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Reconciling theory and empirics on the role of unemployment in mortgage default

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ABSTRACT

Empirical models of mortgage default typically find that the influence of unemployment is negligible compared to other well known risk factors such as high borrower leverage or low borrower FICO scores. This is at odds with theory, which assigns a critical role to unemployment in the decision to stop payment on a mortgage. We help reconcile this divergence by employing a novel empirical strategy involving simulated unemployment histories to measure the severity of attenuation bias in loan-level estimations of default risk due to a borrower becoming unemployed. Attenuation bias results because individual data on unemployment status is unobserved, requiring that a market-wide unemployment rate be used as a proxy. Attenuation is extreme, with our results suggesting that the use of an aggregate unemployment rate in lieu of actual borrower unemployment status results in default risk from a borrower becoming unemployed being underestimated by a factor more than 100. In addition, our analysis indicates that adding the unemployment rate as a proxy for the missing borrower-specific unemployment indicator does not improve the accuracy of the estimated model over the specification without the proxy variable included. Hence, aggregate portfolio-level risk estimates for mortgage guarantors such as FHA also are not improved.

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1. Introduction

There is a marked divergence between the important role played by unemployment in economic models of default and its modest empirical impact in loan level studies of default. In now standard theory, unemployment is one of the two key factors driving default according to the so-called double trigger hypothesis that became widely discussed during the recent housing bust (e.g., Gerardi et al. (2007), Foote et al. (2008), and Foote et al. (2010)). In this approach, a sufficiently severe income loss (typically from becoming unemployed) virtually guarantees default if the borrower also suffers from negative equity. Once an unemployed borrower in negative equity runs out of liquid financial resources, mortgage payments simply cannot be made and a default is inevitable, as not even a quick sale can pay off the outstanding balance.

However, this straightforward theoretical implication does not seem to be borne out in empirical work. One prominent housing agency, the Federal Housing Administration (FHA) did not even include a control for unemployment in its default specifications for several years. From 2008 until the most recent annual evaluation, FHA’s outside actuarial reviewer discontinued use of a metropolitan area-wide unemployment rate in its default models on the grounds that it did not help in explaining default.[1] The most recent annual review of the FHA insurance program reversed this decision and included aggregate unemployment rates as controls in its underlying default (and prepayment) models. However, it found only a modest impact of unemployment on the probability of default, a finding that is consistent with other recent empirical evidence (e.g., Elul et al. (2010)) which also reports a much smaller influence on default for unemployment compared to other known risk factors such as borrower credit quality as reflected in FICO scores and loan-to-value (LTV) ratios.

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[1] The actuarial review for 2008 specifically noted the following: “The unemployment rate variables did not perform well in any of the preliminary models that were estimated, and have not been included in the final model specifications. No consistent pattern was observed between mortgage claims and increases in local unemployment rates.” (IFE 2008, p. A-13).

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We bring new empirical analysis to bear that reconciles the discrepancy in favor of theory. The discrepancy arises because the default decision occurs at the household level, but the unemployment status of individual borrowers is not observed. Thus, a market-level unemployment rate is used to proxy for the unobserved unemployment status of the borrower in empirical models of individual default. This turns out to be a very noisy proxy.[2] Even in a market with a high unemployment rate of 10%, the vast majority of borrowers still are employed, and an increase in that rate obviously does not mean that most borrowers lose their jobs and become income constrained. This leads to attenuation bias in the estimated effects of becoming unemployed on default risk.

We propose a new empirical strategy to measure this bias. It uses results from a simulation exercise involving transitions into and out of unemployment to help gauge the true impact of unemployment on default. We also construct new metropolitan area-level unemployment measures for homeowners with mortgages, in contrast to the standard government measures which include renters and owners without mortgages. Our results indicate that attenuation bias in the estimation of the impact of becoming unemployed on default is severe, with the standard approach underestimating the effect by a factor of more than 100. Correcting for attenuation bias indicates that borrower unemployment status is very important in determining default behavior, with the likely impact larger than that found for other well known risk factors such as FICO scores.

This addresses the conundrum of why theory suggests that unemployment plays a critical role in individual borrower default decisions, but empirical default specifications do not find such a strong influence. However, this still leaves open the issue of whether including even a noisy proxy such as the official metropolitan area unemployment rate in regression models can help improve the accuracy of a portfolio-level default forecast by a large mortgage insurance guarantor like FHA. Our analysis shows that including such a noisy proxy for the borrower's unemployment status does not improve the accuracy of the default forecast as measured by the mean square error. Overcoming this data limitation is important since the ability to merge in borrower-specific unemployment information into default specifications would improve efforts to forecast and reserve for expected mortgage losses.

