

Research Report

Cyclicalities of Collateral Haircuts and Systemic Illiquidity

PRO-CYCLICALITY OF COLLATERAL HAIRCUTS AND MARGINS HAS BECOME A WIDELY PROCLAIMED BEHAVIOUR BUT EMPIRICAL EVIDENCE ON THIS TOPIC IS QUITE SPARSE AND THE DISCUSSIONS ARE PRIMARILY DRIVEN BY INSIGHTS DERIVED FROM THEORETICAL MODELS. BASED ON A UNIQUE DATA SET, WE CONSTRUCT A MEASURE OF SYSTEMIC ILLIQUIDITY OF BOND COLLATERALS AND APPLY BUBBLE DETECTION TECHNIQUES TO IDENTIFY IRRATIONAL BEHAVIOUR AND PRO-CYCLICAL TENDENCIES. FINALLY, WE PROPOSE A QUANTITATIVE TRIGGER AND DESIGN FOR MACROPRUDENTIAL HAIRCUT ADD-ONS.

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Introduction

Pro-cyclical tendencies of haircuts and margins are subject to an ongoing discussion among academics and regulatory authorities since the aftermath of the financial crisis in 2008. The basic line of argumentation is that in calm periods of the business cycle, lower margins (due to lower volatility of market prices) and lower collateral haircuts (due to high levels of liquidity and low counterparty risks) lead to an expansion of overall leverage and of the value of collateral portfolios. During times of financial distress, the same effects work in the other direction and result in lower values of collateral portfolios, i.e., constraints of (fund-

ing) liquidity. If funding liquidity deteriorates suddenly and sharply, i.e., a shock occurs, participants might be forced to liquidate positions, which increases volatility and hence margins. Others might be affected by rising margins and are forced to sell in already falling markets, which might be further fueling distress and result in pro-cyclical tendencies. These interacting effects, known as liquidity spirals, have a systemic character in form of market-wide and exacerbated illiquidity and hence compromise financial stability. As a consequence, regulatory authorities (1) call for further investigation of this phenomenon, (2) demand through-the-cycle monitoring metrics, and (3) have pro-

posed macroprudential counter-measures (ESRB, 2015). Particular measures are counter-cyclical macroprudential add-ons for collateral haircuts. Furthermore, counter-measures to market-wide illiquidity resulting from general loss of confidence in financial markets or exacerbated counterparty risk perceptions are called for in order to mitigate systemic tendencies (ESRB, 2013). Therefore, it is important to measure systemic illiquidity using adequate methods. Additionally, the measure should be able to serve as a quantitative basis for a macroprudential haircut add-on to identify periods of irrational tendencies, in which the haircut add-on should be applied. Thus, any discretionary decisions regarding the triggering process can be avoided.

Methodology

Noise as Illiquidity Measure: Besides several basic measures, only a few comprehensive measures exist to quantify systemic illiquidity. We decided to rely on Hu et al. (2013) and measure systemic illiquidity as the price deviation from actual and theoretical bond yields (also referred to as "noise"). This noise measure can be understood as the aggregation of cross-sectional pricing errors between theoretical bond yields which are computed as the present value of discounted coupons neglecting any risk and actual market yields. The key component of our approach is deriving two different time series representing systemic illiquidity. First, we derive the noise measure for actual market yields (*Noise*) measuring the overall market illiquidity. Second, we derive the synthetic noise measure together with the consideration

of applied haircuts measuring the illiquidity within the collateral portfolio (*Noise_{HC}*).

Identifying Explosive Behavior: After the construction of two different time series for overall market illiquidity and illiquidity within the collateral portfolio, we seek to identify periods of explosive- and bubble-like behavior. Due to the fact that the test procedures of Phillips et al. (2015) allow to identify multiple, structural breaks and provide a date stamping methodology at the same time, we choose their test statistic as the most suitable method. Therefore, we use the Generalized Sup Augmented Dickey-Fuller (GSADF) test procedure to identify the existence of multiple bubbles. This procedure is a recursive and straight-forward application of the Supremum Augmented Dickey-Fuller (SADF) methodology, which is designed to provide additional power in identifying multiple breaks of exuberance and collapse. A similar test procedure (BSADF: Backward Supremum Augmented Dickey-Fuller methodology) can additionally be used as a date stamping method. The application of this method results in consistent estimates of time periods (origination and termination dates) of explosive behavior.

