



## Monetary policy and risk taking



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### ABSTRACT

We assess the effects of monetary policy on bank risk to verify the existence of a risk-taking channel – monetary expansions inducing banks to assume more risk. We first present VAR evidence confirming that this channel exists and is particularly significant on the bank funding side. Then, to rationalize this evidence we build a macroeconomic model where banks subject to runs endogenously choose their funding structure (deposits vs. capital) and risk level. A monetary expansion increases bank leverage and risk. In turn, higher bank risk in steady state increases asset price volatility and reduces equilibrium output.

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### 1. Introduction

It is widely believed that the 2007 financial crisis originated from mis-incentives in the financial markets leading to excessive leverage and risk-taking by financial institutions. High liquidity and persistently low interest rates, combined with lenient bank supervision, allegedly induced banks to finance an increasing volume of risky assets – largely in the real estate sector – by means of cheap short-term funding. This line of argument calls into question the links between monetary policy and financial risk-taking. Largely neglected prior to the crisis – with some notable exceptions, mentioned below – such links are now increasingly discussed,<sup>2</sup> but two elements are missing to provide a foundation to the argument: realistic macroeconomic models that endogenize risk taking behavior and relate it to monetary policy, and time-series evidence documenting this relation.

We move in that direction in two ways. First, we look at time series evidence on the link between monetary policy and risk taking. The empirical literature has been confined to survey and panel data evidence; no aggregate-level time series tests are available. Tests involving aggregate dynamics are important because interest rate changes are likely to influence the banks' balance sheet risk in different ways at different time lags: in the short run, risk is likely to be positively correlated with interest rates, but in the medium to long run this relation may be inverted if the risk-taking channel dominates. Second, we propose a model, based on [Diamond and Rajan \(2000, 2001\)](#), that rationalizes such channel. In our model bank

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<sup>2</sup> For a recent review of the debate see [Dell'Ariccia et al. \(2011\)](#).

managers endogenously choose between two sources of funding, uninsured short-term liabilities (we call them, in short, deposits) and bank capital, to finance risky investment projects. Bank managers have an informational advantage on the projects and act as relationship lenders on behalf of the two outside financiers of the bank, namely depositors and capitalists. Fundamental bank runs arise as a discipline device: when a run materializes, banks must liquidate projects. This both affects the payoff structure among the three bank stakeholders (depositors, capitalists, managers) and entails an aggregate resource loss. Low policy rates reduce the cost of short term finance to banks and, if protracted, provide an implicit guarantee that indirectly impairs market discipline. When rates are low, banks substitute bank capital with deposits, raising bank riskiness (probability of a bank run). Since the probability of bank runs is endogenous, the model can account for the evolution of bank risk in relation to monetary policy and the business cycle.

A noteworthy feature of our model consists in embedding fundamental bank runs into a macroeconomic model for policy analysis. [Diamond and Dybvig \(1983\)](#) modelled panic based banks runs in a partial equilibrium and static context: they analyzed panic runs triggered by liquidity shocks on depositors. Since then, the banking literature has evolved. On the one hand, empirical evidence<sup>3</sup> has documented a correlation between banks' runs and changes in fundamentals. On the other, the notion of purely panic-based run does not lend itself easily to policy analysis, because of the difficulty of pinning down an endogenous probability of bank runs (there are two rational equilibria, each with equal probability). For this reason the theoretical banking literature moved towards considering fundamental and information-based bank runs, ultimately triggered by bad news on investment returns. We follow this latter notion of bank run, embedding it into a macroeconomic model and analyzing its interaction with monetary policy.<sup>4</sup>

We obtain three sets of novel results. First, our time series evidence, based on a standard VAR augmented with various sources of bank risk, supports the notion that monetary policy influences risk in the banking sector by changing the bank's funding structure, as well as the riskiness of its assets. These results are robust to different proxies of bank risk and different VAR identification strategies. Second, we propose a model that rationalizes the risk taking channel on the funding side. Our model shows the mechanisms through which an expansionary monetary policy raises bank leverage and risk (and a contractionary policy does the opposite), by inducing banks to substitute short term risky funding instruments for capital. The effects of the monetary expansion on output and inflation are the conventional ones – they both rise – but they are milder than in a corresponding model without banks; a dampening of monetary policy transmission occurs because risk-taking by banks is contractionary, hence it compensates in part the expansionary first-round effect. Similar effects occur under a positive productivity shock, due to the fact that monetary policy becomes more expansionary, as it targets expected inflation. Third, we also discuss the effects of projects riskiness on the long run levels and the volatility of output and assets prices. The literature found extensive evidence that an increase in such riskiness raises the volatility of output and reduces its long run level<sup>5</sup> as well as raises the volatility of asset prices and reduces their long run level.<sup>6</sup> Our model confirms those links, but highlights a new channel that stems from the endogenous formation of risk: when investment project risk increases, and as investors become aware of such increase, more bank runs occur. This raises the volatility of bank funding and investment and lowers production prospects in the long run due to the resource costs of projects' liquidation.

The paper is organized as follows. In [Section 2](#) we briefly review some recent literature on the risk taking channel of monetary policy. In [Section 3](#) we present time-series evidence on the transmission of monetary policy on bank risk in the US. In [Section 4](#) we review some macro-finance literature and relate our theoretical model to that by highlighting novelties and differences. In [Section 5](#) we present our macroeconomic model with bank runs. In [Section 6](#) we analyze the model and its quantitative properties, mostly in relation to our time series evidence. Finally, [Section 7](#) concludes. Appendices and tables follow.

## 2. Recent empirical evidence

The surge of interest for the implications of monetary policy on financial risks after the recent crisis contrasts sharply with the virtual absence of any reference to risk<sup>7</sup> in the earlier literature on monetary policy transmission. The classic 1995 survey by [Mishkin, Taylor and others](#) in the *Journal of Economic Perspectives* ([Mishkin, 1995](#)) hardly mentions bank and financial risks at all. In the multi-country empirical study of monetary transmission in the euro area conducted by the Eurosystem central banks, dated 2003,<sup>8</sup> indicators of bank risk are actually used in the econometric estimates of the “lending channel,” but only to measure how changes in certain structural characteristics of the banking sector affect the strength of the transmission, not because monetary policy may itself influence those characteristics.<sup>9</sup>

In a different context, however, other authors had stressed the potential importance of the link between monetary policy and financial risks well before the onset of the financial crisis. [Allen and Gale \(2000\)](#) had provided a theoretical underpinning for these ideas by showing how leveraged positions in asset markets create moral hazard. In their paper leveraged investors

<sup>3</sup> See among others [Kaminsky and Reinhart \(1999\)](#) and [Calomiris and Mason \(2003\)](#) for links between bank runs and fundamentals.

<sup>4</sup> See [Diamond and Rajan \(2000, 2001\)](#). In a companion paper, [Angeloni and Faia \(2013\)](#) provide normative analysis within a similar model, also showing that the model matches the main macroeconomic and banking business cycle features.

<sup>5</sup> See [Bloom \(2009\)](#).

<sup>6</sup> See for instance [Bae et al. \(2007\)](#).

<sup>7</sup> As explained earlier by risk here we mean mainly indicators of endogenous formation of risk, not merely exogenous financial shocks.

<sup>8</sup> See [Angeloni et al. \(2003\)](#).

<sup>9</sup> Recently a Minskian view of endogenous risk formation has been proposed in [Assenza and Delli Gatti \(2013\)](#) but in a model with firms' default.

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