yes
Ohio	9000	9000	9000	9000	No
Oklahoma	13600	14200	14900	18600	Yes
Oregon	30200	31300	32100	32300	Yes
Pennsylvania	8000	8000	8000	8000	No
Rhode Island	14000	18000	19000	19000	No
South Carolina	7000	7000	7000	10000	No
South Dakota	9000	9500	10000	11000	No
Tennessee	7000	7000	9000	9000	No
Texas	9000	9000	9000	9000	No
Utah	25400	27800	28300	28600	Yes
Vermont	8000	8000	10000	13000	No
Virginia	8000	8000	8000	8000	No
Washington	31400	35700	36800	37000	Yes
West Virginia	8000	8000	12000	12000	No
Wisconsin	10500	12000	12000	13000	No
Wyoming	20100	21500	22800	22300	Yes

Table 2 - State UI Statutory Min. Tax Rates (%), 2008-2011

State Name	2008	2009	2010	2011
Alabama	0.44	0.44	0.59	2.70
Arizona	0.02	0.02	0.02	0.02
Arkansas	0.80	0.90	1.00	1.00
California	1.50	1.50	1.50	1.50
Colorado	0.00	0.00	0.00	1.00
Connecticut	1.20	1.90	1.90	1.90
Delaware	0.10	0.10	0.10	0.10
Florida	0.10	0.12	0.36	1.03
Georgia	0.03	0.03	0.03	0.03
Idaho	0.26	0.45	0.96	0.96
Illinois	0.80	0.60	0.65	0.70
Indiana	1.10	1.00	1.10	0.70
Iowa	0.00	0.00	0.00	0.00
Kansas	0.00	0.00	0.11	0.11
Kentucky	0.60	1.00	1.00	1.00
Louisiana	0.10	0.10	0.11	0.11
Maine	0.42	0.44	0.78	0.86
Maryland	0.30	0.60	2.20	2.20
Massachusetts	1.12	1.26	1.26	1.26
Michigan	0.06	0.06	0.06	0.06
Minnesota	0.56	0.56	0.69	0.50
Mississippi	0.70	0.70	0.70	0.85
Missouri	0.00	0.00	0.00	0.00
Montana	0.13	0.00	0.42	0.82
Nebraska	0.24	0.00	0.00	0.00
Nevada	0.25	0.25	0.25	0.25
New Hampshire	0.10	0.10	0.50	0.01
New Jersey	0.30	0.30	0.30	0.50
New Mexico	0.03	0.03	0.03	0.05
New York	0.50	0.70	0.90	1.50
North Carolina	0.00	0.00	0.00	0.24
North Dakota	0.20	0.20	0.20	0.20
Ohio	0.40	0.40	0.40	0.40
Oklahoma	0.10	0.10	0.10	0.30
Oregon	0.70	0.90	1.80	2.20
Pennsylvania	1.84	1.84	2.24	2.68
Rhode Island	1.69	1.69	1.69	1.69
South Carolina	1.24	1.14	1.24	0.10
South Dakota	0.00	0.00	0.00	0.00
Tennessee	0.40	0.50	0.50	0.50
Texas	0.22	0.26	0.72	0.78
Utah	0.10	0.20	0.20	0.40
Vermont	0.80	0.80	1.10	1.30
Virginia	0.12	0.18	0.10	0.77
Washington	0.00	0.00	0.98	0.49
West Virginia	1.50	1.50	1.50	1.50
Wisconsin	0.05	0.00	0.27	0.27
Wyoming	0.27	0.30	0.56	0.67

