Value and Momentum Everywhere

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Abstract

Value and momentum ubiquitously generate abnormal returns for individual stocks within several countries, across country equity indices, government bonds, currencies, and commodities. We study jointly the global returns to value and momentum and explore their common factor structure. We find that value (momentum) in one asset class is positively correlated with value (momentum) in other asset classes, and value and momentum are negatively correlated *within* and *across* asset classes. Liquidity risk is positively related to value and negatively to momentum, and its importance increases over time, particularly following the liquidity crisis of 1998. These patterns emerge from the power of examining value and momentum everywhere simultaneously and are not easily detectable when examining each asset class in isolation.

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I. Introduction

Two of the most studied capital market phenomena are the relation between an asset's return and the ratio of its "long-run" (or book) value relative to its current market value, termed the "value" effect, and the relation between an asset's return and its recent relative performance history, termed the "momentum" effect. Value and momentum have captured the attention of financial economists due to their statistical and economic significance relative to standard asset pricing models (e.g., the CAPM), and their locus for discussions of market efficiency and asset pricing theory.

A long literature finds that, on average, value stocks (with high book or accounting values relative to market values) outperform growth stocks (with low book-to-market ratios) and stocks with high positive momentum (high 12-month past returns) outperform stocks with low positive momentum (Stattman (1980), Fama-French (1992), Jegadeesh and Titman (1993), Asness (1994), Grinblatt and Moskowitz (2004)). This evidence has been extended to stocks in other countries (Fama and French (1998), Rouwenhorst (1998), Liew and Vassalou (2000), Griffin, Ji, and Martin (2003), Chui, Wei, and Titman (2000)), and to country equity indices (Asness, Liew, and Stevens (1997), Bhojraj and Swaminathan (2006)). Momentum has also been studied for currencies (Shleifer and Summers (1990), Kho (1996), and LeBaron (1999)) and commodities (Gorton, Hayashi, and Rouwenhorst (2008)).

We broaden and extend this evidence by studying value and momentum in five major asset classes in a unified setting: (i) stock selection within four major countries, (ii) country equity index selection, (iii) government bond selection, (iv) currency selection, and (v) commodity selection. We provide ubiquitous evidence on the excess returns to value and momentum strategies, extending the existing evidence cited above by including government bonds and by considering value for currencies and commodities.

In addition to extending the evidence on the efficacy of value and momentum, we seek to understand their common economic drivers by examining these phenomena simultaneously across markets and asset classes. Prior studies typically examine value and momentum separately and within one asset class at at time. We study the links between value and momentum strategies universally *across* asset classes and their connections to global macroeconomic and liquidity risks. Our global and across-asset-class perspective adds significant statistical power, allowing us to document the statistical and economic strength of these strategies when built as a globally diversified portfolio, and to identify significant value and momentum exposures to liquidity and macro risks. Looking at value or momentum in isolation, or in one asset class at a time, fails to find the structure or power that our unified approach uncovers.

Studying the interaction between value and momentum is also more powerful than examining each in isolation. The negative correlation between value and momentum strategies and their high expected returns makes a simple equal-weighted combination of the two a powerful strategy that produces a significantly higher Sharpe ratio than either stand alone and makes the combination portfolio far more stable across markets and time periods than either value or momentum alone. A universal value and momentum strategy across all the asset classes we examine is statistically and economically stronger than any smaller subset, let alone the single effects often studied. Whether risk-based stories or behavioral stories are put forth to explain these effects, their task is even greater when considering a diversified portfolio across markets and asset classes and when combining value and momentum into the same portfolio.

Our joint approach also uncovers striking comovement patterns across asset classes. A long-short (essentially market-neutral) value strategy in one asset class is positively correlated with long-short value strategies in other asset classes. Similarly, a long-short momentum strategy in one asset class is positively correlated with momentum in other asset classes. Yet, value and momentum are negatively correlated both within and across asset classes. Given the different types of securities we consider, their geographic and market dispersion, and our use of market-neutral long-short strategies, the consistent correlation pattern makes a compelling case for the presence of common global factors in value and momentum. Using a simple three factor model consisting of the global equity market portfolio, a global value, and a global momentum factor, we are able to capture the entire cross-section of value and momentum portfolios across all the asset classes and markets we examine.

Attempting to link this comovement structure to underlying economic risks, we consider the exposure of value and momentum strategies everywhere to various macroeconomic and liquidity-risk indicators. We find that the global value and momentum portfolios, aggregated across asset classes, load only mildly positively on long-run consumption growth (e.g., Parker and Julliard (2005), Bansal and Yaron (2004), Malloy, Moskowitz and Vissing-Jorgensen (2007), Hansen, Heaton, and Li (2007)) and negatively on a global recession indicator. The link between value and momentum and these macroeconomic variables is stronger when we look at globally aggregated portfolios. However, the statistical relation between these macroeconomic indicators and value and momentum strategies is weak and the economic magnitudes are too small to explain the return premia or correlation structure.

To explore the role played by liquidity risk, we regress value and momentum returns on "funding liquidity" indicators such as the U.S. Treasury-Eurodollar (TED) spread, a global average of TED spreads, and LIBOR-term repo spreads.[1] We also use the VIX index, and a host of other market and funding liquidity measures used in the literature (Pastor and Stambaugh (2003), Sadka (2006), Acharya and Pedersen (2005), Adrian and Shin (2007), and Krishnamurthy and Vissing-Jorgensen (2008)) and compute an illiquidity index that takes a weighted average of all these measures. For both levels and

[1]Use of the TED spread as a measure of banks' and traders' "funding liquidity" is motivated by Brunnermeier and Pedersen (2008) who show that funding liquidity is a natural driver of common market liquidity risk across asset classes and markets. Also, Moskowitz and Pedersen (2008) show empirically that funding liquidity measures based on TED spreads and other spreads are linked to the relative returns of liquid versus illiquid securities globally. Further, Brunnermeier, Nagel, and Pedersen (2008) show that the TED spread helps explain currency carry trade returns. Amihud, Mendelson, and Pedersen (2005) provide an overview of the liquidity literature.

changes in liquidity indicators, we find a consistent pattern among value and momentum strategies everywhere. Specifically, value loads positively on liquidity risk, whereas momentum loads either negatively or zero on liquidity risk, depending on the measure. Said differently, value strategies do worse when liquidity is poor and worsening and momentum strategies seem to do better during these times. A 50/50 combination of value and momentum in each market therefore provides good diversification against aggregate liquidity exposure. Conversely, the first principal component of the covariance matrix of all value and momentum strategies, which is long value everywhere and short momentum everywhere, loads strongly on liquidity risk. These results highlight that liquidity risk may be an important common component of value and momentum, and, help explain why value and momentum are correlated across markets and asset classes and why they are negatively correlated with each other within and across asset classes. However, while the liquidity risk exposure of value strategies may help explain part of their return premium under a liquidity-adjusted asset pricing model (see Acharya and Pedersen (2005) and Pastor and Stambaugh (2003)), the negative liquidity risk exposure of momentum only deepens the puzzle presented by its high returns.

While the data hint that macro and liquidity risks may be linked to the value and momentum comovement structure and their return premia, they leave unexplained a significant portion of both. Put simply, we find interesting correlations between value and momentum and these economic variables, but the economic magnitudes are too small to offer a full explanation for these phenomena. One possibility is that measurement error potentially limits the explanatory power of our variables. Another possibility is that value and momentum partially reflect market inefficiencies due to limited arbitrage. Indeed, we do not adjust our returns for trading costs and while momentum does well during illiquid times, momentum has larger trading costs due to its higher turnover, and trading costs are often largest during illiquid times. Hence, an arbitrageur will realize more commensurate net returns, consistent with what equilibrium arbitrage activity would suggest.

We also find that value and momentum exhibit interesting dynamic effects. For instance, both value and momentum become less profitable, more correlated across markets and asset classes, and less negatively correlated with each other over time. Moreover, the importance of liquidity risk in value and momentum strategies increases significantly over time, and rises sharply after the liquidity crisis of 1998. These patterns are consistent with a limited arbitrage explanation for value and momentum, where profits decline, correlations rise, and liquidity risk becomes more important as more money flows into these strategies over time and investors became abruptly aware of liquidity risk following the events of the LTCM crash in 1998. We also find that the correlation of these strategies across markets and asset classes is much higher during extreme return movements and close to zero during the calmest return episodes, also potentially consistent with limited arbitrage.

Finally, we also highlight another virtue of looking at value and momentum everywhere, which is to provide a more general test of patterns found in one market that may not exist elsewhere. The literature on value and momentum, which focuses primarily on U.S.

equities, documents strong seasonal patterns (of opposite sign) to both strategies at the turn of the year (DeBondt and Thaler (1987), Loughran and Ritter (1997), Jegadeesh and Titman (1993), Grundy and Martin (2001), and Grinblatt and Moskowitz (2004)). We find that these seasonal patterns are not prevalent in all markets or asset classes. Not everything works everywhere.

The paper proceeds as follows. Section II outlines our methodology and data. Section III documents new stylized facts on the performance of value and momentum within several major asset classes. We then study the global comovement of value and momentum in Section IV and their exposures to macroeconomic and liquidity risks in Section V. Section VI then examines the dynamics of the performance and correlation of these strategies across markets. Section VII concludes the paper by highlighting the challenges posed by our findings for any theory seeking to explain the ubiquitous returns to value and momentum strategies.

II. Data and Portfolio Construction

We detail our data sources and describe our methodology for constructing value and momentum portfolios across markets and asset classes.

A. Data

Our data come from a variety of sources and markets.

A.1 Global Stock Selection

The U.S. stock universe consists of all common equity in CRSP (sharecodes 10 and 11) with a book value from Compustat in the last 6 months, and at least 12 months of past return history. We exclude ADR's, REITS, financials, closed-end funds, foreign shares, and stocks with share prices less than $1 at the beginning of each month. We also exclude the bottom 25 percent of stocks based on beginning of month market capitalization to exclude the most illiquid stocks that would be too costly to trade for any reasonable size trading volume. The remaining universe is then split equally based on market capitalization into a tradable but illiquid universe (bottom half) and a liquid universe (top half). This procedure results in our "liquid" universe for which we conduct our main tests consisting of the top 37.5% of largest listed stocks.[2]

[2]This percentage is chosen to correspond to a universe that is realistically liquid for say a $1 billion market-neutral hedge fund and to maintain uniformity across the four markets we examine. The liquid universe of stocks in the U.S. corresponds to stocks that have a minimum market capitalization of at least 700 million $USD and a minimum daily dollar trading volume of 3 million in January, 2008. For the U.K., the minimum market capitalization and daily dollar trading volume in January, 2008 is 200 million and 2 million $USD, and for Continental Europe and Japan, the minimum market caps and daily trading volume numbers in January, 2008 are 350 million and 2.5 million $USD and 400 million and 2 million $USD, respectively. We have experimented with other cuts on the data such as splitting each universe into thirds and using the top third of stocks in each market, as well as using different percentage cutoffs in each

For stocks in the rest of the world, we use all stocks in the BARRA International universe from the U.K., Continental Europe, and Japan. Again, we restrict the universe in each market to those stocks with common equity, recent book value, and at least 12 months of past return history. We also exclude REITS, financials, foreign shares, stocks with share prices less than $1 USD at the beginning of the month, and the bottom 25 percent of stocks based on market capitalization. The remaining universe is then split equally based on market cap into a tradable illiquid and liquid universe and we use only the most liquid half of stocks for our portfolios. Data on prices and returns comes from BARRA, and data on book values is from Worldscope.

Our universe of stocks consisting of the largest 37.5% of names in each market represents about 96%, 98%, 96%, and 92% of the U.S., U.K., Europe, and Japan, total market capitalization, respectively. Although including the less liquid but tradable securities in our universe improves the performance of our strategies noticeably (results available upon request), restricting our tests to the most liquid universe provides reasonable estimates of an implementable set of trading strategies.

The U.S. stock sample is from January, 1974 to October, 2008. The U.K. sample is December, 1984 to October, 2008. The Continental Europe sample is from February, 1988 to October, 2008. The Japanese sample covers January, 1985 to October, 2008. The minimum (average) number of stocks in each region over their sample periods is 451 (1,367) in the U.S., 276 (486) in the U.K., 599 (1,096) in Europe, and 516 (947) in Japan.

A.2 Equity Country Selection

The universe of country index futures consists of the following 18 developed equity markets: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, U.K., and U.S. Returns and price data as well as book values are obtained from MSCI. The sample covers the period January, 1975 to October, 2008, with the minimum number of equity indices being 8 and all 18 equity indices represented after 1980.

A.3 Currencies

We get spot exchange rates from Datastream and IBOR short rates from Bloomberg, covering the following 10 exchange rates: Australia, Canada, Germany spliced with the Euro, Japan, New Zealand, Norway, Sweden, Switzerland, U.K., and U.S. The data cover the period January, 1975 to October, 2008, where the minimum number of currencies is 7 at any point in time and all 10 currencies are available after 1980.

A.4 Country Bonds

market to correspond to roughly similar minimum market caps and daily dollar trading volumes across markets. Results in the paper are unaltered by any of these sample perturbations.

We get data on bond index returns from Datastream, short rates and 10-year government bond yields from Bloomberg, and inflation forecasts from investment bank analysts estimates as compiled by Consensus Economics. We obtain government bond data for the following 10 countries: Australia, Canada, Denmark, Germany, Japan, Norway, Sweden, Switzerland, U.K., and U.S. The sample of returns covers the period January, 1976 to October, 2008, where the minimum number of country bond returns is 6 at any point in time and all 10 country bonds are available after 1990.

A.5 Commodities

We cover 27 different commodity futures. Our data on Aluminum, Copper, Nickel, Zinc, Lead, Tin is from London Metal Exchange (LME), Brent Crude, Gas Oil is from Intercontinental Exchange (ICE), Live Cattle, Feeder Cattle, Lean Hogs is from Chicago Mercantile Exchange (CME), Corn, Soybeans, Soy Meal, Soy Oil, Wheat is from Chicago Board of Trade (CBOT), WTI Crude, RBOB Gasoline, Heating Oil, Natural Gas is from New York Mercantile Exchange (NYMEX), Gold, Silver is from New York Commodities Exchange (COMEX), Cotton, Coffee, Cocoa, Sugar is from New York Board of Trade (NYBOT), and Platinum from Tokyo Commodity Exchange (TOCOM). The commodities sample covers the period January, 1975 to October, 2008, with the minimum number of commodities being 10 at any point in time and all 27 commodities available after 1980.[3]

A.6 Macroeconomic and Liquidity Variables

As a passive benchmark for global stocks, bonds, currencies, and commodities, we use the MSCI World equity index. We also use several macroeconomic indicators in our analysis. Consumption growth is the real per-capita growth in nondurable consumption for each country obtained quarterly. Long-run consumption growth is the future 3-year growth in consumption, measured as the sum of log quarterly consumption growth from quarter q to $q+12$. GDP growth is the real per-capita growth in GDP for each country. We also employ a recession variable for each country which is a value between 0 and 1 linearly interpolated between ex-post peak (= 0) and trough dates (= 1).

Macroeconomic data for the U.S. is obtained from the National Income and Product Accounts (NIPA) and recession dates are obtained from the NBER. For U.K., Japan, Europe, and global macroeconomic data we obtain information from Economic Cycle Research Institute (ECRI), which covers production and consumption data as well as business cycle dates using the same methodology as the NBER.

We also use several measures of general "funding liquidity" locally and globally to capture liquidity events (see Brunnermeier and Pedersen (2008) for a theoretical motivation of the importance of funding liquidity risk). We use the TED spread in each

[3] We have also split the universe of commodities in half into a liquid and illiquid set based on open interest and trading volume and get consistent results using only the most liquid commodity contracts. We also get similar results if we weight the commodities by their open interest in the portfolios.

of four markets (U.S., U.K., Japan, and Europe), which is the average over the month of the daily local 3-month interbank LIBOR interest rate minus the local 3 month T-bill rate, and take an average of TED spreads around the world as a global liquidity measure. When the TED spread is wide, bank's financing costs are large, signaling that capital is scarce, which also affects the funding of other traders such as hedge funds and other speculative investors. TED spreads are available from January, 1990. Similarly, we also employ the spread between the local 3-month LIBOR rate and the local term repurchase rate in each market as another proxy for funding liquidity. These spreads are available from January, 1996 onward. The TED spread and LIBOR minus term repo rates are highly correlated in both levels and changes within each market.

We also use a number of other liquidity risk variables from the literature, including the VIX (available from January, 1986) the measures of Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Sadka (2006), Adrian and Shin (2007), and Krishnamurthy and Vissing-Jorgensen (2008), where these measures are all for U.S. stocks only.

B. Value and Momentum Portfolios

We construct value and momentum portfolios among individual stocks within four different equity markets (U.S., U.K., Continental Europe, and Japan), which we refer to as "global stock selection" strategies, and among country equity index futures, government bonds, currencies, and commodities, which we refer to as "non-stock selection."

We construct a long-short portfolio within each asset class where we sort securities on, respectively, value and momentum signals. For each asset class, we consider the simplest and, to the extent a standard exists, most standard value and momentum measures. We are not interested in coming up with the best predictors in each asset class. Rather, our goal is to maintain a simple and fairly uniform approach that is consistent across asset classes and thus minimizes the pernicious effects of data snooping.

