The Cross-Section of Expected Stock Returns:

What Have We Learnt from the Past Twenty-Five Years of Research?

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Abstract

I review the recent literature on cross-sectional predictors of stock returns. Predictive variables used emanate from informal arguments, alternative tests of risk-return models, behavioral biases, and frictions. More than fifty variables have been used to predict returns. The overall picture, however, remains murky, because more needs to be done to consider the correlational structure amongst the variables, use a comprehensive set of controls, and discern whether the results survive simple variations in methodology.

It hardly needs reiterating that one of the central lines of research in finance is understanding the cross-section of equity market returns. Why one stock's expected return might vary from that of another has preoccupied scholars for decades. The CAPM-APT paradigms (Sharpe, 1964, Lintner, 1965, Mossin, 1966, Merton, 1973, Ross, 1976) based on the risk-expected return tradeoff (henceforth, termed the RR paradigms) brought rigor into the field and have served as null hypotheses against which to test a number of alternatives in the literature. Indeed, the number of publications in the top journals avowing deviations from the standard asset pricing models has mushroomed over the years. What have we learnt from this empirical literature and what research issues does this body of work raise? That is the topic of this review article.

I was able to document at least fifty variables that the literature has used to predict stock returns in the cross-section, where the cross-section essentially is the same familiar universe of NYSE-Amex-Nasdaq stocks. The predictive variables are motivated principally in one of four ways. These are:

- Informal Wall Street wisdom (such as "value-investing")
- Theoretical motivation based on risk-return (RR) model variants
- Behavioral biases or misreaction by cognitively challenged investors
- Frictions such as illiquidity or arbitrage constraints

The primary goal of my paper is to review the variables that have been used by various scholars using the preceding categorization, and then discuss some unresolved issues. As a central theme, I maintain that our learning about the cross-section is hampered when so many predictive variables accumulate without any understanding of the correlation structure between the variables, and our collective inability or unwillingness to adequately control for a comprehensive set of variables.

A different issue I discuss in the paper is the methodologies used to document the significance of the variables of interest. These methodologies fall into two categories:

- A regression approach, controlling for risk either by including the factor loadings as controls, or using risk-adjusted returns on the left-hand side. The factors used for risk controls in the above methods vary:
    - The Fama and French factors (1993), possibly augmented by a momentum factor and a liquidity factor
    - Factors rooted in macroeconomic influences (such as those proposed by Chen, Roll, and Ross, 1986)
    - Factors extracted from the data using factor analysis or principal components (Connor and Korajczyk, 1988, 1993)
- The alternative to regression analysis is a portfolio approach, where securities are sorted on the criterion of interest and then portfolios returns (usually adjusted for risk)

documented across the ranked portfolios.

The tendency of scholars to use one methodology or the other raises the question of whether the results are robust to different methodologies. As I point out in a later section, however, disparate methodologies are used by different researchers and there usually is little attempt to demonstrate robustness across methods. This is another reason why the picture remains murky and suggests a need for clarifying studies. Basically, it appears to me that the profession is segmented into groups of like-thinking scholars, and perhaps there is inadequate cross-talk across these groups.

I note here that while I attempt to present a taxonomy of predictors, there may be an inevitable overlap across categories. It may be that some readers would prefer a different taxonomy to the one I present and it is doubtless possible that I may have omitted some key papers on one or other of the themes discussed below. Also, this paper is primarily about empirical findings, and not a treatise about methodological issues. In addition, I primarily discuss more recent empirical work, rather than the work of a previous scholarly generation, even though I refer to older works from time to time. Finally, the focus here is on return predictability at monthly or longer horizons; thus, I do not review the market microstructure-based literature on return predictability at shorter horizons (e.g., Lo and MacKinlay, 1990). In spite of these issues, I think that my review takes first things first and may serve as a useful base from which to build our thought process on where future research on the cross-section of equity returns should be focused.

This paper is organized as follows. Section I reviews predictors obtained from informal arguments. Section II summarizes the evidence on predictors obtained from reasoning based on risk-return model variants. Section III considers predictors based on the activities of cognitively challenged investors. Section IV presents the evidence on predictors obtained from measures of frictions such as illiquidity and short-sale constraints. Section V presents some challenges for future research. Section VI provides brief concluding remarks.

