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Assessing the credit risk of money market funds during the eurozone crisis☆

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ABSTRACT

This paper measures credit risk in prime money market funds (MMFs) and studies how such credit risk evolved during the eurozone crisis of 2011–2012. To accomplish this, we estimate the annualized expected loss on each fund's portfolio. We also calculate by Monte Carlo the cost of insuring a fund against losses amounting to over 50 basis points. We find that credit risk of prime MMFs, though small, doubled from 12 basis points in June 2011 to 23 basis points in December 2011 before receding in 2012. Contrary to common perceptions, this did not primarily reflect funds' credit exposure to eurozone banks because funds took measures to reduce this exposure. Instead, credit risk in prime MMFs rose because of the deteriorating credit outlook of banks in the Asia/Pacific region. We conclude that the increase in the credit risk of prime MMFs in the second half of 2011 reflected contagion in the worldwide banking system coupled with slowing global economic growth, not actions taken by MMFs.

1. Introduction

In the five business days following the default of Lehman Brothers in September 2008, money market funds experienced redemptions totaling over $300 billion. Unlike banks, money market funds (MMFs) do not hold capital against credit losses, nor are they insured by the federal government. Instead, credit risks in money market funds are mitigated by liquidity, maturity, credit rating, and concentration limits on funds' portfolios, as mandated by the Securities and Exchange Commission (SEC). In the aftermath of the Lehman Brothers default, the SEC significantly tightened money market fund regulations. Regulators, press reports and some academic studies (e.g., Chernenko et al., 2014; Rosengren, 2012) have questioned whether the new, tighter regulations were sufficient to constrain credit risks in MMF portfolios during periods of market stress. These studies cite the rapidly deteriorating credit quality during 2011–2012 of certain European banks, in which MMFs held substantial investments. Based on the scale of their investments in European banks, these studies suggest that credit risk in prime MMFs rose markedly during the second half of 2011.[2] If true, this could indicate that the SEC's 2010 reforms to MMFs were insufficient to prevent a replay of September 2008.

This paper offers a detailed analysis of the scale and sources of credit risk in MMF portfolios during the eurozone crisis. We begin by developing a method for assessing credit risks in MMF portfolios. This is necessary because MMFs price their portfolio holdings at amortized cost, such that fund yields (and yield spreads) do not immediately reflect changes in the credit quality of their

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[2] We focus only on the credit risk in prime MMF portfolios in this paper. Prime MMFs are money market funds that invest in a range of money market securities, including commercial paper, bank CDs, medium-term and floating-rate notes, repurchase agreements (repos) and Treasury and agency securities. Government money market funds typically invest only in Treasury or agency securities or repos backed by Treasuries and agencies and therefore should be default-risk-free.

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portfolios securities.[3] Furthermore, current market yields on MMFs' outstanding portfolio securities are frequently unavailable since secondary markets for short-term securities, like certificates of deposit and commercial paper, are notoriously thin (Covitz and Downing, 2007). Thus, to study credit risk in MMFs, we must first develop a measure that evolves with market conditions. Next, we use this measure to study the evolution of MMF portfolio credit risks during the eurozone crisis of 2011–2012. The goal is to understand (a) how much credit risk was in MMF portfolios over this period and (b) whether increases in MMFs' credit risks were attributable to their investments in European banks or other factors.

In theory, CDS premiums could be used to measure the credit risk in MMF portfolios. Numerous recent studies have sought either to assess the credit risk or capital adequacy of banks using CDS premiums. For example, Segoviano and Goodhart (2009) treat the entire banking system as a portfolio, the riskiness of which is based on the CDS premiums of individual banks. Other studies have used 5-year CDS premiums to assess systemic risk in bank portfolios at a fixed horizon, such as over the next quarter or the coming year (Avesani et al., 2006,Huang et al., 2009). Money market funds pose a unique problem, though, in that the bulk of their assets are very short-term, typically maturing in 3 months or less while CDS premiums are not generally quoted at maturities of less than 6 months. Furthermore, market participants indicate that CDS are often thinly traded at 6- and 12-month horizons.

To deal with this, we use default probabilities obtained from the Risk Management Institute (RMI) at the National University of Singapore. RMI generates forward-looking default probabilities for issuers on a daily basis for maturities of 1, 3, 6, 9, 12, 18, and 24 months ahead for about 34,000 firms for 106 economies around the world. RMI publishes default probabilities even in some cases (such as Canadian banks) for which CDS are not generally traded. We match these default probabilities using characteristics of the securities money market funds hold (such as a security's issuer, maturity, and security type) collected from SEC form N-MFP. For example, if a fund holds a Ford Motor medium-term note that has a remaining maturity of 3 months, that note is matched with Ford Motor's annualized 3-month cumulative default probability. This default probability is multiplied by the presumed default loss rate on Ford Motor to generate an annualized expected loss on the security. Aggregating (on an asset-weighted basis) across all of a fund's holdings provides an estimate of the "expected loss-to-maturity" (*ELM*) of the fund's portfolio under the assumption that the fund holds each security until it matures (or defaults). Because the term structure of CDS premiums is normally upward sloping for high quality issuers (Agrawal and Bohn, 2006; Han and Zhou, 2011), we expect *ELM* to be lowest for those MMFs with the shortest portfolio maturities.[4]