To illustrate the construction of our portfolios, consider first the individual stock selection strategies. For stock selection, a common value signal is the ratio of the book value of equity to market value of equity, or book-to-market, *BM* (see Fama and French (1992, 1993) and Lakonishok, Shleifer, and Vishny (1994)).[4] We generate portfolios sorted on value and examine zero-cost portfolios that go long stocks with "good" value characteristics, that is, high *BM,* and short those with low *BM*. We use book values lagged six months to ensure data availability to investors at the time, and use the most recent market values to compute our *BM* ratios. For momentum, we use a similarly "standard" measure which is the past 12-month cumulative raw return on the asset (see Jegadeesh and Titman (1993) and Fama and French (1996)), skipping the most recent

[4] While research has shown that there are other value measures that are more powerful for stock selection (e.g., Lakonishok, Shleifer, and Vishny (1994), Asness, Porter, and Stevens (2000), Piotroski (2000)), we want to maintain a basic and simple approach that is somewhat consistent across asset classes. Backtested performance of our value strategies can be enhanced, from data snooping or from real improvement, by including other value measures.

month's return, *MOM2-12*. We skip the most recent month, which is standard in the momentum literature, since there exists a reversal or contrarian effect in returns at the one month level which may be related to liquidity or microstructure issues (Jegadeesh (1990), Lo and MacKinaly (1990), Boudoukh, Richardson, and Whitelaw (1994), Asness (1994), Grinblatt and Moskowitz (2004)). We construct portfolios sorted on momentum and examine zero-cost portfolios that are long the assets that recently performed relatively well and short those that performed relatively poorly.

For all other asset classes, we attempt to define similar simple and standard value and momentum measures. For momentum, we use the same measure for all asset classes, namely the return over the past 12 months, excluding the most recent month. While skipping the most recent month of returns is not necessary for some of the other asset classes we consider because they suffer less from liquidity issues (e.g., equity index futures, government bonds, and currencies), we do so to maintain uniformity across asset classes. Momentum returns for these asset classes are in fact stronger when we don't skip the most recent month, hence our results are conservative.

For value measures, attaining uniformity is more difficult because not all asset classes have a measure of "book value." For these assets, we try to use simple and consistent measures of value. For country index stock selection, we aggregate up the individual stocks' *BM* ratios by computing the average value-weighted *BM* among the index constituents of the country. For commodity selection, our value measure is the "book value," defined as the spot price 5 years ago divided by the most recent spot price, or, said differently, the value measure is the negative of the return over the last five years. Similarly, for currency selection our value measure is the negative of the 5-year return on the exchange rate, taking into account the interest earned measured using local 3-month LIBOR rates.[5] The currency value measure is equivalently the 5-year deviation from uncovered interest-rate parity, or, assuming that real rates are constant across countries, it is a 5-year change in purchasing power parity. These 5-year return-reversal measures of value are similar to that used by DeBondt and Thaler (1985) in the stock market, which Fama and French (1996) show generates a portfolio that is highly correlated with a portfolio formed on *BM*.

For bond country selection, our value measure is the real bond yield, defined as the yield on the MSCI 10-year government bond index minus forecasted inflation for the next 12 months. We would prefer a 10-year inflation forecast but a reliable history of these does not exist. We interpret book value for bonds as the nominal cash flows discounted at the inflation rate, while price is the nominal cash flows discounted at the yield to maturity by definition, and we then interpret the difference between the nominal yield and inflation as a measure roughly proportional to book versus price. These expected return differences can be interpreted as representing risk (i.e., bonds with higher real yields face great inflation risk) or inefficiency (i.e., bonds with higher real yields are "too cheap" as investors are too frightened, perhaps from extrapolating recently bad news), or both.

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[5] More specifically, we take the average commodity price from between 4.5 and 5.5 years ago, and similarly for the exchange rate.

We first construct portfolios sorted on either value or momentum within each asset class by ranking all securities in the asset class on their value or momentum characteristic and sorting them into three equal groups to form portfolios (high, middle, low). For individual stock strategies we value weight the stock returns in the portfolios by their beginning of month market capitalization. For the non-stock strategies, we equal weight the securities in the portfolios. We also compute three 50/50 value/momentum combination portfolios by taking an equal weighted average of the respective value and momentum portfolios: $low_{combo} = 1/2(low_{value}+low_{mom})$, $middle_{combo} = 1/2(middle_{value}+middle_{mom})$, $high_{combo} = 1/2(high_{value}+high_{mom})$. This process generates 9 portfolios per asset class (3 value, 3 momentum, and 3 combination). We also examine the zero-cost high minus low (H - L) portfolio return spread within each group.

C. Value and Momentum Factors

We construct value and momentum factors for each asset class that are zero-cost long-short portfolios that use the entire cross-section of securities within an asset class as follows. For any security $i=1,\ldots,N$ at time t with signal $SIGNAL_{it}$ (BM or $MOM2\text{-}12$), we choose the position which is proportional to its cross-sectional rank of the signal minus the cross-sectional average rank:[6]

$$w_{it}^{SIGNAL} = c_t \left(\text{rank}(SIGNAL_{it}) - \Sigma_i \, \text{rank}(SIGNAL_{it}) / N \right)$$

The weights above sum to zero, representing a dollar-neutral long-short portfolio. We consider two choices of the scaling factor c_t : we choose c_t such that either (i) the overall portfolio is scaled to one dollar long and one dollar short, or (ii) the portfolio has an ex-ante annual volatility of 10%. The ex-ante volatility is estimated as the past 3-year volatility.[7] It is worth emphasizing that we are not trying to optimize the portfolio or time volatility, but merely scale the portfolios to roughly constant volatility using a simple ex ante measure. The return on the portfolio is

$$r_t^{SIGNAL} = \Sigma_i \, w_{it}^{SIGNAL} \, r_{it.}$$

We also consider the return on a 50/50 equal combination ($COMBO$) of value and momentum, which is

$$r_t^{COMBO} = s_t \left(0.5 \, r_t^{VALUE} + 0.5 \, r_t^{MOM2\text{-}12} \right)$$

where s_t is chosen to maintain the scale (either dollar long and short or ex-ante annual volatility equal to 10%).

[6] Simply using ranks of the signals to form portfolio weights helps mitigate the influence of outliers. Portfolios constructed using the raw signals themselves are nearly identical and if anything generate slightly better performance.

[7] For non-stock selection strategies we have a small set of liquid securities and estimate the volatility using weekly returns for the current portfolio holdings. Holding constant the current portfolio weights and calculating volatility over the past three years is equivalent to using the variance-covariance matrix for the same 3 years of data to scale the portfolio's volatility. For stock selection, we scale by the rolling monthly three-year volatility of the constant dollar long/short portfolio (with its changing weights).

These zero-cost portfolios are another way to examine the efficacy of value and momentum across markets and, as we will show, tend to outperform the simple sorted portfolio spreads above. The better performance of these factors comes from their weight being a (linear) function of the signal, as opposed to the coarseness of only classifying securities into three groups, and their better diversification from using the entire cross-section. We will examine both sets of portfolios for robustness and will use the signal-weighted factors to price the broader set of portfolios above.

D. A Comment on Our Definition of Value

Our value measures, whether the ratio of the book-to-market value or last 5-year returns, use the most recently available price. Fama and French (1992), and others in the literature on stocks following them, lag both book value and price to measure them contemporaneously. We feel updating price as frequently as possible is a more natural measure of value. It is difficult to imagine there is not important information contained in current market prices, and while using a lagged measure of book value introduces some slight mismatching of book and market values through time, the variance in price is far greater than that of book and hence likely more important for capturing the true current "value characteristic" of the asset. For example, if the price drops 50% today, all-else-equal we would argue it is likely, though not definite, that the asset got cheaper (in an inefficient market) or riskier (in an efficient market).

The price going into our value measure (*BM* or 5-year past return) is therefore close to the more recent price going into our momentum measure (*MOM2-12*, they differ by 1 month), but with the opposite sign. All-else-equal a higher price leads to a poorer value measure and a better momentum measure. This effect naturally drives some of the negative correlation we later document between value and momentum within an asset class. However, the negative correlation is also present *across* asset classes, where the correlation cannot be attributed to anything mechanical from some of the securities appearing on the long (short) side of value and short (long) side of momentum.

We focus on the current value measure since value investing means buying assets that are cheap now, not assets that were cheap a year ago. While doing so mechanically increases the negative correlation between value and momentum within an asset class, we feel this is a point of emphasis rather than contention. Creating two strategies so opposite in spirit and opposite in construction, and therefore so negatively correlated with each other, and still having them both consistently produce positive average returns around the world and across asset classes is a rare feat. It is easy to construct strongly negatively correlated strategies. It is not so easy to have them both generate positive abnormal returns.

However, we also illustrate the robustness of our results (and to compare to Fama and French), by considering in Appendix A a value measure where we lag market prices by an additional 12 months. In this case, the beginning price in the *MOM2-12* measure coincides with the price in the value measure, possibly leading to a smaller bias in the opposite direction: a "cheap" value stock a year ago might be expected to have good current momentum as value is a positive expected return strategy, thus creating a positive correlation between value and momentum all else equal.

The bottom line is that, whether one lags value or not, when value and momentum are viewed in combination, which is one of the themes of this paper, we obtain nearly identical results. Lagging value or not merely boils down to a choice of whether the economic strength of combining these two strategies comes from a higher Sharpe ratio of value stand-alone (because it is not short momentum) and a less negative correlation to momentum if value is lagged, versus a smaller Sharpe ratio of value stand-alone and a more negative correlation to momentum if value is measured with recent market prices. Either method leads to the same economic conclusions when viewed in combination. We provide an extensive discussion of the relation between our measures and the Fama-French measures in the appendix as well as evidence that our main results are robust to using lagged value measures.

III.Performance

We first establish the powerful and consistent performance of value, momentum, and the 50/50 combo within each of the major markets and asset classes we study. While other studies provide evidence that value and momentum "work" in some of these asset classes, to our knowledge we are the first to study them in combination with each other, and simultaneously across asset classes. We also find new evidence on value and momentum in new asset classes (e.g., government bonds), but, more importantly, study the relation between value and momentum within and across asset classes to demonstrate the power of applying value and momentum everywhere.

A. Raw Returns

We report in Table 1 the annualized mean return in excess of the local T-bill rate, *t*-statistics on the mean, and annualized volatility of each high, middle, and low portfolio for value, momentum, and the 50/50 combination in each market and asset class. We also report the same statistics for the high minus low (H - L) difference in returns. The last column of Table 1 reports the within-asset class correlation between the value and momentum H - L returns. The table highlights that simple signals of value and momentum generate consistent excess returns in all markets and asset classes and that value and momentum are strongly negatively correlated such that the portfolio combining the two has a much higher Sharpe ratio.

Panel A of Table 1 reports results for each of the stock selection strategies. The returns to the value strategies are very similar across the U.S., U.K., and Europe and about two and a half times stronger in Japan. Conversely, momentum in Japan is much weaker than it is in the other countries. The 50/50 combination of value and momentum is more stable across the regions and more powerful in terms of performance. In every region the value/momentum combo generates less than half the volatility of either value or momentum stand alone. As the fourth column of Panel A of Table 1 indicates, the strength of the combination of these two strategies comes from their negative correlation with each other. In every region, the correlation between the simple value and momentum H - L spread returns ranges from -0.54 to -0.63.

The negative correlation between value and momentum also helps clarify some of the variation in value and momentum performance across these markets. For instance, previous research has attempted to explain why momentum does not seem to work very well in Japan (see Chui, Titman, and Wei (2002) for a behavioral explanation related to cultural biases), a fact we find as well. While not an explanation, the poor performance of momentum in Japan is no more puzzling than the very strong performance of value during the same period, since the two strategies are -0.63 correlated. The fact that momentum did not lose money while being negatively correlated to the highly successful value strategy is itself an achievement. Moreover, over the same sample period, the 50/50 combo of value and momentum in Japan still dominates either stand alone strategy (a fact made more clear when we examine alphas and Sharpe ratios in the next two tables). That is, an optimal portfolio would want both value and momentum in Japan even over the period where momentum appears "not to work."

Panel B of Table 1 reports the same performance statistics for the non-stock selection strategies. While value and momentum efficacy vary somewhat across the asset classes, again the combination of value and momentum is quite robust, due to a consistent negative correlation between value and momentum within each asset class.

Appendix A and Table A1 provide a comparison of the returns of our value and momentum portfolios in the U.S. to those of Fama and French that use the entire universe of CRSP stocks, value weight the stocks in the portfolios, and use a measure of value (book-to-market) where the market value is lagged to coincide with the book value. The Fama and French value and momentum portfolios, HML and UMD, are obtained from Ken French's website along with a description of their construction. We report results for our value portfolios using both recent market prices and prices lagged an additional year. Appendix A shows that we obtain very similar results in the U.S. over the same sample period to those of HML and UMD using our universe and portfolio construction methodology. While using a lagged measure of value increases the correlation of our portfolios with those of Fama and French, importantly, the 50/50 value/momentum combination is not sensitive to lagging value. HML looks like a combination of about 2/3 our value and 1/3 our momentum strategy (see Table A1), since HML is constructed from sorting stocks on 6-18 months lagged value measures. Put simply, viewed alone HML is a better strategy than our version of "current" value, because it is a combination of our "current" value and a little momentum. Hence, combining value and momentum results in nearly the same portfolio whether value is current or lagged.

Lagging value by an additional year improves the stand alone Sharpe ratio of value strategies and reduces the negative correlation with momentum uniformly across the asset classes, since lagging a year avoids shorting momentum. However, the 50/50 value/momentum combo portfolios exhibit similar, though somewhat weaker, performance than those we find. The weaker combo performance when lagging value indicates that some information is lost by lagging market values an additional year.

B. Alpha: The Long and Short of It

Table 2 reports the alphas (intercepts), their *t*-statistics, and the information ratio from time-series regressions of the portfolio returns in Table 1 on the MSCI world equity index. Results are reported for the high minus low return spread for value, momentum, and their combination within each asset class as well as the high minus middle (long side) and low minus middle (short side) return spreads. We separate out the long and short side components to gauge how much of the total alpha from the high minus low spread is driven by longs versus shorts. We report both the alpha from the long and short side and their respective information ratios to assess the contribution from each side in terms of both profits and hedging benefits.

To generate more power and to examine the commonality among value and momentum strategies, we also examine diversified portfolios of these strategies across regions and asset classes. However, as Table 1 highlights, the volatilities of the various strategies are vastly different across the asset classes, making it difficult to combine the strategies in a sensible way (e.g., commodity strategies have about 4 times the volatility as bond country strategies). To account for this variation across asset classes, we compute the average return series using equal volatility weighting across the asset classes and report results for "all stock selection", "all non-stock selection", and "all asset selection."

Table 1 shows that the alphas are economically large and statistically significant for most strategies, ubiquitously (save for bonds) highly significant once we examine the value/momentum combination, and even more significant when we examine the "all" strategies across regions and asset classes. Betas (not reported for brevity) for the most part, are very close to zero and insignificant except for the U.S. stock value strategy, which has a significant beta of -0.22.

The results highlight the power and robustness of combining value and momentum everywhere and, in particular, the power of combining value/momentum combo portfolios everywhere. Global stock selection value generates an annualized information ratio of 0.36, which is lower than the information ratio of the all non-stock selection value portfolio, which is 0.82. Momentum among stocks produces a 0.62 information ratio, which is a little higher than the information ratio for momentum among non-stock asset classes, which is 0.41. The negative correlation between value and momentum is also consistent across asset classes and evident among the average portfolios. Because of their positive average returns and negative correlation between them, the combination of value and momentum in every asset class produces powerful performance results, generating information ratios consistently greater than either of the stand alone strategies in all markets and asset classes. Combining the stock and non-stock combo strategies across asset classes produces even stronger results, generating an information ratio of 1.36 per year, which indicates that significant diversification benefits are being gained by combining different markets and asset classes. The somewhat stronger results for stock selection come at least partially from the fact that transactions costs, which are higher for stock selection than non-selection strategies, are not accounted for in the paper.

The contribution from longs and shorts varies by asset class for value and momentum. On average, value strategies for stock selection seem to be driven more by the short side (60.4 percent of profits), though the information ratios of the long and short are about the same. For non-stock selection value strategies, the reverse is true -- roughly 65 percent of the alpha comes from the long side and the information ratio of the long side is about twice that of the short side. For momentum both stock selection and non-stock selection have about 60 to 70 percent of their profits coming from the short side. Combining value and momentum results in about 60 percent of all stock selection profits coming from the short side and about an even split between long and short contributions for all non-stock selection. For the all combination strategy, the contribution from longs and shorts is also about equal.

The last three columns of Table 2 report the within-asset class correlation in residual returns between value and momentum for the high minus low (H - L) total spread as well as the longs (high minus middle) and shorts (low minus middle) separately. Compared to Table 1, the correlations between value and momentum within each asset class are slightly more negative once market exposure is stripped out of their returns. For stock selection strategies, the long sides of value and momentum are (more than twice) more negatively correlated than the short sides. Recalling that the alpha contribution for the all stock selection combination strategy is smaller from the long side, this result implies that the less profitable long side makes up some ground by offering better diversification than the short side. This fact is also evident in the information ratios. For non-stock selection strategies, the split is even in terms of diversification, just as it is in terms of alpha contribution.

C. Constant Volatility Portfolios

To provide a more uniform set of strategies that have roughly equal volatility, we scale the H - L strategies to have an ex-ante volatility of 10% per year as described in the previous section. We also report the scaled value and momentum rank-weighted factors, which are the dollar-neutral portfolios formed by weighting every security in the cross-section by its rank based on the signal (either value or momentum) and scaled to 10% ex ante volatility, as described in the last section. This scaling essentially entails levering up or down various strategies based on an ex ante covariance matrix of the securities to achieve a 10% annual volatility. Not only do the different strategies have the same ex-ante volatility, but also, unlike a constant dollar strategy, their volatility does not vary over time to the extent that our volatility estimates are accurate.

Table 3 reports the annualized Sharpe ratios of the constant ex-ante volatility versions of our value and momentum portfolios and compares the H - L scaled returns to those of the rank-weighted factors. The performance of value and momentum when these strategies are scaled to constant ex-ante volatility is slightly stronger than with constant notional exposure. This is consistent the variance in volatility in the constant dollar portfolios not being associated positively with times of higher expected returns. The rank-weighted factors also tend to outperform the simple H - L spreads based on portfolio sorts, particularly for stock selection strategies. Most of this extra performance is from the additional signal the strategies use by weighting each security in proportion to its rank rather than three coarse groupings, and some of the performance is from slightly better diversification.

