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ABSTRACT

This paper presents and analyzes a simple banking model in which banks have access to international capital markets and domestic asset markets. The model generates two types of equilibria: a no-default equilibrium and a mixed equilibrium. In the no-default equilibrium, all banks are symmetric and always solvent, while in the mixed equilibrium, some banks can be internationally illiquid and default simultaneously. The latter equilibrium captures the basic features of banking crises after financial liberalization in emerging market economies. In this case, a large capital inflow leads to high asset price volatility and magnifies a banking crisis.

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1. Introduction

Countries have experienced banking crises throughout history. In particular, since financial liberalization in many parts of the world in the 1970s, crises have become more frequent and costlier. Notable examples include Chile (1982), Mexico (1994), Argentina (1995), Brazil (1996), East Asia (1997), Russia (1998), Colombia (1998), Argentina (2001), and Uruguay (2002). Some countries (e.g., those in Latin America in the 1970s and 1980s) have experienced crises because of inconsistent and unsustainable macroeconomic policies, whereas others (e.g., countries in East Asia in 1997) have experienced crises despite having sound macroeconomic policies. However, in the latter case, the empirical evidence strongly indicates that after financial liberalization during the 1990s, their short-term external liabilities were growing faster than their international reserves.¹ That is, the financial liberalization policies of these countries led to *internationally illiquid* financial systems, making them vulnerable to crises.

In addition, banking crises have often been accompanied by a sharp decline in asset prices. When under strain, some banks demand liquidity and sell their assets to the market. This causes asset prices to fall and, subsequently, puts other banks under strain, forcing them to sell as well. A collapse in asset prices can cause a widespread financial crisis. For example, [Sarno and Taylor \(1999\)](#) show that the East Asian crisis of 1997 was precipitated by such an event, which had been fueled by strong capital inflows.

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¹ See, for example, [Chang and Velasco \(1998, 2000b\)](#).

Despite a large literature on banking and currency crises in emerging markets, studies have for the most part developed separately. Most models of currency crises abstract financial institutions, while banking theory largely ignores financial markets and treats a closed economy. To understand the relationship between financial liberalization and financial crises in emerging markets, it is thus essential to develop an open economy version of a banking model that includes financial markets.

Here, I present a simple banking model that accounts for the observed effects of financial liberalization on banking crises. The model addresses the following basic characteristics of banking crises in emerging markets:

1. Systemic banking crises are typically preceded by large capital inflows.²
2. Financial institutions take on significant amounts of short-term debt before crises occur.³
3. Banking crises are closely linked to an asset price boom and burst.⁴

Most previous studies have considered a combination of either characteristics (i) and (ii) or characteristics (ii) and (iii). Examples of the former group include Goldfajn and Valdés (1997) and Chang and Velasco (2000a,b, 2001), while those in the latter group include Allen and Gale (1998, 2004a, 2004b). Here, I consider all three characteristics, which is crucial to the analysis and to the contribution of this study.

To analyze the effects of financial liberalization on banking crises, I extend the banking model developed by Chang and Velasco (2001) by incorporating interbank asset markets. Chang and Velasco (2001) develop an open economy version of the Diamond and Dybvig (1983) banking model.⁵ They show that domestic bank runs, caused by panic among domestic depositors, may interact with panic by international creditors. That is, bank runs may occur when domestic banks are internationally illiquid. Despite the elegance and usefulness of the model, it appears to have two limitations. First, there is no aggregate uncertainty in the model: banking crises are “sunspot” phenomena. Important empirical evidence exists that banking crises are related to weak economic fundamentals (e.g., Calomiris and Gorton, 1991; Gorton, 1988; Kaminsky and Reinhart, 1999). Second, their model does not include interbank asset markets. That is, they do not explicitly model a situation in which financial institutions trade financial assets, which plays an important role in a banking crisis.

My analysis is also based on the banking model proposed by Allen and Gale (1998, 2004a,b) and Allen et al. (2009).⁶ Here, I extend their models to a small open economy. There are three periods in the usual way. Banks can borrow funds from domestic depositors and international creditors, and they hold one-period liquid international assets or two-period long-term domestic assets with a higher return. Banks face uncertain liquidity demands from their domestic depositors in the middle period. That is, there is the *aggregate uncertainty* that the overall level of the liquidity demands banks face is stochastic. Banks can meet the liquidity demands of their depositors and international creditors by using liquid international assets or selling long-term assets in a competitive interbank asset market. In the market, asset prices are determined endogenously by demand for and the supply of liquidity in each state of nature.

I show that two types of equilibria can emerge depending on liquidity risk: a *no-default equilibrium* and a *mixed equilibrium*. When the probability of high liquidity risk is high, a no-default equilibrium exists. In this case, all banks find it optimal to keep sufficient international reserves and avoid defaults. When the probability of high liquidity risk is low, holding liquid reserves becomes costly, and the mixed equilibrium can emerge. In the mixed equilibrium, ex ante identical banks take different portfolios. Some banks, called *risky banks*, invest heavily in long-term assets and default in a bad state of nature, experiencing a bank run. As risky banks sell all their long-term assets in the bad state, asset prices drop significantly because the supply of liquidity is limited. In this case, creditors obtain the liquidation proceeds instead of the promised repayments. The remaining banks, called *safe banks*, hold sufficient liquidity to always meet their commitments and buy the long-term assets of risky banks.

I then illustrate that the mixed equilibrium captures many important features of a crisis in emerging market economies. In this equilibrium, a large capital inflow encourages banks to hold more short-term debt relative to their liquid reserves and may increase the number of risky banks. This international illiquidity can result in many asset sales in the market, price drops, and banking defaults. That is, in my model, a crisis is a systemic event. This result is obtained because of the introduction of an interbank market, which is the main departure from the Chang and Velasco model.

Finally, I present an economy in which both short-term and long-term foreign debt are allowed to examine the composition effect. If a mixed equilibrium exists, a term structure of interest rates emerges endogenously and this implies that long-term debt is more expensive than short-term debt. This happens because, in the event of a crisis, the full amount of long-term debt is defaulted, while short-term international creditors can receive the partial repayment of their claims. It is shown numerically that introducing long-term debt increases the expected utilities and reduces asset price volatility and that the number of safe banks, which implies a shift in composition toward longer debt maturities, may have a destabilizing effect on the banking system.

² See Kaminsky and Reinhart (1999), Reinhart and Reinhart (2008), and Reinhart and Rogoff (2009a,b).

³ See Sachs et al. (1996), Radelet and Sachs (1998), and Chang and Velasco (1998).

⁴ See Kaminsky and Reinhart (1999), Reinhart and Reinhart (2008), and Reinhart and Rogoff (2009a,b).

⁵ See also Chang and Velasco (2000a,b).

⁶ This paper also bears a theoretical similarity to the recent work of Carletti and Leonello (2016), who study a model with banking and asset markets. They focus on credit market competition and find no trade-off between banking competition and financial stability.

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