Momentum and Funding Conditions

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Abstract

We find evidence linking momentum with macroeconomic conditions, namely, the funding environment. We show that the momentum premium varies systematically across funding states with winners outperforming losers by 1.4% per month in restrictive states, while in expansive states winners and losers perform similarly. This pattern is consistent with changing shareholder preferences for winners and losers in response to signaled shifts in funding availability. Furthermore, the funding environment influences the relationship between momentum and firm characteristics, while largely subsuming the influence of market states and return dispersion. Overall, it appears that transitions in the funding environment encourage investors to revise portfolio allocations; which produces inter-temporal variation in momentum.

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In this paper we examine the momentum pattern in stock returns relative to the funding environment. The paper addresses two major questions: (i) Does the momentum pattern vary systematically with the funding environment? and (ii) Does the funding environment influence the association between firm-specific attributes and momentum? We investigate these two issues to provide information regarding the underlying factors that drive momentum in stock returns. Our research is motivated by studies such as Cooper, Gutierrez and Hameed (2004), Avramov and Chordia (2006) and Stivers and Sun (2010), which suggest that shifting market states influence investor pricing decisions and create temporal variation in the momentum premium. In our paper, funding conditions (the funding environment) is defined by monetary policy developments and is predicated on an extensive theoretical and empirical literature. In addition, we rely on past research to identify the momentum and firm-specific attributes that are considered in our empirical analysis.

The existence of momentum in stock returns is a widely acknowledged phenomenon in financial markets.[1] The acceptance of the phenomenon is witnessed by the widespread application of the Carhart (1997) model, which treats momentum as a priced factor. The prominence of momentum in stock returns is confirmed by Daniel and Moskowitz (2015) as they show that the difference in returns between the top and bottom momentum deciles is an astounding 16.5% per year. Knowledge of the momentum return pattern has been advanced substantially by the numerous studies that examine various aspects of the momentum pattern. Relatively few studies, however, have investigated the relation between economic conditions and return momentum. Furthermore, the studies that have attempted to relate momentum to underlying economic variables have generally been unable to document any consistent systematic relationship.

[1] Numerous studies also confirm that momentum exists in other asset markets (see for example Griffin, Ji and Martin (2003), Okunev and White (2003), Erb and Harvey (2006), Moskowitz, Ooi and Pedersen (2012), Asness, Moskowitz and Pedersen (2013), and Daniel and Moskowitz (2015)).

Motivated by previous evidence, we evaluate several attributes of return momentum relative to changes in funding conditions. Bernanke and Gertler (1995) contend that monetary policy developments have a substantial influence on financial markets via a credit channel mechanism in which changes in the funding environment impact bank lending, firm balance sheet health and the spread between the cost of internal and external finance. Brunnermeier and Pedersen (2009) link funding conditions directly with the actions of security market participants as they propose a model in which changes in the funds available to speculators cause them to alter their holdings of liquid versus illiquid securities. Finally, there has been considerable evidence linking the funding environment with investor pricing decisions (e.g. Jensen, Mercer and Johnson (1996), Thorbecke (1997), Patelis (1997) and Jensen and Moorman (2010)).

The above studies suggest that funding conditions play a prominent role in the determination of security prices. Further, the studies link the funding environment with investor pricing of firm characteristics, particularly market capitalization. Market capitalization has also been shown to play a prominent role in momentum returns (see Hong, Lim, and Stein (2000), Lesmond, Schill and Zhou (2004), Novy-Marx (2012) and Asness, Moskowitz and Pedersen (2013)). In addition, the momentum model advocated by Sagi and Seasholes (2007) links momentum to firm growth options and sales volatility, which are firm characteristics whose value is influenced by the availability of financing. Sagi and Seasholes state that their model does not preclude macroeconomic effects on momentum; however, they choose to simplify matters by limiting their investigation to time-varying expected returns resulting from a firm's microeconomic attributes. It is reasonable to expect that the premium they ascribe to firm growth options and sales volatility deviates based on the expected availability of funding. A change in funding conditions, as a macroeconomic influence, is likely to impact investor pricing with respect to return momentum, just as microeconomic factors are shown to influence return momentum in the Sagi and Seasholes model.

Finally, studies by Cooper, Gutierrez and Hameed (2004), Avramov and Chordia (2006), Stivers and Sun (2010), Moskowitz, Ooi and Pedersen (2012), and Daniel and Moskowitz (2015)

present evidence of substantial temporal variation in momentum returns, which suggests that underlying economic conditions play an important role in the pattern's prominence. Avramov and Chordia conclude, "The fact that time-varying alpha captures the impact of past returns points to a potential business-cycle related explanation for the impact of momentum on the cross-section of individual stock returns." In this paper, we propose that funding conditions are a potential explanation for the documented time-varying momentum premium.

Our major contribution to the literature is that we find evidence suggesting that the momentum pattern in equity returns is conditional on signaled shifts in the funding environment. We present several specific findings that support this proposition. First, a significant momentum premium is shown to exist exclusively during periods when the funding environment is constrained. Thus, it appears that momentum is only priced during periods when the future availability of funding is potentially threatened. Second, we show that the momentum premium, which is observed during constrained funding environments, is attributed to a combination of outperformance of winners and underperformance of losers. Third, our evidence indicates that during expansive funding states *losers* with value characteristics and small size perform well on both an absolute basis and relative to losers with other characteristics. Fourth, we show that the link between the funding environment and the momentum pattern is remarkably consistent across the 1963-2014 sample period. Finally, after controlling for the funding state, the influence of market states and return dispersion on momentum returns is greatly diminished. In contrast, after adjusting for the influence of market states and return dispersion, funding conditions still provide significant information about the momentum premium.

We also explore the channel by which the link between momentum returns and funding conditions operates. Similar to Brunnermeier and Pedersen (2009) and Jensen and Moorman (2010), if innovations in aggregate liquidity are particularly impactful for illiquid securities, it could be that investors reallocate their portfolios away from illiquid, loser stocks in favor of more liquid, winner stocks as aggregate funding conditions become restrictive. If this is the case, the more robust momentum returns in restrictive funding states could be indicative of a "flight to

safety", where past performance serves as an indication of relative safety and liquidity. Consistent with this theory, we document that loser stocks become significantly more illiquid than winner stocks during restrictive funding conditions. Furthermore, the improved performance of a momentum strategy in restrictive states is particularly strong among a sample of illiquid stocks.

Overall, our findings are consistent with the view that a shift to a restrictive funding state increases the relative appeal of stocks with strong recent performance (winners). According to this view, investors believe that an environment offering more difficult access to funds is better tolerated by stocks that have been prospering versus stocks that have been withering. Thus, an impending restrictive funding state motivates investors to increase (decrease) their allocation to winners (losers). This portfolio reallocation drives the stock price for winners (relative to losers) up and causes the momentum premium to expand. In contrast, a shift to an expansive funding state is viewed as a favorable indicator for future funding conditions in general. The improved prospects for easier access to funds will help losers recover from their recent slide, while also not inhibiting the advance of winner stocks. As such, the momentum premium is subdued during these expansive states.

Our analysis proceeds as follows. Section I motivates a relation between momentum and funding conditions and describes the measure of funding conditions used in our analysis. Section II reports the data and analysis. Section III presents our results and Section IV concludes.

I. Momentum and Funding Conditions

Since Jegadeesh and Titman (1993) first documented the profitability of momentum-based trading strategies, numerous alternative explanations have been proposed for the phenomenon. The majority of explanations rely on behavioral patterns engrained in investor trading. Examples of such studies include Daniel, Hirshleifer and Subrahmanyam (1998), Barberis, Shleifer and Vishny (1998), Hong and Stein (1999), Jegadeesh and Titman (2001), and Grinblatt and Han (2005). These studies rely on a variety of behavioral biases to explain

momentum.[2] While less common, there are several studies that offer rational explanations for momentum (see as examples Conrad and Kaul (1998), Berk, Green and Naik (1999), Johnson (2002) and Sagi and Seasholes (2007)). Our analysis is consistent with the various explanations offered for momentum as we investigate the relation between momentum and changes in funding conditions.

While the majority of research has focused on the cross-sectional attributes of momentum, several studies have examined the time series behavior of momentum and identified time-variation in the pattern. Cooper, Gutierrez and Hameed (2004) find evidence that momentum returns are related to aggregate stock market performance. In particular, they find that momentum returns are substantial during "up-market" periods, but are negative during down markets. Further, the authors show that the up/down market classification effectively differentiates momentum returns; however, they find that the macroeconomic variables advanced by Chordia and Shivakumar (2002) are insignificant in explaining time-variation in return momentum.[3] Cooper et al. conclude that to be used effectively, asset pricing models, both rational and behavioral, need to predict shifts in the state of the market. Stivers and Sun (2010) show that changes in cross-sectional return dispersion reliably predict time variation in momentum returns; however, consistent with Cooper et al. they fail to find any consistent relation between momentum and macroeconomic variables. The authors argue that changes in return dispersion identify transitions in market states, which encourage investors to reallocate

[2] For example, Daniel, Hirshleifer and Subrahmanyam (1998) contend that investors are overconfident and suffer self-attribution bias; in Daniel et al. this combination of biases results in a momentum pattern due to a delayed overreaction to information. Barberis, Shleifer and Vishny (1998) build a behavioral model that is based on representativeness and conservatism, this combination of biases results in a delayed reaction to public information. Hong and Stein (1999) claim that communication frictions cause information to diffuse slowly through the investment community. Grinblatt and Han (2005) develop a model in which prospect theory and mental accounting are responsible for both momentum and disposition behavior. They argue that, relative to other explanations, their model is more consistent with the empirical evidence.

[3] Cooper et al. report evidence that the explanatory power of the macroeconomic variables proposed by Chordia and Shivakumar (default premium, term premium, dividend yield and T-bill yield) is eliminated after applying data adjustments for microstructure issues (bid-ask bounce and transactions frictions). Likewise, Griffin, Ji and Martin (2003) show that macroeconomic variables fail to explain time variation in momentum in foreign equity markets.

their portfolios. This evidence further promotes the presence of an underlying variable that corresponds with shifts in investor pricing of firm characteristics.

A. Funding Conditions and Asset Prices

There are several alternative channels by which the funding environment has been linked to asset prices. Early models by Friedman and Schwartz (1963), Tobin (1969) and Brunner and Meltzer (1972) introduce a direct link between Fed policy and equity prices as Fed actions are argued to influence market liquidity and alter required equity returns. For example, expansive Fed policy encourages investors to substitute from more liquid to less liquid securities, thus increasing equity prices. Gertler and Gilchrist (1994) argue that shifts in monetary policy impact firm balance sheet health by affecting firm financing costs. Bernanke and Gertler (1995) advance a credit channel mechanism whereby changes in the funding environment correspond with adjustments in bank lending, firm balance sheet health, and the spread between the cost of internal and external finance. Finally, Lastrapes' (1989) and Whitelaw (1994) report evidence linking changes in funding conditions to shifts in market volatility.

Gertler and Gilchrist (1994) propose that the funding environment has a different influence across firms based on their characteristics. In particular, they argue that credit constraints are generally more binding for small firms due to their more limited access to capital, which makes them more vulnerable to a monetary policy shift. In a closely related study, Patelis (1997) evaluates the role of monetary policy on asset returns and concludes that changes in funding conditions affect the risk structure of the economy and the risk attributes of stocks. Likewise, Thorbecke (1997) reports evidence of a significant risk premium associated with changes in funding conditions. Further, he finds that the premium varies widely across industries and is substantially larger for small firms relative to large firms. Thorbecke concludes that funding conditions represent a common factor and investors require large premiums to compensate for exposure to the factor.

In a similar research vein, Brunnermeier and Pedersen (2009) advance a theory that links funding conditions with market liquidity. According to Brunnermeier and Pedersen, the funds available to speculators determine their relative willingness to hold illiquid securities. For example, when aggregate liquidity diminishes, speculators become more reluctant to hold illiquid equities. In contrast, improving market liquidity encourages speculators to increase their holdings of illiquid equities. Thus, according to the theory, asset prices for illiquid securities fluctuate directly with aggregate liquidity. Jensen and Moorman (2010) extend the Brunnermeier and Pedersen analysis and relate the illiquidity premium in equities to changes in funding conditions. The authors report evidence that a shift to an expansive funding environment encourages investors to reallocate their portfolios to less liquid stocks. This portfolio reallocation causes the illiquidity premium to expand as investors put upward pressure on the price of illiquid stocks.

Based on this prior research, we contend that a shift in the funding environment alters investor pricing and trade decisions due to its implications for the future availability and cost of financing. According to this view, a change in the funding state motivates investors to reassess their investment strategies and make appropriate modifications. Therefore, whether return momentum results from investor trading biases (irrational behavior) or is due to a priced risk factor (rational behavior), a change in the funding environment can potentially alter the momentum pattern. A perceived change in the future availability and/or cost of financing may cause investors to change their opinions regarding the value of particular firm characteristics and/or the relative attractiveness of particular trading strategies. Both changes have the potential to alter the momentum return pattern.

B. Defining the Funding Environment

We rely on a number of previous research studies to develop a classification system for the funding environment. Bernanke and Blinder (1992) advocate the federal funds rate as an effective indicator of monetary policy due to its close association with the level of bank reserves.