I. Simple arguments based on informal Wall Street wisdom

I first consider those predictors that are not based on any a priori theoretical reasoning, but are motivated largely by informally appealing to the wisdom of scholars or finance professionals, or are just chance discoveries. Based partially on the notion that recommending stocks based on price/earnings ratios and the like is common on Wall Street, Basu (1977) documents a P/E effect (that low P/E stocks appeared to earn higher abnormal returns than high P/E stocks). Similarly, Banz (1981) documents a size effect in stock returns. The classical version of this effect is that stocks of firms with low market capitalization outperform those with high market capitalization. Miller and Scholes (1982) find that low priced stocks earn higher expected returns. In informal reasoning combined with some theory, Brennan (1970) argues that high dividend yield stocks command a differential premium because dividends are taxed at a different rate than capital gains.

The literature on predictors obtained from intuitive reasoning was given a tremendous fillip by Fama and French (1992), who convincingly document the role of size and book/market in the cross-section of expected stock returns, and show that standard risk/return models are not supported by the data. Fama and French (1993) provide evidence that a three-factor model based on factors formed on the size and book-market characteristics, and the market explains average returns, and argue that the characteristics compensate for “distress risk." But Daniel and Titman (1997) argue that, after controlling for size and book/market ratios, returns are not strongly related to betas calculated based on the Fama and French (1993) factors. Zhang (2006) argues that stocks with greater information uncertainty (e.g., those which are small and have low analyst following) exhibit stronger statistical evidence of mispricing in terms of return predictability from book/market and momentum within cross-sectional regressions.

Jegadeesh (1990) documents the negative impact of one lag of the return on future returns. This finding is subsequently confirmed in Cooper (1999), Subrahmanyam (2005), and Avramov, Chordia, and Goyal (2006). However, the source of the effect is subject to debate. While Cooper (1999) and Subrahmanyam (2005) suggest that overreaction is the cause of this phenomenon, Avramov, Chordia, and Goyal (2006) indicate that part of the phenomenon may be caused by illiquidity-related price reversals.

Jegadeesh and Titman (1993) demonstrate a momentum effect (prediction from three to twelve months of past returns). Grinblatt and Moskowitz (2004) demonstrate the effects of return consistency, that is, they claim that momentum profits depend on whether returns were achieved in a steady way, or due to a few unusual months.

Hong, Lim, and Stein (HLM) (2000) refine the momentum effect by documenting that momentum profits decrease with size and analyst coverage (i.e., the evidence supports their argument that neglected stocks have less information flows and greater market inefficiencies). Doukas and McKnight (2005) provide out of sample confirmation to HLM by demonstrating that their results carry over to Europe. Cooper, Gutierrez, and Hameed (2004) show that momentum profits are much larger after positive market returns than after negative ones. Avramov, Chordia, Jostova, and Philipov (2007) argue that momentum profits derive primarily from low credit quality stocks. This is broadly supportive of the HLM notion under the assumption that distressed stocks are not attractive investments and are thus neglected by the investing public.

Chordia and Shivakumar (2002) argue that momentum profits in the U.S. can be explained by business cycles. Specifically, they show that profits to momentum strategies drop significantly once returns are adjusted for predictability based on macroeconomic variables. Griffin, Ji, and Martin (2003), however, do not find support for the Chordia and Shivakumar (2002) findings in the context of international markets, and find pervasive momentum across many countries. Rouwenhorst (1998) also finds out-of-sample evidence of a momentum effect in many European countries. Asness, Moskowitz, and Pedersen (2009) find that momentum as well as book/market effects are pervasive not only in international equities but also in markets for other assets such as government bonds and foreign currencies. Hvidkjaer (2006) considers how momentum at six- to twelve-month horizons is related to order flows. He finds that momentum may be caused by the underreaction of small traders. For example, he uncovers that small traders continue to buy loser stocks for up to an year, and then start selling these stocks. Large traders show no such pattern. In a twist on the momentum literature, Heston and Sadka (2008) document that winner stocks in a given month outperform loser stocks in that same month for up to 20 annual lags, which is an intriguing result destined to receive a lot of attention in future research.

In addition to momentum over six to twelve month horizons, evidence of long-term reversal (negative autocorrelation of returns over three- to five-year horizons) is found by DeBondt and Thaler (DT) (1985, 1987). While Conrad and Kaul (CK) (1993) take issue with the findings of DT partially on the basis of the notion that the reversals are largely due to low-price stocks, Loughran and Ritter (1996) counter this by arguing that low prices simply proxy for low past returns; they also raise the issue that CK's requirement that stocks be present throughout the three-year portfolio pre-formation period introduces a survivorship bias that diminishes the DT effect. In addition to being supported by Loughran and Ritter (1996), DT's finding is confirmed by Chopra, Lakonishok, and Ritter (1992).