Empirical Analysis

To analyze whether haircuts show pro-cyclical behavior, we start by applying the mentioned test procedures and test the two distinct time series of systemic and portfolio illiquidity (Figure 1) for existence of multiple breaks. Subsequently, if the tests indicate multiple periods of explosive behavior, we identify the origination and termination dates of the corre-

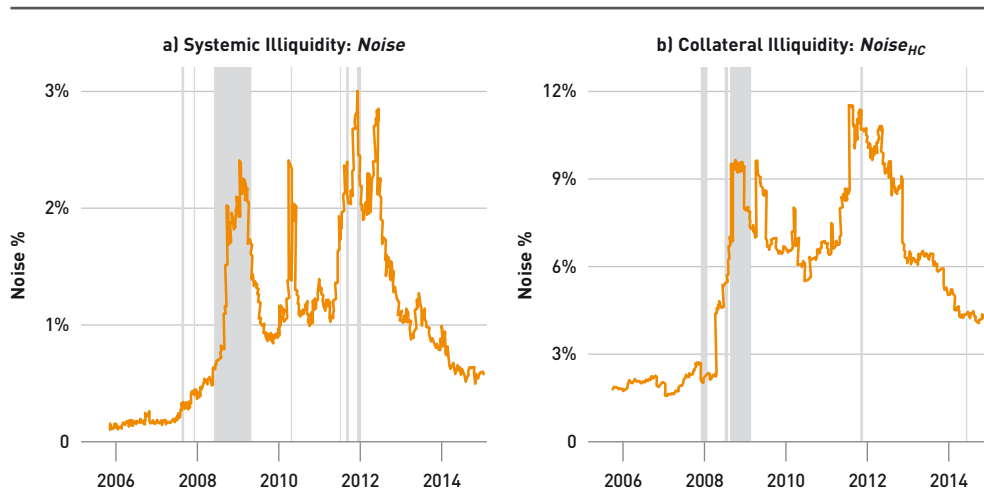


Figure 1: Overall Systemic Illiquidity (a) and Collateral Illiquidity (b) as Well as Periods of Explosive Behavior (Shaded Periods)

sponding periods. All test statistics indicate multiple periods of structural breaks far beyond the critical values of 99% confidence. To identify explosive periods, we shaded the periods where the BSADF test statistics exceed their 95% critical values. The identified periods of irrational and explosive behavior (identified with Noise in Figure 1a) include the global financial crisis where the first signs of a crisis are identified in August and December 2007. The outbreak of the financial crisis in Europe is identified in June 2008 lasting until April 2009. The second spike is related to the periods of financial turmoil in Greece and is identified in April 2010, very timely after the formal request of a first bailout package for Greece. The third set of periods with explosive behavior is identified in July 2011 and is obviously related to the European debt crisis and the ongoing financial distress in many

European countries. The bubble periods identified with $Noise_{HC}$ (see Figure 1b) are very similar to the bubble periods described above but they differ in length and with respect to the starting point. The length is considerably shorter. We only identify 43 weeks of irrational illiquidity instead of 62 in the normal measure. Due to the fact that the noise measure considering haircuts ($Noise_{HC}$) always displays less bubble periods than the normal noise measure (43 and 49 weeks instead of 62 and 69 weeks, respectively) and that we are not able to observe a foreshadowing or amplifying behavior of $Noise_{HC}$, we conclude that the design of past and present haircuts does not come or even exacerbate market-wide illiquidity. Furthermore, we observe that illiquidity measured by noise with applied haircuts ($Noise_{HC}$) is much smoother and is not as explosive as the normal illiquidity measure.

Macroprudential Add-On: Haircut Discounts

As a final step, we introduce a method to derive haircut discounts in times of irrational (funding) liquidity distress to provide relief of distrust-induced systemic illiquidity. The proposed haircut add-ons are only granted for periods in which we identify irrationality. They are computed by integrating the area under the $Noise_{HC}$ curve from the start of the bubble until the day the discount is applied. Hence, on the one hand, the add-on is designed in a way that the discount increases with observed systemic illiquidity. On the other hand, it increases with the level of irrationality.

By running a simulation and neglecting any possible reaction of market participants, we observe that our proposed methodology prevents lasting periods of irrationality. However, it does not intervene if the systemic illiquidity is of short temporary nature and if it is dissolved by the market itself. During the period of the longer lasting financial distress phase beginning in 2008, the add-on becomes increasingly active and smoothes the irrational component of the system-wide illiquidity. We argue that this is a highly desirable feature since market interventions should be reduced to a minimum and should be based on a data-driven approach instead of discretionary or even political decision making processes.

Conclusion

The question of whether collateral haircuts show a pro-cyclical pattern is investigated and a macroprudential haircut add-on to mitigate irrational illiquidity is proposed. We can

reject the hypotheses that collateral haircuts amplify systemic illiquidity by comparing the noise measure for yields with and without haircuts. For our analysis, we apply a measure to identify the start and end points of periods of irrational systemic illiquidity. In addition, this indicator serves as a quantitative trigger for a macroprudential haircut add-on. The proposed haircut add-on shows desirable features to mitigate stretching periods of irrational liquidity constraints during periods of financial distress.

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