Importantly, we can now combine the various strategies across asset classes into meaningful portfolios since they are all scaled to the same ex ante volatility. For this reason, we focus on the constant volatility strategies for the remainder of the paper. Computing the equal-weighted average return of the four regional stock selection strategies, "all stock selection," the four non-stock selection strategies, "all non-stock selection," and all strategies, "all asset selection" we again see the benefits of global and asset class diversification. The rank-weighted all asset selection combination of value and momentum produces an astounding 1.93 annual Sharpe ratio. Asset pricing theories which grapple with an aggregate equity Sharpe ratio of 0.40 per year face a significantly greater challenge when considering a universally diversified value and momentum combination portfolio whose Sharpe ratio is four to five times larger.

Figure 1 shows the time-pattern of the returns to value, momentum, and the 50/50 combo in each market and asset class using the rank-weighted constant volatility factors. The benefit of combining the two negatively correlated strategies is evident from the graphs, even during times when one or both of the stand alone strategies experiences extreme performance (e.g., the "tech episode" for stocks in late 1999 early 2000). The cumulative returns to the average strategies that combine markets and asset classes also highlight the large diversification benefits obtained when deploying value and momentum everywhere.

While the increased power of combining value and momentum across asset classes and markets presents an even greater challenge to theories seeking to explain these phenomena in any single market or asset class, examining these phenomena across asset classes simultaneously provides an opportunity to identify common movements that may point to economic drivers of these effects. We investigate in the next section the common factor structure of value and momentum everywhere.

IV. Comovement Everywhere

In this section we examine the common components of value and momentum across markets and asset classes.

A. Correlations

Panel A of Table 4 reports the average of the individual correlations among the stock selection and non-stock selection constant volatility value and momentum strategies. We first compute the correlation of all individual strategies (e.g., U.S. value with Japan value) and then take the average for each group. We exclude the correlation of each strategy with itself (removing the 1's) when averaging and also exclude the correlation of each strategy with all other strategies within the same market. For example, we exclude U.S. momentum when examining U.S. value's correlation with other momentum strategies in order to avoid any mechanical negative relation between value and momentum and because the correlations between value and momentum within the same market were reported previously. We report correlations for both monthly and quarterly returns, which help mitigate any non-synchronous trading problems (e.g., due to illiquid assets that do not trade continuously, or non-synchronicity induced by time zone differences). An F-test on the joint significance of the individual correlations within each category is performed to test if the correlations are different from zero.

Panel A of Table 4 shows a consistent pattern, namely that value here is positively correlated with value elsewhere, momentum in one place is positively related to momentum elsewhere, and value and momentum are negatively correlated everywhere. These patterns are slightly stronger for quarterly returns. Stock selection value strategies using monthly (quarterly) returns are on average 0.36 (0.49) correlated across markets. Likewise, non-stock selection value strategies are positively correlated with other non-stock selection value strategies, though the effect is weaker than for stocks. The same pattern holds for momentum. On average, stock selection momentum strategies are 0.36 (0.42) correlated with each other across regions monthly (quarterly) and non-stock momentum strategies are 0.15 (0.18) correlated across asset classes.

The cross-correlations are also interesting. The average individual stock selection value (momentum) strategy is positively correlated with the average non-stock selection value (momentum) strategy. This result is striking in that these are totally different asset classes, yet there is common movement in the value and momentum strategies across the asset classes.

Finally, value and momentum are negatively correlated everywhere. In stock selection, value in one region is on average -0.26 (-0.36) correlated with momentum in another region (recall, we exclude the within market correlation between value and momentum) and value in one asset class is on average -0.10 (-0.14) correlated with momentum in another asset class monthly (quarterly). Again, the fact that value here is positively correlated with value there and momentum here is positively correlated with momentum there, while value and momentum are negatively correlated everywhere, cannot be explained by the correlation of the passive asset classes themselves (i.e., by construction).

Panel B of Table 4 reports the correlations of the averages, where we first take the average return series for a group (e.g., stock selection value equal-weighted across regions) and then compute the correlation between the two average return series. The diagonal of the correlation matrix in Panel B of Table 4 is computed as the average correlation between each market's return series and the equal-weighted average of all other return series in other markets. As Panel B indicates, looking at the correlations of the average return series is more powerful than the average of the individual correlations.

The average stock selection value strategy is 0.48 (0.61) correlated with other market stock selection value strategies and is 0.10 (0.15) correlated with the average non-stock selection value strategy monthly (quarterly). The average stock momentum strategy is 0.48 (0.55) correlated with other market stock selection momentum strategies and is 0.45 (0.45) correlated with the average non-stock momentum strategy at a monthly (quarterly) frequency. The negative correlation between value and momentum across asset classes is also stronger, ranging from -0.20 to -0.74. These results are stronger and more significant than those in Panel A of Table 4. Looking at broader portfolios leads to more powerful statistical findings than the average finding among narrower portfolios -- a theme we emphasize throughout the paper.

Panel C of Table 4 breaks down the correlations of the average stock selection series with each of the non-stock selection series. While not all of the correlations are statistically different from zero, it is quite compelling that all of the value strategies across asset classes are consistently positively correlated, all of the momentum strategies are consistently positively correlated, and all of the correlations between value and momentum are consistently negative across every asset class. This pattern is striking in that these are long-short strategies in completely different asset classes.

Panel D of Table 4 reports the quarterly correlations of the average return series for the long and short sides separately. For value, the short sides are more correlated across markets than the long sides, which is also where a larger fraction of the profits come from (Table 2). Hence, while the shorts to a value strategy are more profitable, they also provide less diversification benefits across markets. For momentum, the long and short side correlations are similar.

Figure 2 examines the first principal component of the covariance matrix of the value and momentum rank-weighted factors by plotting the eigenvector weights associated with the largest eigenvalue from the covariance matrix of the stock selection strategies in each region (top figure) and all asset classes (bottom figure) including the global stock selection factor (an equal-weighted average of the stock selection strategies). Both figures show quite strikingly that the first principal component loads in one direction on all value strategies and loads in exactly the opposite direction on all momentum strategies. This result highlights the strong ubiquitous negative correlation between value and momentum everywhere as well as the positive correlation among value strategies themselves and among momentum strategies themselves. A simple proxy for the first principal component (which accounts for 45% of the stock selection covariance matrix and 23% of the all asset class covariance matrix) is therefore long momentum and short value in every market and asset class (or vice versa since principal components are sign invariant). The annualized Sharpe ratio of a factor portfolio that uses the first principal components as weights is 0.41 when examining all asset classes.

B. Asset Pricing Tests

To further explore the common structure of value and momentum strategies universally, we conduct asset pricing tests on the full cross-section of value and momentum sorted portfolios across all markets and asset classes. We propose a three factor model to capture value and momentum globally across all asset classes. The first factor is the MSCI World equity index return in excess of the U.S. Treasury Bill rate (MSCI-Rf), the second and third factors are the rank-weighted average-across-all asset classes value and momentum factors (VAL^{rank} and MOM^{rank}). Table 5 reports time-series regression asset pricing tests for the cross-section of value, momentum, and combination portfolios across all asset classes on our three factor model to see how much of the cross-section of average returns are captured by the common components of value and momentum everywhere. Specifically, we run the following regression,

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i (MSCI_t - r_{f,t}) + \gamma_i VAL_t^{rank} + \delta_i MOM_t^{rank} + \varepsilon_{i,t}^{value} \qquad \forall i \in N$$

where $r_{i,t}$ is the return to asset i among the N test assets we study, where N = all high, middle, and low value and momentum portfolios within each market and asset class comprising 3×2×8 = 48 test assets (Panel A), all 50/50 combination of value and momentum portfolios in each asset class comprising 24 test assets (Panel B), and the average-across-all asset classes high, middle, and low portfolios for value and momentum comprising 6 test assets as well as the all-asset-class high, middle, and low 3 combination portfolios (Panel C).

Table 5 reports the coefficient estimates, *t*-statistics, and R-squares from these time-series regressions. Panel A of Table 5 reports the estimates for the 48 test assets of value and momentum high, middle, and low portfolios in each asset class. Across the board, the high (low) value portfolios in every asset class load positively (negatively) on the common value factor and negatively (positively) on the common momentum factor. Likewise, the high (low) momentum portfolios load positively (negatively) on the common momentum factor and negatively (positively) on the common value factor. These results are consistent with the cross-market correlations reported in Table 4. The R-squares are reasonably high, particularly for the equity strategies.

The time-series regressions also provide an intercept (alpha), which can be interpreted as the average residual return to each individual value and momentum strategy after accounting for its common exposure to global value and momentum everywhere. For comparison, we also report intercept values (alphas) from the CAPM time-series regressions using only the MSCI-Rf as a single factor. The bottom of Panel A of Table 5 reports the average absolute value of the alphas under our three factor model and the CAPM. We also report the Gibbons, Ross, and Shanken (1989) multivariate *F*-statistic and *p*-value on the joint significance of the alphas under both models. The average absolute alpha under the CAPM is 32 basis points per month, whereas under our three factor model only 13 basis points remain unaccounted for. Economically, our model captures roughly 60 percent of the cross-sectional variation in alphas left over from the CAPM. Statistically, the GRS test rejects the null hypothesis of zero alpha under the CAPM with a *p*-value of less than 0.10%, but fails to reject the null under our three factor model. Hence, the global common components to value and momentum seem to capture the majority of the cross-sectional variation in average returns across value and momentum sorted portfolios *within* each market and asset class. That is, the common component seems to generate almost all the action in asset or market-specific value and momentum strategies.

Panel B of Table 5 repeats the asset pricing tests using the 50/50 combination of value and momentum in each market and asset class. High combination portfolios typically load positively on both of the common value and momentum factors and low combination portfolios load negatively on both factors. In addition, the average absolute alpha left over from our three factor model is 18 basis points compared to the CAPM's 29 basis points per month. More formally, the GRS test is again rejected strongly for the CAPM, indicating that significant alphas remain from this model, while the test fails to reject for our three factor model, indicating that the addition of global value and momentum factors captures the cross-section of the combination portfolio returns as well.

Panel C of Table 5 conducts the same exercise for the cross-section of high, middle, and low value, momentum, and combination portfolios for the diversified average return series across all asset classes. The results are consistent with those above, and the difference between the two models is made even more clear. The CAPM leaves unexplained a significant portion of average returns (28 to 30 basis points per month, with GRS *F*-stats of nearly 12 and 20), whereas the three factor model leaves unexplained only 11 to 12 basis points per month and an insignificant GRS test. The sharper distinction between the two models when looking at the average return series highlights the power of looking everywhere at once rather than each strategy in isolation.

Finally, in looking at Panel B of Table 5 and the bottom of Panel C of Table 5, it seems that although the combo strategies are correlated with the common value and momentum factors, the common component of value and momentum does not explain as much of the cross-section of returns of the combination strategies as it does when value and momentum are separated into stand alone portfolios. For example, our three factor model only captures about 36 percent of the cross-section of combo portfolio returns in Panel B versus about 60 percent of the cross-section of value and momentum stand alone portfolio returns in Panel A. This result implies that some of the common structure to value and momentum is eliminated or diversified away when the two strategies are combined. Since value and momentum are negatively correlated everywhere, if there is common structure imbedded in that negative correlation, combining the two strategies effectively provides a hedge on some of the common risks. We investigate in the next section what those common risks might be and which factor exposures are exaggerated or diminished when combining value and momentum.

V. Macroeconomic and Liquidity Risks

To gain further insight into the common variation of value and momentum strategies universally and their underlying economic drivers, this section investigates the relation between value and momentum and several macroeconomic and liquidity variables.

A. Macroeconomic and Liquidity Risk Exposures

Table 6 reports results from time-series regressions of the average value and momentum returns for global stock selection strategies, all non-stock selection strategies, and all asset selection on various measures of macroeconomic and liquidity risks. Panel A of Table 6 reports results for the macroeconomic variables global long-run (3 year forward) consumption growth, global recession, and global GDP growth as described in Section II. We also include the excess return on the MSCI World equity index as a regressor. Value strategies are positively related to long-run consumption growth, but neither value or momentum are very related to recessions or GDP growth. When value does well, future long-run consumption growth rises and, to a lesser extent, current economic conditions are strong. These results are consistent with and extend the literature on long-run consumption risks (Parker and Julliard (2005), Bansal and Yaron (2004), Malloy, Moskowitz, and Vissing-Jorgensen (2007), and Hansen, Heaton, and Li (2007)) that finds a positive relation between the value premium in U.S. stocks and long-run consumption risk. We find that the positive relation between value and long-run consumption risk is robust across a variety of markets and asset classes, lending further support to the empirical findings in the literature that have been based solely on U.S. equities.

Panel B of Table 6 reports results from regressions that add various liquidity risk proxies to the macroeconomic regressors in Panel A. We only report the coefficient estimates on the liquidity variables in Panel B and do not report the coefficient estimates on the macroeconomic variables for brevity and because they do not change much with the addition of the liquidity variables. We include each liquidity variable one at a time in separate regressions. The liquidity risk measures are: an equal weighted average of the Treasury-Eurodollar (TED) spread across the U.S., U.K., Europe (Germany) and Japan, the U.S. TED spread, a global average of LIBOR minus term repo rates, the U.S. LIBOR minus term repo rate, the level of the VIX, the returns of a long-short portfolio of passive liquidity exposure, which is the most liquid securities in each region or asset class (top half based on market cap) minus the least liquid securities (bottom half based on market cap), the levels and innovations and factor returns of Pastor and Stambaugh (2003), liquidity measures of Sadka (2006), illiquidity measure of Acharya and Pedersen (2005), growth in quantities of Adrian and Shin (2007), which is the average growth rate in prime broker assets, repurchases, and commercial paper activity, and AAA-Treasury spread from Krishnamurthy and Vissing-Jorgensen (2008).

Panel B of Table 6 shows that the illiquidity risk loadings are predominantly negative for value strategies and positive for momentum strategies. Value performs poorly when funding liquidity is poor, as proxied for example by a wide TED spread or libor-term repo spread, which occurs during times when borrowing is difficult, while momentum performs well during these times (which may contribute to their negative correlation).[8]

[8] Another interpretation of the TED spread and libor-term repo rates is that they proxy for changes in risk aversion. So, in addition to funding liquidity being tight when spreads are wide, it may also be the case that risk aversion in the economy is particularly high and that is what is driving the returns to value and momentum. Under this alternative view, however, it would seem that *both* value and momentum returns would decline with rising risk aversion, whereas we find that momentum returns increase.

Value securities are those that typically have high leverage (in the case of stocks) or have been beaten down over the past couple of years. Such securities, it would seem, would suffer more when funding liquidity tightens. Momentum securities, on the other hand, exhibit the opposite relation.

Pastor and Stambaugh (2003) and Sadka (2006) find an opposite-signed relation for U.S. momentum equity strategies and their liquidity risk measures. We confirm those results using our portfolios, hence the measure of liquidity risk matters. To investigate this apparent discrepancy further and more generally the role of liquidity risk we examine a host of proposed liquidity risk variables in the literature. We find that the various liquidity measures are not very correlated to each other. However, we also find that the common component of all these measures loads consistently negatively on value and somewhat positively on momentum. We construct an illiquidity index of all of these measures using the first principal component of the correlation matrix of all these variables (except Libor-term repo rates because of their short history) to weight them in the index. For both *levels* and *changes* in this index, value strategies load negatively on illiquidity risk and momentum strategies load positively. The 50/50 equal combination of value and momentum therefore hedges some of this risk, while the value - momentum difference exacerbates it.

One possible explanation for these patterns is that arbitrageurs who put on value and momentum trades may be restricted during times of low liquidity. Their reduced participation in the market may make "cheap" or value assets even cheaper, as arbitrageurs' price impact will be smaller. The same effect might lead to initial losses on momentum strategies, but, since this strategy quickly changes its postions, illiquidity may soon make the momentum effect stronger if momentum is the result of general under-reaction in markets and arbitrageurs play a less disciplinary role during these times. This explanation is consistent with limited arbitrage (Shleifer and Vishny (1997)) and slow moving capital (Mitchell, Pedersen, and Pulvino (2007)). Moreover, liquidity risk may help explain part of why value and momentum are negatively correlated, and the return premium to liquidity risk may help explain the return to value. On the other hand, our results only deepen the puzzlingly high returns to momentum strategies as these strategies do *better* when the market is illiquid, presumably a characteristic investors would pay for in terms of lower expected returns.

B. Average Exposure versus Exposure of the Average

A key feature of the analysis in Table 6 is that we examine the average returns to value and momentum across a wide set of markets and asset classes together. The power of looking at the average return to value and momentum greatly improves our ability to identify common factor exposure. For example, if we examine each individual value and momentum strategy's exposure to liquidity risk separately, we do not find nearly as strong patterns and, in fact, might have concluded there is not much there.

Figure 4 reports the *t*-statistics of the betas of each of our individual value and momentum strategies on liquidity risk (using the illiquidity index we constructed). The average t-statistic from the individual strategy regressions on liquidity risk is -1.3 for value strategies and 2.1 for momentum – the right direction but hardly convincing. In contrast, when we regress the average value and momentum return series across all markets and regions on liquidity risk, we get a t-statistic of -4.2 for value and 5.6 for momentum. The average relation to liquidity risk among the individual strategies is not nearly as strong as the relation of the average of the strategies to liquidity risk.

Naturally, by averaging across all markets and asset classes we mitigate much of the noise that is not common to value or momentum in general, and we identify a common component that bears a relation to liquidity risk. When restricting attention to one asset class at a time, or worse to one strategy within an asset class, the patterns above are difficult to detect. The scope and uniformity of studying value *and* momentum *everywhere* at once is what allows us to identify patterns and links that are not detectable looking more narrowly at one asset class or strategy in isolation, which much of the previous literature has limited its attention to.

C. Economic Magnitudes

While the statistical relations between value and momentum strategies and liquidity risk are strong, we also want to assess their economic magnitudes. For example, how much of the abnormal returns to value and momentum can it explain? How much correlation structure can it explain?