In a comprehensive study of stock return predictors in the cross-section (obtained from informal reasoning), Haugen and Baker (1996) find that the strongest determinants of expected returns are past returns, trading volume, and accounting ratios such as return on equity and price/earnings. They find no evidence that risk measures such as systematic or total volatility are material for the cross-section of equity returns.

II.Theoretical motivation based on RR model variants

The early work of Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973) tests the standard CAPM and stimulated a vast body of work on the subject in the 70s and early 80s that I will not review here. In Section I, I already have mentioned the work of Fama and French (1992), who find that the data do not appear to support the pricing of systematic risk. In more recent work, Jagannathan and Wang (1996) argue that when returns to labor income are included in the total return on the market portfolio, a conditional CAPM (where betas vary with business cycles) works well in describing the data. Campbell and Vuolteenaho (2004) argue that beta can be decomposed into two parts: one due to covariance with cash flows, and one due to covariance with discount rates. Using as test assets, two sets of portfolios sorted by size and book/market, they show that the former component is the one that is priced in the cross-section of stock returns.

Brennan, Wang, and Xia (2004) test Merton's (1973) intertemporal CAPM by showing that two state variables: the stochastic real interest rate and the stochastic maximum Sharpe ratio (the familiar slope of the capital market line) describe the expected returns of all assets in equilibrium. They estimate these quantities (and the associated betas) and show that the model works well in explaining cross-sectional variation of returns in the 25 portfolios sorted by size and book/market that are used by Fama and French (1993). Indeed, their model has lower pricing errors than the three-factor model of Fama and French (1993). Da (2009) shows that the expected return of an asset arises from two characteristics of its cash flow, namely the beta with aggregate consumption, and the duration (time pattern) of the cash flow. He shows that his model explains more than 80% of the variation in the Fama and French (1993) portfolio returns.

Brennan, Cheng, and Li (2009) argue that when managers are evaluated with respect to an index benchmark and they are the marginal investors, assets that covary considerably with the component of the benchmark uncorrelated with the market portfolio will earn low expected returns. Using the CRSP value-weighted index as the market proxy and the S&P 500 as the benchmark, they find strong evidence in support of their hypothesis. Gomez and Zapatero (2003) also find evidence supporting the benchmarking model.

In a paper at odds with the systematic risk pricing argument of the CAPM, Lehmann (1990) finds evidence of the pricing of idiosyncratic risk. But Ang, Hodrick, Xing and Zhang (2006) find that stocks with high idiosyncratic risk earn low expected returns. Fu

(2009) uses an exponential GARCH model to estimate expected idiosyncratic volatility, and finds a positive relation between his measure and future returns.

In a separate line of work, Petkova (2006) shows that a factor model that incorporates macro factors such as the term and credit spreads dominates the Fama and French (1993) model, in that only the loadings on the macro factors are priced. Petkova (2006) uses as test assets the 25 portfolios sorted by size and book/market that are used by Fama and French (1993). Zhang (2009) shows that factors extracted as principal components from portfolios sorted by size and book/market remove the size and book/market effects in the cross-section of returns. The factor extraction method of Zhang (2009) is inspired by Connor and Korajczyk (1988, 1993) but his insight is to use principal component analysis on size and book/market sorted portfolios as opposed to individual securities, on the grounds that if size and book/market truly capture risk factors, as suggested by Fama and French (1993) then these would be more evident in principal components extracted from size and book/market sorted portfolios.

The consumption CAPM (where expected returns are related to covariances of stock returns with aggregate consumption growth) of Breeden (1979) has recently generated interest. This model finds weak support in Breeden, Gibbons, and Litzenberger (1989). Parker and Julliard (2005) document that measuring consumption risk by covariance between returns and cumulative consumption growth over many quarters supports the consumption CAPM. Santos and Veronesi (2006) show that the conditional CAPM with the labor income to consumption ratio as a conditioning variable is a useful descriptor of expected returns. The economic intuition is that consumption varies with stock returns only insofar as it is funded by nonlabor (stock market) income. Therefore, the risk premium depends on the fraction of consumption funded by labor income. Jacobs and Wang (2004) point to idiosyncratic consumption risk as a priced risk factor. Lettau and Ludvigson (2001) argue that including the consumption to wealth ratio as a proxy for agents' furture expectations improves the performance of the consumption CAPM. The idea is that this ratio captures future expectations about stock returns. Malloy, Moskowitz, and Vissing-Jorgensen (2005) as well as Bansal, Dittmar, and Kiku (2006) point to long-run consumption risk (consumption betas at horizons of four years or more) as being reflected in the cross-section of returns.

