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Mortgage contract design and systemic risk immunization☆

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ABSTRACT

This paper provides theoretical results for the design of contracts used in the market for residential household mortgages and mortgage securities. Critical elements in the problem of immunizing systemic risk through efficient contract design are identified. Using an extension of classical immunization theory, this paper demonstrates that systemic risk of long amortization mortgage contracts is reduced when term to maturity of the contract at origination is significantly less than the amortization period. In addition, incorporating prepayment and limited recourse default options into the mortgage contract increases systemic risk when compared with full recourse mortgage contracts having yield maintenance prepayment penalties. The theoretical results are used to evaluate the systemic risk management problems that have plagued the US mortgage funding system.

1. Introduction

The primary objective of this paper is to illustrate the implications of mortgage contract design for immunization of systemic interest rate and house price risks inherent in the residential mortgage funding system. The classical fixed income portfolio immunization model is extended to assess the implications of systemic interest rate and house price risk, e.g., Redington (1952), Reitano (1991a,b), and Poitras (2007, 2013). It is demonstrated that shortening mortgage term to maturity and having a 'yield maintenance' prepayment penalty reduces the systemic risk inherent in the origination of long amortization period, single-family residential mortgages.[1] In addition to mitigating the difficulty of determining an actuarially sound fair market value at origination, shortening mortgage term to maturity strengthens adherence to underwriting standards by requiring borrowers (mortgagors) to periodically reaffirm both the equity value in the underlying asset and the source of household income required to service the mortgage. Even if the mortgage contract has no prepayment penalty and includes a no recourse default option, reducing mortgage term to maturity still significantly reduces the market value of these options when the mortgage is priced at origination, thereby reducing the systemic risk associated with the exercise of options that are unpriced or incorrectly priced.[2]

2. Mortgage contract design

The history of the mortgage contract stretches back to antiquity. Cuneiform tablets from the second millennium BC record debt-bondage contracts for consumption loans in ancient Mesopotamia that were structured with landed property as security. Much of mortgage contract history is concerned with: evolving legal interpretations of the contract, such as the remedies available to mortgagee and mortgagor in the event of default; and, how mortgage contract language can be structured to achieve a particular objective, such as including a power of sale clause to avoid costs of foreclosure for the mortgagee.[3] In the modern era, mortgage contract design varies substantively across countries and over time. These differences are the result of the unique evolution of the mortgage contract in each country. In particular, Campbell (2013, Fig. 2) demonstrates that mortgage contract design in the US is anomalous compared to other countries in having a long amortization period

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[1] By allowing periodic review of borrower creditworthiness, term to maturity restriction also enhances achievement of adequate underwriting standards. The approach of restricting mortgage contract term to maturity to manage systemic risk of residential mortgage funding is not new. Included in the long history of studies up to the S&L crisis advocating some variation of this approach are Guthmann (1938), Muth (1962), Clickner (1967), Findlay and Capozza (1977) and Eskridge (1984).

[2] This follows from the distribution free property of options that the price of an option with a longer term to maturity cannot be less than an option with the same contract features but with a shorter term to maturity. This is not a statement about the total value of these options over the full amortization period. More precisely, for a mortgage with a term to maturity that is less than the amortization period, the contract options can be divided into those that are priced over the initial term to maturity and those that are priced over the term remaining between the initial maturity date and the end of the amortization period. It is possible that the value of options priced at origination when term to maturity and amortization period are equal may be less than the sum of option values over the amortization period for the shorter term to maturity mortgage.

[3] Older sources on the history of mortgage contracts includes Anonymous (1856), Frederiksen (1894), Sakolski (1932), Fahey (1934), Rabinowitz (1945) and Skilton (1946).

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with a fixed interest rate. This contract design feature is combined with other anomalous features: no prepayment penalties; and, in many state jurisdictions, limited recourse for deficiency claims. Consistent with fundamental support for individual freedom and distrust of concentrated financial power, the modern US mortgage contract is decidedly in favor of the mortgagor, though this has not always been the case.

The collapse of the mortgage funding system in the US brought on by the Great Depression was the result of a combination of factors, e.g., Rose (2011), VLR (1937), and Fahey (1934). Whatever the causes, a fair estimate of the general collapse of residential houses' prices was around a 50% decline. At the time, mortgage contract design called for short term to maturity mortgages, usually 3–10 years depending on the security of the borrower with loan-to-value ratios of 60% or less. Because the amortization period was usually much longer, 25 years or interest only being common, the unpaid principle was due on maturity (Jaffee & Quigley, 2008, p. 123).[4] Typically, this would be accomplished by taking another mortgage with the same lender. However, the collapse of house prices prevented this from happening as the value decrease of the underlying assets was so severe that the lenders could not fund such roll-over loans, even at much higher loan-to-value ratios. The consolidation of mortgage loans starting in 1933 under the Home Owners' Loan Corporation (part of the Federal Home Loan Bank System) combined with the home mortgage insurance under the National Housing Act (1934) led to the introduction of the conventional 30 year fixed rate, no prepayment penalty US mortgage contract that, more or less, has survived to the present.