To assess what part of the returns are explained by liquidity risk, we create factor-mimicking portfolios for liquidity risks. We use a portfolio of the liquid stocks in each market (top half of market cap) minus the illiquid securities (bottom half of market cap). This portfolio has a strong positive correlation with the TED spread and other global liquidity factors (the correlation with our liquidity index is 0.50). In unreported results, we find that the fraction of returns explained by this liquidity factor-mimicking portfolio to be on the order of 15 percent of the value return premium, leaving unexplained a significant part of the premium. For momentum, the abnormal return of course goes up when liquidity risk is accounted for.

In terms of how much correlation can be explained, liquidity risk explains about 15 percent of the correlations among value strategies with other value strategies and momentum strategies with other momentum strategies, and about 15 percent of the negative correlation between them.

The bottom line is that while the data hint strongly toward a link between value and momentum and liquidity risks, little of the return premia or correlation structure is captured by our proxies for these risks. We view these findings as an interesting starting point for possible theories related to value and momentum phenomena, but emphasize that we are far from a full explanation of these ubiquitous effects at this point.

VI. Dynamics of Value and Momentum

In the previous section we show that liquidity risk has a stronger impact on value and momentum strategies over time and suggest that limits to arbitrage activity may play a role in the efficacy and correlation structure of these strategies. To gain further insight into these economic relations, we examine the dynamic performance and correlations of global value and momentum across different liquidity environments and extreme return events. We also examine the seasonal patterns of these strategies across markets to see if the strong seasonalities documented in U.S. equities for value and momentum are a global phenomenon and to what extent they contribute to our findings.

A. Liquidity Environments

To examine further the time-varying relation between liquidity risk and value and momentum, Figure 4 plots the rolling 10-year illiquidity beta estimates (using the illiquidity index we construct) for the all-asset-class value and momentum strategies over time. In the early part of the sample period, neither value or momentum exhibit much of an illiquidity beta, but the beta for value decreases significantly, while the beta for momentum becomes increasingly positive over time. These changing betas also coincide with growth in hedge fund assets and the financial sector over the same period. For example, as reported on the graphs, the correlation between value's (momentum's) illiquidity beta and hedge fund asset growth (obtained from HFR) is -0.85 (0.83). This result is consistent with liquidity risk becoming more important as quantitative arbitrageurs (e.g., hedge funds) increased participation in the market and, indeed, in value and momentum strategies specifically. Likewise, the financial sector's share of U.S. output (all finance and insurance company output obtained from Philippon and Reshef (2008)) and the subsector of credit intermediation's share of U.S. output (all banks, savings and loans, and credit companies obtained from Philippon and Reshef (2008)), are -0.91 (0.82), and -0.91 (0.80), respectively, correlated with value's (momentum's) illiquidity beta. These results also suggest that liquidity risk became more important as the financial sector as a whole became a larger part of the economy.

On closer inspection, Figure 4 shows that the sharpest decrease (increase) in value's (momentum's) illiquidity beta occurs right around the Fall of 1998, which follows the Russian debt default and collapse of Long-Term Capital Management that prompted a banking concern. In fact, the graphs highlight what looks like a regime shift in the response of value and momentum strategies to liquidity risk around that time. This result is consistent with the market becoming aware of or being more concerned by funding liquidity risks in the wake of the LTCM crash -- a story that resonates anecdotally among traders and portfolio managers. Consistent with this conjecture, we also find that the rolling illiquidity betas to value and momentum change just as much even if we remove the observations from 1998 when calculating those betas. Hence, while the observations during the latter half of 1998 are indeed influential, those data points themselves are not driving the drastic changes in illiquidity betas. Rather, illiquidity betas for value and momentum simply shifted after the Fall of 1998, even when estimated using only data outside of the events of 1998.

Table 7 reports the Sharpe ratios and correlations among the value and momentum strategies as well as the correlation between value and momentum strategies prior to and after August, 1998, which is roughly when the funding crisis peaked. We also report the Sharpe ratio for the 50/50 combination of value and momentum. Panel A of Table 7 reports the results for the stock selection strategies and Panel B for the non-stock asset classes. For stock selection, momentum is a much more profitable strategy early in the sample period and value is slightly less profitable before 1998. More interestingly, the correlation among value strategies across markets is higher in the latter part of the sample (0.32 pre-1998 versus 0.52 post-1998). Similarly, momentum strategies are also more correlated with each other after 1998, and value and momentum are slightly less negatively correlated with each other post-1998. Assimilating all these findings implies that the combination of value and momentum is less profitable after 1998 due to both diminished performance of the strategies on average as well as less diversification benefits from combining the strategies, though an impressive Sharpe ratio remains. Panel B of Table 7 shows that the same patterns are not as clear for non-stock asset classes. The combination of value and momentum is indeed less profitable post-1998, but this fact seems to be driven by worse value and momentum performance and not by higher correlations among the strategies.

The next four rows of Panels A and B of Table 7 report the same statistics for the best and worst 20% of months based on our illiquidity index in the pre- and post-1998 periods. We first take the period prior to August, 1998 and then take the months corresponding to the 20% most illiquid times based on our illiquidity index and calculate the performance and correlations of the value and momentum strategies and report them in the third row of each panel. The fourth row of each panel reports the same statistics for the 20% most liquid times prior to August, 1998. The fifth and sixth rows of each panel report results for the same analysis in the post-August, 1998 period. For stock selection (Panel A), value strategies do worse in illiquid times and momentum strategies do better both in the pre- and post-1998 period, but the results are stronger post-1998. The correlations among the value and momentum strategies are not that different in liquid versus illiquid environments, save for a slightly more negative correlation between value and momentum during liquid times post-1998. For non-stock selection strategies (Panel B), there is virtually no liquidity effect on value or momentum prior to 1998, and a big impact from liquidity risk post-1998, where value strategies do poorly and momentum strategies do well in illiquid times.

Figure 5 highlights these patterns and demonstrates their economic significance by plotting the annualized returns to value and momentum constant volatility strategies for stock selection (top graph) and non-stock asset classes (bottom graph) for the 10% most liquid months, 80% middle months, and 10% least liquid months both before and after August, 1998. The differences across the two regimes are striking as the spread in value (momentum) between the least liquid and most liquid months is about -12% (3%) on average prior to 1998 and -33% (51%) after 1998.

These results highlight the increased importance of liquidity risk on the efficacy of value and momentum strategies, particularly following the events of the Summer of 1998. The liquidity shock in Summer 1998 may have roused concerns of liquidity risk and the growth in popularity of value and momentum strategies among levered arbitrageurs over the subsequent decade may have made these concerns more relevant. These findings suggest that liquidity risk and limits to arbitrage activity may be a progressively more crucial feature of these strategies going forward and perhaps even more so after the recent financial meltdown that started in 2007.

B. Extreme Return Events

To further explore the dynamics of value and momentum, we also examine their profitability and correlation structure during extreme returns. We first examine the 20% most extreme returns on the MSCI World equity index. Rows 7 and 8 of both panels of Table 7 report results for the worst and best 20% months of MSCI excess returns. Starting with stock selection (Panel A), value and momentum exhibit much higher Sharpe ratios during the worst MSCI return months, and are slightly more correlated across markets during the best return months. However, the most notable result is that value and momentum are very negatively correlated (-0.86) when the MSCI performs extremely well, and small but positively correlated (0.11) when the MSCI experiences its worst performance. This finding is consistent with correlations rising during bad times globally, as proxied by the MSCI index performance. Panel B of Table 7 shows similar but muted patterns for non-stock strategies, with the exception that momentum does well during good times and poorly during bad times.

The last four rows of each panel condition on the 20% most extreme and least extreme returns to value and momentum, where we rank months on the *absolute return* to value and momentum separately and select the most extreme and least extreme 20% return events. Here, we are not conditioning on the *direction* of the return as we do above for the MSCI index, but rather the absolute *magnitude* of the return to gauge how these strategies do when prices move significantly in either direction versus when prices are relatively calm.

The ninth and tenth rows of Panel A (Panel B) of Table 7 report the results for the most volatile and calmest periods for value strategies among individual stocks (non-stock asset classes). The most volatile value return periods are good for value and bad for momentum among both stock and non-stock strategies, which is not too surprising given we are conditioning on the absolute return to value and the negative correlation between value and momentum. More interestingly, the correlation structure among value strategies across markets and asset classes is decidedly different for extreme versus calm periods. For stock selection, value strategies are 0.63 correlated across markets during their most extreme return episodes, while during the most calm periods, value strategies are -0.11 correlated across markets. Momentum strategies are also more correlated during times when value is volatile, though the effects are not as striking. Likewise, across asset classes (Panel B), value strategies are 0.28 correlated when returns are extreme and -0.17 correlated when things are calm. These results suggest that most of the correlation structure to value across markets and asset classes occurs during extreme return movements, which is also, perhaps not coincidentally, when most of the premium to value occurs.

The last two rows of each panel of Table 7 condition on the absolute return to momentum (20% most and least extreme). Momentum also does better (and value worse) when momentum returns are extreme and the correlation of momentum strategies across markets and asset classes is significantly higher during volatile versus calm episodes. Stock momentum strategies are on average 0.57 correlated across markets during the most volatile times and -0.07 correlated in the calmest periods. Stock value strategies are also more correlated with each other when momentum returns are extreme. For non-stock selection, the correlation of momentum strategies across asset classes is 0.40 during extreme periods and -0.13 during calm periods. The results for momentum mirror those for value: the correlations among momentum strategies rise significantly when returns are extreme and this is precisely when momentum strategies are most profitable.

Taken together, these results suggest that an investor looking to adopt a globally diversified value or momentum strategy should recognize that the diversification benefits are significantly smaller at precisely the time you need them most -- when returns are extreme -- and it is these times that contribute largely to the average premia associated with value and momentum.

Finally, the one bright spot to value and momentum during extreme return episodes is that the correlation between them is large and negative when returns (to either value or momentum) are large and close to zero when returns are small. Hence, the benefit of combining value and momentum due to more negative correlation between them may offset the increased correlation among these strategies across markets during extreme times. Judging by the Sharpe ratios reported for the 50/50 value/momentum combination strategies in Table 7, it appears that for stock selection (Panel A) the increased value-momentum diversification benefits are not enough to overcome the decrease in global diversification benefits, particularly for value strategies. However, for non-stock selection (Panel B), the opposite is true, as the Sharpe ratios for the combination strategy are higher during extreme events, suggesting that the added diversification benefits from combining value with momentum outweigh the loss of benefits from increased correlation of value and momentum strategies across the asset classes.

C. Seasonals (Not Everything Works Everywhere)

One of the virtues of our unified approach of looking at value and momentum everywhere at once is the increase in statistical power that helps identify common themes associated with value and momentum. This feature can uncover links that are not easily detectable when examining only one asset class or strategy at a time, but it can also provide a more general test of patterns found in one asset class or market that may not exist elsewhere and hence may be idiosyncratic to that market or be a random occurrence (e.g. a product of data mining).

Much of the literature on value and momentum focuses its attention on U.S. equities and typically examines these phenomena separately. One of the more robust findings from this literature is the strong positive performance of value in January (DeBondt and Thaler (1987), Loughran (1997)), which some argue captures all of the return premium to value (Loughran (1997)). A separate literature documents a very strong negative return to momentum in January (Jegadeesh and Titman (1993), Grundy and Martin (2001), and Grinblatt and Moskowitz (2004)). We would again make the obvious observation that these findings are related given the negative correlation between value and momentum.

We investigate the robustness of these seasonal patterns across markets and asset classes and whether our unified approach can shed further insight on them. Furthermore, since some of the most extreme performance of value and momentum occurs at the turn of the year, we also assess how much of our findings on the profitability and correlation structure of value and momentum everywhere can be attributed to these seasonals.

Table 8 reports the annualized Sharpe ratios of our value, momentum, and 50/50 value/momentum combo strategies in the months of January and the rest of the year. Panel A reports results for the stock selection strategies and Panel B for the non-stock selection strategies. As the first row of Panel A of Table 8 shows, we replicate the results in the literature for U.S. equities that value performs well predominantly in January and momentum does poorly in January. However, the results across other markets for stocks are mixed: value does badly in the U.K. in January, performs slightly better in January for Europe, and performs worse in January for Japan. Moreover, there are still positive returns to a value strategy in February to December in all these markets. Overall, we do not find evidence that stock selection value strategies perform significantly better in January. Likewise, momentum strategies do better on average in non-January months for the U.S., but the opposite is true outside of the U.S. Overall, momentum performs no better from February to December on average than it does in January once you look across all markets. Panel B of Table 8 reports the seasonal results for the non-stock selection strategies. Here, we find no discernable January versus non-January performance differences for value or momentum strategies. The seasonal results documented in the literature for U.S. stocks are not supported when looking globally across markets and asset classes.

Consistent with many of our previous findings, the 50/50 value/momentum combination is much more stable across seasons, markets, and asset classes. On average, the combination strategies do no better in January versus non-January months. As the last two columns of Table 8 indicate, the negative correlation between value and momentum is relatively stable in January versus the rest of the year, save currencies where it dramatically increases in January. This result implies that the combination of value and momentum will mitigate the prevalence of any seasonal patterns in each.

Finally, Panel C of Table 8 recomputes the average monthly return correlations among the stock and non-stock value and momentum strategies in January and non-January months separately to see if the often extreme January performance of value and momentum is largely driving the correlations across markets and asset classes we document. As Panel C of Table 8 shows, however, the correlations across markets are, if anything, stronger outside of January, inconsistent with this hypothesis. The only effects that seem to be stronger in January are the off diagonal terms between stock and non-stock selection strategies.

The sum of these results indicates that turn-of-the-year seasonal effects in value and momentum strategies in general are not nearly as strong or as important as they appear to be for U.S. stocks. Hence, theories offered for the U.S. seasonal effects must now confront the lack of seasonal effects in other markets and asset classes. Looking everywhere at once can not only highlight common features among value and momentum, but also identify effects idiosyncratic to a market.

VII. Conclusion

Value and momentum deliver positive expected abnormal returns in a variety of markets and asset classes, their combination performs even better than either alone, and the benefits of diversification across markets and asset classes are large, both in terms of the strategies' performance and in terms of the arising statistical power to detect economic exposures. The power of examining value and momentum across asset classes in a unified setting allows us to uncover an intriguing global comovement structure.

We find that value (and momentum) strategies are positively related across markets and asset classes and that value and momentum are negatively related within and across markets and asset classes. This intriguing global factor structure is consistent with the presence of common underlying economic factors driving part of the returns to these strategies. Moreover, we show that these correlations rise considerably during extreme return events. Liquidity risk is positively related to value and negatively related to momentum, and the importance of liquidity risk on these strategies has risen over time, particularly after the credit crisis following the Summer of 1998. Our examination of both value and momentum simultaneously across markets and asset classes provides improved statistical power to detect these common economic exposures that are not easily detectable when examining any one strategy in isolation.

While the data hint strongly toward a link between value and momentum and liquidity risk, much is left to be explained. Mispricing due to limited arbitrage in light of liquidity risk may contribute to the prevalence of these phenomena and we find some intriguing dynamic patterns of value and momentum during liquidity events that may help provide the ingredients for an explanation of their underlying drivers. At this point, we leave the ubiquitous evidence on the efficacy of value and momentum everywhere, its strong correlation structure, and intriguing dynamics as a challenge for future theory and empirical work to accommodate.

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Appendix A: Current versus Lagged Measures of Value

We compare the performance and correlations of our value and momentum strategies that use current value measures to those that use lagged value measures.

A.1 Comparison to Fama and French Portfolios in U.S. Equities

We first compare the performance of our U.S. equity value and momentum strategies (and 50/50 combo) to those of Fama and French. Panel A of Table A1 reports the Sharpe ratios of the Fama-French value (HML) and momentum (UMD) strategies, our (AMP) dollar long-short and constant volatility value and momentum strategies using both current and lagged measures of value, and the correlation between our portfolios and Fama-French's. The Sharpe ratios are similar, though our value portfolios do not perform as well as HML over the same period when we use current value. The correlations are between 0.78 and 0.88. We also report the same statistics for the 50/50 combination of value and momentum, which again is consistent with a 50/50 combo of HML and UMD.

The last column of Panel A of Table A1 reports the correlation between value and momentum for the Fama and French and AMP portfolios. Our correlations are more negative than those for the Fama-French portfolios. The main driver for this difference is that we employ the most recent *BM* ratio we have by using the most recent 6-month lagged book value number and allowing the denominator (market value) to be updated every month, whereas Fama and French induce an additional 13-24 months lag in their book value measure (using the fiscal year end prior to June in the previous year) and only update the market value once a year, using the value from December of the year prior to the most recent June (which could be contemporaneous with the book value, depending on the fiscal year for that company). This procedure makes our value portfolios more negatively correlated with momentum since, if a security has experienced an increase in value over the previous 12 months, its momentum characteristic increases and its value characteristic decreases ceteris paribus. Fama and French essentially skip the most recent year's history of returns in forming their value measure, thus making HML more neutral to momentum. For this reason, our value portfolios are both more negatively correlated to momentum and exhibit lower Sharpe ratios (since they "fight" momentum). Employing a lag in our *BM* ratios similar to Fama and French by skipping an extra year, we get much closer to the returns of Fama and French. However, the combination of value and momentum is relatively unaffected by lagging or not lagging, since whatever is gained in terms of Sharpe ratio for value, is offset by the less negative correlation to momentum.

Panel B of Table A1 reports time-series regression estimates of our constant dollar value and momentum portfolios on the four factor Fama and French model consisting of RMRF, SMB, HML, and UMD. The Fama and French factors explain 75-81% of the variation in our zero-cost portfolio returns. Our value, momentum, and combination portfolios provide significant intercepts relative to the Fama and French four factor model, which is not too surprising as Fama and French use value-weight portfolios while we use rank-weighted portfolios. Our value (momentum) portfolio also loads heavily on HML (UMD). Most telling, our current value portfolio loads heavily on HML but must then short Fama and French's UMD (UMD beta = -0.35 with a *t*-statistic = -20.66) to restore it's "current value" nature, whereas our lagged value portfolio is neutral to momentum (UMD beta = -0.02 with a *t*-statistic = -1.08). Turning this regression around and regressing Fama and French's portfolios on our current value and momentum portfolios in Panel C of Table A1, we find that HML loads about *positively* on value *and* momentum, where HML is essentially a combination of 2/3 our value and 1/3 our momentum. By lagging their values in an effort to be conservative, Fama and French create a value portfolio that avoids being short momentum.