Thorbecke and Alami (1992), Thorbecke (1997) and Patelis (1997) extend the examination of the federal funds rate and identify a systematic relation between changes in the funds rate and stock returns. Related research by Jensen, Mercer and Johnson (1996) presents evidence that stock returns are also related to the Federal Reserve's broad policy directive, which they proxy with directional changes in the Fed discount rate. Jensen et al. show that this broad policy measure corresponds with significant patterns in monetary and reserve aggregates and is also systematically linked with expected stock returns.

Patelis (1997) claims that the effect of a monetary policy shock differs during periods of easy money relative to tight money. Based on this contention, Jensen and Moorman (2010) develop a measure of funding conditions that incorporates changes in the federal funds rate along with changes in the Fed discount rate. Jensen and Moorman argue that directional changes in the federal funds rate relate most closely to changes in the availability of money in the short-term market; they define this aspect of funding conditions as a change in monetary "Stringency." Likewise, directional changes in the Fed discount rate are claimed to identify adjustments in the Fed's broad policy "Stance." The authors show that a variable that combines Stringency and Stance is strongly related to changes in monetary and reserve aggregates and effectively differentiates the realized illiquidity premium in equities. Specifically, the authors find that the realized illiquidity premium is economically large and statistically significant during periods when Stance and Stringency are expansive, but otherwise is inconsequential. The authors conclude that their evidence indicates that changes in funding conditions significantly influence investor pricing decisions.

While our funding conditions measure is based on monetary policy developments, the measure necessarily also reflects economic conditions due to the interdependent nature of Fed policy actions and economic conditions. Federal Reserve actions are predicated on current economic conditions and Fed expectations regarding future developments in the economy. While it is difficult to disentangle the effect of Fed actions from economic developments that the Fed is reacting to, we document our measure's consistency with other measures of capital

availability to mitigate the possibility that our measure is picking up variation that is unrelated to the availability of capital. In Appendix A we compare our funding conditions measure to seven measures of capital availability, including both measures of the stock of money in the economy as well as its cost.[4] Whether evaluating monetary aggregates, costs of funding, or implied funding liquidity from U.S. treasuries (Fontaine and Garcia (2012)), our expansive (restrictive) states align with periods of significantly greater (lower) access to capital.

II. Data and Methodology

A. Sample and Data

The analysis covers the period from July 1963 through December 2014 and includes stocks in the CRSP universe, except financial and low-priced (i.e., less than $1) stocks, which are excluded.[5] Following previous research, we rely primarily on the traditional momentum measure, which is based on past performance from month -12 through month -2 (R-12,-2). In order to control for microstructure issues and isolate the momentum effect, we follow past research and consider a one-month skip period in deriving our past-performance measure.[6] We also consider size and book-to-market in our empirical analysis of momentum returns. Size is measured as the

[4] Recent work has put forth other measures of funding conditions. Adrian, Etula, and Muir (2014) focus on broker-dealer leverage; Fontaine and Garcia (2012) on funding liquidity implied by the term structure of U.S. Treasury securities; and Chen and Lu (2014) on stock margin requirements, using firm-level characteristics as proxies. Compared to this work, our funding conditions measure is motivated by a long strand of theoretical and empirical literature, can be computed over a long period of time, and has a straightforward economic interpretation. Other measures may more directly capture the current availability of funding for a particular type of firm or investor; however, we are more concerned with evaluating how broad funding conditions alter investor pricing decisions using publicly available and highly visible signals of current and future capital availability communicated in Fed policy actions.

[5] Following the literature, we exclude stocks with a price lower than $1 as of the beginning of the holding period. In a robustness check at the end of the paper, we use a sample that excludes stocks with a price below $5; the main conclusions do not change. Stock returns are also adjusted for delisting by using the delisting return from CRSP; however, if the delisting is for performance-related reasons, the delisting return is -55% if trading on Nasdaq or -30% if on NYSE/Amex, following Shumway (1997) and Shumway and Warther (1999).

[6] Following the evidence of Jegadeesh (1990), it has become standard practice to apply a one-month skip period when examining momentum returns. Jegadeesh reports evidence of a strong short-term reversal effect associated with the return in the most recent prior month.

log of firm market capitalization lagged one month (lnME), while book-to-market is the log of book equity to market equity (lnBEME), where BEME is defined as in Novy-Marx (2012).

For the majority of our empirical analysis, we follow Fama and French (1996), Chordia and Shivakumar (2002) and Daniel and Moskowitz (2015) and measure returns over a one-month holding period. Focusing on one-month holding period returns is appropriate given the inconsistent length of funding environments.

B. Measuring Funding Conditions

As noted previously, we rely on prior monetary policy research in developing a funding conditions measure. For example, Patelis (1997) and Jensen and Moorman (2010) argue that the influence of Fed policy shifts is conditional on the Fed's broad policy objectives, which warrants using a combined measure that incorporates two dimensions. The first dimension captures the Fed's broad policy "Stance" and is based on a change in the Fed discount rate. A reversal in the direction of the Fed discount rate (e.g. a rate decrease following a previous rate increase) initiates a new Fed policy Stance. The second dimension captures a shift in Fed "Stringency" and is based on a change in the effective federal funds rate. A change in the direction of the federal funds rate initiates a new period of policy Stringency. Stance and Stringency are assumed to remain in the same classification until the direction of change is reversed. Thus, a decrease (an increase) in the relevant policy rate subsequent to a prior decrease (increase) maintains the existing environment. When the most recent prior change in both rates is a decrease, the environment is classified as expansive. In contrast, the environment is considered restrictive if the previous change in both rates is an increase. When Stance and Stringency are contradictory i.e. the most recent change in the two are in different directions, the environment is classified as indeterminate. Following Jensen and Moorman we lag the funding conditions measure one month relative to the measured

return.[7] The exhibit below shows the classification approach for the three funding states (expansive, restrictive and indeterminate).

Exhibit 1. Funding Environments

		Discount Rate Signal (Stance)	
		Expansive	**Restrictive**
Federal Funds Rate Signal (Stringency)	**Expansive**	Expansive	Indeterminate
	Restrictive	Indeterminate	Restrictive

In Appendix A, we verify the robustness of our funding environments by comparing our classification with several prominent alternative measures of funding availability including monetary and reserve aggregates (Thornton 1998), the TED spread (Asness, Moskowitz, Pedersen, 2013), aggregate illiquidity (Amihud, 2002; Kamara, Lou, and Sadka, 2008)[8], and the value of funding liquidity (Fontaine and Garcia, 2012)[9]. Each of these alternative measures differs significantly across our classified expansive and restrictive funding environments. Specifically, using our approach, all measures indicate significantly greater funding availability when conditions are classified as expansive.[10]

III. Results

A. The Funding Environment and Short and Intermediate Term Momentum

[7] We repeat the analysis using returns that are measured contemporaneous with the initiation of a funding environment and obtain results that are not materially different.
[8] Jensen and Moorman (2010) report a link between aggregate liquidity, funding availability, and the illiquidity premium.
[9] We thank Jean-Sébastien Fontaine for making the funding liquidity factor publicly available at http://jean-sebastienfontaine.com.
[10] Due to the presence of extreme observations in several of the funding measures, we apply both parametric and non-parametric statistics in testing for differences across the funding states. In particular, extreme funding measures are apparent during periods of financial crisis, such as the 2008/2009 period.

To assess the influence of funding conditions on stock return momentum, we perform Fama-MacBeth regressions of firm returns against past performance and the traditional control variables. Regressions are estimated for the full sample and for each of the alternative funding environments. In addition, we define momentum using three alternative approaches: the traditional approach with past performance based on month -12 through month -2, R(-12,-2), and the two alternative approaches advanced by Novy-Marx (2012). Novy-Marx separates past performance into two alternative categories, short-term and intermediate term, with the short-term period comprising past performance from month -6 through -2, R(-6,-2), and the intermediate term extending from month -12 through -7, R(-12,-7).

The results of the Fama-MacBeth regressions are reported in Table 1. The first four columns rely on the traditional measure of past performance, R(-12,-2), and present results for the full period, and separately for each of the three funding environments. The four columns in the right portion of the table report the results associated with the alternative past performance definitions advocated by Novy-Marx, R(-12,-7) and R(-6,-2).

The full sample findings produced from the traditional measure of past performance (column 1) confirm the existence of a momentum pattern in stock returns even after controlling for other firm characteristics. Specifically, we find a strong positive relation between past performance and current returns; a significant momentum pattern. The observed relation with each of the control variables is also consistent with past evidence. For example, a strong short-term reversal is observed as evidenced by the large and significant negative coefficient on the previous month's return, R(-1,0). Firm market capitalization (lnME) and firm book-to-market equity (lnBEME) have significant negative and significant positive coefficients, respectively, which is consistent with the acknowledged relation each characteristic has with returns.

Columns 2 through 4 report the findings for the three funding environments, beginning with the expansive environment in column 2. It is readily apparent that the relation between past performance and returns is dramatically different across the alternative funding states. The

relation is negative, but insignificant and trivial, when funding conditions are expansive; however, when funding conditions are restrictive or indeterminate a strong momentum pattern prevails (the coefficient is positive and highly significant). Furthermore, the portion of returns that is unexplained by the model (the intercept) is substantially higher during expansive funding environments, relative to periods defined by restrictive or indeterminate funding. With the exception of the coefficient on lnME, the coefficients on the control variables are highly consistent across the three funding environments. Overall, the evidence in columns 2 through 4 indicates that the relation between past performance and equity returns is conditional on the funding environment.

Columns 5 through 8 present findings with past performance separated into two distinct classifications: the intermediate-term, R(-12,-7), and the short-term, R(-6,-2), classification. The full-sample results confirm the evidence of Novy-Marx (2012) that the momentum pattern is largely driven by intermediate-term past performance, rather than near-term past performance. However, the findings reported in the final three columns of Table 1 indicate that, regardless of how past performance is defined, the funding environment has a strong influence on the momentum pattern. Whether past performance is defined as near-term or intermediate term, there is no evidence of a unique momentum pattern when funding conditions are expansive. In contrast, when funding conditions are restrictive, a prominent momentum pattern prevails regardless of the definition of past-performance used in defining momentum. Although not shown, results are similar if we restrict the sample to the pre-crisis period, 1963-2006.

B. The Funding Environment, Firm Characteristics, and Momentum

Given that momentum in returns appears to be conditional on the funding state, we next examine whether this relation is concentrated in certain types of firms. Specifically, we form portfolios by double sorting firms into quintiles by past performance and firm size (Table 2) and past performance and BEME (Table 3). The derived portfolios are evaluated across the three funding environments in order to assess the influence of funding conditions on momentum for

firms of various types. Previous studies have shown that the momentum premium is related to firm size (ME) and BEME. By evaluating returns across the three separate dimensions, we provide additional evidence on the dynamics of the inter-relation between the variables. The returns are reported as market-adjusted returns to control for general market movements. Our evidence from Table 1 shows that the relation between funding conditions and the past performance return anomaly is largely invariant to the measure of past performance used. Therefore, throughout the rest of the analysis, we define momentum according to past performance based on the traditional approach, which relies on month -12 through -2.[11]

The market-adjusted returns reported in Panel A of Table 2 document the well-known momentum and size effects for the full sample period. Winners dominate losers by a significant amount over four of the five size quintiles and "small" firm performance dominates "big" firm performance over all five past performance quintiles. An inter-relation between past performance and size is also clearly apparent; however, the relation is not monotonic across portfolios. For the smallest firms, the performance of winners and losers does not differ significantly. In contrast, a substantial winner premium exists across the other four size quintiles, with the premium diminishing as firm size increases. Jegadeesh and Titman (1993) and Hong, Lim and Stein (2000) also find evidence of greater momentum profits associated with smaller firms. Hong et al. contend that once one moves past the smallest capitalization stocks, the momentum premium diminishes rather rapidly as firm size increases, which matches the pattern we observe. The Panel A results clearly indicate that the momentum premium is a widespread phenomenon and cannot be attributed to extreme returns for the smallest size firms.

The next three panels of the table report portfolio returns across the funding environments as follows: Expansive (Panel B), Restrictive (Panel C) and Indeterminate (Panel D). The returns in Panel B indicate that during expansive funding conditions only two of the five size portfolios show a significant winner premium; and furthermore, the winner premium is only

[11] Our general conclusions are invariant to the measure of past performance used in the empirical analysis. The findings obtained with the alternative measures (R(-12,-7) and R(-6,-2)) are available upon request.

marginally significant in one of the two cases. Surprisingly, the winner premium is negative, yet insignificant, for the smallest quintile of firms. In contrast, the size premium prevails across all five past performance quintiles during expansive funding periods.

Panel C shows evidence indicating that a prominent and consistent winner premium exists during periods when funding conditions are restrictive. The winner premium is large and highly significant across each of the size quintiles establishing the robustness of the pattern to differences in market capitalization. Surprisingly, the smallest quintile has the smallest momentum premium; however, the momentum premium is inversely related to firm size across the other four quintiles. The size premium is positive in all five cases, but is statistically significant in only three.

The returns reported in Panel D are generally consistent with those reported in Panel C, but the winner premiums are much less pronounced. The winner premium remains highly significant across four of the five size portfolios; however, it is insignificant for the smallest portfolio. Interestingly, the small firm premium is insignificant across all five of the past performance portfolios.