Table 3 - State UI Statutory Max. Tax Rates (%), 2008-2011

State Name	2008	2009	2010	2011
Alabama	6.04	6.04	6.74	8.34
Arizona	5.40	5.40	5.90	5.86
Arkansas	6.70	6.80	6.90	6.90
California	6.20	6.20	6.20	6.20
Colorado	5.40	5.40	5.40	5.40
Connecticut	6.10	6.80	6.80	6.80
Delaware	8.00	8.00	8.00	8.00
Florida	5.40	5.40	5.40	5.40
Georgia	5.40	5.40	5.40	5.40
Idaho	5.40	5.40	6.80	6.80
Illinois	7.20	6.80	7.25	8.40
Indiana	5.60	5.60	5.60	9.50
Iowa	8.00	8.00	9.00	9.00
Kansas	7.40	7.40	7.40	7.40
Kentucky	9.75	10.00	10.00	10.00
Louisiana	6.20	6.20	6.20	6.20
Maine	5.40	5.40	7.19	7.95
Maryland	7.50	9.00	13.50	13.50
Massachusetts	10.96	12.27	12.27	12.27
Michigan	10.30	10.30	10.30	10.30
Minnesota	10.70	10.70	10.84	9.40
Mississippi	5.40	5.40	5.40	5.40
Missouri	9.10	9.75	9.75	9.75
Montana	6.50	6.12	6.12	6.12
Nebraska	5.40	5.40	8.66	8.66
Nevada	5.40	5.40	5.40	5.40
New Hampshire	6.50	6.50	7.00	7.00
New Jersey	5.40	5.40	5.40	5.80
New Mexico	5.40	5.40	5.40	5.40
New York	8.50	8.70	8.90	9.90
North Carolina	6.84	6.84	6.84	6.84
North Dakota	9.86	9.86	10.00	10.00
Ohio	9.20	9.00	9.00	9.60
Oklahoma	5.50	5.50	5.50	7.50
Oregon	5.40	5.40	5.40	5.40
Pennsylvania	9.98	13.16	13.56	10.82
Rhode Island	8.59	9.79	9.79	9.79
South Carolina	6.10	6.00	6.10	11.28
South Dakota	8.50	8.50	8.50	9.50
Tennessee	10.00	10.00	10.00	10.00
Texas	6.22	6.26	8.60	8.25
Utah	9.10	9.20	9.20	9.40
Vermont	6.50	6.50	7.70	8.40
Virginia	6.22	6.28	6.20	6.87
Washington	5.40	5.40	6.20	6.00
West Virginia	7.50	7.50	7.50	7.50
Wisconsin	9.80	8.50	9.80	9.80
Wyoming	9.03	9.10	10.00	10.00

Table 4 - State UI Cost Multiples, Reserves, Q32007

State Name	HCM	AHCM	Reserves ($mil)
Alabama	0.35	0.55	437,221
Arizona	0.43	1.07	1,012,100
Arkansas	0.21	0.38	187,895
California	0.18	0.27	3,073,479
Colorado	0.49	0.56	635,952
Connecticut	0.24	0.57	644,653
Delaware	0.48	1.02	185,444
Florida	0.49	1.12	2,398,992
Georgia	0.45	1.02	1,363,397
Idaho	0.34	0.45	193,328
Illinois	0.23	0.26	1,894,239
Indiana	0.31	0.46	401,695
Iowa	0.68	0.87	728,776
Kansas	0.72	0.97	659,019
Kentucky	0.19	0.26	274,988
Louisiana	0.85	0.96	1,443,746
Maine	1.12	1.64	476,593
Maryland	0.55	0.82	1,062,590
Massachusetts	0.23	0.41	1,326,089
Michigan	0.02	0.03	103,629
Minnesota	0.23	0.29	533,034
Mississippi	1.39	1.78	740,360
Missouri	0.12	0.07	125,802
Montana	0.79	1.41	272,062
Nebraska	0.65	1.06	278,470
Nevada	0.61	0.99	807,679
New Hampshire	0.5	1.35	252,261
New Jersey	0.13	0.23	762,103
New Mexico	1.73	2.03	587,229
New York	0.04	0.07	630,538
North Carolina	0.07	0.12	459,100
North Dakota	0.68	0.75	127,581
Ohio	0.1	0.14	582,829
Oklahoma	1.32	1.44	832,173
Oregon	1.08	1.38	1,914,937
Pennsylvania	0.23	0.28	1,742,027
Rhode Island	0.32	0.47	182,178
South Carolina	0.17	0.34	249,587
South Dakota	0.22	0.28	24,426
Tennessee	0.35	0.56	602,368
Texas	0.36	0.39	2,105,307
Utah	1.08	1.35	819,485
Vermont	0.81	1.36	184,518
Virginia	0.43	0.67	814,180
Washington	0.87	1.36	3,697,741
West Virginia	0.36	0.46	257,097
Wisconsin	0.29	0.38	664,115
Wyoming	0.96	1.14	237,020