A.2 Performance and Correlation Using Lagged Value Measures

Although not reported in the paper for brevity, if we examine the performance of value across the other markets and asset classes outside of the U.S. using lagged measures of value we find similar results to those highlighted in Table A1. Overall performance of value strategies improves, because they no longer short the profitable momentum strategy, and the within asset class correlations between value and momentum are closer to zero, though still negative in many cases. However, the 50/50 combination portfolios of value and momentum are very similar to those obtained when we do not lag value, and in fact are slightly weaker in their performance. These results highlight the tradeoff between improving value's stand alone Sharpe ratio versus benefiting from the larger negative correlation with momentum, but they also suggest that some additional information is gained from using current value because the combination portfolios' Sharpe ratios are consistently better when we use current value measures.

If we also replicate the results from Table 4 in the paper on the cross-correlations of value and momentum across markets and asset classes using lagged value measures, we find similar, though slightly weaker results. Value in one market or asset class is still correlated with value in another market or asset class when using lagged value measures, but the correlation is a little bit weaker than it is for current value measures. This result suggests that current value measures may contain a larger common component than the lagged value measures. In addition, the negative correlation between value and momentum in different markets and asset classes is also still present, but it is weaker when using lagged value measures.

Table A1:
Comparison to Fama-French Factors (01/1974-10/2008)

Panel A reports the annualized Sharpe ratios of the U.S. Value, Momentum, and 50/50 value/momentum Combo portfolios of Fama and French (obtained from Ken French's website and corresponding to HML, UMD, and an equal-weighted combination of HML and UMD) and our (denoted AMP) dollar long-short and constant volatility portfolios over the common period 01/1974 to 10/2008. We report two versions of our value portfolios: one that uses the most recent quarterly book values and most recent monthly market values, and one that uses an additional one year lag in the book-to-market ratio similar to Fama and French's construction of HML. Also reported in Panel A are the correlations between each value and momentum strategy as well as the correlations between our strategies and those of Fama and French. Panel B reports time-series regression coefficients and *t*-statistics of our portfolios on the Fama-French factors RMRF, SMB, HML, and UMD. Panel C reports the time-series regression results of the Fama-French portfolios HML and UMD (and their equal-weighted combination) on our value and momentum portfolios. The intercepts are reported in annualized percent. The R-squares from the regressions are reported at the bottom of each panel.

Panel A: Sharpe ratio comparison

	Value	Momentum	Combo	Corr(Val, Mom)
Fama-French	**0.51**	**0.70**	**0.93**	**-0.15**
Using most recent value measure available:				
AMP ($1 long-short)	0.32	0.60	1.04	-0.55
Correlation with FF	0.78	0.87	0.83	
AMP (constant volatility)	0.18	0.78	1.09	-0.64
Correlation with FF	0.78	0.87	0.83	
Using value measure lagged an additional year:				
AMP ($1 long-short)	0.57	0.63	0.82	-0.18
Correlation with FF	0.88	0.92	0.92	
AMP (constant volatility)	0.44	0.78	0.92	-0.22
Correlation with FF	0.86	0.87	0.82	

Panel B: Regression of AMP ($1 long-short) on Fama-French portfolios

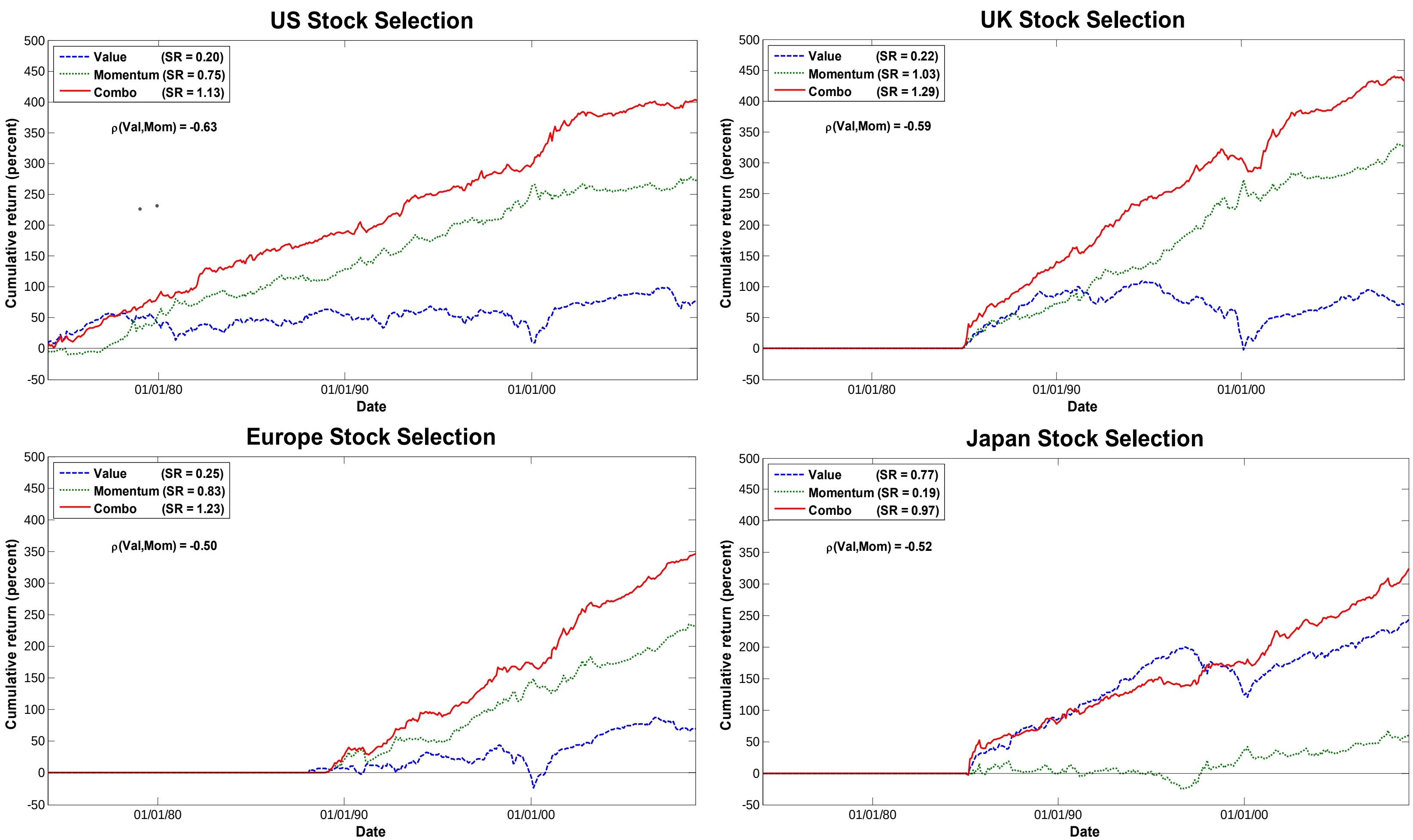
Dependent variable =	AMP Value	AMP Value (lag)	AMP Momentum	AMP Combo
Coefficient				
Intercept	1.99%	0.73%	1.75%	3.13%
RMRF	-0.08	-0.08	0.06	-0.01
SMB	-0.11	-0.03	0.13	0.03
HML	0.71	0.85	-0.10	0.67
UMD	-0.35	-0.02	0.65	0.44
t-statistic				
Intercept	2.37	0.74	2.11	3.34
RMRF	-4.97	-4.02	3.81	-0.44
SMB	-4.62	-1.25	5.51	1.24
HML	28.07	28.43	-3.98	23.60
UMD	-20.66	-1.08	39.08	23.15
R-square	81.2%	74.5%	80.2%	74.3%

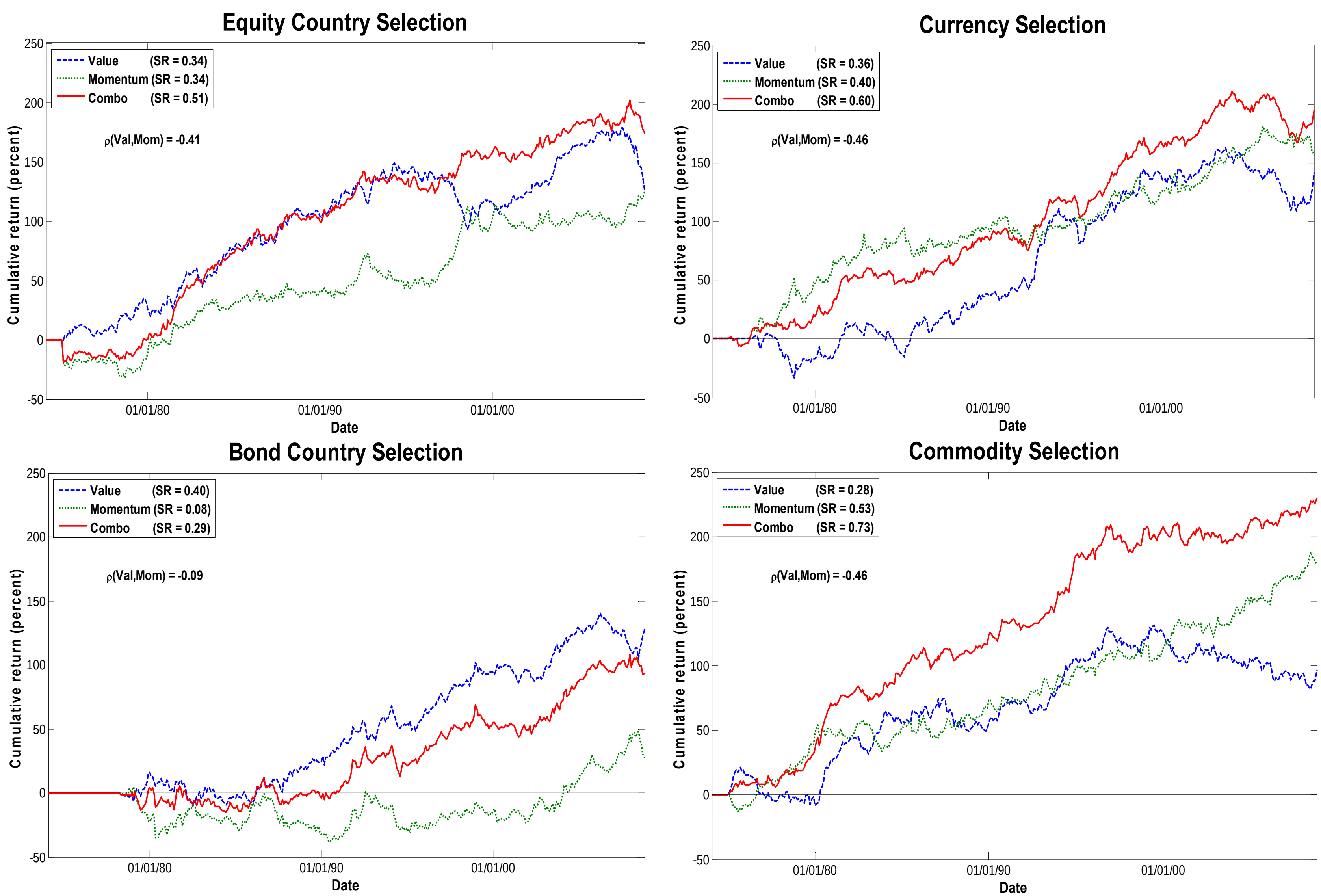
Panel C: Regression of Fama-French portfolios on AMP portfolios

Dependent variable =	HML	UMD	HML+UMD
Coefficient			
Intercept	0.17%	0.71%	0.44%
AMP Value	0.99	0.02	0.50
AMP Momentum	0.45	1.21	0.83
t-statistic			
Intercept	0.18	0.61	0.54
AMP Value	28.27	0.49	17.00
AMP Momentum	13.39	30.03	29.31
R-square	73.7%	79.3%	71.6%

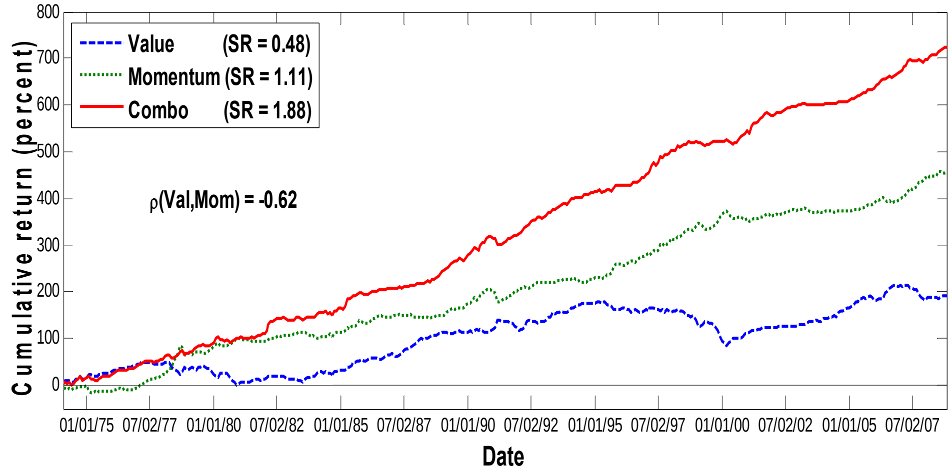
Figure 1: Performance of value and momentum strategies

Plotted are the cumulative returns to value, momentum, and a 50/50 combination of value and momentum strategies among individual stocks in four markets: U.S., U.K., Japan, and Continental Europe, in four different asset classes: Country equity index futures, country bonds, currencies, and commodities, and for the equal-weighted combination of all stock selection strategies, all non-stock selection strategies, and an equal-weighted combination of both. Also reported on each figure are the annualized Sharpe ratios of each strategy and the correlation between value and momentum in each market.

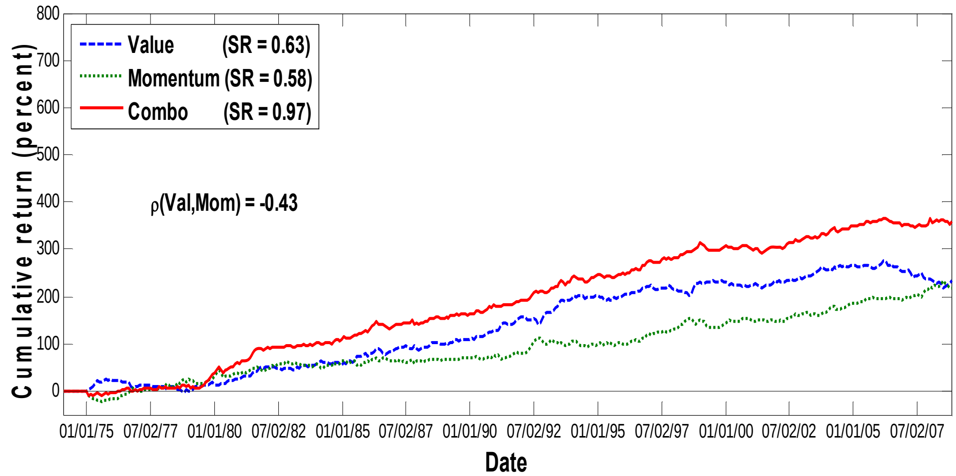



Equity Country Selection
Value (SR = 0.34)
Momentum (SR = 0.34)
Combo (SR = 0.51)
ρ(Val,Mom) = -0.41
Cumulative return (percent)
Date
Currency Selection
Value (SR = 0.36)
Momentum (SR = 0.40)
Combo (SR = 0.60)
ρ(Val,Mom) = -0.46
Cumulative return (percent)
Date
Bond Country Selection
Value (SR = 0.40)
Momentum (SR = 0.08)
Combo (SR = 0.29)
ρ(Val,Mom) = -0.09
Cumulative return (percent)
Date
Commodity Selection
Value (SR = 0.28)
Momentum (SR = 0.53)
Combo (SR = 0.73)
ρ(Val,Mom) = -0.46
Cumulative return (percent)
Date
250
200
150
100
50
0
-50
01/01/80
01/01/90
01/01/00

All Stock Selection



All Non-Stock Selection



All Asset Selection

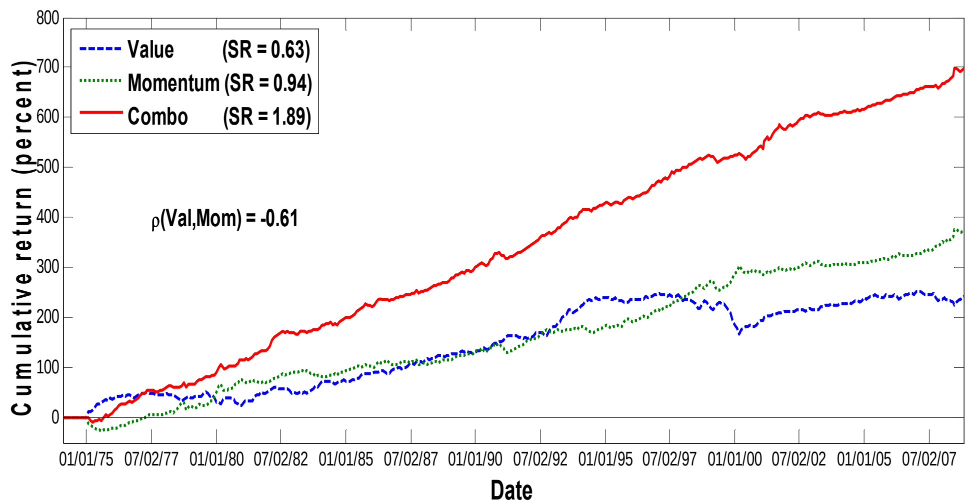
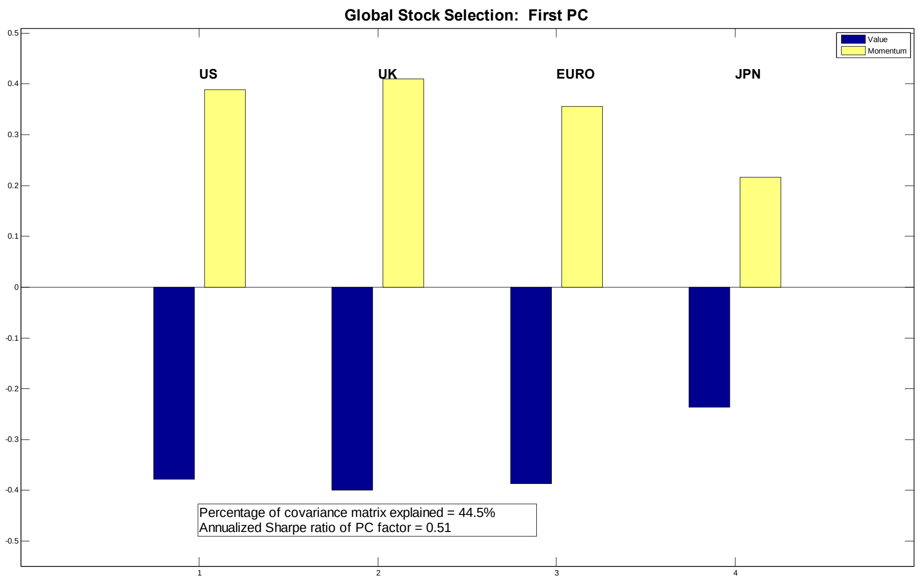


Figure 2: First principal component for value and momentum strategies

Plotted are the eigenvector values associated with the largest eigenvalue of the covariance matrix of returns to value and momentum in stock selection in four markets: U.S., U.K., Continental Europe, and Japan (top graph) and in all asset selection in five asset classes: overall stock selection, country equity indices, country bonds, currencies, and commodities (bottom graph). Also reported on each figure are the percentage of the covariance matrix explained by the first principal component and the annualized Sharpe ratio of the returns to the portfolio of the assets constructed from the principal component weights.