In each of the panels of Table 2, the largest winner premium occurs for firms of moderate size (quintile 2 or quintile 3) with the premium being particularly pronounced for quintile 2 during restrictive conditions. Furthermore, during periods of expansive funding, small *losers* perform by far the best of any portfolio over any environment, producing a market-adjusted monthly return of 1.81%. In contrast, over the same period, big losers perform very poorly with a market-adjusted return of -1.21%. These results clearly indicate that the relative performance of winner versus loser stocks is conditional on the funding environment. However, the premiums also suggest that there is an interrelation between firm size, momentum, and funding conditions as the premiums display systematic patterns across the quintiles. We investigate the interrelation between these variables more thoroughly in a later section.

Table 3 follows the format of Table 2 and reports market-adjusted returns for portfolios that are double sorted on past performance and BEME. The full sample returns (reported in Panel A) confirm the long-acknowledged winner and value premiums. The performance of winners exceeds the performance of losers across all five BEME quintiles; however, the winner premium is considerably smaller for value firms (high BEME) relative to growth firms. Value stocks outperform growth stocks by a significant amount across all five past-performance quintiles.

The findings reported in Panel B, C and D are consistent with those reported in Table 2 in that they strongly support the claim that funding conditions drive the winner premium. During expansive conditions (Panel B), the winner premium is insignificant across all five BEME quintiles. The premium is even negative for value firms during expansive conditions. In stark contrast, during restrictive and indeterminate funding states, the winner premium is consistently positive and highly significant. The winner premium is especially prominent during restrictive funding states with the largest premium reaching 1.63% for growth firms.

Once again, the evidence in Table 3 indicates a systematic relationship exists between funding states, momentum, and BEME. More specifically, and consistent with Asness, Moskowitz, and Pedersen (2013), there is evidence of a negative association between value and momentum in the full sample (Panel A) and across each of the funding environments (Panel B, C, and D). That is, momentum is higher for Low than High BEME stocks (e.g. WML is 1.25% vs. 0.80% in the full sample). Similarly, the value premium is higher for Loser than Winner stocks for the full sample (HML is 1.04% vs. 0.58%), and for each of the separate funding environments. We investigate the interrelation between these variables further in a later section.

The evidence from Tables 2 and 3 indicates that the relation between the momentum premium and firm characteristics is significantly influenced by the funding environment. While our evidence indicates that the performance of winners generally dominates the performance of losers, we show that the relation is conditional on firm characteristics and the funding state.

Surprisingly, small losers, and losers with value characteristics, perform relatively well when funding conditions are expansive, which is exactly counter to return momentum. Specifically, during expansive funding conditions these two loser portfolios outperform winners (of comparable characteristics) by an average of 0.57% and 0.14% per month, respectively. Furthermore, the returns reported for these two loser portfolios are the highest reported for any portfolio over any environment.

C. The Funding Environment and Holding Period Returns

Previous research identifies strong momentum returns, but shows that the returns diminish relatively quickly as the holding period is extended. In order to assess the influence that the holding period has on our findings, we extend the analysis of abnormal returns beyond a single month. In particular, Table 4 reports abnormal returns for holding periods ranging from one to six months. Holding period returns longer than a month are divided by the number of holding months to report a monthly average in the table. Given the influence of size and BEME on the momentum pattern illustrated in Tables 2 and 3, abnormal returns are adjusted for market capitalization (ME) and industry-adjusted BEME following the approach advanced by Daniel, Grinblatt, Titman and Wermers (1997) and Hoberg and Phillips (2010).[12]

The results reported in Table 4 clearly show a prominent momentum pattern even after controlling for differences in ME and BEME. For the full sample (Panel A) the average abnormal return for the WML portfolio is prominent in both economic and statistical terms for each of the four alternative holding periods. Interestingly, the premium is driven to a large extent by the strong positive abnormal performance of the winner portfolio; however, the underperformance of losers clearly contributes to the premium. The average abnormal return is very consistent across the first three holding periods, but drops considerably by the sixth month.

[12] To sufficiently populate the industry data necessary to complete the BEME adjustment, the sample period for Table 4 begins in January 1965. We use this same sample period for the Figures 1-5 for consistency and ease of comparison.

This evidence is consistent with Jegadeesh and Titman (1993) and Grundy and Martin (2001) who also find that momentum profits diminish over time.

The results across the three funding environments are reported in Panel B (expansive), Panel C (restrictive) and Panel D (indeterminate). Consistent with our previous approach, funding environments are determined based on a one-month lag relative to the start of the return measurement interval. In addition, holding periods are classified based on the funding environment existing in the first month of the holding period. For example, when considering expansive environment returns for multi-month holding periods, only the first month of the holding period has to lie in an expansive period for the holding period return to be classified as expansive.[13]

Consistent with our prior findings, there is no evidence of a significant momentum pattern during expansive funding environments. This observation holds across the spectrum of holding periods. The lack of a momentum pattern during expansive conditions can be attributed to the better than average performance of losers. During expansive conditions, the winner portfolio performs similarly to its average as evidenced by a significant average abnormal return for each of the first three holding periods. In contrast, during expansive conditions, the loser portfolio performs much above its average for each holding period.

During restrictive conditions (Panel C), the evidence once again supports a prominent momentum pattern. The pattern shows surprisingly strong persistence across the range of holding periods with each of the average abnormal returns being economically and statistically significant. Furthermore, the momentum pattern is driven by a combination of very strong abnormal performance from the winner portfolio and extraordinarily weak performance from the loser portfolio. The winner and loser portfolio each register a very consistent level of abnormal performance across the holding periods, yet the performance is of opposite sign. This evidence is

[13] This conservative treatment may contribute to the diminished momentum return for longer holding periods. If, for example, the funding environment switches in the second month after portfolio formation, the six-month holding period would contain three months of expansive funding conditions and three months of restrictive conditions.

consistent with the Novy-Marx (2012) claim that both the winner and loser portfolio contribute to momentum profits. Once again, the consistency and persistence of the momentum pattern during restrictive funding conditions adds additional support for the contention that the funding environment represents an underlying factor influencing investor pricing decisions.

The evidence in Panel D (indeterminate environments) also supports the view that the momentum pattern is conditional on the funding environment. Assuming the funding environment influences momentum returns, as our previous evidence suggests, then the momentum pattern during indeterminate periods should lie between the pattern that prevails during expansive and restrictive periods. After all, the indeterminate period includes elements of both expansive and restrictive policy, which, based on our classification approach, makes it a period of mixed policy signals. The momentum returns reported in Panel D are entirely consistent with this interpretation as the WML premium is marginally significant for three of the four holding periods. Interestingly, for both the restrictive and the indeterminate case, the WML premium is created from approximately equal contributions from winners (outperformance) and losers (underperformance), which strongly supports the Novy-Marx claim that the premium results jointly from the two components.

D. The Funding Environment and Temporal Variation in Momentum Returns

We next evaluate the temporal variation in the relationship between momentum returns and the funding environment by plotting portfolio performance over time. In particular, Figure 1 plots the cumulative value of $1 invested in a portfolio that tracks the abnormal returns from a WML strategy adjusted for ME and BEME, as described in Table 4, over the entire sample period. When examining the entire sample period, irrespective of funding conditions, the momentum returns appear to be relatively pervasive except for a few short periods in the post-2000 time frame. From Panel A of Figure 1, the growth of the WML portfolio cumulates from $1 in January 1965 to approximately $31 by the end of 2014. From Panel B of Figure 1, it appears that the outperformance of the WML portfolio is attributable to a combination of a fairly

strong and consistent positive performance of the winner portfolio along with a consistently weak performance of the loser portfolio. The figure does illustrate the large, but rare, "momentum crashes" highlighted by Daniel and Moskowitz (2015) especially during the most recent financial crisis of 2007-2009, but with these few exceptions, the abnormal returns of the momentum strategy appear to be generally positive throughout our entire sample period.

Next, in order to clearly differentiate the abnormal returns for the momentum portfolio across funding states, we plot the cumulative portfolio value for each funding environment. In each graph in Figure 2, the timing of the funding environments is identified as the shaded region. To isolate the unique contribution to WML portfolio performance that comes during each funding environment, we advance the value of the WML portfolio investment only during periods when the relevant environment is under consideration. For example, in Panel A of Figure 2, which considers expansive funding conditions, the plot of the WML portfolio advances only when conditions are expansive. When conditions are indeterminate or restrictive, the cumulative value maintains its previous value. Therefore, we are able to clearly establish the contribution to portfolio growth that is accomplished during each of the three funding environments. Furthermore, by plotting the cumulative values over time, we are able to illustrate the consistency of the momentum return patterns, for each funding environment, throughout the entire sample period. Finally, we apply a log scale to each graph to allow for more valid comparison of performance across time.

The cumulative value of the WML investment plotted in Panel A of Figure 2 clearly shows that during expansive funding conditions the risk-adjusted performance of the WML portfolio was dismal. Over the entire sample period, expansive funding environments contributed negatively to the growth in value of the WML portfolio. Remarkably, if the WML strategy relied strictly on abnormal returns earned during expansive funding conditions, it would have started the period with a value of $1 and ended with a value of $0.56. Throughout the entire sample period, the only expansive period that contributed in a meaningful way to the cumulative value was the expansive funding period in the 2000s.

In Panel B, we plot the cumulative growth of the WML portfolio during restrictive funding conditions. The value of the WML investment in Panel B offers a stark contrast to the plot in Panel A. Over the entire sample period, the risk-adjusted value of the WML portfolio advances substantially during restrictive funding conditions, growing from $1 to $15.48. Furthermore, with few exceptions, the portfolio grew considerably during each of the extended restrictive environments (witnessed by relatively solid shaded bands).[14] Over the sample period, the WML portfolio growth shows tremendous consistency and persistence across the extended restrictive periods. The portfolio value stumbled at the beginning of the restrictive period in the late 1980s and again at the start of the restrictive period in the mid-2000s; however, even in these cases the portfolio recovered to end the extended restrictive period with a much higher valuation.

Panel A and Panel B support the claim that both expansive and restrictive funding periods tend to be maintained for considerable lengths of time. This is confirmed by the relatively wide shaded bands shown in each of the first two panels. Note, the bands in Panel A and B are not strictly solid as indeterminate events tend to be interspersed within each band. Indeterminate conditions, as one might expect, tend to prevail for relatively short intervals. This is apparent with the many narrow shaded bands shown in Panel C, which plots the cumulative value of the WML portfolio during indeterminate funding conditions. One should expect relatively prolonged periods of expansive and restrictive policy, which is consistent with the wider shaded bands in Panel A and Panel B, because short-term and long-term Fed policy indicators should generally align. The indicators should be particularly consistent in the first several months following a signaled shift in broad policy.

Over the entire sample period, indeterminate funding conditions were responsible for pushing the WML portfolio value from $1 to $3.45. This performance greatly exceeds the contribution attributed to expansive funding periods, but is trivial in comparison to the contribution attributed to restrictive periods. If funding conditions alter investor pricing

[14] In many cases, indeterminate months are interspersed within the expansive and restrictive environments; these months may not appear unless they extend for more than a single month.

decisions as we surmise, the moderate growth of the portfolio during indeterminate conditions is expected. Indeterminate periods reflect uncertainty regarding funding conditions, and as such, do not allow investors to make typical adjustments to their pricing models.

In order to better determine what drives the momentum pattern, Figure 3 reports the value of a $1 investment in each component of the WML portfolio. Once again, the graphs in Figure 3 apply a log scale to allow for better comparisons across time. Panel A reports the growth of the winner and loser portfolio during expansive funding conditions. Interestingly, the cumulative performance of the loser portfolio exceeds or closely tracks that of the winner portfolio for most of the sample period. During expansive states, the abnormal returns for both the winner and loser portfolio are immaterial except for a few very short periods of time. Specifically, outside of the dramatic abnormal returns that occur over a few month period in the mid 1970's, the early 2000s and late 2000s, the portfolios experience virtually no change in value across the entire sample period.

The stair-step plots in Panel B represent a stark contrast to the haphazard value movements shown in Panel A. During restrictive conditions, the winner portfolio advances consistently during each of the extended periods of restrictive conditions. In addition, the loser portfolio declines during a majority of the extended restrictive periods. Thus, the superior performance of the WML portfolio can be attributed to a combination of the underperformance of losers and the strong performance of winners; however, the strong performance of winners is the larger contributing factor. The consistency of the positive performance for winners and negative performance of losers during restrictive monetary conditions, offers considerable support to the view that the momentum pattern is strongly linked to the funding environment.

Panel C shows the plots of winners and losers during indeterminate funding states. The plots for each portfolio are similar to those shown in Panel B, but the changes are less pronounced. In particular, except for a short period around 2003, the loser portfolio declined by a very similar amount in both restrictive and indeterminate periods; however, the winner

portfolio advanced far less during indeterminate periods relative to restrictive periods. In each case (winners and losers), the progression is fairly steady across the sample period, but is not as consistent during indeterminate periods as during restrictive periods. Again, this is consistent with the indeterminate periods containing elements of both restrictive and expansive funding conditions.

E. The Funding Environment, Factor Prices, and Momentum

Our findings so far suggest that funding conditions influence the momentum premium in a pervasive and predictable fashion. During periods of restrictive funding conditions, our results suggest the presence of a strong momentum premium, while during expansive periods, momentum returns disappear. To this point we have illustrated that this relation is robust to alternative definitions of past returns (Table 1), firm characteristics ME and BEME (Tables 2 and 3), and various holding periods (Table 4). Additionally, Figures 2-3 show that the relation is pervasive throughout our entire sample period and that both the outperformance of winners and the underperformance of losers contributes to positive WML abnormal returns in restrictive periods. We next attempt to further isolate the source of this relation by examining the WML portfolio returns relative to funding conditions and other documented risk factors.