Jagannathan and Wang (2007) document that measuring growth in consumption by year-on-year consumption growth in the fourth quarter supports the CAPM. The argument is that the consumption CAPM requires consumption and investment decisions to be made simultaneously, and many investors may monitor their portfolio or their consumption infrequently (only towards the end of the calendar year). In a paper with a humorous title ("Asset Pricing With Garbage"), Savov (2009) indicates that garbage production in the U.S. provides a better measure of consumption variation than traditional measures of consumption obtained from National Income and Product Accounts (NIPA) and he shows that garbage growth is priced in the cross-section of expected stock returns.

In other work based on RR arguments, Hou and Robinson (2006) show that firms in industries that are not concentrated earn higher expected returns than other firms, and the implicit argument is that concentrated industries have higher barriers to entry, insulating the firms from non-diversifiable risk. Fang and Peress (2009) document that stocks with low media coverage earn higher expected returns than stocks with high coverage, suggesting a risk premium for "neglected stocks".

III. Behavioral biases or cognitively challenged investors

Many predictors derive from informal arguments about investor overreaction/underreaction. Lakonishok, Shleifer, and Vishny (1994) find a negative relation between long horizon returns and past financial performance measures such as earnings or sales growth. They attribute this to the notion that investors extrapolate historical growth too far in the future. In a similar vein, La Porta (1996) finds that analysts' long-run earnings growth forecasts are negatively related to future returns, suggesting that analysts also excessively extrapolate future growth from past growth.

On the premise that investors do not properly separate accounting income and cash flows, Sloan (1996) documents that accounting accruals are negatively related to returns. Sloan, Frankel and Lee (1998) document the positive predictive power of value-price ratios where value is derived from accounting models. The notion here is that investors overreact to information in the value. Cooper, Gulen, and Schill (2008) indicate that growth in book assets is cross-sectionally related to future returns and the implication is that investors underreact to information in the time-series of balance sheets.

If managers issue equity when stocks are overvalued, then stock issuance will negatively predict returns. Evidence supportive of this conjecture is provided by Daniel and Titman (2006). In addition, Titman, Wei, and Xie (2004) suggest that managers often undertake bad investments for reasons of power or empire building and investors do not fully understand this motive for investment. They provide support for this hypothesis by documenting that capital investment negatively predicts returns.

Hvidkjaer (2008) and Barber, Odean, and Zhu (2009) show that small trade order flows negatively predict future returns, in the sense that stocks sold by small investors outperform stocks purchased by these investors over horizons of between six months to two years. This indicates that small investors' irrational beliefs cause deviations of prices from fundamental values, and correction of these divergences manifests itself in future returns.

Dichev (1998) and Campbell, Hilscher, and Szilagyi (2008) show that the risk of bankruptcy is negatively related to expected returns. One would expect these distressed firms to have high book/market, based on the Fama and French (1993) notion that book/market proxies for distress risk. However, Griffin and Lemmon (2002) show that distressed firms often have low book/market ratios and that Dichev's (1998) results are driven by distressed firms with low book-market ratios that earn very low returns. All of this evidence, taken together, contradicts the Fama and French (1993) notion that book/market is positively related to expected returns because book/market ratios capture financial distress. They are instead supportive of the hypothesis that investors underreact to information in the balance sheet about impending distress

Cohen and Frazzini (2008) show predictability in returns across economically linked firms. They argue that stock prices of firms upstream from customer firms underreact, based on their finding that investment strategies involving buying firms whose customer firms have performed well in the past and vice versa earn positive returns. Baker and Wurgler (2006) show that young, risky firms underperform significantly after periods of high sentiment, as measured by proxies such as IPO/SEO activity and trading volume. The notion is that periods of high sentiment reflect overvaluation for hard to value firms (i.e.., young firms with high return volatility).