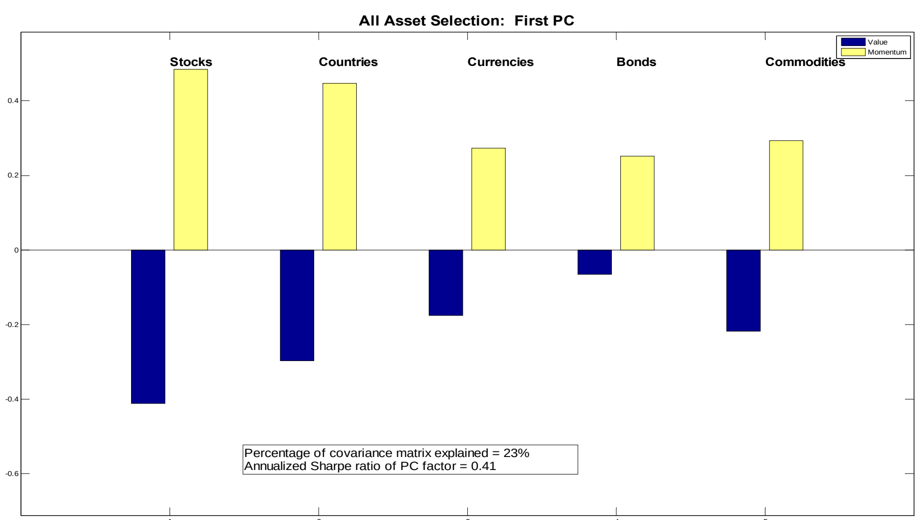


Figure 3: T-statistics of Illiquidity Risk Betas

Plotted are the *t*-statistics on the illiquidity beta estimates of the value and momentum constant volatility portfolios in each asset class using the illiquidity index, which is a principal component weighted average of all the liquidity indicators used in Table 6. Also reported is the cross-sectional average *t*-statistic across the asset classes ("average") for value and momentum and the *t*-statistic of the average return series across all asset classes for value and momentum ("all asset selection").

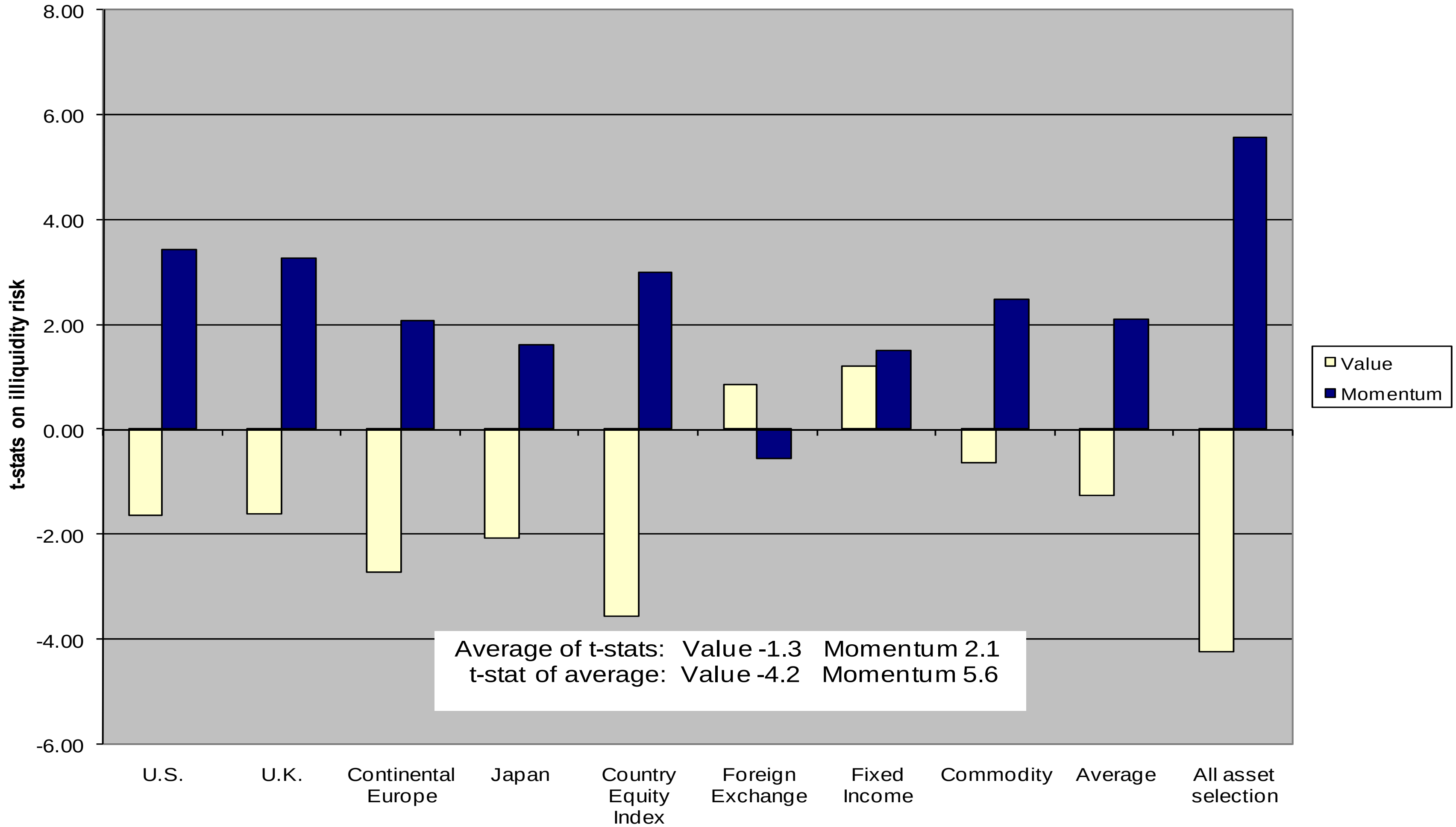
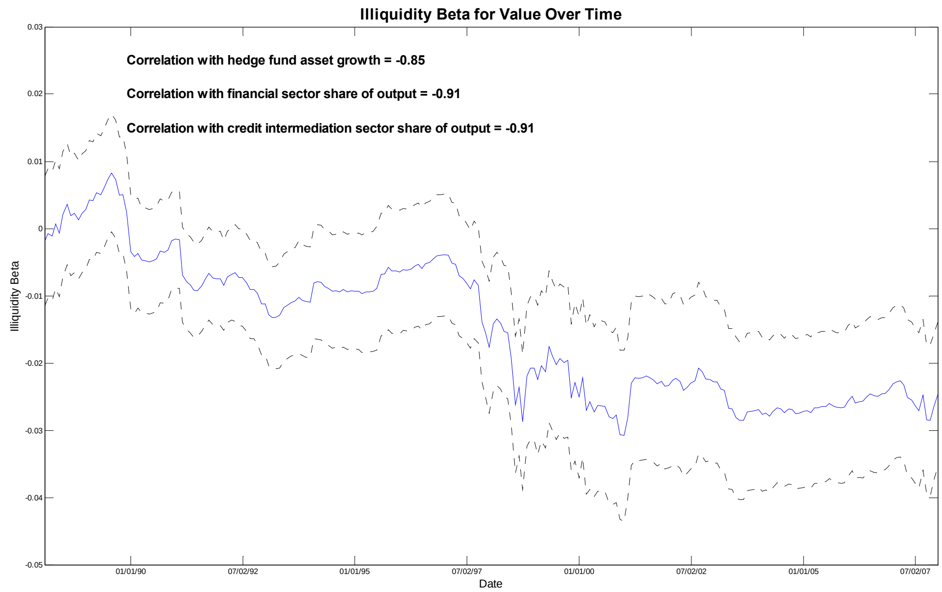


Figure 4: Time-Varying Illiquidity Betas on Value and Momentum Portfolios

Plotted are the rolling 10 year illiquidity beta estimates, and their 95% confidence bands, of the value and momentum constant volatility portfolios across all asset classes using the illiquidity index, which is a principal component weighted average of all the liquidity indicators used in Table 6. Also reported is the time-series correlation between the time-varying betas and the growth in hedge fund assets under management (1990 to 2008 from HFR), the financial sector's share of output in the U.S. (1980 to 2007 from Philippon and Reshef (2008)), and the share of U.S. output from the credit intermediation sector (a subset of the financial sector, 1980 to 2007 Philippon and Reshef (2008)).



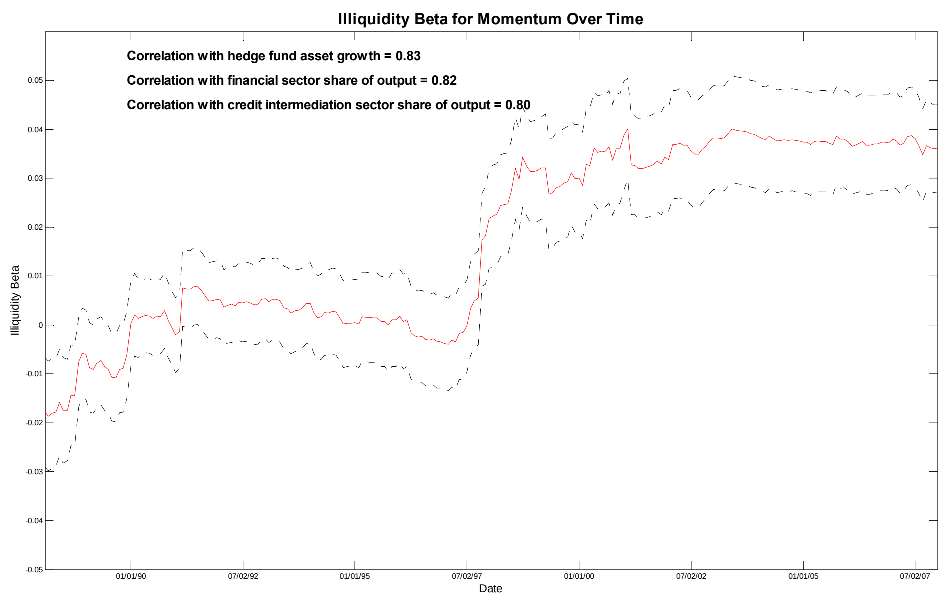


Figure 5: Performance of Value and Momentum Strategies in Liquid and Illiquid Environments Before and After August, 1998

Plotted are the average returns of the constant volatility portfolios for value and momentum across all stock selection strategies (average of U.S., U.K., Europe, and Japan), all non-stock selection strategies (average of country equity index, currencies, bonds, and commodities), and all asset selection strategies (average of stock and non-stock strategies) in three different liquidity environments. The average returns of each value and momentum strategy are computed during the 10% most liquid months, 80% middle or normal months, and 10% least liquid months as determined by the illiquidity index. Results are reported separately for the periods before and after August, 1998, the time of LTCM's demise. The top graph reports results for value portfolios and the bottom for momentum portfolios.

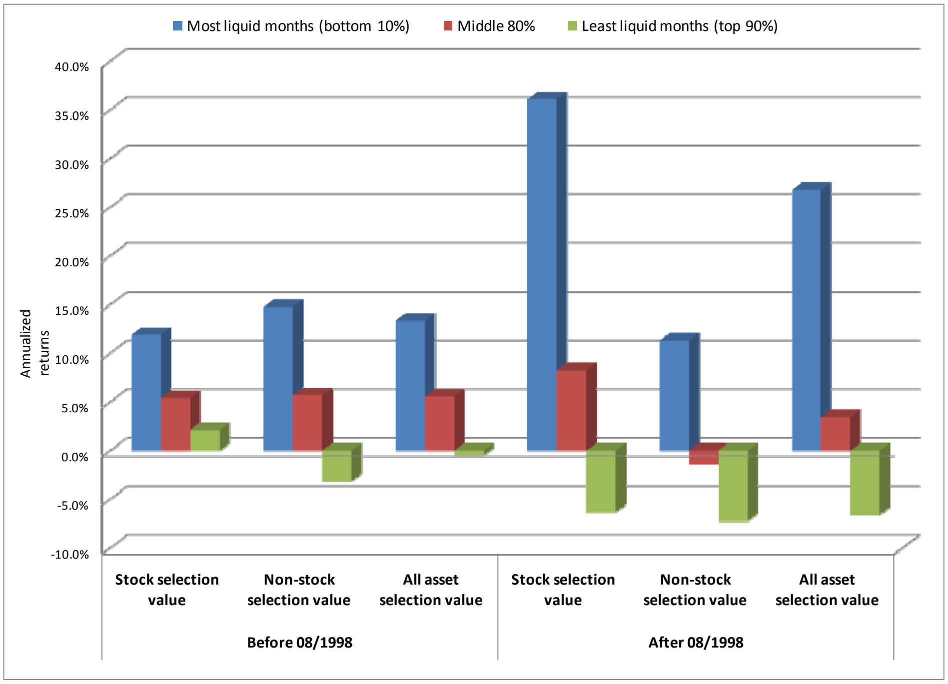


Table 1:
Performance of Value and Momentum Sorted Portfolios Across Markets and Asset Classes

Reported are the annualized mean, *t*-statistic (in parentheses), and standard deviation of returns of portfolios sorted by value and momentum, and a 50/50 combination of value and momentum in various markets and asset classes. In each market or asset class the universe of securities is first sorted by either value or momentum and then broken into three equal groups based on those sorts to form tretile portfolios (high, middle, and low). For stock selection, individual stocks within the three portfolios are value weighted by their beginning of month capitalization and for non-stock asset classes, the securities within the tretile portfolios are equal weighted. Each strategy is scaled to be $1 long and $1 short. The difference between the high and low portfolios (H - L) are also reported. The 50/50 combination portfolios are an equal weighted average of the value and momentum portfolios for each group within each market/asset class (e.g., high combo = 1/2 high value + 1/2 high momentum). The time-series correlation between the value and momentum strategies in each market/asset class is also reported. Statistics are computed from monthly return series but are reported as annualized numbers.

