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Dynamic debt runs and financial fragility: Evidence from the 2007 ABCP crisis

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ABSTRACT

We use the 2007 asset-backed commercial paper (ABCP) crisis as a laboratory to study the determinants of debt runs. Our model features dilution risk: maturing short-term lenders demand higher yields in compensation for being diluted by future lenders, making runs more likely. The model explains the observed tenfold increase in yield spreads leading to runs and the positive relation between yield spreads and future runs. Results from structural estimation show that runs are very sensitive to leverage, asset values, and asset liquidity, but less sensitive to the degree of maturity mismatch, the strength of guarantees, and asset volatility.

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1. Introduction

Debt runs played a central role in the financial crisis of 2007–2008. Investors ran on asset-backed commercial paper (ABCP) starting in August 2007, on repo starting in September 2007, and on money market mutual funds in September 2008. Investors also ran on some large banks such as Northern Rock (September 2007) and Bear Stearns (March 2008).[1]

These events have reignited the debate about what causes runs and how we can prevent them. We contribute to this debate by measuring the sensitivity of runs to several contributing factors, including maturity mismatch, leverage, asset volatility and liquidity, and the strength of guarantees. The results help answer four questions that are vital to policy makers, regulators, bankers, and investors: How fragile are financial intermediaries? How can we design financial intermediaries ex ante to control the risk of future runs? What are the warning signs that a run is imminent? Finally, which interventions best prevent runs ex post once conditions have started deteriorating?

We address these questions by estimating a structural model of debt runs using data from the 2007 ABCP crisis. ABCP issuers, commonly referred to as conduits, are off-balance sheet investment vehicles that banks structure to invest in pools of medium- and long-term assets such as trade receivables and mortgage-backed securities (MBS).[2] A conduit finances these investments by issuing short-term ABCP to dispersed creditors and rolling it over until the conduit chooses to stop investing. The bank sponsoring the conduit provides some form of guarantee in the event that the conduit can no longer roll over its debt.

The amount of ABCP outstanding in the U.S. contracted by $370 billion (roughly one-third) between August and December of 2007. Several authors have interpreted this event as a run on debt.[3] In a debt run, creditors refuse to roll over their debt if they fear that other creditors will not roll over, in some cases even if the borrower is solvent. In the case of ABCP, roughly 40% of conduits had stopped rolling over maturing debt by the end of 2007.

ABCP provides a useful laboratory to study financial fragility for four reasons. First, since ABCP conduits perform maturity transformation, they are representative of many other financial intermediaries. Second, the simple balance sheet and operating structure of ABCP conduits lend themselves to modeling. Third, we have detailed data on the yield, maturity, size, and issuer's identity for all U.S. ABCP transactions in 2007. Because yields adjust at each maturity date, their time series measures the conduit's health continuously and can potentially be an important lead indicator of runs. Finally, as Krishnamurthy, Nagel, and Orlov (2014) argue, the ABCP crisis was important in itself:

> The contraction in both repo and ABCP are consistent with the views of many commentators that a contraction in the short-term debt of shadow banks played an important role in the collapse of the shadow banking sector. However, it is important to note that the ABCP plays a more important role than repo in this regard.

In fact, runs on ABCP could have had a broad effect on financial intermediation through two channels. First, runs impaired ABCP conduits' ability to fund assets such as trade receivables or student loan receivables. Second, the runs on ABCP conduits forced their sponsoring banks to take troubled assets like mortgage securities back onto their own books, which impaired lending to nonfinancial firms and ultimately harmed economic activity (Irani, 2011).

Our model of ABCP conduits is based on He and Xiong (2012a). A conduit finances a long-term asset using short-term, dispersed debt with overlapping maturities. Creditors track the asset's value and optimally run as soon as the conduit's leverage crosses above an endogenous threshold. A creditor's decision to run depends on changing expectations that other creditors will run. We extend He and Xiong's (2012a) model so that debt yields are not fixed but instead vary endogenously over time, so as to make lenders indifferent between rolling over or not. This extension is necessary: we show empirically that yields on ABCP forecast runs, and yields increase exponentially leading up to runs. To have any chance of fitting these data, the model must make predictions about the time series of yields.

The model's parameters include the debt's maturity; the perceived strength of the sponsor's guarantee; and the asset's volatility, maturity, and liquidation discount in default. We observe some of these parameters directly in the data, and we estimate others using the simulated method of moments (SMM).

We find three main results. First, we show that runs are very sensitive to leverage and asset liquidity, but are less sensitive to the degree of maturity mismatch, asset volatility, and perceived guarantee strength. We measure these sensitivities by comparing simulated run probabilities between our estimated model and a counterfactual model with altered parameter values. We measure these sensitivities in both the early and late stages of a simulated crisis. In the late stages, increasing the asset's liquidation recovery rate by 1% (from 92.0% to 92.9%), while holding all else equal, lowers the probability of a run within three months from 70% to 39%. Decreasing the conduit's leverage by 1% (from 91.4% to 90.4%) has an almost identical impact. In contrast, reducing the run probability by the same amount would require either reducing asset volatility by 40%, increasing average debt maturity by 190%, reducing average asset maturity by 98%, or increasing the guarantee's expected life span by 413%.

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[1] Brunnermeier (2009) and Krishnamurthy (2009) summarize the events of 2007–2008. We discuss the literature on ABCP below. Gorton and Metrick (2012) and Krishnamurthy, Nagel, and Orlov (2014) empirically investigate the run on repo. Martin, Skeie, and Von Thadden (2012) provide a model of repo runs. Kacperczyk and Schnabl (2013) examine the run on money market funds.

[2] One prevalent view is that ABCP conduits were essentially a way for sponsoring banks to take on systemic risk beyond regulations, without transferring the risk to ABCP investors. See Acharya and Richardson (2009), Acharya and Schnabl (2010), Acharya, Schnabl, and Suarez (2013), Brunnermeier (2009), and Shin (2009).

[3] See, for instance, Covitz, Liang, and Suarez (2013), Acharya, Schnabl, and Suarez (2013), and Gorton and Metrick (2012).