Research has also focused on the stock price reactions to recommendations of stock market analysts. Womack (1996) shows that stock prices drift in the direction of analysts' revisions, suggesting that investors underreact to these revisions. Sorescu and Subrahmanyam (2006) indicate that the drift is only for experienced analysts; revisions by inexperienced analysts actually experience price reversals. Bernard and Thomas (1989,

1990) show that stock returns, on average, drift in the direction of earnings surprises for up to three months after earnings announcements, and the implied notion is that investors underreact to information contained in earnings surprises.

Gompers, Ishii, and Metrick (GIM) (2003) develop a measure of corporate governance and show that better governed firms have greater average returns in the future than others, suggesting an underreaction to governance quality. However, Johnson, Moorman, and Sorescu (JMS) (2009) indicate that the GIM results are sensitive to the methods used in the study; specifically, JMS take issue with the industry controls in GIM. Chen, Kacperczyk, and Ortiz-Molina (2009) show that stocks in industries with organized labor unions have a higher cost of equity. This can be interpreted either as underreaction to information contained in unionization or an increased risk premium due to organized labor.

IV. Frictions such as illiquidity or arbitrage constraints

There is a vast literature on market frictions as predictors of stock returns. The basic notion is that greater trading frictions cause investors to require a higher return. In a landmark paper, Amihud and Mendelson (1986) find evidence that asset returns include a significant premium for the quoted bid-ask spread. Since that study, several papers have elaborated upon the role of liquidity as a determinant of expected returns.

An important issue in studies that relate illiquidity to asset prices is the measurement of illiquidity. Other than direct empirical measurements of illiquidity by the bid-ask spread, the approach taken in the literature has been to employ empirical arguments in order to measure illiquidity. For example, Amihud (2002) proposes the ratio of absolute return to dollar trading volume as a measure of illiquidity. Brennan and Subrahmanyam (1996), based on the analysis of Glosten and Harris (1988), suggest measuring illiquidity by the relation between price changes and order flows. Both of these studies find that their measures are positively related to average stock returns Datar, Naik, and Radcliffe (1998), and Brennan, Chordia, and Subrahmanyam (1998) suggest measuring liquidity by share turnover and find that this measure is negatively related to average returns.

In recent work, Chordia, Huh, and Subrahmanyam (CHS) (2008) use an illiquidity measure derived from Kyle's (1985) theory and show that it is positively related to future expected returns (CHS's measure incorporates parameters such as return volatility and volume into the illiquidity measure in a manner indicated by Kyle's expression for illiquidity in equilibrium). Brennan, Chordia, Subrahmanyam and Tong (2008) show that the pricing of illiquidity emanates principally from the sell-side. Allowing for differential price impacts on the buy- and sell-sides, they show that it is the sell-side price impact that is related to future expected returns. The basic notion is that demands for immediacy are likely to be greater on the sell-side (it is unlikely that agents will face needs to buy stock urgently, whereas it is quite plausible that unanticipated liquidity needs may force them to sell stock), thus strengthening the premium for sell-side illiquidity.

Some recent studies have focused on whether the second moment of liquidity is priced. The premise is that the variability of prospective future trading costs may command a premium in the stock market in addition to the level of such costs. Chordia, Subrahmanyam, and Anshuman (2001) use share turnover as a measure of liquidity and find that the second moment of liquidity actually bears a negative relation to future returns, countering the pricing of liquidity risk. However, Pastor and Stambaugh (2003) measure illiquidity by the extent to which returns reverse upon high volume, an approach based on the notion that such a reversal captures inventory-based price pressures. They do indeed find that stock sensitivities to aggregate liquidity risk are related to expected returns. Acharya and Pedersen (2005) use Amihud's (2002) measure to also conclude that liquidity risk is priced.

There also have been attempts to document the pricing of information risk, or the risk of trading with agents who have superior information. Easley, Hvidkjaer, and O'Hara (2002) indicate that their theory-based measure of information asymmetry, PIN, is priced in the cross-section of returns. However, Duarte and Young (2009) decompose the PIN into components due to information-based and liquidity trading and find that it is the latter component that is priced, thus raising questions about whether PIN is a valid measure of information asymmetry. Sadka (2006) argues that time-variations in an empirical estimate of the illiquidity parameter in a Kyle (1985)-type model of information asymmetry are priced in the cross-section of stock returns. Coval and Moskowitz (2001) proxy for informed agents by "local" investors, i.e., funds that are located close to the headquarters of a firm. They find that stocks with greater holdings by local investors command higher average returns.