	Value				**Momentum**				**50-50 Combo of value and momentum**				**corr(val,mom)**
	High	Middle	Low	**H - L**	High	Middle	Low	**H - L**	High	Middle	Low	**H - L**	**H - L**
Panel A: Stock Selection													
U.S. 02/1974-10/2008 (average #securities = 1,367, minimum #securities = 451)													
mean	6.1%	4.5%	2.5%	**3.6%**	7.7%	3.0%	1.6%	**6.0%**	6.9%	3.8%	2.1%	**4.8%**	**-0.54**
(t-stat)	(2.24)	(1.70)	(0.78)	**(1.55)**	(2.36)	(1.18)	(0.52)	**(2.19)**	(2.51)	(1.46)	(0.69)	**(3.91)**	
stdev	16.1%	15.7%	19.0%	**13.7%**	19.1%	15.0%	18.7%	**16.2%**	16.2%	15.2%	17.8%	**7.2%**	
U.K. 12/1984-10/2008 (average #securities = 486, minimum #securities = 276)													
	4.3%	3.1%	1.1%	**3.1%**	6.6%	4.1%	-3.4%	**10.0%**	5.4%	3.6%	-1.1%	**6.6%**	**-0.54**
	(1.22)	(0.92)	(0.35)	**(1.22)**	(1.83)	(1.28)	(-0.85)	**(2.82)**	(1.68)	(1.12)	(-0.33)	**(4.29)**	
	17.1%	16.6%	16.1%	**12.6%**	17.5%	15.8%	19.5%	**17.2%**	15.8%	15.9%	16.5%	**7.5%**	
Continential Europe 02/1988-10/2008 (average #securities = 1,096, minimum #securities = 599)													
	10.5%	5.9%	6.3%	**4.2%**	10.8%	5.4%	0.6%	**10.3%**	10.4%	5.4%	3.1%	**7.3%**	**-0.51**
	(2.49)	(1.49)	(1.46)	**(1.43)**	(2.45)	(1.41)	(0.12)	**(2.71)**	(2.53)	(1.37)	(0.70)	**(4.25)**	
	19.1%	18.0%	19.6%	**13.3%**	19.6%	17.1%	21.5%	**16.8%**	18.3%	17.5%	19.6%	**7.6%**	
Japan 01/1985-10/2008 (average #securities = 947, minimum #securities = 516)													
	6.2%	2.5%	-4.4%	**10.6%**	1.7%	0.6%	-2.3%	**4.0%**	4.0%	1.5%	-3.3%	**7.3%**	**-0.63**
	(1.44)	(0.65)	(-1.02)	**(3.15)**	(0.40)	(0.14)	(-0.47)	**(0.96)**	(1.02)	(0.40)	(-0.79)	**(4.42)**	
	21.1%	19.0%	20.9%	**16.5%**	20.6%	19.3%	23.4%	**20.1%**	18.9%	18.9%	20.7%	**8.1%**	
Panel B: Non-Stock Selection													
Equity country indices 01/1975-10/2008 (average #securities = 18, minimum #securities = 8)													
mean	8.9%	5.6%	4.8%	**4.2%**	9.1%	7.0%	4.8%	**4.3%**	9.1%	6.5%	5.3%	**3.9%**	**-0.34**
(t-stat)	(3.39)	(2.12)	(1.81)	**(2.49)**	(3.32)	(2.79)	(1.63)	**(1.96)**	(3.56)	(2.62)	(1.91)	**(3.01)**	
stdev	15.3%	15.3%	15.4%	**9.7%**	15.9%	14.6%	17.2%	**12.6%**	14.9%	14.4%	16.0%	**7.5%**	
Currencies 01/1975-10/2008 (average #securities = 10, minimum #securities = 7)													
	3.1%	1.0%	-0.7%	**3.8%**	2.0%	0.6%	-1.2%	**3.2%**	2.4%	0.7%	-1.0%	**3.4%**	**-0.41**
	(2.44)	(0.64)	(-0.42)	**(2.30)**	(1.33)	(0.48)	(-0.81)	**(1.95)**	(2.01)	(0.55)	(-0.78)	**(3.77)**	
	7.1%	8.6%	9.2%	**9.3%**	8.7%	7.8%	8.5%	**9.4%**	6.9%	7.8%	7.7%	**5.2%**	
Country bonds 01/1976-10/2008 (average #securities = 10, minimum #securities = 6)													
	1.8%	1.0%	0.8%	**1.0%**	1.4%	0.7%	1.7%	**-0.3%**	1.6%	0.9%	1.2%	**0.4%**	**-0.05**
	(2.63)	(1.46)	(1.15)	**(1.28)**	(2.27)	(1.26)	(2.32)	**(-0.47)**	(2.70)	(1.46)	(1.90)	**(0.74)**	
	3.9%	4.1%	3.9%	**4.5%**	3.5%	3.3%	4.3%	**4.3%**	3.4%	3.4%	3.6%	**3.0%**	
Commodities 01/1975-10/2008 (average #securities = 22, minimum #securities = 10)													
	6.3%	-0.2%	0.6%	**5.8%**	7.6%	3.4%	-1.7%	**9.3%**	7.0%	1.6%	-0.6%	**7.5%**	**-0.48**
	(2.23)	(-0.09)	(0.16)	**(1.45)**	(2.24)	(1.43)	(-0.59)	**(2.52)**	(2.67)	(0.70)	(-0.22)	**(3.85)**	
	16.5%	15.2%	19.9%	**23.0%**	19.8%	13.9%	16.9%	**21.5%**	15.1%	13.1%	15.5%	**11.4%**	

Table 2:
Alphas with Respect to Global CAPM

Reported are the intercept (alpha), *t*-statistic (in parentheses), and information ratio from a time-series regression of each value, momentum, and 50/50 val/mom combination strategy in each market and asset class from Table 1 on the MSCI world equity index. Results are reported for the constant dollar high minus low return spread, as well as for the high minus middle ("long side") and low minus middle ("short side") portfolios. The contribution to the total long minus short alpha from the long and short sides separately is also reported. Results for the average return series across markets and asset classes (“all” strategies) are also reported where averages are computed using equal volatility weights across markets and asset classes. The last three columns report the correlation between the value and momentum residual returns from the market model within a market/asset class for the high minus low return spread as well as the long and short sides separately.

	Value			**Momentum**			**Combo**			**corr(val,mom)**		
	H - L	H - M	L - M	**H - L**	H - M	L - M	**H - L**	H - M	L - M	**H - L**	H - M	L - M
		long	*short*		*long*	*short*		*long*	*short*		*long*	*short*
Panel A: Stock Selection												
U.S.												
alpha	**4.3%**	1.7%	-2.6%	**6.1%**	4.0%	-2.1%	**5.2%**	2.9%	-2.3%	**-0.55**	-0.35	-0.17
(t-stat)	**(1.85)**	(1.39)	(-1.52)	**(2.22)**	(2.22)	(-1.35)	**(4.28)**	(3.19)	(-2.23)			
info ratio	**0.32**	0.24	-0.26	**0.38**	0.38	-0.23	**0.73**	0.54	-0.38			
% contribution		39.7%	60.3%		65.8%	34.3%		55.1%	45.0%			
U.K.	**2.7%**	0.8%	-1.9%	**10.8%**	2.4%	-8.4%	**6.7%**	1.6%	-5.2%	**-0.53**	-0.09	0.01
	(1.05)	(0.35)	(-0.93)	**(3.05)**	(1.01)	(-3.34)	**(4.39)**	(1.01)	(-3.15)			
	0.22	0.07	-0.19	**0.63**	0.21	-0.69	**0.90**	0.21	-0.65			
		29.3%	70.7%		22.0%	78.0%		23.4%	76.6%			
Continental Europe	**4.2%**	4.5%	0.3%	**10.9%**	5.3%	-5.6%	**7.6%**	4.9%	-2.7%	**-0.52**	-0.15	-0.11
	(1.41)	(2.96)	(0.13)	**(2.92)**	(2.12)	(-2.41)	**(4.53)**	(3.61)	(-1.70)			
	0.31	0.65	0.03	**0.66**	0.48	-0.54	**1.02**	0.81	-0.38			
		107.5%	-7.5%		48.3%	51.7%		64.4%	35.7%			
Japan	**11.3%**	4.0%	-7.3%	**4.2%**	1.1%	-3.0%	**7.7%**	2.6%	-5.2%	**-0.63**	-0.50	-0.18
	(3.35)	(2.00)	(-3.32)	**(1.01)**	(0.42)	(-1.38)	**(4.71)**	(2.09)	(-3.66)			
	0.69	0.41	-0.68	**0.21**	0.09	-0.28	**0.97**	0.43	-0.76			
		35.1%	64.9%		27.3%	72.8%		33.0%	67.0%			
All stock selection	**3.8%**	1.5%	-2.3%	**8.8%**	3.4%	-5.5%	**6.3%**	2.4%	-3.9%	**-0.68**	-0.48	-0.21
(equal vol. weighted)	**(1.63)**	(1.39)	(-1.33)	**(2.75)**	(1.67)	(-3.15)	**(5.32)**	(2.71)	(-3.49)			
	0.36	0.31	-0.29	**0.62**	0.38	-0.71	**1.20**	0.61	-0.79			
		39.6%	60.4%		38.4%	61.6%		38.5%	61.5%			
Panel B: Non-Stock Selection												
Equity country indices	**4.5%**	3.3%	-1.1%	**4.8%**	1.8%	-3.0%	**4.4%**	2.5%	-2.0%	**-0.35**	-0.11	-0.07
	(2.64)	(1.85)	(-0.69)	**(2.21)**	(1.08)	(-1.63)	**(3.49)**	(2.13)	(-1.54)			
	0.46	0.32	-0.12	**0.38**	0.19	-0.28	**0.60**	0.37	-0.27			
		74.3%	25.7%		37.0%	63.0%		56.0%	44.0%			
Currencies	**4.9%**	3.2%	-1.7%	**2.7%**	1.5%	-1.2%	**3.8%**	2.4%	-1.4%	**-0.34**	-0.09	-0.07
	(2.84)	(2.35)	(-1.27)	**(1.56)**	(1.22)	(-0.89)	**(3.84)**	(2.67)	(-1.58)			
	0.54	0.44	-0.24	**0.29**	0.23	-0.17	**0.72**	0.50	-0.30			
		65.1%	34.9%		56.8%	43.2%		62.2%	37.8%			
Country bonds	**0.3%**	0.3%	0.0%	**0.3%**	0.7%	0.5%	**0.3%**	0.5%	0.3%	**-0.12**	0.12	0.07
	(0.48)	(0.52)	(0.03)	**(0.33)**	(1.22)	(0.71)	**(0.61)**	(1.15)	(0.50)			
	0.09	0.10	0.01	**0.06**	0.23	0.13	**0.11**	0.22	0.09			
		106.3%	-6.3%		295.6%	-195.6%		189.4%	-89.4%			
Commodities	**6.4%**	6.7%	0.4%	**8.8%**	3.6%	-5.3%	**7.6%**	5.1%	-2.4%	**-0.45**	-0.11	-0.14
	(1.64)	(2.38)	(0.12)	**(2.43)**	(1.13)	(-1.98)	**(3.87)**	(2.59)	(-1.25)			
	0.28	0.41	0.02	**0.42**	0.20	-0.34	**0.67**	0.45	-0.22			
		106.0%	-6.0%		40.3%	59.7%		67.8%	32.2%			
All non-stock selection	**3.6%**	2.4%	-1.3%	**2.1%**	0.7%	-1.3%	**2.8%**	1.5%	-1.3%	**-0.39**	-0.08	-0.10
(equal vol. weighted)	**(4.29)**	(3.32)	(-1.91)	**(2.13)**	(1.01)	(-1.89)	**(5.68)**	(3.19)	(-2.83)			
	0.82	0.63	-0.37	**0.41**	0.19	-0.36	**1.09**	0.61	-0.54			
		64.8%	35.2%		35.0%	65.1%		54.1%	45.9%			
All asset selection	**3.4%**	2.3%	-1.1%	**3.0%**	0.9%	-2.1%	**3.1%**	1.5%	-1.6%	**-0.48**	-0.22	-0.18
(equal vol. weighted)	**(3.75)**	(3.43)	(-1.74)	**(2.67)**	(1.24)	(-2.79)	**(5.90)**	(3.54)	(-3.54)			
	0.85	0.78	-0.39	**0.62**	0.29	-0.64	**1.36**	0.81	-0.82			
		66.9%	33.1%		29.8%	70.2%		48.9%	51.2%			

Table 3:
Value and Momentum Factors Scaled to Constant Volatility

Reported are the annualized Sharpe ratio of factors based on value, momentum, and a 50/50 combination of value and momentum in various markets and asset classes, where each strategy is scaled to an ex ante 10% annual volatility using an estimated covariance matrix from the past 3 years of monthly returns for stocks and weekly returns for other asset classes. Two sets of factors are reported: the high minus low spread returns from the tretile sorts in Table 1 (scaled to constant volatility) and the dollar-neutral rank-weighted factors described in Section II rescaled to constant volatility. The time-series correlation between the value and momentum factors in each market/asset class are also reported. The "all" strategies are a simple equal-weighted combination of the individual strategies across markets and/or asset classes.

	Value factor	Momentum factor	Combo factor	corr(val,mom)
Panel A: Stock Selection				
U.S.				
H - L	0.04	0.47	0.60	-0.54
RANK	0.20	0.75	1.13	-0.64
U.K.				
H - L	0.09	0.71	0.83	-0.48
RANK	0.27	1.27	1.60	-0.61
Continental Europe				
H - L	0.07	0.71	0.88	-0.53
RANK	0.32	1.12	1.71	-0.53
Japan				
H - L	0.70	0.24	0.99	-0.60
RANK	0.94	0.24	1.19	-0.53
All stock selection				
H - L	**0.36**	**0.62**	**1.09**	**-0.51**
RANK	**0.48**	**1.11**	**1.88**	**-0.62**
Panel B: Non-Stock Selection				
Equity country indices				
H - L	0.28	0.42	0.59	-0.37
RANK	0.35	0.35	0.51	-0.44
Currencies				
H - L	0.35	0.33	0.64	-0.47
RANK	0.37	0.41	0.61	-0.46
Country bonds				
H - L	0.42	0.01	0.32	-0.06
RANK	0.43	0.09	0.31	-0.09
Commodities				
H - L	0.29	0.44	0.66	-0.42
RANK	0.28	0.54	0.74	-0.46
All non-stock selection				
H - L	**0.36**	**0.62**	**1.09**	**-0.51**
RANK	**0.64**	**0.59**	**0.99**	**-0.43**
All asset selection				
H - L	**0.62**	**0.69**	**1.33**	**-0.49**
RANK	**0.64**	**0.95**	**1.93**	**-0.61**

Table 4:
Correlation of Value and Momentum Across Markets and Asset Classes

Reported are the average correlations among all value and momentum strategies across markets and asset classes. Panel A reports the average of the individual correlations, where we first compute the correlation of all individual strategies (e.g., U.S. value with Japan value) and then take the average for each group. Panel B reports the correlations of the averages, where we first take the average return series for a group (e.g., stock selection value, which is an equal-weighted index of all the stock selection value strategies) and then compute the correlation between the two average return series. The diagonal in Panel B is computed as the average correlation between each market's return series and the equal-weighted average of all other return series in other markets. Both panels exclude the correlation of each strategy with itself (e.g., removing the 1's) and exclude the correlation of each strategy with all other strategies within the same market (e.g., exclude U.S. momentum when examining U.S. value's correlation with other strategies). Both monthly and quarterly return correlations are reported for Panels A and B. Panel C breaks down the (quarterly) correlations of the average stock selection series within each of the non-stock selection series and Panel D reports the quarterly correlations of the average returns series for the long and short sides of each strategy separately. An F-test on the joint significance of the individual correlations within each category is performed to test if the correlations are different from zero.

Panel A: Average of individual correlations

	Monthly return correlations				Quarterly return correlations			
	Stock value	Non-stock value	Stock momentum	Non-stock momentum	Stock value	Non-stock value	Stock momentum	Non-stock momentum
Stock value	0.36*	0.05	-0.26*	-0.10*	0.49*	0.03	-0.36*	-0.14*
Non-stock value		0.04	-0.07	-0.06		0.05	-0.06	-0.06
Stock momentum			0.36*	0.20*			0.42*	0.22*
Non-stock momentum				0.15*				0.18*

Panel B: Correlation of average return series

	Monthly return correlations				Quarterly return correlations			
	Stock value	Non-stock value	Stock momentum	Non-stock momentum	Stock value	Non-stock value	Stock momentum	Non-stock momentum
Stock value	0.48*	0.10*	-0.70*	-0.21*	0.61*	0.15	-0.74*	-0.22*
Non-stock value		0.07	-0.23*	-0.39*		0.09	-0.20*	-0.45*
Stock momentum			0.48*	0.45*			0.55*	0.45*
Non-stock momentum				0.23*				0.27*

*indicates significantly different from zero at the 5% level.

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Panel C: Correlation of average stock selection with each non-stock strategy								
	Country index value	Currency value	Country bond value	Commodity value	Country index momentum	Currency momentum	Country bond momentum	Commodity momentum
	Quarterly return correlations							
All stock selection, value	0.19*	0.02	0.10*	0.02	-0.34*	-0.08	-0.10*	-0.05
All stock selection, momentum	-0.32*	-0.07	-0.04	-0.06	0.48*	0.27*	0.22*	0.18*

Panel D: Quarterly correlation of average return series (long and short separately)								
	Stock value	Non-stock value	Stock momentum	Non-stock momentum	Stock value	Non-stock value	Stock momentum	Non-stock momentum
	Long side only				**Short side only**			
Stock value	0.20*	0.13*	-0.43*	-0.18*	0.53*	-0.01	-0.15*	-0.08
Non-stock value		0.04	-0.02	-0.15*		0.13*	0.03	-0.14*
Stock momentum			0.52*	0.22*			0.40*	0.22*
Non-stock momentum				0.01				0.06

*indicates significantly different from zero at the 5% level.

Table 5:
Asset Pricing Tests of Value and Momentum Strategies Everywhere

Panel A reports the coefficient estimates, t-statistics, and R-squares from time-series regressions of each value and momentum portfolio in every market and asset class from Tables 1 and 2 on our three-factor model consisting of the MSCI World Equity index, and the constant volatility rank-weighted average value and momentum factors across all markets and asset classes. Panel B reports the same statistics for the combination portfolio across asset classes and Panel C reports the same statistics for the average returns series across all asset classes. The average absolute alpha is reported at the bottom of each panel. The GRS (1989) *F*-statistic on the joint significance of the alphas is also reported along with its *p*-value. For comparison these aggregate statistics and tests are also performed for the CAPM or market model consisting of the MSCI index as the single factor. Regressions are estimated from monthly returns.