Appendix B – Select UI Financing Trends

Figure 1 – Aggregate State AHCM, 2001 - 2007

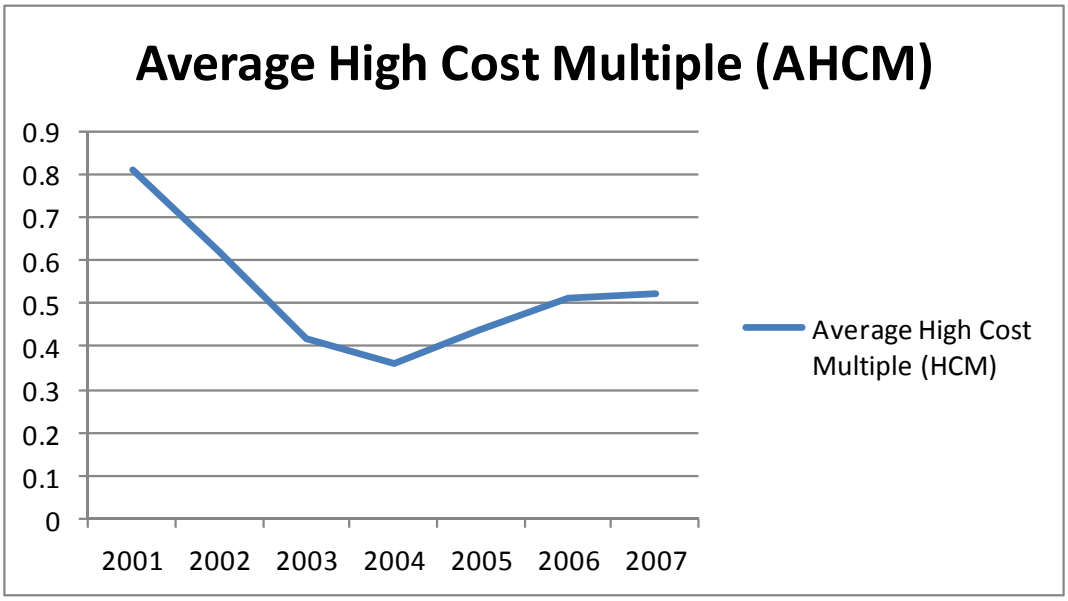


Figure 2 – Average Annual Unemployment Rate, 2007 – 2011