Using time-series returns, we investigate the influence of funding conditions on the relation between the momentum premium and the risk factors from the three-factor model, SMB, HML and MKT (the excess market return). In Table 5, following prior literature, the momentum premium (WML) is derived as the difference between the mean monthly return for the winner portfolio (the 10% of firms with the best past performance) and the mean monthly return for the loser portfolio (the 10% of firms with the worst past performance)[15]. The relation between WML and the funding environment is investigated using two funding environment dummy variables (restrictive and indeterminate) along with risk-factor interaction variables for each of the two

[15] We define WML using deciles of past-performance to allow for comparison with prominent research in this area (e.g. Jegadeesh and Titman (1993), Cooper et al. (2004), and Novy-Marx (2012)).

funding environment dummy variables.[16] The interaction terms are designed to determine whether the relation of each of the three factors with WML differs systematically across funding states. Theoretically, the analysis in Table 5 can be seen as a conditional version of the three factor model in which the factor exposures vary with funding states. While we do not claim this model to be correct, the conditional asset pricing model interpretation can help provide economic meaning to the results.

The results of the time-series regression are reported in Table 5. Fama and French (1996), among others, show that momentum returns are not priced by the three factor model. Our findings from Model 1 confirm this result. Specifically, a significant momentum premium (0.0150; t=6.07) is observed even after controlling for market returns, the size premium, and the value premium. This result motivates the use of the four-factor model as advocated by Carhart (1997). The results for Model 2 confirm the evidence in Table 1 that the momentum premium is insignificant during periods of expansive funding, as indicated by the insignificant intercept. However, the momentum premium is significant and positive when the funding environment is restrictive.

Model 3 reports results for the three factor model modified to allow the momentum premium to differ across the three funding environments, and to allow each of the factor coefficients to also differ across funding conditions. The findings highlight the important role that funding conditions play in the relation between the factors and the momentum premium. In particular, while the momentum premium has a negative relation to general market performance (Model 1), this negative relation can be attributed entirely to the pattern that prevails during expansive funding conditions. When funding conditions are restrictive or indeterminate the relation between market returns and momentum returns is inconsequential.[17] In particular, during

[16] Based on the evidence in Table 1, which shows that during expansive funding states the coefficient on past performance is insignificant, we choose the expansive period to represent the excluded case.

[17] t-tests confirm that the coefficient on market returns is not statistically different from 0 during both indeterminate and restrictive funding environments. Furthermore, t-tests confirm that the coefficient on market returns during

indeterminate funding periods the coefficient on (MKT) is -0.1324 (or, -0.4798 + 0.3474), while the coefficient is a meager +0.0437 when funding conditions are restrictive.

Model 1 shows evidence suggesting that SMB does not relate in a material way with WML; however, Model 3 indicates that a significant relation does exist between the two factors, but the relation is conditional on the funding environment. During expansive funding periods, SMB has a negative relation with WML. In contrast, the relation between SMB and WML is positive when conditions are restrictive. The contrast in SMB coefficients across the two most extreme funding environments is especially striking, -0.4731 (expansive) versus 0.2785 (restrictive; -0.4731 + 0.7516). This finding is consistent with the arguments of Thorbecke (1997), Brunnermeier and Pedersen (2009), and Jensen and Moorman (2010) that a restrictive funding environment is more constraining for small (illiquid) firms. Extending this view, we contend that during restrictive environments investors look to other firm characteristics, specifically recent stock performance, as support in making pricing decisions. During restrictive states, strong recent performance is likely to be viewed more favorably by small-firm investors because it helps allay concerns regarding the potential damage of future funding shortages, whereas recent weak performance would be viewed as an especially unfavorable firm feature in such states. In contrast, expansive conditions favor small firms, and thus, recent stock performance would be less of a concern for investors interested in small stocks.

The final three entries in Model 3 suggest that, after allowing for funding-related time variation in market and size exposures, there is no relation between HML and WML. This confirms the conjecture of Asness, Moskowitz, and Pedersen (2013) that the negative association between value and momentum is associated with time variation in funding availability.

Model 4 and Model 5 report the results for each component of the WML portfolio, and thus, help to isolate the influence of the separate portfolios on our findings. After controlling for

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indeterminate and restrictive environments are significantly more positive relative to the coefficient during expansive conditions.

differences in funding conditions, we find evidence indicating that the winner portfolio contributes most strongly to momentum profits. The alpha for the Winner portfolio is 0.93% (t = 3.79) versus the Loser portfolio's alpha of -0.24% (t = -0.49).

Models 4 and 5 contain two very interesting findings relative to our primary focus, which is the influence of funding conditions on the momentum effect. First, we find that the negative association between the winner premium (WML) and general market performance (which from Model 1 is -0.2100; t= -1.99) results from the unusually strong performance of losers during periods of expansive funding. Both winners and losers perform exceptionally well during periods of strong market performance; however, the performance of losers relative to winners is significantly stronger when funding conditions are expansive. When funding conditions are restrictive, the performance of winners is advanced, while the performance of losers is muted.

Second, the relation between the winner premium and SMB is impacted dramatically by the funding state. Model 3 indicates that the WML portfolio performs relatively poorly when there is a small size premium in general (SMB is positive). From Model 5, it appears that this relation is driven primarily by the fact that losers perform extremely well during periods with significant small size premiums. Examining the interaction term Res*SMB, however, suggests that these relations reverse in restrictive periods. From Model 3, in restrictive periods, WML is more positively related to SMB while Model 5 suggests that this finding stems from a more negative relation between SMB and loser stock returns in restrictive periods. In sum, these findings suggest that the strong performance of small losers in expansive periods attenuates the momentum premium. While in restrictive states, losers perform relatively poorly, especially when a small size premium exists. These findings are consistent with small, loser firms benefitting the most from the additional capital availability that is signaled during expansive states. In restrictive states, when the signaled funding environment is less favorable, losers perform worse and their performance is no longer positively associated with that of small firms.

These findings suggest that funding conditions play a significant role in determining the interaction between size and past performance. Additionally, this association suggests that the existence of the momentum premium solely in restrictive states may be related to the differential performance of certain size (or highly correlated characteristics like illiquidity) groups across funding environments and relative to past performance. To further explore this hypothesis, we later examine the performance of different size (and illiquidity) groups of winners and losers relative to shifts in funding conditions.

The results for Models 4 and 5 indicate that the influence that the common risk factors (MKT and SMB), and to a lesser extent HML, have on investor views of winners and losers varies systematically across the funding environment. Thus, the evidence suggests that the role that these factors play in determining winner and loser returns is conditional on the funding environment. For stocks with poor prior performance (losers), constrained funding states have a significantly different influence on the MKT and SMB coefficients, which supports a heightened sensitivity of loser stock prices to changes in funding conditions. This result is consistent with funding conditions impacting investor pricing decisions and motivating investors to reallocate capital using recent stock performance as a criterion. We explore this prospect more fully in a later section where we evaluate winner and loser stock returns around shifts in funding states.

As discussed above, prior research has documented time-varying patterns in momentum. Specifically, Cooper et al. (2004) and Stivers and Sun (2010) show that market states and return dispersion explain time variation in momentum returns, respectively. We propose that funding conditions are a more fundamental economic determinant of investor pricing decisions that also vary over time and appear to impact momentum. In order to test the relative importance of funding conditions, market states and return dispersion, we estimate a series of regressions as presented in Table 6.

In Panel A of Table 6 we examine whether market states and return dispersion continue to have any influence on momentum returns after we control for the influence of funding

conditions. In Model UP/RD we regress momentum returns (WML) on market states (UP) and return dispersion (RD). Cooper et al. (2004) and Stivers and Sun (2010) document that momentum is significantly stronger following up markets. Our evidence confirms this finding as the UP variable has a coefficient of 0.0292, which is significant at the 5% level. And, as documented in Stivers and Sun (2010), return dispersion has a significantly negative association with momentum, which we confirm as our estimated coefficient is -0.3070 and is also significant at the 5% level. Thus, our Model UP/RD coefficients show that these variables continue to impact momentum as predicted in prior literature.

We next examine whether the importance of the two state variables in explaining momentum returns is incremental to the influence of funding conditions. To do so, in the second column of Table 6, we regress the residuals from our Model 3 in Table 5 on market states (UP) and return dispersion (RD). Once we control for the influence of funding conditions, we see that both UP and RD lose much of their ability to explain momentum. Specifically, the coefficient on UP becomes only marginally significant while the coefficient on RD becomes insignificant. Additionally, the adjusted R^2 falls to only 1.65%.

In Panel B of Table 6 we reverse the analysis and test whether funding conditions have explanatory power after controlling for market states and return dispersion. We first reproduce our Model 3 from Table 5 in the first column of Panel B, which is labelled Model 5.3. Then in the second column of Panel B, we use the same independent variables from Model 5.3, but with the residuals from the regression of WML on UP and RD (Model UP/RD in Panel A) as the dependent variable. Once we control for the impacts of market states and return dispersion, we find that little changes in terms of the significance of funding conditions in explaining the momentum pattern. The interaction terms of Res*MKT and Res*SMB remain strongly positive and significant (0.4615** and 0.7305**, respectively), while the interaction of Res*HML remains negative and insignificant. Additionally, the adjusted R^2 drops minimally from 15.04%

to 13.56%.[18] The results in Panel B suggest that even after controlling for state variables that have been previously shown to impact momentum, funding conditions still play a significant role in determining the differential returns to winners and losers. As in Table 5, it appears that funding conditions alter the way that investors price factors, especially firm size, momentum and market risk, which leads to variation in the momentum pattern across funding states.[19]

The results from Table 6 suggest that market states and return dispersion have relatively little incremental ability to explain momentum once funding conditions are considered. This finding suggests that variation in market states and return dispersion align with changes in funding conditions, which contributes to the strong relation these variables have shown with momentum in prior research. Also, even after controlling for market states and return dispersion, funding conditions continue to have substantial influence on the momentum premium. Therefore, in addition to potentially explaining why market states and return dispersion are related to momentum, funding conditions appear to contain incremental information to other factors that have been proposed as instrumental in investor pricing decisions.

F. Stock-level Illiquidity

Our results to this point suggest that the momentum pattern in stock returns is conditional on the funding environment. This evidence is predicated on the notion that investors alter their pricing decisions across different funding states. We next provide initial evidence of how those

[18] As in Table 5, both models in Table 6 contain an indicator for indeterminate conditions and also the interactions between the indeterminate indicator and each of the risk factors. Also, as in Table 5, the indeterminate indicator and all the interaction terms are insignificant and therefore are withheld from the table for expositional purposes.

[19] We replicate the Cooper et al. (2004) procedure to examine the importance of the macro-economic variables advocated by Chordia and Shivakumar (2002) on momentum returns. Specifically, we confirm their Table 2 results in our extended sample (updated time series and Nasdaq stocks in addition to Amex and NYSE). Using their Table 2 approach and replacing Up/Down states with Expansive/Restrictive/Indeterminate states, we find there is no momentum during Expansive states. We also confirm the momentum results of Stivers and Sun (2010) in our sample. Similar to their Table 3, we find the negative association between return dispersion (RD) and momentum is significantly more negative when conditions are expansive, and that this is driven by a very large positive association between the performance of losers and RD when conditions are expansive. This is consistent with our conjecture that RD is related to shifts in funding conditions affecting the relative attractiveness of losers and winners to investors.

different decision-making processes may lead to a momentum pattern that occurs only in restrictive funding states. Jensen and Moorman (2010) show that stock level illiquidity is also viewed by investors conditional on the funding environment. They attribute this result to investors becoming more willing to hold illiquid stocks as aggregate funding constraints are loosened. As investors move (back) into illiquid stocks, their prices are pushed up, resulting in the empirically documented "illiquidity premium".

In a similar fashion, our findings are consistent with the view that investors are less willing to hold loser stocks as the funding environment turns restrictive. If losers become relatively more illiquid during restrictive conditions, it is plausible that investors will exhibit a "flight to liquidity", moving from illiquid losers to relatively liquid winners. As investors reallocate from losers to winners downward pressure is placed on loser stock prices and upward pressure on winner stock prices, resulting in a momentum pattern in returns.

Therefore, in Table 7, we investigate whether the relative illiquidity of winners and losers differs across funding conditions. Following Amihud (2002), we calculate ILLIQ for each stock in each month and then evaluate whether stock-level illiquidity varies across winners and losers by funding conditions. In Panel A of Table 7, we first verify our earlier results once the sample is modified to be consistent with Amihud (2002). More specifically, the sample used in Table 7 includes NYSE-traded stocks with return and volume data for more than 200 days during a year, and with price greater than $5. Thus, Table 7 also serves as a robustness check of our prior results.

From Panel A, we find a positive momentum premium in the full sample of 0.52% per month. As previously, however, there appears to be no momentum in expansive periods (-0.02) and strong momentum in restrictive periods (1.16***).

Having confirmed our earlier results, we next test whether ILLIQ varies across winners and losers and across funding conditions. In Panel B, we find that in the full sample losers are significantly more illiquid than winners (-0.45*** WML). Partitioning these results by the

funding environment, we find that loser stocks are significantly more illiquid than winner stocks in both expansive conditions (-0.29***) and restrictive conditions (-0.53***). However, the difference in illiquidity of losers versus winners (Column E-R) in restrictive periods is significantly higher than the illiquidity difference in expansive periods (0.24***). Also, the difference in illiquidity for winners and losers for expansive versus restrictive periods shows that illiquidity is substantially greater for both groups during restrictive conditions. These results indicate that loser stocks are generally more illiquid than winners, but the difference in illiquidity between the two groups is magnified during restrictive funding states.