The plan of the paper is as follows. The next section begins by briefly reviewing the literature on the linkage between mortgage default and unemployment risk. This is followed with a presentation of our analysis on how one can use labor market employment transition data to estimate the potential magnitude of the attenuation bias that inevitably results from regressing individual borrower default data on a market-wide measure of unemployment. Section 3 then describes the sample of mortgages and borrowers used to estimate the impact of unemployment on the propensity to default. That is followed by a presentation and discussion of our key results in Section 4. This section also addresses the implication of our analysis for whether the FHA's recent inclusion of the aggregate unemployment rate in its micro-level default model helps it generate more reliable forecasts of portfolio-level default risk. There is a brief summary and conclusion.

2. Default and unemployment risk

2.1. Literature review

Financial economists have traditionally modeled default as a put option because the decision not to pay the contractually required future stream of interest and principal payments essentially involves the borrower 'putting' back the mortgage to the lender. Early thinking on the problem viewed the decision to default as being determined by whether the borrower had negative equity in the home, on the premise that it was rational to walk away from a house only when its value was less than the present value of the debt owed on it. Kau et al. (1994) showed that even this was not sufficient because it still could be optimal for a borrower to wait and default in the future. That is, the value of the put option need not be maximized when the borrower first enters negative equity.

That negative equity is not the sole factor behind the decision to default seems evident from the fact that at any point in time most borrowers with negative equity are not seriously delinquent on their mortgages. One recent industry study indicates that about 85% of households with a mortgage who are estimated to be in negative equity are current on their debt service payments.[3] Empirical analysis in the academic literature also concludes that the decision to default is based on more than current and prospective negative equity.[4] In particular, default has been shown to be associated with negative shocks to income, including that arising from becoming unemployed.[5] Deng et al.'s (2000) classic empirical paper on the competing risks of default and prepayment reports evidence consistent with negative equity and income each influencing the probability of default.

One way to summarize the literature is with the so-called 'double trigger' terminology in which negative equity and income loss are the two triggers.[6] In this framework, a borrower in negative equity is at heightened risk of default. But, we know from above that this is not a sufficient condition for default to occur. The second trigger is a large enough adverse income shock, say via losing one's job, that leaves the borrower unable to make scheduled monthly mortgage payments. That will precipitate default because the borrower also cannot pay off the mortgage in full from sale proceeds.[7]

That unemployment risk plays a critical role in conceptual models of default through its impact on income is consistent with the FHA's own survey results of special servicers which tell it that income loss is the primary reason why the typical FHA borrower is no longer current on her mortgage payments.[8]

This then begs the question of whether one can reconcile the important role of unemployment in mortgage default models with the economically small effects found for this factor in empirical default studies. If not, then theoretical models of mortgage default need to be reworked to emphasize risk factors other than unemployment. To better understand this issue, we turn next to how unemployment risk should be measured if it were to be controlled for in a loan level empirical investigation of mortgage default.

2.2. Measuring unemployment risk

To measure how unemployment-related risk would affect a portfolio of mortgages insured by a guarantor such as the FHA,

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[2] This point was raised by Haughwout et al. (2010, p. 17) footnote 22.

[3] This particular estimate is from a study by CoreLogic in the second quarter of 2012. See the web article here (http://www.dsnews.com/articles/borrowers-in-negative-equity-slowly-declining-as-home-values-gain-report-2012-09-12).

[4] Measurement error in determining if a borrower is in negative equity is also likely a factor. That is, some borrower's who are estimated to be in negative equity may in fact have positive equity.

[5] See Foster and van Order (1984) and Vandell (1995) for early discussions and presentation of data on this matter.

[6] See Gerardi et al. (2007), Foote et al. (2008), and Foote et al. (2010) for more on the double trigger hypothesis and the most recent housing cycle.

[7] Even before a borrower experiences a negative income shock, negative equity makes it difficult for the borrower to pay off the mortgage either by selling the house or by refinancing (see Ferreria et al. (2010, 2012) and Caplin et al. (1997)). This means that the mortgage will be exposed to the default risk for a longer period of time, which increases the expected cumulative default probability.

[8] See Table 5 (p. 22) of *HUD's Annual Report to Congress, Fiscal Year 2011 Financial Status, FHA Mutual Mortgage Insurance Fund*, November 15, 2011.

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