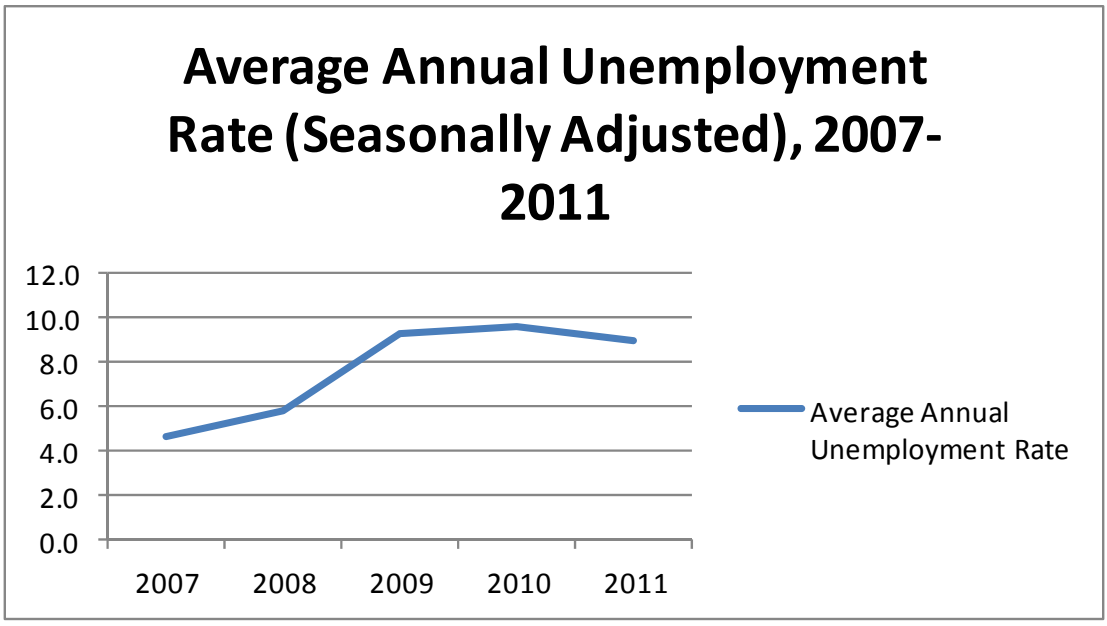


Figure 3 – State UI Revenues ($ bil), 2007 - 2010

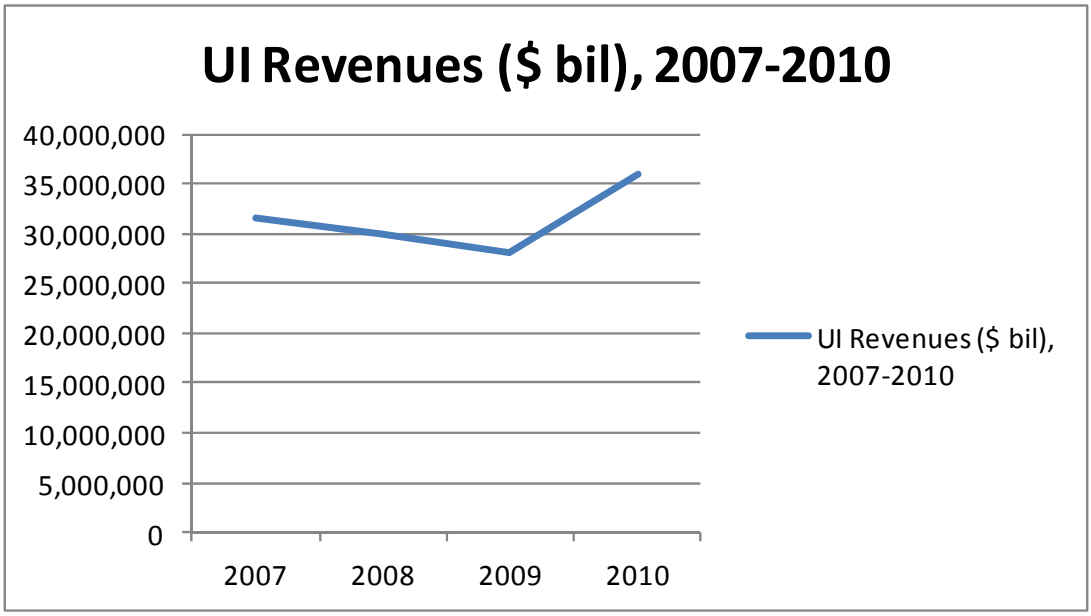
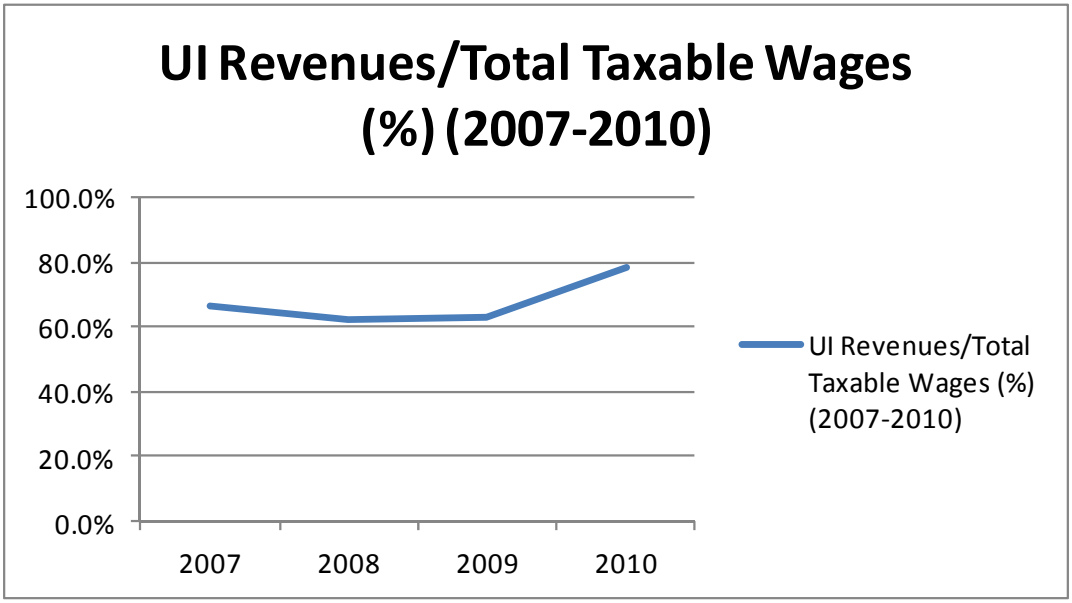