The results from Table 7 suggest one possible mechanism by which changing investor pricing decisions across funding conditions lead to a momentum pattern in restrictive funding states. Namely, loser firms become relatively more illiquid in restrictive funding environments and at a time where investors are particularly concerned with liquidity, they are hesitant to hold illiquid losers and instead reallocate to winner stocks or other more liquid assets. This view is largely consistent with the theory advocated by Brunnermeier and Pedersen (2009). The reallocation not only provides a potential source of the momentum pattern in restrictive periods, but also helps explain the strong positive returns to small losers during expansive periods as reported in Table 2. As aggregate funding constraints loosen and investors move back into illiquid stocks, their prices exhibit upward pressure. This effect is strongest for the smallest stocks, which are likely the most illiquid. Thus, the relative illiquidity of loser stocks offers a plausible motivation for investor pricing decisions that lead to momentum during restrictive funding conditions.[20]

[20] Asness Moskowitz, and Pedersen (2013) report that momentum performs well when funding liquidity rises; however, they measure liquidity shocks using the residuals from an AR(2), which arguably measures liquidity changes at a "high-frequency" compared to our approach, which measures aggregate liquidity regime changes. Further, Asness et al. link momentum and liquidity shocks at the asset-class level, whereas we focus on firm-level momentum. Finally, Asness et al. regress momentum against liquidity shocks and a set of macroeconomic variables, such as a measure of long-run consumption growth, a recession dummy, contemporaneous GDP growth rates, the excess return on the MSCI world equity index, and variables measuring the term structure (TERM) and credit spreads (DEF). Thus, given the vast differences in objective and approach, our findings are only indirectly related to that of Asness et al.

In our final analyses we provide further evidence of the mechanism for how differences in investor pricing decisions across funding environments may lead to momentum in one funding state, but not the other. Based on the implications of Table 7, we investigate the momentum pattern within illiquid stocks across *shifts* to expansive and restrictive funding states. Here we evaluate the return patterns of winners and losers around changes in funding conditions to evaluate whether investors appear to change their pricing decisions around innovations in funding conditions. In this analysis, we focus on illiquid stocks because such firms are likely to be most sensitive to shifts in aggregate funding conditions as noted by Brunnermeirer and Pedersen (2009).

In Figure 4, we evaluate the changing investor preferences around shifts in funding conditions by comparing the returns of illiquid losers to those of liquid winners. This comparison contrasts the performance of the most extreme classifications to help assess the extent of any potential flight to liquidity that occurs around the shift in funding state. The expansive graph in Panel A of Figure 4 shows no significant divergence of cumulative returns for winners versus losers. In fact, the returns contradict a momentum pattern as illiquid losers outperform liquid winners, with the strongest outperformance exhibited in the months immediately surrounding the shift to expansive conditions (-1 to +1). In the restrictive graph, we see a significant divergence of winner and loser returns, with the liquid winners vastly outperforming illiquid losers around shifts to restrictive funding conditions. These implications are further supported by the graphs in Panel B of Figure 4 where we combine the illiquid loser and liquid winner returns to create a liquid-illiquid WML strategy. From the expansive graph in Panel B, the cumulative market-adjusted performance of the liquid-illiquid WML is slightly negative at -2.2% for the six months preceding and following an expansive shift. Around restrictive shifts, however, this WML strategy produces cumulative market-adjusted returns of 9.7% with much of the return generated immediately around and after the shift.[21]

[21] We replicate these two figures using size as a firm characteristic as opposed to illiquidity and obtain qualitatively identical results.

This figure presents two general conclusions about how investor pricing decisions change around shifts in funding conditions. First, investors view losers and winners more similarly around shifts to expansive conditions and more differently around shifts to restrictive conditions. Specifically, the spread between the cumulative returns to winners and losers is significantly wider around restrictive funding conditions shifts. Second, investors find stock liquidity much more desirable around shifts to restrictive funding states. Around expansive shifts, illiquid loser firms actually outperform liquid winners while in restrictive shifts the relation is reversed.

These results provide insight as to why the momentum pattern is only associated with certain funding conditions. Specifically, it appears that investors especially value strong past performance and liquidity as funding conditions tighten. Thus, the momentum pattern appears to manifest itself during restrictive funding conditions in part because investors exhibit a "flight to safety/liquidity" in moving from illiquid, weak past performance stocks to liquid, strong past performance stocks. A stock's strong recent performance helps to allay investor concerns about the potential impact the reduction in fund availability will have on stock price. With respect to expansive funding states, our evidence is consistent with previous evidence that shows expansive funding conditions are favorable for stocks, and particularly small/illiquid stocks. Thus, expansive states motivate relatively little reallocation across losers and winners as the prospects for easier access to funds is viewed as very beneficial to both groups. Easier access to funds helps losers recover from their recent dismal performance, yet also makes funds available to winners to facilitate their continued exceptional performance.

Overall, our results confirm the existence of a strong momentum pattern in stock returns. We identify a strong link between funding conditions and momentum returns. Cooper et al. (2004) and Stivers and Sun (2010) argue that their evidence is consistent with the view that inter-temporal variation in the momentum pattern can be attributed to shifts in the market state, which motivate investors to reallocate their portfolios. Our results suggest that funding conditions represent an underlying macroeconomic variable that identifies shifts in the market state. Furthermore, our results shed light on the "momentum crashes" identified by Daniel and

Moskowitz (2015). We find that on average a "loser" premium (momentum crash) prevails for portfolios comprised of small firms and value firms during expansive funding periods. Finally, we provide evidence that investor preferences for certain firm characteristics change with innovations in funding conditions and that these changes in preferences help explain why momentum profits only exist in restrictive funding environments.

IV. Conclusions

We evaluate the inter-relationship between momentum in equity returns, firm characteristics, market states, and funding conditions. We follow previous research in defining our measure of funding conditions, and then, establish the efficacy of the measure by confirming its effectiveness in differentiating ex post measures of actual fund availability and fund cost.

We identify several findings that support the conclusion that funding conditions play an influential role in the momentum effect. First, we show that there is no evidence of a significant momentum pattern in equity returns during expansive funding periods. In contrast, our findings support the existence of a strong and consistent momentum effect when funding is constrained (restrictive funding periods). Second, we show that the relationship between momentum and both the size factor and the market factor is conditional on the funding environment. Specifically, the coefficients on the size and market factor are significantly different across funding states, which supports the claim that factor prices vary with shifts in the funding state. Third, during periods of expansive funding, losers with value characteristics and small market capitalizations perform well on an absolute basis and relative to the performance of winners. This finding corresponds with previous research that identifies incidents of "momentum crashes." Fourth, we show that the relationship between the funding environment and the momentum pattern is remarkably consistent over the 1963-2014 period. Over the sample period, when the funding environment is restrictive, the abnormal performance of winners is consistently positive, whereas loser abnormal performance digresses consistently. Fifth, the momentum pattern varies systematically with the funding state from being non-existent (expansive conditions), to greatly

diminished (indeterminate conditions) to pronounced (restrictive conditions). Furthermore, once we control for the influence of funding conditions on the momentum premium, the previously documented effect of market states and return dispersion diminishes considerably; however, controlling for market states and return dispersion has minimal impact on the influence that funding conditions has on the momentum premium. Finally, by evaluating returns around shifts in the funding state, we show evidence consistent with investors reallocating from losers to winners around shifts to restrictive states, whereas there is no evidence of a significant reallocation that occurs around an expansive shift.

Overall, our findings are consistent with the contention that the momentum pattern is conditional on the funding state. The alignment between funding conditions and the inter-temporal variation in momentum returns implies that the price investors assign to alternative firm characteristics (such as illiquidity, size and momentum) differs based on the funding environment. Cooper et al. (2004) and Stivers and Sun (2010) contend that investors reallocate their portfolios based on the market state. Our evidence suggests that the funding environment corresponds with alternative states that reflect differences in investor pricing approaches, and thus, the funding environment alters the value investors attach to firm characteristics, such as momentum.

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Table 1. Alternative Momentum Measures and Funding Conditions

The table reports results from Fama-MacBeth regressions of firm returns on past performance, measured at horizons -12 to -2 months, R(-12,-2), -6 to -2 months, R(-6,-2) and -12 to -7 months, R(-12, -7). Regressions include controls for prior month return (R(-1,0)), size (lnME), and book-to-market (lnBEME). ME equals market capitalization in month -1; BEME equals book value of equity in the prior fiscal year-end divided by market capitalization in month -6. Independent variables are winsorized each month at the 1% and 99% levels. The sample covers July 1963 to December 2014. The sample excludes financial companies and is adjusted for delisting bias. When the most recent prior change in the Fed discount rate (Stance) and the effective federal funds rate (Stringency) is a decrease, the environment is classified as expansive. In contrast, the environment is considered restrictive if the previous change in both rates is an increase. When Stance and Stringency are contradictory i.e. the most recent change in the two are in different directions, the environment is classified as indeterminate. Reported coefficients are in percent (%).

	Full Sample N=618 (1)	Expansive N=173 (2)	Restrictive N=220 (3)	Indeterminate N=225 (4)	Full Sample N=618 (5)	Expansive N=173 (6)	Restrictive N=220 (7)	Indeterminate N=225 (8)
Intercept	1.28%** (2.52)	4.37*** (3.87)	-0.15 (-0.22)	0.29 (0.37)	0.64 (1.07)	4.48*** (3.23)	-1.22 (-1.50)	-0.49 (-0.49)
R(-12,-2)	0.60%*** (2.97)	-0.15 (-0.28)	1.07*** (4.68)	0.70*** (2.68)				
R(-12,-7)					0.83*** (4.11)	0.12 (0.28)	1.20*** (5.18)	1.00*** (3.35)
R(-6,-2)					0.29 (1.16)	-0.67 (-1.18)	0.92*** (2.74)	0.41 (1.06)
R(-1,0)	-6.34%*** (-11.56)	-6.96*** (-7.55)	-5.57*** (-5.91)	-6.63*** (-7.86)	-6.44*** (-11.61)	-7.11*** (-7.51)	-5.65*** (-6.02)	-6.70*** (-7.91)
lnME	-0.14%** (-2.99)	-0.41*** (-4.89)	-0.07 (-1.13)	-0.01 (-0.18)	-0.14** (-2.90)	-0.38*** (-4.83)	-0.07 (-1.18)	-0.01 (-0.15)
lnBEME	0.31%*** (4.44)	0.33** (3.39)	0.25*** (2.64)	0.36*** (3.82)	0.33*** (4.61)	0.37*** (3.60)	0.26*** (2.66)	0.37*** (3.89)

Table 2. Sorts of Market-Adjusted Return by Momentum and Size

The table reports market-adjusted equally-weighted returns (in %) for portfolios based on monthly independent sorts on momentum (R(-12,-2)) and size (ME), as defined in Table 1. The sample excludes financial companies and stocks with price less than $1 in the month prior to the holding period and is adjusted for delisting bias. Panel A presents results for the entire sample, while Panels B-D split the sample on funding conditions as defined in Table 1. The market is defined as the CRSP equally-weighted index. Reported t-statistics (in parentheses) are based on Newey-West standard errors with six lags.