While *ELM* is useful for measuring a fund's overall credit risk, it may overstate the risk of a September 2008-like event. A money market fund may offer a per-share price of $1.00 if its mark-to-market value remains within $\frac{1}{2}$ cent (50 basis points) of $1.00. If its mark-to-market value drops below $.995, the fund must lower its per-share price to $.99. This is colloquially known as "breaking the buck." Policymakers and other experts have expressed concerns that if one fund breaks the buck, this could lead to a run on other MMFs.[5] Following the default of Lehman Brothers on September 15, 2008, the Reserve Primary Fund broke the buck on September 16, 2008. Over the 5 days ending September 19, prime MMFs met historic redemptions. Prime money funds with exposure to Lehman Brothers' debt experienced outflows. However, several MMFs with no direct exposure to Lehman Brothers or other distressed issuers also incurred heavy outflows in September-October 2008 (McCabe, 2010). These redemptions are reported to have contributed to a freezing of commercial paper markets, threatening the mechanism through which business make payrolls and finance their daily operations (Schapiro and Mary, 2012). Therefore, investors, fund managers, and policymakers may be interested in the risk premium associated with a fund breaking the buck. We therefore compute an alternative measure of MMF risk, namely the cost of insuring against a fund breaking the buck, which we call $BBI(l, \mu)$. We allow for a insurance deductible, l, of 50 basis points of a fund's assets and a maximum coverage amount, μ, of 300 basis points of a fund's assets. We select l and u to be consistent with the structure of the U.S. Treasury's 2008–2009 temporary guarantee program for MMFs.

$BBI(l, \mu)$ is more difficult to calculate than *ELM* because defaults may be correlated across issuers. For example, MMFs hold (U.S. dollar-denominated) commercial paper and other short-term debt issued by large global banks. The failure of a large global bank could threaten the solvency of other large banks if, for instance, surviving banks hold debt issued by the failing bank. To correctly assess the probability that a fund might break-the-buck, default correlations need to be taken into account. We do this using a copula (Li, 2000) implemented by Monte Carlo simulation.

ELM and $BBI(l, \mu)$ have elements in common with measures of systemic risk and stress indicators for banks (Tarashev and Jackel, 2008; Huang et al., 2009; Segoviano and Goodhart, 2009). They also have similarities to Bank for International Settlement (BIS) guidelines for assessing Incremental Risk Charge (IRC). Under Basel II, a bank may face a capital surcharge (the IRC) on its "trading book," those securities a bank intends to actively trade and hold for less than one year. Under BIS guidelines, to determine the capital surcharge, the bank models the credit risk in its trading book under three assumptions: (a) the horizon for measuring credit risk ("credit horizon") is one year; (b) the capital surcharge takes into account a security's "liquidity horizon," which is the point at which the bank can dispose of trading book securities (generally, the shorter the liquidity horizon, the lower is the IRC); (c) the bank maintains a "constant-risk" trading book, periodically rebalancing its trading book to maintain a constant level of credit quality (for example, if the credit rating of a trading book security declines from AAA to AA, the bank is assumed to replace that security with a AAA-rated security). Studies by regulators (Dunn et al., 2006) indicate that the IRC is 30 percent lower for a hypothetical bank with a liquidity horizon of 1-month compared to a bank with a liquidity horizon of 1 year. Given that we measure a fund's credit risk from annualized expected losses derived from annualized cumulative default probabilities on portfolio securities, we are implicitly setting a fund's "credit horizon" to one year. In addition, our approach sets a fund's "liquidity horizon" to the remaining maturity of its securities holding.[6] Finally, we assume that a fund maintains a

[3] At first glance, the most obvious way to estimate the credit risk on an MMF is by the difference between the yield on a prime MMF and the yield on a comparable government-only MMF. If a fund holds a security and that security's credit quality declines, the security's market price should also decline, boosting the security's market yield. But because funds use amortized cost accounting, the rise in the security's yield would not be immediately reflected in the fund's yield. Generally speaking, only if that security matures and the fund rolls over its holding of that security, would the fund's yield then rise to reflect the increased credit risk.

[4] Data sources and code used to produce the results in this paper are available on request.

[5] See, for example, FSOC (2012) and Squam Lake (2011, 2013).

[6] Our approach is in some sense more conservative than the BIS guidelines under which banks compute IRC. BIS guidelines allow banks to treat a security's liquidity horizon as the date by which the bank can reasonably expect to dispose of the security in the market with little price pressure. Thus, if a bank holds a 10-year corporate bond and believes it could dispose of it in, say, 6 months with little or no