Figure 4 – State UI Revenues as Share of Total Taxable Wages



Appendix C – Definitions of Variables and Summary Statistics

Table 1 – Definitions of Variables

Name	Abbreviation	Definition
Borrower Status	BORROW	Indicator = 1 if state borrowed anytime between Jan. '08 and Dec. '11, 0 otherwise
Net Indebtedness	DEBT	Net FUA indebtedness as of December 31, 2011
Tax Base Index	INDEX	Indicator = 1 if state indexed its UI tax base as of 2010
Statutory Minimum UI Rate	MINRATE	Four year average minimum statutory UI tax rate, 2008-2011
Statutory Maximum UI Rate	MAXRATE	Four year average maximum statutory UI tax rate, 2008-2011
Size of Wage Base	BASE	Four year average UI tax base, 2008-2011
Average Annual Unemployment Rate	U1-4	Four year average annual unemployment rate, 2008-2011
Real Estate Share of GDP	REALEST	Four year average real estate share of state GDP, 2007-2010
Manufacturing Share of GDP	MANU	Four year average manufacturing share of state GDP, 2007-2010
Construction Share of GDP	CONST	Four year average construction share of state GDP, 2007-2010
Retail Share of GDP	RETAIL	Four year average retail share of state GDP, 2007-2010
Financial Services Share of GDP	FINSERV	Four year average financial services share of state GDP, 2007-2010
Personal Income Tax Share of Total Revenue	PIT4	Four year average share of personal income tax revenue in total state revenue, 2005-2009
Corporate Income Tax Share of Total Revenue	CIT4	Four year average share of corporate income tax revenue in total state revenue, 2005-2009
Sales/Gross Receipts Share of Total Revenue	SGR4	Four year average of sales/gross receipts tax revenue in total state revenue, 2005-2009
Average High Cost Multiple, Q32007	AHCMQ307	Average high cost multiple, Q3 2007
Average High Cost Multiple Sq., Q32007	AHCMQ307^2	Average high cost multiple squared (i.e. AHCMQ307*AHCMQ307), Q3 2007