Panel A. Full Sample Period (Mean Monthly Market-Adjusted Returns)						
	Small	2	3	4	Big	SMB
Loser	0.43%	-0.92	-1.00	-0.89	-0.93	1.36*** (4.82)
2	0.26	-0.30	-0.48	-0.41	-0.40	0.66*** (2.76)
3	0.40	-0.04	-0.11	-0.20	-0.35	0.75*** (3.43)
4	0.72	0.26	0.19	-0.01	-0.15	0.87*** (3.73)
Winner	0.73	0.69	0.50	0.34	0.16	0.57*** (2.64)
WML	0.30 (1.23)	1.61*** (6.93)	1.50*** (6.17)	1.23*** (4.91)	1.08*** (3.93)	
Panel B. Expansive Funding Environments						
	Small	2	3	4	Big	SMB
Loser	1.81	-0.46	-0.84	-0.93	-1.21	3.01*** (5.56)
2	1.03	-0.25	-0.57	-0.56	-0.98	2.02*** (4.49)
3	0.69	0.02	-0.05	-0.53	-1.01	1.69*** (3.85)
4	1.23	0.31	-0.05	-0.23	-0.81	2.05*** (4.55)
Winner	1.24	0.77	0.38	-0.16	-0.60	1.84*** (4.46)
WML	-0.57 (-0.93)	1.23** (2.24)	1.22* (1.76)	0.77 (1.23)	0.61 (0.95)	
Panel C. Restrictive Funding Environments						
	Small	2	3	4	Big	SMB
Loser	-0.12	-1.06	-1.08	-0.93	-0.82	0.70** (2.06)
2	0.05	-0.35	-0.45	-0.28	-0.23	0.28 (0.82)
3	0.31	-0.10	-0.13	-0.09	-0.20	0.50* (1.66)
4	0.75	0.39	0.33	0.13	0.11	0.63** (1.98)
Winner	0.82	0.82	0.62	0.75	0.58	0.24 (0.73)
WML	0.94*** (3.57)	1.88*** (6.30)	1.70*** (5.20)	1.68*** (5.07)	1.40*** (3.77)	
Panel D. Indeterminate Funding Environments						
	Small	2	3	4	Big	SMB
Loser	-0.09	-1.12	-1.05	-0.81	-0.83	0.74 (1.61)
2	-0.13	-0.30	-0.44	-0.40	-0.13	-0.03 (-0.01)
3	0.28	-0.03	-0.15	-0.06	0.01	0.28 (0.77)
4	0.30	0.11	0.24	0.01	0.12	0.19 (0.49)
Winner	0.25	0.50	0.48	0.32	0.32	-0.07 (-0.17)
WML	0.34 (0.84)	1.62*** (4.10)	1.53*** (4.85)	1.13*** (2.97)	1.14*** (2.99)	

Table 3. Sorts of Market-Adjusted Return by Momentum and BEME

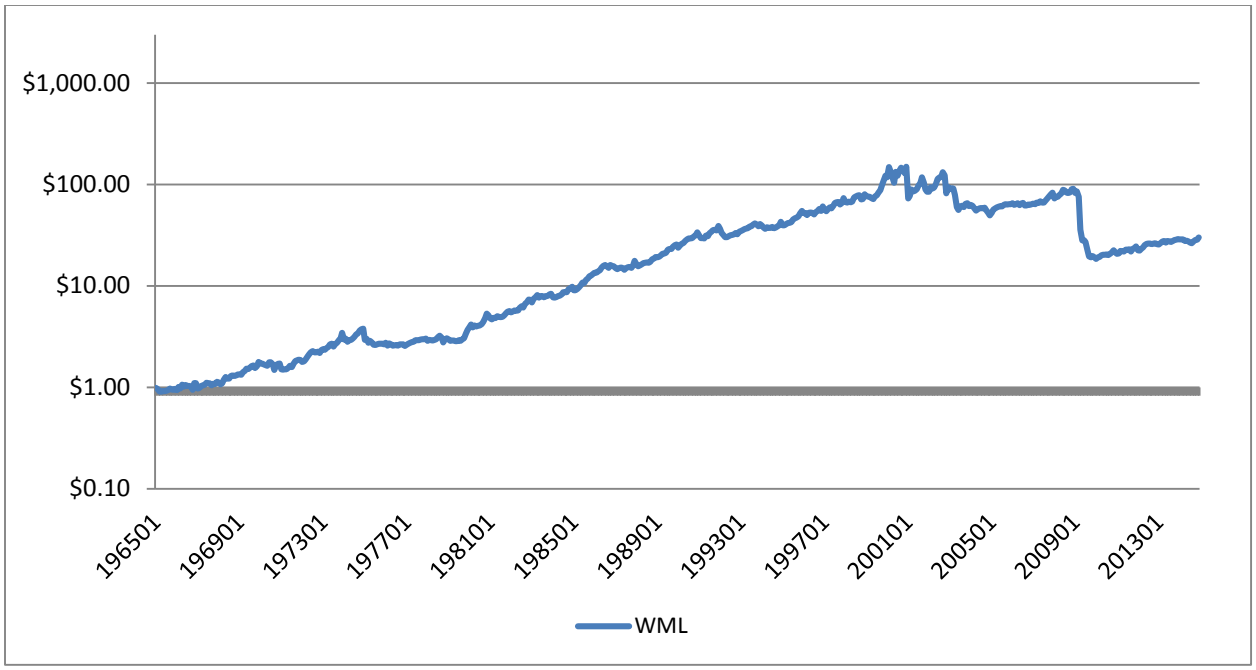
The table reports market-adjusted equally-weighted returns (in %) for portfolios based on monthly independent sorts on momentum (R(-12,-2)) and book-to-market (BEME), as in Table 1. The sample excludes financial companies and stocks with price less than $1 in the month prior to holding and is adjusted for delisting bias. The market is defined as the CRSP equally-weighted index. Panel A presents results for the entire sample, while Panels B-D split the sample on funding conditions as defined in Table 1. Reported t-statistics (in parentheses) are based on Newey-West standard errors with six lags.

Panel A. Full Sample Period (Mean Monthly Market-Adjusted Returns						
	Low	2	3	4	High	HML
Loser	-1.07%	-0.71	-0.43	-0.38	-0.03	1.04*** (5.18)
2	-0.72	-0.58	-0.39	-0.13	0.06	0.79*** (4.15)
3	-0.68	-0.38	-0.19	0.09	0.31	0.99*** (5.94)
4	-0.21	-0.07	0.13	0.29	0.46	0.68*** (3.97)
Winner	0.18	0.44	0.49	0.56	0.77	0.58*** (2.97)
WML	1.25*** (4.96)	1.15*** (5.37)	0.92*** (4.34)	0.94*** (4.35)	0.80*** (3.11)	
Panel B. Expansive Funding Environments						
	Low	2	3	4	High	HML
Loser	-0.78	-0.30	-0.08	0.10	0.91	1.69*** (4.47)
2	-0.86	-0.58	-0.38	-0.09	0.39	1.25*** (3.26)
3	-0.94	-0.48	-0.30	-0.10	0.27	1.21*** (3.48)
4	-0.49	-0.28	-0.15	-0.05	0.45	0.94*** (2.66)
Winner	-0.20	0.23	0.26	0.59	0.77	0.96** (2.56)
WML	0.59 (1.08)	0.53 (1.12)	0.33 (0.63)	0.49 (0.93)	-0.14 (-0.21)	
Panel C. Restrictive Funding Environments						
	Low	2	3	4	High	HML
Loser	-1.22	-0.77	-0.58	-0.57	-0.45	0.77** (2.58)
2	-0.55	-0.70	-0.43	-0.15	-0.05	0.50** (1.98)
3	-0.52	-0.40	-0.26	0.01	0.30	0.82*** (3.56)
4	0.03	0.05	0.22	0.55	0.54	0.51** (2.34)
Winner	0.42	0.75	0.84	0.76	0.81	0.40 (1.48)
WML	1.63*** (4.99)	1.54*** (4.50)	1.41*** (4.38)	1.33*** (4.45)	1.26*** (4.34)	
Panel D. Indeterminate Funding Environments						
	Low	2	3	4	High	HML
Loser	-1.15	-0.96	-0.55	-0.57	-0.35	0.80** (2.52)
2	-0.79	-0.47	-0.37	-0.14	-0.07	0.72** (2.34)
3	-0.64	-0.28	-0.04	0.32	0.34	0.98*** (3.95)
4	-0.24	-0.02	0.27	0.31	0.39	0.64** (2.24)
Winner	0.25	0.29	0.33	0.34	0.72	0.47* (1.65)
WML	1.40*** (3.08)	1.24*** (3.01)	0.88** (2.04)	0.91** (2.25)	1.07*** (2.63)	

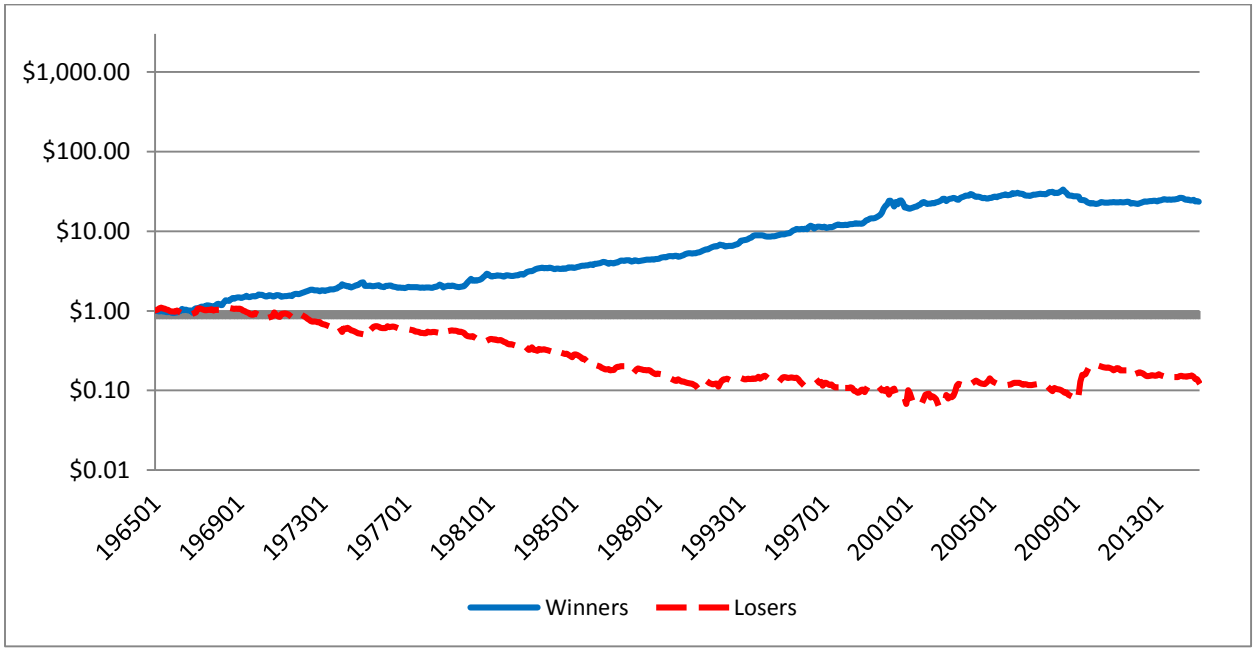
Table 4. Average Abnormal Momentum Return (in %) by Holding Period

Abnormal monthly returns are derived by adjusting for market capitalization (ME) and book-to-market equity (BEME) as follows. Every June, stocks are sorted into quintiles based on ME (NYSE breakpoints), then into quintiles based on (prior fiscal-year) industry-adjusted BEME (using FF 49 industries and the average BEME over the full sample). Value-weighted returns on the 25 portfolios are used to compute abnormal returns. That is, we subtract from each stock return the corresponding portfolio return based on where the stock falls in ME and BEME quintile. To allow for sufficient industry representation in deriving industry BEME, the sample period begins in January 1965. The table reports average abnormal monthly returns for decile portfolios based on monthly (month t-1) independent sorts on momentum (R(-12,-2)) and holding periods ranging from one month (month t) to six months (month t through t+5; divided by six to report a monthly return in the table). The sample excludes financial firms and stocks with a price less than $1 in the month prior to holding and is adjusted for delisting bias. t-statistics (in parentheses) are derived based on Newey-West standard errors with six lags.

	Holding Period			
	1 month	**2 months**	**3 months**	**6 months**
Portfolio	Panel A. Full Sample			
Winner	0.55%*** (5.27)	0.49*** (5.64)	0.41*** (4.97)	0.28*** (3.54)
Loser	-0.23 (-1.17)	-0.30* (-1.89)	-0.30** (-2.08)	-0.18 (-1.35)
WML	0.78*** (3.15)	0.79*** (3.97)	0.72*** (3.88)	0.46*** (2.62)
	Panel B. Expansive Funding Environments			
Winner	0.59*** (3.26)	0.58*** (4.10)	0.48*** (3.40)	0.23 (1.48)
Loser	0.61 (1.37)	0.26 (0.66)	0.28 (0.78)	0.21 (0.56)
WML	-0.03 (-0.05)	0.32 (0.72)	0.20 (0.47)	0.01 (0.03)
	Panel C. Restrictive Funding Environments			
Winner	0.68*** (3.46)	0.57*** (3.79)	0.56*** (3.82)	0.45*** (3.44)
Loser	-0.72*** (-3.61)	-0.66*** (-4.26)	-0.69*** (-4.94)	-0.48*** (-4.68)
WML	1.40*** (4.18)	1.22*** (5.24)	1.25*** (6.19)	0.93*** (6.00)
	Panel D. Indeterminate Funding Environments			
Winner	0.40** (2.44)	0.34** (2.22)	0.22 (1.56)	0.14 (1.19)
Loser	-0.40 (-1.11)	-0.38 (-1.40)	-0.38 (-1.54)	-0.20 (-1.05)
WML	0.80* (1.89)	0.72** (2.09)	0.60* (1.86)	0.34 (1.41)



