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Stock returns with consumption and illiquidity risks

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ABSTRACT

This paper derives closed-form expressions for consumption-based stochastic discount factors adjusted by market-wide illiquidity shocks, considering both contemporaneous and *ultimate consumption risk*. We find that market-wide illiquidity risk is important for pricing risky assets under alternative preference specifications, although it is especially relevant when we allow for *ultimate consumption risk*. We also find a large and highly significant illiquidity risk premium for the first quarter of the year suggesting a time-varying behavior of the market-wide illiquidity premium.

1. Introduction

The economic understanding of the stock markets' behavior is based on the fact that investors dislike stocks because they tend to do badly – reducing consumption ultimately – in economic downturns and especially on recessions. Although this foundation made consumption-based asset pricing models very popular, their systematic empirical rejection has led to new models in which utility depends not only on consumption but also on other arguments which enter the utility function in a non-separable fashion. Well-known models with habit persistence or recursive utility functions are good examples. Because of the non-separability, marginal utility of consumption responds to changes in state variables making the countercyclical behavior of the stochastic discount factor (SDF hereafter) more pronounced.

In this framework, different papers have shown the relevance of some state variables that are constrained to a slow adjustment; this is the case of labor income growth, habits, housing collateral or the share of housing consumption in total consumption. This insight, together with the cost of adjusting consumption itself, suggests that the basic consumption-based model may hold at long-horizons. Indeed, a recent line of research explores this field. Jagannathan and Wang (2007) find that the basic consumption-based model can account relatively well for annual frequency data being the relevant data those corresponding to the fourth quarter of each year. And Parker and Julliard (2005) argue that changes in wealth have a delayed

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effect on consumption patterns. Hence, the covariance between portfolio returns and consumption growth over the quarter of the return and many following quarters (ultimate consumption) is needed for conciliating expected returns and consumption risk.[1] The dynamics of the long-run consumption growth results in an *ultimate consumption risk* SDF with a counter-cyclical behavior much more pronounced than the one observed for the contemporaneous consumption growth model. The model has some success in explaining the pricing of size and book-to-market portfolios, although it is unable to fit the extreme small-value and small-growth stock portfolios.

Given this discussion, we propose a fundamental consumption-based model in line of the Parker and Julliard's (2005) ultimate consumption framework. We take advantage of the long-run consumption risk but improving the counter-cyclical pattern of the SDF considering other pertinent state variables. Of course, the identification of the additional proper state variables is crucial. Our theoretical proposal considers two state variables; the market return, as a consequence of assuming recursive preferences instead of the standard power utility function, and an aggregate illiquidity factor.

The market liquidity role in asset pricing has extensively been analyzed in the literature. The papers by Chordia, Roll, and Subrahmanyam (2000) and Hasbrouck and Seppi (2001) could be considered the starting point on this research line. Their main results show that the time-varying liquidity for individual stocks has common systematic components suggesting the possibility of a market-wide liquidity variable being a priced aggregate factor.[2] Amihud (2002) shows that the level of market-wide liquidity affects expected returns and, among others, Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Sadka (2006), Liu (2006), and Korajczyk and Sadka (2008) find that the covariance between returns and some measure of aggregate liquidity shocks is significantly priced by the market.[3] Lastly, Watanabe and Watanabe (2008) show that the liquidity risk premium is time varying. They report a large liquidity premium for states with particularly large liquidity betas and argue that their result is consistent with investors facing uncertainty about their trading counterparties' preferences.[4]

Rather surprisingly, however, all previous papers simply include an additional market-wide illiquidity factor to traditional portfolio-based asset pricing models. None of these papers theoretically justify why such a factor may be priced in the market.[5] This paper covers this gap by deriving closed-form expressions for contemporaneous and ultimate consumption-based stochastic discount factors adjusted by exogenous market-wide illiquidity shocks. In particular, we propose a model in which the aggregate liquidity risk factor arises as a result of illiquidity shocks affecting the investor's budget constraint when solving the investor's optimization problem. We then obtain a closed-form expression for a consumption-based SDF adjusted by aggregate liquidity. To the best of our knowledge, this papers reports for the first time how aggregate illiquidity behaves together with consumption growth risk. Our evidence suggests that aggregate illiquidity is indeed important in pricing risky stocks in models with *ultimate consumption risk*, and that these adverse shocks are particularly relevant during the first quarter of the year.

This paper is organized as follows. Section 2 derives our three-factor asset pricing model with market-wide consumption and illiquidity risk under recursive preferences, while Section 3 contains a description of data. Section 4 discusses the estimation strategy, and reports the empirical results. Section 5 concludes with a summary of our main findings.

2. The consumption-based liquidity-adjusted stochastic discount factor

All the empirical papers concerning the existence of a liquidity market-wide factor are based on the implicit assumption that there exists a SDF that depends on some measure of aggregate liquidity. To be explicit about how systematic liquidity enters the SDF is not an easy task. He and Modest (1995) argue that a combination of short-selling, borrowing and solvency constraints together with trading cost frictions can generate a wedge between the SDFs and asset prices large enough to make some well-known empirical puzzles compatible with equilibrium in financial markets. Indeed, Lustig and Van Nieuwerburgh (2005) explore a model in which shocks in the housing market affecting housing collateral determine the size of the wedge between prices and the marginal rate of intertemporal substitution of consumption.

In this paper, we do not include the market-wide liquidity measure as an argument of the utility function. Instead, we assume that shocks to aggregate liquidity directly affect the representative agent intertemporal budget constraint. In that way, future market-wide liquidity conditions will affect future aggregate consumption and, therefore, how investors value today future payoffs.

[1] Note that this is different from the long-run consumption model of Bansal and Yaron (2004), and Hansen, Heaton, and Li (2008) who propose an asset pricing framework with time-varying expectations on future consumption growth under Epstein and Zin's (1991) recursive preferences with either higher than one or unitary intertemporal elasticity of substitution respectively. In this model, key shocks moving stock prices are the changing expectations of long-run consumption growth and its volatility where there is a persistent predictable component of consumption growth.

[2] See also the related paper by Brockman and Chung (2008) who show that commonality in liquidity increases at the aggregate level in an order-driven market during periods of market stress.

[3] Martínez, Nieto, Rubio, and Tapia (2005) find a similar evidence using returns from the Spanish equity market as an example of a pure order-driven market.

[4] International evidence regarding the importance of liquidity for stock returns can be found in Ke, Huang, Liao, and Wang (2013), and He, Lepone, and Leung (2013) for the Taiwanese and Australian markets respectively.

[5] Of course, we recognize the relevant contributions of Acharya and Pedersen (2005), and Watanabe and Watanabe (2008) who introduce illiquidity shocks by subtracting an illiquidity cost from the asset return. Their approach can also to be understood as an alternative way to incorporate illiquidity shocks via the budget constraint. Indeed, the papers of Acharya and Pedersen (2005), and Brunnermeier and Pedersen (2009) are consistent with a SDF that, like ours, is the consumption-based augmented by a multiplicative factor that captures the state of market-wide illiquidity.