Hou and Moskowitz (2005) develop an alternative measure, nonsynchronicity, which is one minus the R^2 of the regression of stock returns on the market. The notion is that this measure captures information asymmetries under the premise that much private information flows through the idiosyncratic component of returns. They show that their measure predicts future average returns in the cross-section.

There also is a small literature on how proxies for short-selling constraints act as frictions and are predictors of returns the stock market. Jones and Lamont (2002) show that stocks with high costs of borrowing have current high valuations and low future returns. Asquith, Pathak, and Ritter (2005) show that stocks with high short interest and low institutional ownership (and, in turn, less availability of stock for borrowing) earn low returns. These findings indicate that short-sale constraints act as a barrier to arbitrage and cause persistent overvaluation.

Demonstrating that the ease of short-selling facilitates market efficiency, Nagel (2005) shows that stocks with high institutional ownership (and thus greater availability of stock for borrowing) exhibit less cross-sectional predictability. In turn, this indicates more more efficient pricing in stocks where short-sale constraints are less binding. Gompers and Metrick (2001) document that the increase in institutional demand in the 1990s led to an upward pressure on stock prices and that this can account for the disappearance of the small firm effect in recent years.

Chen, Hong, and Stein (2002) find that breadth of ownership influences stock returns. The idea is that when few investors have long positions, then the short sale constraint binds, and stocks are overpriced. They find that stocks with breadth increases in the past significantly outperform those with breadth decreases. Diether, Malloy, and Scherbina (DMS) (2002) show that high dispersion of analyst opinion predicts low subsequent returns, on the notion that the short-sale constraint binds and therefore high disagreement simply reflects negative sentiment that is not yet in the current stock price (this general notion is usually credited to Miller, 1977). However, Avramov, Chordia, Jostova, and Philipov (2009) take issue with this interpretation and argue that the DMS result is mainly confined to distressed stocks which have large dispersion of opinion and low average future returns (viz., Dichev, 1998) cited earlier.

V. Issues of concern

It appears that the cross-section of expected stock returns is subject to myriad empirical influences. The research at this point presents a rather unsatisfying picture of a morass of variables, and an inability of us finance researchers to understand which effects are robust and which do not survive simple variations in methodology and use of alternative controls. I discuss the issues surrounding the interpretation of the results in this section.

First, most of the recent cross-sectional studies use the Fama and French (1993) factors as controls for risk. However, there is some evidence that the Fama and French (1993) may not be risk factors (Daniel and Titman, 1997). Indeed, Petkova (2006) suggests that macroeconomic factors may even dominate the Fama and French (1993) factors but the industry standard generally is still to use the Fama and French factors. Some other studies (Brennan, Chordia, and Subrahmanyam, 1998, Zhang, 2009) use the Connor and Korajczyk (1988, 1993) principal components approach to extract risk factors, but later studies have not resorted to this approach. Lehmann and Modest (2005) show that maximum likelihood methods for extracting factors may be a viable alternative to principal components methods, but this idea has not been developed further by scholars. Further, some studies (e.g., Zhang, 2006) supplement the Fama and French (1993) factor by a UMD factor (formed by subtracting returns of loser stocks from those of winner stocks), but it is unlikely that momentum is a risk factor (Griffin, Ji, and Martin, 2003), so the motivation for this exercise is unclear.

Another issue arises because factor loadings are measured with error, creating an errors-in-variables problem in a regression that has returns on the left-hand side and controls for these loadings on the right-hand side. Fama and French (1992) address this by sorting stocks into portfolios by loadings (to reduce measurement error) and assigning the portfolio loading to the stock. This introduces the problem that the assigned loading may not resemble the true loading of the stock. Shanken (1992) proposes a correction to the errors in variables problem, assuming the actual loading (as opposed to the assigned loading from the portfolio) is used in the regressions. Brennan, Chordia, and Subrahmanyam (1998) address the errors in variables issue by using risk-adjusted returns as the dependent variable, so that the loadings are transferred to the left-hand side. The merits and demerits of these approaches need to be better understood from an empirical standpoint, as does the impact of these methods on the findings described in this review.