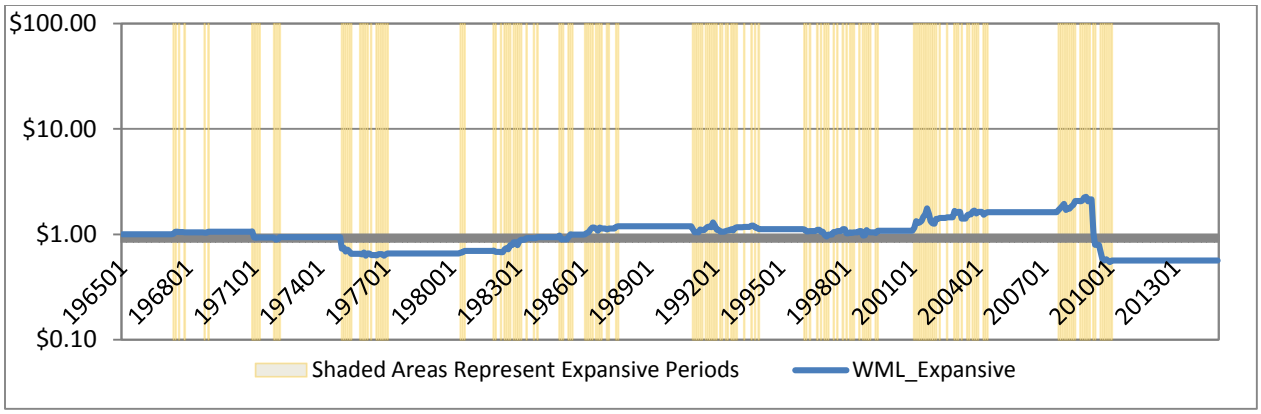
Panel A – WML



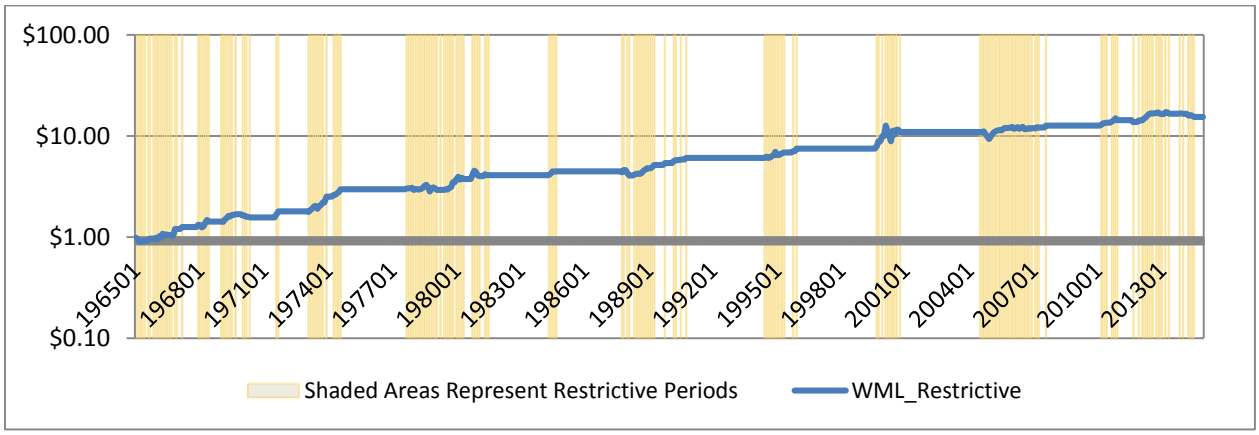
Panel B – Winners and Losers

Figure 1 – Growth of the WML Portfolio and its Components

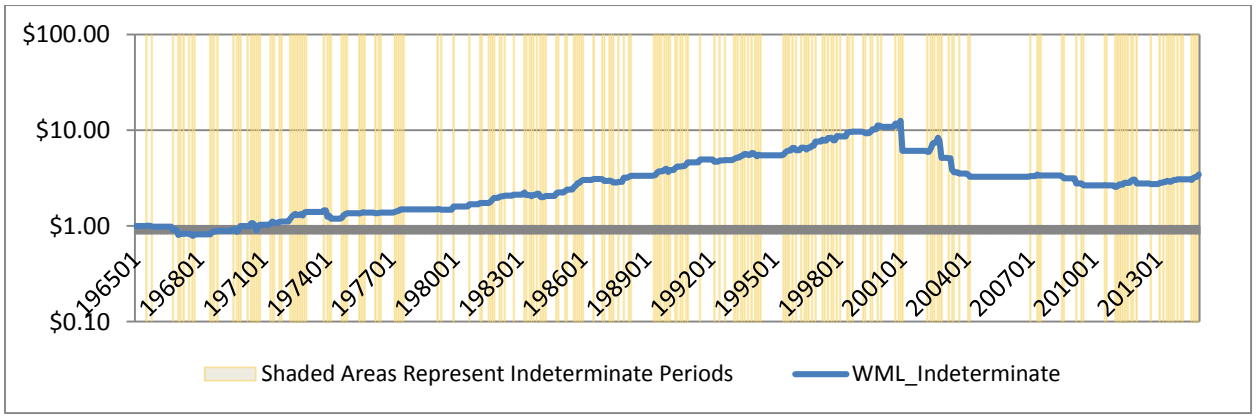
The figure reflects the cumulative value of $1 invested in a portfolio that tracks monthly abnormal returns of the WML strategy after adjusting for ME and BEME. Abnormal returns are calculated following the procedure from Table 4. The investment period is from January 1965 – December 2014. The figure also depicts the cumulative value of an investment in the two individual components of the WML strategy (Winners and Losers). The value of the WML investment is shown in Panel A. The values of the Winner investment (blue) and the Loser investment (dashed red) are shown in Panel B.



Panel A – Expansive Conditions



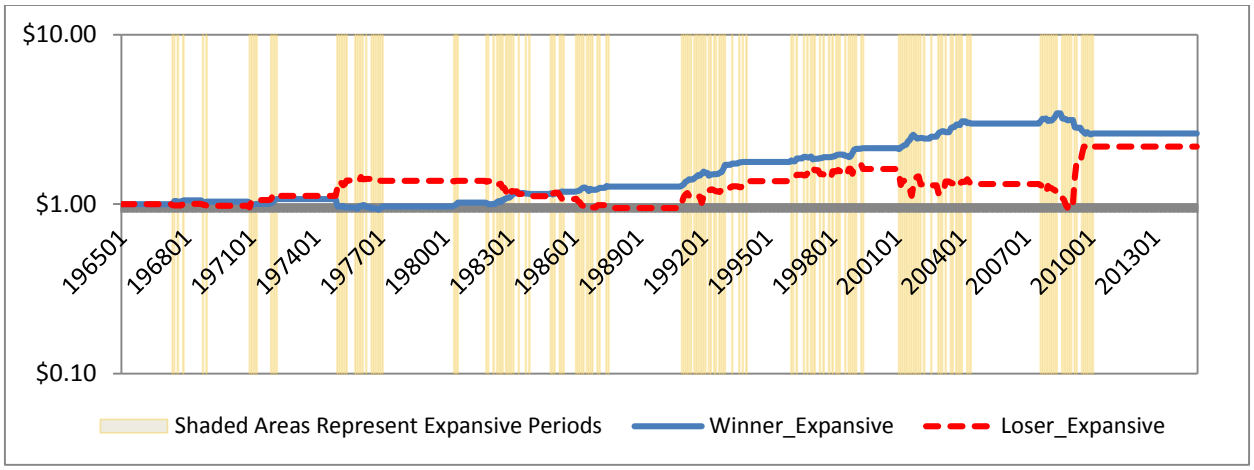
Panel B – Restrictive Conditions



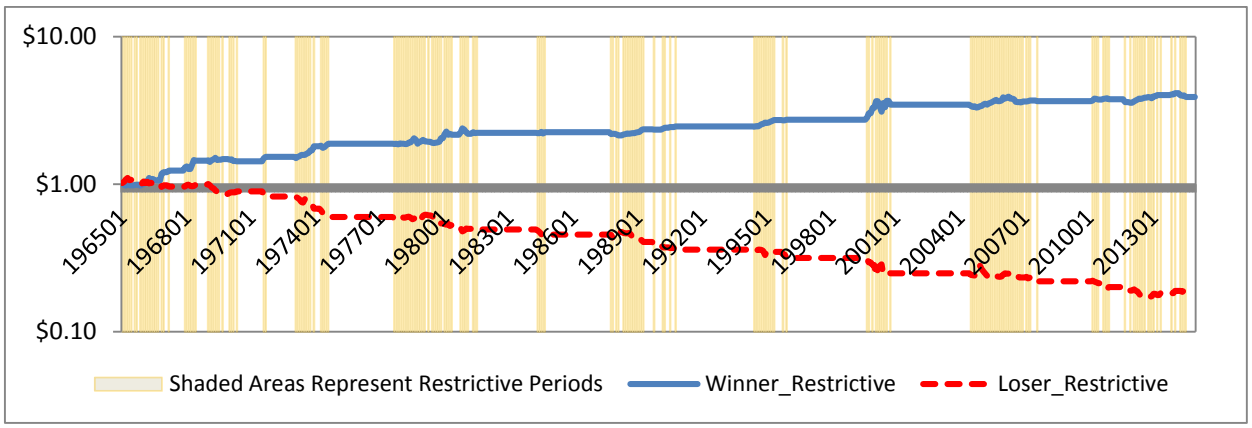
Panel C – Indeterminate Conditions

Figure 2 – Growth of the WML Portfolio Across Funding Conditions

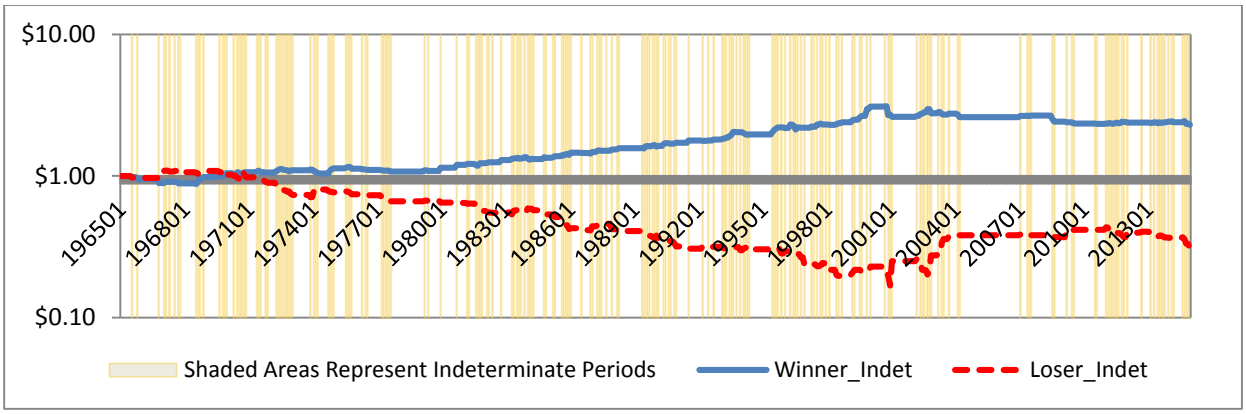
The figure reflects the cumulative value of $1 invested in a portfolio that tracks monthly abnormal returns of the WML strategy after adjusting for ME and BEME. Abnormal returns are calculated following the procedure from Table 4. The investment period is from January 1965 – December 2014. The growth in value of the WML investment is partitioned by funding conditions with each graph containing the cumulative value for the portfolio only during the specified funding condition. The specified funding condition is indicated by the shaded areas in each graph and values only cumulate within these shaded regions, within all non-shaded regions the returns are zero (flat). Panel A depicts the cumulative value during expansive funding conditions, Panel B depicts the cumulative value during restrictive conditions and Panel C depicts the cumulative value during indeterminate conditions.



Panel A – Expansive Conditions



Panel B – Restrictive Conditions



Panel C – Indeterminate Conditions

Figure 3 – Growth of the Winner and Loser Portfolios Across Funding Conditions

The figure reflects the cumulative value of $1 invested in a portfolio that tracks monthly abnormal returns of two components of the WML strategy (Winners and Losers) after adjusting for ME and BEME. Abnormal returns are calculated following the procedure from Table 4. The investment period is from January 1965 – December 2014. The growth in value of the investment is partitioned by funding conditions with each graph containing the cumulative value for the portfolio only during the specified funding condition. The specified funding condition is indicated by the shaded areas in each graph and values only cumulate within these shaded regions, within all non-shaded regions the returns are zero (flat). Panel A depicts the cumulative value during expansive funding conditions, Panel B depicts the cumulative value during restrictive conditions and Panel C depicts the cumulative value during indeterminate conditions.

Table 5. Momentum, Funding Conditions and Risk Factors

The table evaluates the influence of funding conditions on the relationship between the winner minus loser portfolio (WML) and the three factor model. The momentum premium (WML) is derived as the difference between the mean monthly return for the winner portfolio (the 10% of firms with the best past performance) and the mean monthly return for the loser portfolio (the 10% of firms with the worst past performance) using R(-12,-2) as defined in Table 1. The sample excludes financial companies and is adjusted for delisting bias. t-statistics (in parentheses) are derived based on Newey-West standard errors with six lags.

	Model 1	Model 2	Model 3	Model 4	Model 5
Dependent Variable	WML	WML	WML	Winner	Loser
Intercept	0.0150*** (6.07)	0.0026 (0.35)	0.0117* (1.88)	0.0093*** (3.79)	-0.0024 (-0.49)
Indeterminate (Ind)		0.0097 (1.12)	0.0021 (0.25)	-0.0004 (-0.12)	-0.0024 (-0.36)
Restrictive (Res)		0.0160** (2.01)	0.0102 (1.46)	0.0044 (1.35)	-0.0058 (-1.09)
MKT	-0.2100** (-1.99)		-0.4798** (-2.36)	0.9959*** (14.58)	1.4758*** (9.49)
Ind*MKT			0.3474 (1.45)	-0.0030 (0.04)	-0.3444* (-1.81)
Res*MKT			0.5235** (2.33)	0.1806** (2.00)	-0.3429** (-2.01)
SMB	-0.2070 (-1.00)		-0.4731** (-2.11)	1.1023*** (8.99)	1.5754*** (9.15)
Ind*SMB			-0.4556 (-1.30)	-0.1927 (-1.21)	0.2629 (0.93)
Res*SMB			0.7516** (2.62)	0.1235 (0.79)	-0.6281*** (-3.01)
HML	-0.4342* (-1.77)		-0.1589 (-0.50)	-0.0487 (-0.42)	0.1103 (0.48)
Ind*HML			-0.0703 (-0.21)	-0.2875** (-2.09)	-0.2171 (-0.77)
Res*HML			-0.5936 (-1.54)	-0.1874 (-1.00)	0.4062 (1.63)
Adjusted R^2	4.02%	0.52%	15.04%	86.39%	69.64%

Table 6. Prior Time-Varying Explanations for Momentum

The table evaluates the influence of previously cited factors that influence momentum, market states (UP, Cooper et al. (2004)) and return dispersion (RD, Stivers and Sun (2010)). In Panel A, we provide results from two separate regressions of WML on UP and RD (Model UP/RD), and WML on the residuals from our Model 3 from Table 5 (Model UP/RD.R). In Panel B we first report the results that were reported for our Model 3 from Table 5 (Model 5.3). We then report the results of estimating the residuals of Model UP/RD as the dependent variable in Model 5.3 (Model 5.3.R). In Panel B, the coefficients on the indeterminate variable are omitted for brevity. The momentum premium (WML) is derived as the difference between the mean monthly return for the winner portfolio (the 10% of firms with the best past performance) and the mean monthly return for the loser portfolio (the 10% of firms with the worst past performance) using R(-12,-2) as defined in Table 1. The sample excludes financial companies and is adjusted for delisting bias. t-statistics (in parentheses) are derived based on Newey-West standard errors with six lags.