Any practical discussion of issues associated with mortgage contract design would be incomplete without consideration of the seemingly incongruent regulatory and legal framework governing US mortgage origination. From the National Housing Act (1934) to the Community Reinvestment Act (1977) to the American Dream Downpayment Act (2003) to the Helping Families Save Their Homes Act (2009), the US federal government has actively promoted home ownership. Yet, various legislative initiatives aimed at achieving this end have often conflicted with the regulatory goal of maximizing economic efficiency. For example, consider the efficiency losses associated with Regulation Q. From the Banking Act (1933, Sec. 11) and the Glass-Steagall Act (1933) until passage of the Monetary Control Act (1980), Regulation Q was the cornerstone of a mortgage funding system that depended fundamentally on the thrift and S&L industry for origination of long term, fixed rate mortgages.[5] By prohibiting the payment of interest on demand deposits, Regulation Q provided a significant implicit subsidy to mortgage borrowers. The de facto collapse of Regulation Q in the face of inflation fuelled interest rate increases of the 1970s exposed the underlying systemic risk associated with the duration gap inherent in the balance sheets of the S&Ls and other mortgage lenders.

While the originate-to-distribute, government sponsored enterprise (GSE)-based residential mortgage funding system has much earlier historical origins, passage of the FDICIA (1990) can be used to demarcate the transition from funding mortgages through the balance sheets of specialized depository institutions to funding through capital markets, e.g., Benston and Kaufman (1997). Recognizing the underlying duration gap and credit risk problems confronting depository institutions funding mortgages, this transition sustained the development and growth of a range of primarily OTC cash and derivative products designed to "slice up" the cash flows from pools of conventional US mortgages underlying the GSE mortgage securities that were being traded, thereby mitigating risks and providing more efficient pricing.[6] A partial list of the 'innovative' financial engineering products includes: credit default swaps and related synthetic derivatives; various exotic interest rate derivatives; and, rebundled mortgage pass-throughs producing tranche and Z-class CMOs. There were also variations on the conventional mortgage:sub-prime and Alt-A mortgage pools; and, alternative mortgage products such as interest-only and payment-option ARMs (GAO, 2006). Following Hirtle (2009), Shin (2008, 2009) and others, it is now claimed that dispersion of default risk and duration gap risk through securitization does not necessarily enhance financial stability as financial engineering advocates have claimed. Instead, it is argued that these products directly contributed to a system wide increase in leverage that fuelled an expansion of bank balance sheets sustaining an overall reduction in mortgage lending standards.

Starting around mid-2005, the survival performance of single-family residential mortgages in the US deteriorated sharply, e.g., Sanders (2008) and Mayer, Pence, and Sherland (2009). For proponents of securitization such as Hayre, Saraf, Young, and Chen (2008) and Chen, Chang, Lin, and Shyu (2010), this exposed weaknesses in methods for predicting mortgage defaults and estimating default loss severities used in the market valuation of collateralized mortgage products. However, while improvements in the data and models used to assess single-family mortgage default risk could partially mitigate problems for trading difficult-to-price securities, this paper examines the impact of conventional US mortgage contract design on the on-going failure of US mortgage markets to adequately originate long amortization period mortgages. Do specific US mortgage contract features combine in a systemically perverse fashion with 'originate-to-distribute' underwriting procedures used in the creation of collateralised mortgage obligations and related financing vehicles, e.g., Wilmarth (2009)?[7] Will improvement in pricing models permit accurate enough pricing of the interest rate and default options inherent in collateralized mortgage products to prevent future mortgage funding system failures, e.g., Kau, Keenan, Muller, and Epperson (1995), Deng and Gabriel (2006), Longstaff and Rajan (2007), and Ozeki, Umezawa, Yamazaki, and Yoshikawa (2009)? Or, alternatively, is a substantive change in mortgage contract design required?

3. What is systemic risk?

Despite numerous studies of systemic risk over many years, the situation described by Greenspan (1995) remains: "the very definition [of systemic risk] is still somewhat unsettled". More recently, FRBNY (2007, p. 7) also observes: "Systemic risk in the financial system is difficult to define precisely". Kane (2010, p. 251) accurately recognizes that "one must define [systemic risk] comprehensively and fashion from this definition one or more verifiable metrics for monitoring the target". Kane (2010, p. 7–8) also finds "official definitions of system risk fail" to satisfy either of these requirements. "Official definitions focus on a perceived potential for substantial spillovers of institutional defaults across important firms in the financial sector and from this sector to

[4] A definitive historical study on the US mortgage market on the eve of the Great Depression is unavailable. The description given by Jaffee and Quigley (2008) differs from Guthmann (1938) where a fully amortizing 10–12 year mortgage term to maturity is identified for the building and loan societies. Guthmann (1938, p. 31) refers to "life insurance companies, mutual savings banks, and building and loan associations" as the "backbone of the urban mortgage market". Evidence provided in Jaffee and Quigley and similar sources identify the mortgage contracts used by commercial banks.

[5] Though the commercial banking sector was also an important source of mortgage financing during the period where depository institutions directly funded mortgages, the problems with the S&Ls were substantively greater. While over 25% of all S&Ls failed between 1983 and 1990, only 8% of commercial and savings banks failed (Benston & Kaufman, 1997). Commercial banks also had considerable latitude in asset selection that was not available to S&Ls which were largely confined to mortgage lending until various states and the FHLBB loosened these restrictions in the early to mid-1980s.

[6] For example, Green and Wachter (2005, p. 112) observe: "the US mortgage system – with the implicit government guarantee for Fannie Mae and Freddie Mac – has solved the problem of how to persuade low-risk borrowers to join with higher-risk borrowers in broad mortgage pools, which provide the basis for mortgage-backed securities which can then be sliced up in financial markets."

[7] Shin (2009, p. 309) observes: "Securitization by itself may not enhance financial stability if the imperative to expand assets drives down lending standards." In turn, such driving down of lending standards would be more difficult if mortgage insurance was accurately priced. In some cases, the systemic risk generated by the mortgage mispricing was legislatively mandated, e.g., GAO (2006), GAO (2009), and Jaffee and Quigley (2008).