A related issue in estimating factor loadings emanates from the fact that they typically require several months of return data to be computed with adequate precision. Some studies use rolling estimates (e.g., using the most recent 60 months of data), and some use a single set of loadings estimated from the entire data sample. Thus, for example, Brennan Chordia and Subrahmanyam (1998) use rolling estimates, whereas Petkova (2006) uses full sample estimates. These different methodologies for factor loadings allow for yet another degree of freedom that hampers a full understanding of what cross-sectional predictors are robust.

Another problem in the estimation of loadings emanates from the recognition that these loadings, of course, may not be constant over time. In a prominent attempt to address the time-variation in loadings, Ferson and Harvey (FH) (1999) model loadings as varying with macroeconomic variables such term and default spreads. They use size and book/market sorted portfolios as test assets and find that their conditional model explains returns in the cross-section. Avramov and Chordia (AC) (2006) use individual securities and model the loadings as varying with size, book/market and macroeconomic variables such as the credit and default spread. While the economic motivation for both of these studies is a bit nebulous, I conjecture the implicit idea to be that certain stocks are more sensitive to the macroeconomy during recessions than others. Such stocks could belong to financially constrained firms, who may have difficulty raising capital during recessions, or to internet companies with cyclical revenue streams (e.g., from advertisements) that may disappear during recessions because the revenue sources themselves become distressed. The basic finding of AC is that their conditional analysis reduces the significance of size and book/market as cross-sectional predictors of stock returns.

A concern about conditional betas is raised by Ghysels (1998) who argues that misspecifying the model for time-variation in betas could lead to a model with greater pricing error than an unconditional beta model even if the betas truly are time-varying. Lewellen and Nagel (LN) (2006) address the problem of time-varying betas by estimating them over short (weekly and daily) horizons, instead of long horizons, on the basis of the notion that betas would be constant over shorter horizons, so the issue of specifying a model for conditional betas is addressed. LN find that the conditional version of the CAPM cannot account for size and book/market. The results of FH, AC, and LN notwithstanding, it has not become the norm to use conditional betas in asset pricing regressions.

Blume and Stambaugh (1983) show that microstructure noise (e.g., induced by the bid-ask spread) can cause an upward bias in estimated returns. Brennan and Wang (2009) and Asparouhova, Bessembinder, and Kalcheva (2009) show that this bias can create issues in interpreting the results of predictive return regressions when the explanatory variables are correlated with noise. The latter set of authors show that various procedures such as using mid-quote returns or a weighted least-squares regression with the prior period's return as weights can correct for this bias. It remains to be seen whether future studies adopt these approaches.

The regression approaches in the literature generally use the Fama and MacBeth (1973) approach of running monthly regressions of returns on predictors, and using the time-series average and standard error of the regression coefficients to make statistical inferences. However, equally weighting the coefficients which are estimated with unequal precisions creates issues. Litzenberger and Ramaswamy (1979) present a correction for this problem. Some studies (e.g., Datar, Naik, and Radcliffe, 1998) use this correction, but many do not. Brennan and Subrahmanyam (1996) use a generalized least squares approach that uses panel data and takes into account time-series as well as cross-sectional effects of illiquidity on stock returns, but most studies prefer the standard Fama-MacBeth approach.

Yet another issue relates to the controls used to document an effect of interest. A recent study of Fama and French (2008) shows that the most robust cross-sectional predictors of returns are those associated with accruals, stock issues, and momentum. However, the study uses only a standard Fama and MacBeth (1973) approach and portfolio sorts, and does not consider conditional beta models, illiquidity proxies, order flows, or any measures of asymmetric information.

In general, most studies use size, book/market, and momentum as controls, but it is quite rare for liquidity controls to be used. As a recent example, Cooper, Gulen and Schill (2008) do not use any control for market friction in their study documenting that growth in assets predicts returns. Further, studies attributing cross-sectional predictability to cognitively challenged investors or frictions (e.g., Cohen and Frazzini, 2008, Chordia, Huh, and Subrahmanyam, 2008) usually do not control for the predictors recently documented in resurrecting the consumption CAPM or the pricing of idiosyncratic risk (viz. Section II).

VI. Concluding remark

Because of varying methods and varying controls it is unclear, at least to me, how to interpret the current state of the literature on the cross-sectional predictors of stock returns. I hope that we can come together as a scholarly community and make significant progress on this topic, which is not only of interest from an academic standpoint, but also of fundamental importance in business education as well as in our interfacing activity with the private financial sector.

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