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journal homepage: [www.elsevier.com/locate/jme](http://www.elsevier.com/locate/jme)Optimal monetary policy in a ‘sudden stop’<sup>☆</sup>Fabio Braggion<sup>a</sup>, Lawrence J. Christiano<sup>b,\*</sup>, Jorge Roldos<sup>c</sup><sup>a</sup> EBC, CentER and Tilburg University, The Netherlands<sup>b</sup> Northwestern University and NBER, USA<sup>c</sup> International Monetary Fund, USA

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## ABSTRACT

In the wake of the 1997–98 financial crises, interest rates in Asia were raised immediately, and then reduced sharply. We describe an environment in which this is the optimal monetary policy. The optimality of the immediate rise in the interest rate is an example of the theory of the second best: although high interest rates introduce an inefficiency wedge into the labor market, they are nevertheless welfare improving because they mitigate distortions due to binding collateral constraints. Over time, as the collateral constraint is less binding, the familiar Friedman forces dominate, and interest rates are optimally set as low as possible.

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## 1. Introduction

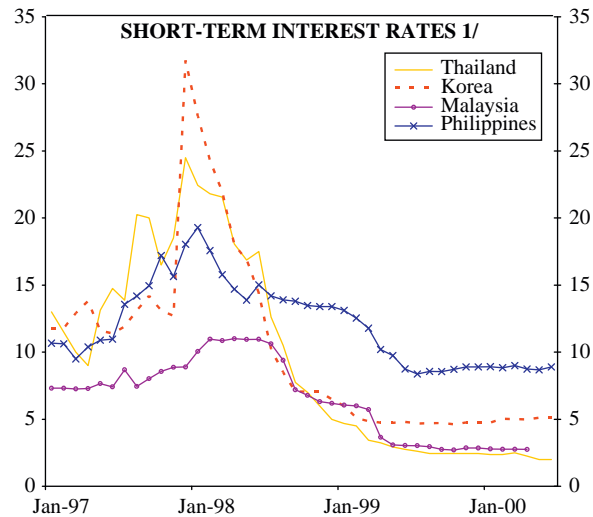
The Asian financial crises of 1997–98 triggered a sharp debate over the appropriate response of policy to a financial crisis. The hallmark of the crises was a ‘sudden stop’ (Calvo, 1998): capital inflows turned into outflows and output suddenly collapsed. Some argued, appealing to the traditional monetary transmission mechanism, that a cut in the interest rate was required to slow or reverse the drop in output. Others argued that because of currency mismatches in balance sheets, the exchange rate depreciation associated with a cut in the interest rate might exacerbate the crisis. They argued for an increase in interest rates. Interestingly, a look at the data indicates that *both* pieces of advice were followed in practice. Fig. 1 shows what happened to short-term interest rates in each of four Asian crisis countries. Initially they rose sharply. Within six months or so, the policy was reversed and interest rates were ultimately driven to below their pre-crisis levels. A casual observer might infer that policy was simply erratic, with policymakers trying out different advice at different times.

We argue that the observed policy may have served a single coherent purpose. We describe a model in which the optimal response to a financial crisis is an initial sharp rise in the interest rate, followed by a fall to below pre-crisis levels.<sup>1</sup>

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**Fig. 1.** This figure displays the short-term interest rates for Korea, Malaysia, Philippines and Thailand expressed at a monthly frequency. Korea: Overnight call market rate, end of period. Malaysia: 1-month KLIBOR, end of the period. Philippines: 91-day Treasury Bill Rate, end of period. Thailand: 1-m repo, end of period\Repurchase Rate (30-day).

We characterize a financial crisis as a time when collateral constraints bind unexpectedly and are expected to remain in place permanently. Real frictions in our model have the consequence that in the immediate aftermath of the collateral shock, the monetary transmission mechanism is the reverse of what it would otherwise be. In particular, a rise in the interest rate increases economic activity and welfare. Over time, as the real frictions wear off, the monetary transmission mechanism has the traditional long run property that low interest rates stimulate output and raise welfare.

Our model is a version of the standard small, tradable/non-tradable goods open economy model. The real friction is that labor in the tradeable sector is chosen prior to the realization of the current period shock.<sup>2</sup> Thus, when the financial shock occurs the allocation of labor to the tradeable sector cannot respond immediately, although it can respond in subsequent periods.

We adopt two financial frictions. First, to capture the non-neutrality of money our model incorporates the portfolio allocation friction in the limited participation model.<sup>3</sup> In the absence of collateral constraints, our model reproduces the traditional monetary transmission mechanism: when the domestic monetary authority expands the money supply, the liquidity of the banking system increases and interest rates fall, leading to an expansion in output and a depreciation of the exchange rate. Second, we assume firms make use of labor and a foreign intermediate input, and that these must be financed in advance. The collateral constraint applies to the loans undertaken to purchase the foreign intermediate input. Our collateral constraint captures the balance sheet mismatch problems often emphasized in the context of currency crises, because liabilities are denominated in foreign currency while assets are denominated in domestic currency.<sup>4</sup>

The surprising feature of optimal policy in our model is that the domestic nominal interest rate rises sharply in the period of the collateral shock. That this policy response is optimal is a consequence of the interaction of the financial and real frictions. A rise in the interest rate acts like a tax on the employment of labor in the non-traded good sector, and raises the marginal cost of production in that sector. Other things the same, this slows down economic activity. However, when the collateral constraint is binding another effect dominates. Because the employment of labor by firms in the traded sector is predetermined in the period of the shock, the interest rate rise does not increase the marginal cost of production in that sector. With the marginal cost of non-traded goods rising relative to the marginal cost of traded goods, the relative price of

<sup>1</sup> Other studies have examined the relationship between optimal interest rates and financial crises. [Aghion et al. \(2000\)](#) present a model with multiple equilibria, in which a currency crisis is the bad equilibrium. The possibility of the bad equilibrium is the outcome of the interplay between credit constraints on private firms and nominal price rigidities. The authors show that the monetary authority should tighten monetary policy after any shock that results in the possibility of the currency crisis equilibrium. Our analysis differs from this analysis in three ways. First, equilibrium multiplicity plays no role in this paper. Second, our model emphasizes a different set of rigidities. Third, [Aghion, Bacchetta and Banerjee](#) focus on the prevention of crises, while we focus on their management after they occur. Similarly, [Caballero and Krishnamurthy \(2001\)](#) show that when the economy faces a binding international collateral constraint, a monetary expansion that would redistribute funds from consumers to distressed firms has no real effects. Given this lack of effectiveness, a monetary authority that trades-off output and an inflation target focuses on the latter and tightens monetary policy to achieve the inflation objective.

<sup>2</sup> A similar friction is used by [Fernandez de Cordoba and Kehoe \(2000\)](#) to study the role of capital flows following Spain's entry to the European Community. In effect, our model combines the two models studied in [Christiano et al. \(2004\)](#). In one model of that paper, labor in the traded good sector was fixed in each period. In another model, labor was completely flexible.

<sup>3</sup> For closed economy analyses of this model, see [Lucas \(1990\)](#), [Fuerst \(1992\)](#) and [Christiano and Eichenbaum \(1992, 1995\)](#).

<sup>4</sup> The relevance of balance sheet effects during sudden stops for emerging markets—but not for developed countries—is documented in [Calvo et al. \(2004\)](#).

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