Table 2 – Summary Statistics

Variable	No. Obs.	Mean	Std. Dev.	Min.	Max.
BORROW	48	0.67	0.48	0	1
DEBT	48	758386	1608702	0	9803253
INDEX	48	0.292	0.46	0	1
MINRATE	48	0.584	0.55	0	2.15
MAXRATE	48	7.63	1.89	5.4	11.94
BASE	48	14311	8153	7000	35225
U1-4	48	7.688	1.77	3.7	11.5
REALEST	48	12.05	2.4	8.53	17.3
MANU	48	12.12	4.79	4.31	26.74
CONST	48	4.25	0.91	2.95	7.54
RETAIL	48	6.33	0.99	4.02	8.45
FINSERV	48	8.19	5.36	2.23	35.46
PIT4	48	31.95	17.19	0	70.64
CIT4	48	6.05	3.8	0	26
SGR4	48	47.26	15.48	11.42	81.08
AHCMQ307	48	0.746	0.507	0.03	2.03

Appendix D – Tables of Econometric Results

Variable	Coeff.	Robust St. Error	t-score	p-value
INDEX	-0.2359	0.2412	-0.98	0.335
MINRATE	-0.0961	0.1099	-0.87	0.388
MAXRATE	-0.0272	0.0285	-0.95	0.347
BASE	-0.00001	0.00013	-0.84	0.406
U1-4	0.0294	0.0404	0.73	0.472
REALEST**	0.0917	0.0343	2.68	0.012
MANU	0.0167	0.0186	0.9	0.375
CONST	0.1247	0.0878	1.42	0.165
RETAIL	-0.0176	0.0814	-0.22	0.83
FINSERV	0.0089	0.001	0.9	0.375
PIT4	-0.0077	0.0052	-1.47	0.151
CIT4	-0.0136	0.0205	-0.66	0.511
SGR4*	-0.0136	0.0067	-2.02	0.051
AHCMQ307***	-0.5922	0.1362	-4.35	<0.001
CONSTANT	0.5425	0.6564	0.83	0.415

Dependent Variable = BORROW

Table Guide

* = Sig. at 10%
** = Sig. at 5%
*** = Sig. at 1%

N = 48
F-Statistic = 7.07
R-sq. = 0.6654

F-Tests of Joint Significance

Joint Significance of MINRATE and MAXRATE
F-Statistic = 1.30 (p = 0.2863)

Joint Significance of MANU, CONST, RETAIL, FINSERV
F-Statistic = 0.69 (p = 0.6040)

Joint Significance of PIT4, CIT4, SGR4
F-Statistic = 1.39 (p = 0.2628)

Table 2 – Results of Stage Two Estimation – Net Indebtedness ($000) 2011

Variable	Coeff.	Robust St. Error	t-score	p-value
AHCMQ307	-124005	477303	-0.26	0.796
FITTEDVALUES	2033941	1234670	1.65	0.106
CONSTANT	-504984	989063.6	-0.51	0.612

Dependent Variable = DEBT

Table Guide

* = Sig. at 10% N = 48

** = Sig. at 5% F-Statistic = 4.55

*** = Sig. at 1% R-sq. = 0.27

Table 3 – Results of Stage Two Estimation – Net Indebtedness ($000) 2011

Variable	Coeff.	Robust St. Error	t-score	p-value
AHCMQ307**	-2698458	1185721	-2.28	0.028
AHCMQ307^2**	1517995	693850	2.19	0.034
FITTEDVALUES*	2246539	1260783	1.78	0.082
CONSTANT	46972	879190	0.05	0.958

Dependent Variable = DEBT

Table Guide

* = Sig. at 10% N = 48

** = Sig. at 5% F-Statistic = 4.12

*** = Sig. at 1% R-sq. = 0.3292