Panel A: UP and RD after controlling for Funding Conditions

	Model UP/RD	Model UP/RD.R
Dependent Variable	WML	Table 5 Model 3 Residuals
Intercept	-0.0128 (-1.04)	-0.0181 (-1.50)
UP	0.0292** (2.27)	0.0215* (1.70)
RD	-0.3070** (-2.26)	-0.1886 (-1.45)
Adjusted R^2	3.15%	1.65%

Panel B: Funding Conditions after controlling for UP and RD

	Model 5.3	Model 5.3.R
Dependent Variable	WML	Residuals from Model UP/RD
Intercept	0.0117* (1.88)	0.0033 (0.61)
Restrictive	0.0102 (1.46)	0.0036 (0.56)
MKT	-0.4798** (-2.36)	-0.4432** (-2.32)
Res*MKT	0.5235** (2.33)	0.4615** (2.16)
SMB	-0.4731** (-2.11)	-0.4477* (-2.00)
Res*SMB	0.7516** (2.62)	0.7305** (2.57)
HML	-0.1589 (-0.50)	-0.1575 (-0.51)
Res*HML	-0.5936 (-1.54)	-0.5561 (-1.47)
Indeterminate Interaction Terms	Yes	Yes
Adjusted R^2	15.04%	13.56%

Table 7. Momentum, Illiquidity, and Funding Conditions

The table reports illiquidity characteristics of momentum winners and losers across different funding environments. The illiquidity measures are computed following Amihud (2002), as follows. ILLIQ is calculated for each stock in every month as:

$$ILLIQ_{iM} = \frac{1}{t}\sum_{t}\frac{1{,}000{,}000 \times |return_t|}{price_t \times volume_t}$$

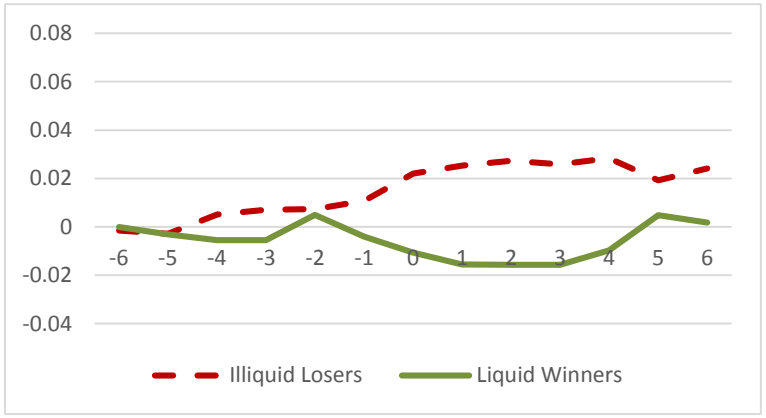
Where t is a positive-volume trading day within the month the measure is calculated. The sample includes stocks traded on the NYSE that meet the following criteria: the stock has return and volume data for more than 200 days in a year, and more than 10 days in a month; and the stock price is higher than $5. The highest and lowest 1% tails of the annual average of ILLIQ are eliminated. ILLIQMA is the ratio of ILLIQ to the average market illiquidity across stocks in each month. The sample covers July 1963 to December 2014. The sample excludes financial companies and is adjusted for delisting bias. Momentum winners and losers are based on the mean monthly return for the winner portfolio (the 10% of firms with the best past performance) and the mean monthly return for the loser portfolio (the 10% of firms with the worst past performance) using R(-12,-2) as defined in Table 1. t-statistics are derived based on Newey-West standard errors with six lags.

Panel A - Return (in %)

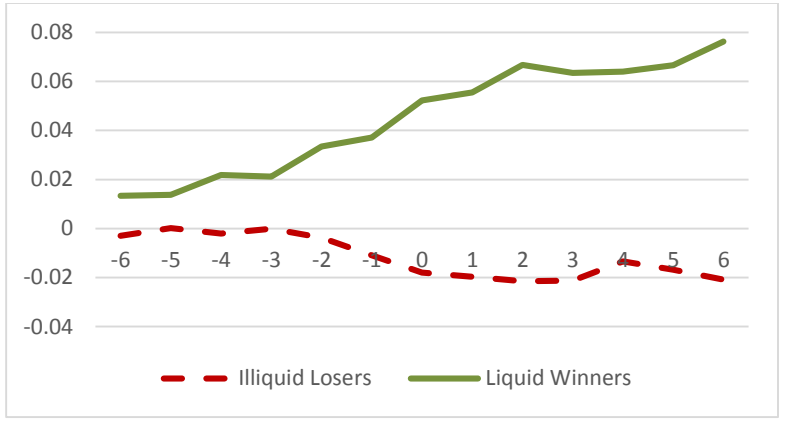
	Full Sample N=618	Expansive (E) N=173	Restrictive (R) N=220	E - R
Winner	1.17%***	1.95***	1.02***	0.93
t-statistic	4.58	4.41	2.13	1.37
Loser	0.64**	1.97***	-0.14	2.11**
t-statistic	2.17	3.15	-0.33	2.46
WML	0.52**	-0.02	1.16***	-1.18**
t-statistic	2.41	-0.04	3.70	-1.96

Panel B – ILLIQ

	Full	Expansive (E)	Restrictive (R)	E - R
Winner	0.35***	0.24***	0.41***	-0.17***
t-statistic	13.08	7.17	8.81	-3.04
Loser	0.80***	0.53***	0.94***	-0.41***
t-statistic	13.55	8.05	8.63	-3.27
WML	-0.45***	-0.29***	-0.53***	0.24***
t-statistic	-11.43	-7.18	-7.26	2.90

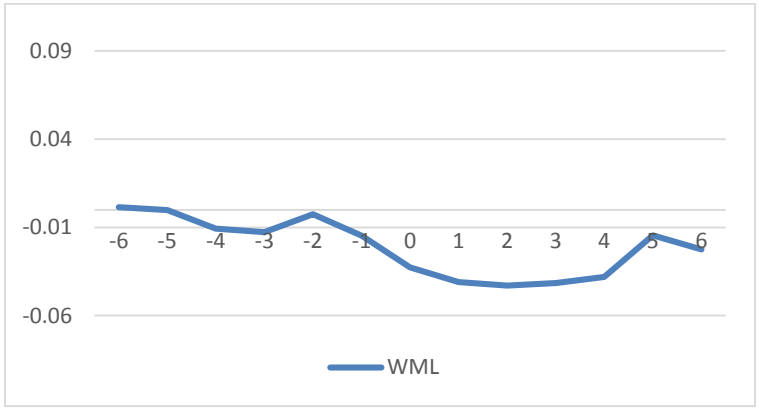


Expansive Conditions

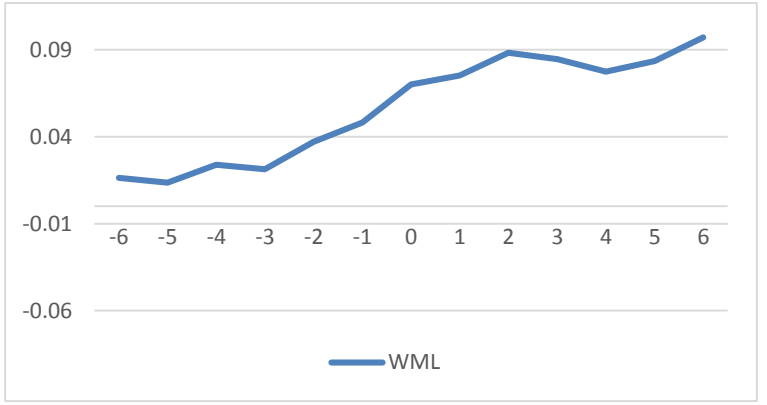


Restrictive Conditions

Panel A - Winners and Losers



Expansive Conditions



Restrictive Conditions

Panel B – WML

Figure 4 – Cumulative Market-Adjusted Returns of Liquid and Illiquid Firms Relative to Shifts in Funding Conditions

The figure shows cumulative market-adjusted returns for liquid firms and illiquid firms in the six months prior to and six months following a shift in funding conditions. The investment period is from January 1965 – December 2014. Month 0 indicates the first month in which both funding conditions indicators reflect the specified condition. Separate graphs are presented for expansive shifts and restrictive shifts. Illiquid (liquid) firms are identified as the lowest (highest) quintile of Amihud (2002) ILLIQ in the prior month. Monthly returns are adjusted using the CRSP equally-weighted market return. Panel A depicts the cumulative returns of liquid winners (top quintile of R(-12,-2)) and illiquid losers (bottom quintile of R(-12,-2)). Panel B depicts the cumulative returns to a Winner-Loser (WML) portfolio formed as the monthly difference in returns of liquid winners and illiquid losers. The sample includes NYSE stocks that meet the following criteria: the stock has return and volume data for more than 200 days in a year, and more than 10 days in a month; and the stock price is higher than $5. Annual average ILLIQ is trimmed at the top and bottom one percent and those observations are excluded. Returns are adjusted for delisting bias.

Appendix A – Alternative Measures of Aggregate Capital Availability across Funding Conditions

The table shows changes in alternative measures of fund availability across different funding environments. Changes in monetary aggregates are taken from monthly observations in total reserves, non-borrowed reserves, and the adjusted monetary base (Fed descriptors TRARR, BOGNONBR, and AMBSL respectively; the TRARR and BOGNONBR series were discontinued in 2013). Ted Spread is defined as the difference between the three-month LIBOR rate and the three-month Treasury bill rate. ILLIQ is computed monthly following Amihud (2002); ILLIQ changes are computed as log(Illiquid t / Illiquid t-1), following Kamara, Lou, and Sadka (2008). The value of funding liquidity is from Fontaine and Garcia (2012). Monthly changes are from July 1963 through December 2014 (the Ted Spread is for 1986-2014 and the value of funding liquidity is for 1986-2013). Changes are measured in month *t+1* based on funding conditions determined in month *t*. Newey-West t-statistics are reported in italics and underneath the monthly average returns. The bandwidth parameter for Newey-West t-statistics is equal to one plus the number of autocorrelated lags that persist in significance at the 5% level. Reported z-scores are for Wilcoxon tests comparing distributions. ***,**,* indicate a significant difference across funding conditions at the 1%, 5%, 10% levels. Significant differences are noted separately for t-statistics and z-scores.

	Average / Median			*Difference (t-stat) [z-score]*		
Aggregate	Expansive (E)	Indeterminate (I)	Restrictive (R)	E vs. I	E vs. R	I vs. R
Total Reserves Change	3.47	0.41	-0.01	3.06	3.48	0.42
(% change)	0.71	0.33	-0.01	(1.56)	(1.78)*	(2.17)**
				[2.89]***	[5.21]***	[2.79]***
Non-Borr. Res. Change	4.13	0.80	-0.18	3.33	4.31	0.99
(% change)	0.83	0.39	-0.11	(0.90)	(1.16)	(3.06)***
				[2.71]***	[5.21]***	[2.81]***
Adj. Mon. Base Change	1.15	0.66	0.41	0.49	0.74	0.25
(% change)	0.65	0.59	0.45	(1.53)	(2.38)**	(2.50)**
				[1.89]**	[5.00]***	[3.33]***
Ted Spread Change	-0.01	0.01	0.02	0.04	0.05	0.01
(% points)	-0.01	0.00	0.01	(1.95)**	(2.16)**	(0.40)
				[3.43]***	[2.82]***	[0.38]
Market ILLIQ Change	-0.05	0.00	0.02	0.05	0.07	0.02
(% change)	-0.03	0.00	0.01	(2.56)**	(2.97)***	(1.17)
				[2.67]***	[2.82]***	[0.38]
Market ILLIQ	0.45	0.65	0.72	0.20	0.27	0.07
	0.27	0.37	0.52	(1.42)	(1.93)*	(0.46)
				[2.08]**	[2.22]**	[0.96]
Funding Liquidity	0.26	0.40	0.70	0.14	0.44	0.30
	0.28	0.42	0.73	(2.14)**	(4.95)***	(3.21)***
				[7.88]***	[2.42]**	[5.92]***