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HOUSE-PRICE EXPECTATIONS, ALTERNATIVE
MORTGAGE PRODUCTS, AND DEFAULT**

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by[†]

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Abstract

Rapid house-price depreciation and rising unemployment were the main drivers of the huge increase in mortgage default during the downturn years of 2007 to 2010. However, mortgage default was also partly driven by an increased reliance on alternative mortgage products such as pay-option ARMs and interest-only mortgages, which allow the borrower to defer principal amortization. The goal of this paper is to better understand the forces that spurred use of alternative mortgages during the housing boom and the resulting impact on default patterns, relying on a unifying conceptual framework to guide the empirical work.

The conceptual framework allows borrowers to choose the extent of mortgage “backloading,” the postponement of loan repayment through various mechanisms that constitutes a main feature of alternative mortgages. The model shows that, when future house-price expectations become more favorable, reducing default concerns, mortgage choices shift toward alternative contracts. This prediction is confirmed by empirical evidence showing that an increase in past house-price appreciation, which captures more favorable expectations for the future, raises the market share of alternative mortgages. In addition, using a proportional-hazard default model, the paper tests the fundamental presumption that backloaded mortgages are more likely to default, finding support for this view.

[†]*The views expressed in this paper are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System. This paper is available free of charge at <http://www.philadelphiafed.org/research-and-data/publications/working-papers>.*

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1. Introduction

Rapid house-price depreciation and rising unemployment were the macroeconomic drivers of the huge increase in mortgage default during the downturn years of 2007 to 2010. However, mortgage default was also associated with an increased reliance on alternative mortgage products (AMPs). These AMPs include pay-option adjustable-rate mortgages (option ARMs), which are ARMs that allow negative amortization, and interest-only (IO) mortgages (usually ARMs), which defer principal amortization for an initial period of five to 10 years. Compared to standard fixed-rate mortgages (FRMs), AMPs had substantially worse repayment performance during the downturn.

In previous work (Brueckner, Calem, and Nakamura (2012)), we analyzed the genesis of another important factor leading to the surge in defaults during the housing downturn: the relaxation of underwriting standards associated with subprime lending. The theoretical model in that paper showed how more-favorable expectations regarding future house-price appreciation can spur relaxation of underwriting standards by easing concerns about potential default, and the paper's empirical results supported this prediction.

The present paper makes the same argument with regard to the growing use of AMPs, which were widely viewed as lacking the credit risks of subprime loans. We argue that, when rapid house-price appreciation is expected, the higher default risk still inherent in these contracts is mitigated, encouraging their use. As in the prior paper, we provide theoretical and empirical analysis supporting this view. Together, the papers demonstrate that, once the housing bubble gained momentum, the favorable price expectations it generated fed the decline of underwriting standards and the use of AMPs, setting the stage for a surge in defaults once prices started to fall.

Our conceptual framework extends the model of Brueckner, Calem, and Nakamura (2012) (hereafter BCN), which explains loosened underwriting as a consequence of evolving price expectations. We modify this framework to allow borrowers to choose the extent of mortgage "backloading," the postponement of loan repayment through various mechanisms that

constitutes a main feature of AMPs. By postponing mortgage payments, greater backloading is more likely to generate negative equity when house prices fall, making default risk higher for AMPs.¹ However, as house price expectations become more favorable, with future price gains perceived as more likely by both borrowers and lenders, the riskiness of AMPs lessens, spurring their use. Whereas this argument would also apply to traditional ARMs, especially those (as is frequently the case) that have relatively low, initial “teaser” interest rates, AMPs represent a more extreme case of backloading that should be observed in borrower choices when house prices are rising fastest.²

This argument is consistent with empirical evidence that we develop in two directions. We first examine the connection between the market share of AMPs and house price appreciation. We find that, irrespective of whether the loans are retained on bank balance sheets or packaged into Agency or non-Agency securities, growth of alternative mortgages is positively associated with prior appreciation in house prices and other favorable economic indicators, similar to the association between high-risk subprime lending and house price growth observed by BCN. We also find that, in the areas with the steepest rises in house prices, alternative mortgages are favored over traditional ARMs.

Next, in order to test the underlying presumption that alternative mortgages are more likely to default, we examine repayment performance during the downturn across the spectrum of mortgage contracts.³ We find substantially higher default rates for the alternative contracts, again irrespective of whether the mortgages are retained on bank balance sheets or packaged into securities. Results from a multivariate Cox proportional-hazard model demonstrate that these differences exist even after controlling for the effects of the initial rise and subsequent fall in house prices, for regional differences in unemployment, and for standard credit-quality measures such as FICO score and interest rate spread. These results confirm that backloaded mortgages

¹ In our stylized, two-period model, the higher default risk of AMPs is a direct consequence of the impact of backloading on negative equity. Empirically minded readers might argue that insufficient time had elapsed on most AMPs (particularly those originated after 2005) at the onset of the housing downturn for this feature to have had a substantial impact on accumulated equity relative to traditional mortgage products. However, our model more generally implies that the decision to backload depends on an expectation that the future value of the home will suffice to repay the mortgage, and a reversal of these expectations (arising from a decline in house prices) provides an incentive to default.

² Unlike in, for example, Keys et al. (2009), this argument does not depend on agency problems, which cause lenders to be indifferent to the likelihood of repayment of the credit instrument.

³ Our empirical analysis focuses on the prime and near-prime market segments, reflecting the composition of our sample.

are riskier, being more prone to default than traditional contracts. Moreover, as the AMP loans held in portfolio did not perform substantially better than the securitized loans, the role of agency issues in spurring risky mortgage lending appears weak in this context.

The present paper contributes to the large prior literature on mortgage choice, which is extensively referenced in Brueckner (2000) and in the recent paper by Chiang and Sa-Aadu (2013). Much of that literature focuses on the choice between fixed and adjustable-rate mortgages, recognizing that borrower interest rate risk is absent with FRMs but present with ARMs. Our framework, by contrast, ignores the fact that AMPs usually involve interest rate risk, focusing instead on the backloading feature of these contracts.

Chiang and Sa-Aadu (2013) share some aspects of the present focus by using simulation methods to analyze the choice of alternative mortgages. Additional previous papers that analyze mortgage choice in a model that includes default are those of Posey and Yavas (2001) and Campbell and Cocco (2003), which focus on the choice between traditional fixed and adjustable-rate mortgages, as well as that of LaCour-Little and Yang (2010).

Like the present paper, LaCour-Little and Yang (2010) develop a model of alternative mortgage products while presenting an empirical analysis of contract choice that includes a connection to prior house-price appreciation. To a more limited extent, they also analyze default performance. Despite the broad similarities to this paper, we use different theoretical and empirical models, employ a more broadly representative data set, and provide more detailed analysis of repayment performance.⁴

Our empirical findings are consistent with LaCour-Little and Yang's evidence that favorable house-price expectations helped drive the rise in AMPs, and we identify other factors that spurred the use of these contracts. Whereas their evidence is primarily limited to Bear Stearns securitizations, our substantially larger data set permits us to evaluate the empirical importance of prior price appreciation in contract choice for a large portion of the overall U.S. housing market, including loans held in bank portfolios. Indeed, a substantial volume of AMPs

⁴ The theoretical framework in LaCour-Little and Yang (2010) is relatively complex and incorporates both income shocks (payment-driven default risk) and house price shocks (equity-driven default risk), thus requiring numerical analysis. It portrays reduction in default risk associated with adverse income shocks as the primary incentive for choosing an interest-only loan. Thus, the model implies (somewhat counterintuitively and in contrast to the empirical results in our paper) that higher expected income growth makes an AMP less attractive. In contrast, default risk in our model is solely equity driven, and the model remains agnostic on the relationship of AMP choice to expected income growth.

was present in bank portfolios at the onset of the financial crisis, and these loans played an important role in bank losses during the crisis. At the end of 2010, according to Inside Mortgage Finance (2013), U.S. banks and thrifts held \$1.8 trillion in mortgage loans on their portfolios, of which nearly 13 percent were in default at the time.

Our empirical work on default shows that AMPs had higher default rates than other types of contracts with comparable measured credit quality, while pointing out that bank portfolios of AMPs performed, broadly speaking, as badly as securitized AMPs. The empirical analysis of default in LaCour-Little and Yang (2010), by contrast, is mainly devoted to analyzing default risk conditional on the choice of an AMP, not to comparing default risk between AMPs and other types of contracts. In addition, their data are limited to 2007 and earlier, prior to the peak years of the mortgage crisis, whereas our analysis of repayment performance extends through the first quarter of 2012.

Another related paper is that of Cocco (2013), who uses British data to show that AMP borrowers expected higher future income growth than users of traditional mortgages, a finding that parallels some findings of LaCour-Little and Yang (2010). In addition, Barlevy and Fisher (2011) examine backloaded mortgages from a different perspective, arguing that lenders preferred to make these mortgages to encourage prepayment.

The paper is organized as follows. Section 2 presents the simple theoretical framework that formalizes the notion of backloading, demonstrating the link between favorable house-price expectations and backloading of mortgage repayments through use of AMPs. Section 3 demonstrates empirically the link between expected house-price appreciation and reliance on AMPs. Section 4 presents the default analysis, and section 5 offers conclusions.

2. Model

In this section, the model of Brueckner (2000) is adapted to analyze the effect of house price expectations on the choice of nontraditional mortgages by borrowers. Brueckner's earlier model analyzed only the choice of loan size in the presence of borrower default, but the framework can be recast to study the choice of mortgage backloading, the key feature of nontraditional contracts, in a setting with default.

The model has two periods, 0 and 1. At the beginning of period 0, the borrower purchases a house of value P_0 with a 100 percent mortgage (this no-down-payment assumption is used only

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