Panel A: Each Individual High, Middle, and Low Value and Momentum Portfolio

		Coefficient estimates					t-statistics					
		AMP 3-factor model				CAPM	**AMP 3-factor model**				CAPM	3-factor
		alpha	MSCI-Rf	Value	Momentum	alpha	alpha	MSCI-Rf	Value	Momentum	alpha	R-square
Value portfolios:												
U.S.	High	0.31%	0.91	0.26	-0.37	0.16%	(1.75)	(22.40)	(2.39)	(-4.11)	(0.94)	0.75
	Middle	0.37%	0.89	0.03	-0.15	0.28%	(2.47)	(26.09)	(0.29)	(-1.96)	(2.14)	0.78
	Low	0.32%	0.97	-0.79	0.10	0.11%	(1.69)	(22.30)	(-6.72)	(1.02)	(0.57)	0.75
U.K.	High	0.03%	0.88	0.37	-0.25	0.00%	(0.13)	(17.33)	(2.68)	(-2.17)	(-0.01)	0.63
	Middle	-0.16%	0.81	0.30	0.15	0.04%	(-0.73)	(15.77)	(2.19)	(1.31)	(0.19)	0.54
	Low	-0.01%	0.76	-0.45	0.16	-0.06%	(-0.05)	(17.45)	(-3.80)	(1.60)	(-0.36)	0.63
Europe	High	0.55%	1.05	0.31	-0.11	0.59%	(2.09)	(17.38)	(1.91)	(-0.80)	(2.53)	0.61
	Middle	0.15%	1.02	0.10	0.04	0.21%	(0.63)	(18.44)	(0.66)	(0.29)	(1.00)	0.62
	Low	0.54%	1.00	-1.00	0.05	0.23%	(2.19)	(17.73)	(-6.56)	(0.41)	(0.92)	0.67
Japan	High	-0.24%	0.90	0.70	0.04	0.02%	(-0.64)	(10.35)	(2.97)	(0.21)	(0.07)	0.35
	Middle	-0.35%	0.92	0.17	-0.01	-0.30%	(-1.12)	(12.88)	(0.88)	(-0.05)	(-1.09)	0.45
	Low	-0.59%	1.00	-0.76	0.01	-0.84%	(-1.77)	(13.22)	(-3.70)	(0.09)	(-2.79)	0.51
Country index	High	-0.02%	1.04	0.32	0.05	0.13%	(-0.11)	(29.53)	(3.31)	(0.69)	(0.93)	0.81
	Middle	0.00%	1.03	-0.05	0.18	0.10%	(0.01)	(27.26)	(-0.50)	(2.10)	(0.67)	0.78
	Low	0.00%	1.02	-0.11	0.06	0.01%	(0.04)	(38.13)	(-1.45)	(1.02)	(0.07)	0.88
Currency	High	0.16%	0.02	0.20	0.07	0.27%	(1.11)	(0.53)	(2.27)	(0.99)	(2.20)	0.02
	Middle	0.11%	0.05	-0.17	0.00	0.05%	(0.60)	(1.25)	(-1.54)	(-0.02)	(0.30)	0.03
	Low	0.09%	0.02	-0.29	-0.13	-0.10%	(0.49)	(0.50)	(-2.60)	(-1.43)	(-0.61)	0.04
Bond	High	0.05%	0.06	0.17	0.13	0.19%	(0.75)	(4.01)	(4.13)	(3.66)	(3.15)	0.10
	Middle	0.04%	0.04	0.10	0.07	0.12%	(0.62)	(2.60)	(2.57)	(2.04)	(2.10)	0.04
	Low	0.03%	0.01	0.05	0.04	0.08%	(0.64)	(1.17)	(1.52)	(1.65)	(1.74)	0.01
Commodity	High	0.29%	0.18	0.49	0.04	0.49%	(0.99)	(2.59)	(2.68)	(0.29)	(1.88)	0.06
	Middle	0.12%	0.13	-0.16	-0.13	-0.01%	(0.41)	(1.90)	(-0.85)	(-0.81)	(-0.05)	0.03
	Low	0.37%	0.11	-0.92	0.02	0.07%	(0.97)	(1.25)	(-3.87)	(0.11)	(0.20)	0.12
Momentum portfolios:												
U.S.	High	0.26%	1.02	-0.54	0.65	0.49%	(1.28)	(22.26)	(-4.32)	(6.36)	(2.16)	0.75
	Middle	0.13%	0.81	0.08	-0.04	0.13%	(0.91)	(24.90)	(0.90)	(-0.54)	(1.07)	0.76
	Low	0.50%	0.94	-0.28	-0.93	-0.20%	(2.26)	(18.66)	(-2.03)	(-8.23)	(-0.87)	0.72
U.K.	High	-0.15%	0.84	-0.18	0.79	0.29%	(-0.73)	(17.26)	(-1.40)	(7.28)	(1.29)	0.63
	Middle	-0.08%	0.80	0.33	0.16	0.14%	(-0.36)	(16.62)	(2.55)	(1.45)	(0.76)	0.56
	Low	0.05%	0.86	-0.29	-0.95	-0.66%	(0.21)	(14.92)	(-1.88)	(-7.38)	(-2.66)	0.64
Europe	High	0.34%	1.04	-0.38	0.73	0.68%	(1.33)	(17.69)	(-2.39)	(5.53)	(2.58)	0.64
	Middle	0.18%	0.93	-0.03	0.12	0.24%	(0.73)	(16.86)	(-0.22)	(0.94)	(1.15)	0.58
	Low	0.48%	1.07	-0.41	-0.89	-0.23%	(1.86)	(17.99)	(-2.52)	(-6.71)	(-0.93)	0.69
Japan	High	-0.57%	0.97	-0.30	0.53	-0.34%	(-1.77)	(13.02)	(-1.49)	(3.16)	(-1.13)	0.47
	Middle	-0.52%	0.91	0.11	-0.06	-0.52%	(-1.63)	(12.41)	(0.53)	(-0.34)	(-1.88)	0.44
	Low	-0.29%	0.93	-0.06	-0.64	-0.72%	(-0.71)	(9.96)	(-0.22)	(-3.07)	(-1.98)	0.39
Country index	High	-0.13%	1.07	0.09	0.55	0.26%	(-0.90)	(32.13)	(1.02)	(7.44)	(1.76)	0.83
	Middle	0.03%	0.96	-0.02	0.06	0.06%	(0.20)	(27.89)	(-0.19)	(0.82)	(0.50)	0.79
	Low	0.09%	1.06	0.09	-0.34	-0.09%	(0.64)	(31.24)	(1.01)	(-4.54)	(-0.67)	0.84
Currency	High	0.13%	0.06	-0.08	0.08	0.15%	(0.73)	(1.64)	(-0.75)	(0.95)	(1.01)	0.03
	Middle	0.10%	0.01	-0.07	0.04	0.10%	(0.65)	(0.17)	(-0.76)	(0.44)	(0.73)	0.01
	Low	0.12%	0.03	-0.14	-0.19	-0.05%	(0.70)	(0.80)	(-1.25)	(-2.15)	(-0.31)	0.03
Bond	High	0.02%	0.04	0.12	0.12	0.13%	(0.28)	(2.84)	(2.90)	(3.56)	(2.32)	0.06
	Middle	0.02%	0.03	0.10	0.06	0.10%	(0.40)	(2.20)	(2.72)	(2.13)	(1.91)	0.04
	Low	0.08%	0.04	0.11	0.05	0.15%	(1.34)	(2.91)	(2.97)	(1.70)	(2.87)	0.06
Commodity	High	0.26%	0.20	-0.11	0.64	0.63%	(0.67)	(2.33)	(-0.48)	(3.27)	(1.82)	0.10
	Middle	0.29%	0.11	-0.12	0.00	0.25%	(1.06)	(1.72)	(-0.69)	(-0.02)	(1.04)	0.02
	Low	0.18%	0.10	-0.31	-0.62	-0.32%	(0.60)	(1.43)	(-1.61)	(-3.88)	(-1.14)	0.10
avg. |alpha|		0.13%				0.32%						
GRS *F*-stat (*p*-value)		1.08	(0.348)			1.89	(0.001)					

		Coefficient estimates					t-statistics					
		AMP 3-factor model				CAPM	AMP 3-factor model				CAPM	3-factor
		alpha	MSCI-Rf	Value	Momentum	alpha	alpha	MSCI-Rf	Value	Momentum	alpha	R-square
Panel B: Each Individual High, Middle, and Low Combination Portfolio												
Combination portfolios:												
U.S.	High	0.23%	0.96	-0.03	0.10	0.33%	(1.49)	(28.24)	(-0.69)	(1.94)	(2.37)	0.78
	Middle	0.19%	0.86	0.05	-0.01	0.21%	(1.41)	(28.78)	(1.04)	(-0.17)	(1.73)	0.79
	Low	0.18%	1.01	-0.14	-0.13	-0.04%	(0.97)	(24.95)	(-2.39)	(-2.18)	(-0.26)	0.75
U.K.	High	-0.06%	0.84	0.06	0.16	0.14%	(-0.33)	(20.79)	(0.98)	(2.56)	(0.88)	0.65
	Middle	-0.04%	0.79	0.13	0.06	0.09%	(-0.20)	(17.38)	(1.97)	(0.83)	(0.49)	0.57
	Low	-0.20%	0.86	-0.04	-0.13	-0.36%	(-1.01)	(20.11)	(-0.64)	(-2.01)	(-2.11)	0.66
Europe	High	0.46%	1.02	-0.08	0.20	0.63%	(1.92)	(19.66)	(-1.01)	(2.48)	(2.97)	0.64
	Middle	0.20%	0.96	-0.06	0.05	0.22%	(0.84)	(18.83)	(-0.82)	(0.70)	(1.10)	0.62
	Low	0.22%	1.09	-0.23	-0.10	0.00%	(0.92)	(20.69)	(-2.96)	(-1.20)	(-0.01)	0.68
Japan	High	-0.01%	0.87	-0.07	-0.10	-0.16%	(-0.04)	(12.53)	(-0.74)	(-0.93)	(-0.57)	0.43
	Middle	-0.04%	0.88	-0.11	-0.28	-0.41%	(-0.13)	(12.98)	(-1.11)	(-2.77)	(-1.51)	0.46
	Low	-0.18%	0.96	-0.30	-0.41	-0.78%	(-0.52)	(13.02)	(-2.77)	(-3.63)	(-2.59)	0.48
Country index	High	-0.09%	1.04	0.13	0.19	0.19%	(-0.76)	(38.95)	(3.38)	(4.82)	(1.73)	0.87
	Middle	-0.05%	0.99	0.00	0.12	0.08%	(-0.39)	(32.87)	(0.06)	(2.63)	(0.66)	0.83
	Low	-0.03%	1.06	0.05	-0.04	-0.04%	(-0.25)	(44.72)	(1.53)	(-1.10)	(-0.46)	0.90
Currency	High	0.19%	0.03	-0.01	0.02	0.21%	(1.43)	(1.01)	(-0.31)	(0.56)	(1.82)	0.01
	Middle	0.16%	0.02	-0.11	-0.02	0.07%	(0.97)	(0.62)	(-2.20)	(-0.40)	(0.52)	0.03
	Low	0.18%	0.03	-0.15	-0.15	-0.07%	(1.13)	(0.86)	(-3.08)	(-2.92)	(-0.52)	0.06
Bond	High	0.04%	0.04	0.08	0.07	0.16%	(0.70)	(3.13)	(3.80)	(3.46)	(2.90)	0.08
	Middle	0.07%	0.03	0.04	0.02	0.11%	(1.13)	(1.96)	(2.20)	(0.89)	(2.07)	0.03
	Low	0.08%	0.02	0.03	0.01	0.11%	(1.56)	(1.85)	(2.11)	(0.84)	(2.53)	0.03
Commodity	High	0.13%	0.19	0.18	0.31	0.56%	(0.44)	(2.89)	(1.88)	(3.20)	(2.17)	0.06
	Middle	0.11%	0.13	-0.03	0.02	0.12%	(0.41)	(2.36)	(-0.41)	(0.29)	(0.52)	0.03
	Low	0.39%	0.11	-0.39	-0.28	-0.12%	(1.32)	(1.77)	(-4.11)	(-2.89)	(-0.47)	0.10
avg. |alpha|		0.18%				0.29%						
GRS *F*-stat (*p*-value)		0.97	(0.512)			2.87	(0.000)					
Panel C: Average Across All Asset Classes High, Middle, and Low Value, Momentum, and Combination Portfolios												
Value portfolios:												
All assets	High	0.11%	0.82	0.30	0.06	0.36%	(0.94)	(30.80)	(7.17)	(1.41)	(3.10)	0.71
	Middle	-0.03%	0.79	-0.05	0.11	0.04%	(-0.21)	(27.07)	(-1.08)	(2.53)	(0.37)	0.66
	Low	0.17%	0.69	-0.44	0.02	-0.09%	(1.52)	(28.15)	(-11.50)	(0.48)	(-0.77)	0.73
Momentum portfolios:												
All assets	High	0.06%	0.75	-0.08	0.46	0.43%	(0.52)	(29.73)	(-1.99)	(12.04)	(3.30)	0.75
	Middle	0.19%	0.79	-0.06	0.02	0.17%	(1.46)	(28.10)	(-1.35)	(0.53)	(1.51)	0.67
	Low	0.04%	0.80	-0.05	-0.36	-0.33%	(0.30)	(30.51)	(-1.17)	(-9.03)	(-2.75)	0.73
avg. |alpha|		0.12%				0.28%						
GRS *F*-stat (*p*-value)		1.12	(0.352)			11.81	(0.000)					
50/50 Combination portfolios:												
All assets	High	0.11%	0.83	0.14	0.29	0.47%	(0.88)	(31.41)	(3.35)	(7.37)	(4.14)	0.72
	Middle	0.07%	0.81	-0.05	0.08	0.11%	(0.54)	(28.47)	(-1.20)	(1.88)	(0.96)	0.68
	Low	0.14%	0.78	-0.26	-0.18	-0.20%	(1.19)	(30.58)	(-6.61)	(-4.72)	(-1.84)	0.72
avg. |alpha|		0.11%				0.30%						
GRS *F*-stat (*p*-value)		0.60	(0.617)			19.96	(0.000)					

Table 6:
Macroeconomic and Liquidity Risk Exposures

Reported are results (coefficient estimates and *t*-statistics in parentheses) from time-series regressions of the average value and momentum constant volatility portfolio among all stock selection strategies globally, all non-stock selection strategies, and among all strategies in stock and non-stock selection, where strategies are equal-weighted within each of these groups, on various measures of macroeconomic (Panel A) and liquidity (Panel B) risks. The last two columns of each panel report results for the 50/50 combination of value and momentum as well their return difference. Panel A reports results from multivariate regressions of the value and momentum returns on a measure of global long-run consumption growth, which is the three year future growth rate in per capita nondurable real consumption (quarterly) averaged across the U.S., U.K., Japan, and Continental Europe, a global recession variable, which is a linearly interpolated value between 0 and 1 between peak and troughs (0 = peak, 1 = trough) averaged across the U.S., U.K., Japan, and Continental Europe, an equal weighted average of contemporaneous GDP growth rates across the U.S., U.K., Japan, and Europe, and the MSCI world equity index excess return. The macroeconomic variables are derived from data from NIPA and the NBER in the U.S. and from the Economic Cycle Research Institute outside of the U.S.. Panel B repeats the regressions from Panel A adding a set of liquidity risk measures to the macroeconomic variables. The coefficient estimates on the macroeconomic variables are omitted for brevity in Panel B, which only reports the coefficients on the various liquidity risk measures from separate regressions. The liquidity risk measures are: an equal weighted average of the Treasury-Eurodollar (TED) spread across the U.S., U.K., Europe (Germany) and Japan, the U.S. TED spread, a global average of LIBOR minus term repo rates, the U.S. LIBOR minus term repo rate, the level of the VIX, the returns of a long-short portfolio of passive liquidity exposure, which is the most liquid securities in each region or asset class (top half based on market cap) minus the least liquid securities (bottom half based on market cap), the levels and innovations and factor returns of Pastor and Stambaugh (2003), liquidity measures of Sadka (2006), illiquidity measure of Acharya and Pedersen (2005), growth in quantities of Adrian and Shin (2007), which is the average growth rate in prime broker assets, repurchases, and commercial paper activity, and AAA-Treasury spread from Krishnamurthy and Vissing-Jorgensen (2008). We also construct an illiquidity index, which is the first principal component weighted average of all these variables, and construct another illiquidity index (subset) from only those variables available back to 1975. We examine both the levels and changes in these variables for the regressions below. The intercepts from all regressions are not reported for brevity.

Panel A: Multivariate regression results on macroeconomic variables (01/1975 to 10/2008)

	Global Stock Selection		**All Non-Stock Selection**		**All Asset Selection**			
Dependent variable =	Value	Momentum	Value	Momentum	Value	Momentum	Combo	Val-Mom
Long-run consumption growth	0.054	-0.034	0.016	-0.012	0.036	-0.035	0.008	0.070
	(2.78)	(-1.90)	(0.80)	(-0.86)	(2.16)	(-2.43)	(0.55)	(2.51)
Global recession	-0.014	0.004	0.004	-0.001	-0.006	0.005	-0.003	-0.011
	(-1.60)	(0.61)	(0.71)	(-0.22)	(-0.68)	(0.70)	(-0.56)	(-0.72)
Global GDP growth	(-0.07)	(0.61)	(-0.60)	(0.13)	(-0.63)	(0.30)	(-0.15)	(-0.93)
	(-0.18)	(1.84)	(-1.98)	(0.39)	(-1.51)	(0.75)	(-0.48)	(-1.20)
MSCI - rf	-0.141	0.007	0.069	-0.013	-0.077	0.000	-0.123	-0.077
	(-1.82)	(0.08)	(1.70)	(-0.18)	(-1.20)	(0.00)	(-1.33)	(-0.54)
R-square	4.7%	1.2%	2.1%	0.2%	2.1%	0.9%	2.5%	1.5%

Panel B: Liquidity risk measures

	All Asset Selection (full sample)			
Dependent variable =	Value	Momentum	Combo	Val-Mom
Global TED spread	-0.056	0.059	0.002	-0.115
01/1990	(-2.98)	(5.51)	(0.26)	(-4.17)
US TED spread	-0.023	0.021	-0.001	-0.044
01/1990	(-3.13)	(4.59)	(-0.20)	(-4.48)
Global Libor - term repo	-0.027	0.046	0.010	-0.073
01/1996	(-1.68)	(2.94)	(1.67)	(-2.48)
US Libor - term repo	-0.022	0.022	0.000	-0.044
01/1996	(-1.75)	(1.91)	(0.09)	(-1.88)
VIX	-0.018	-0.058	-0.038	0.040
01/1986	(-0.63)	(-1.69)	(-2.32)	(0.74)
Liquid-illiquid passive returns	-0.102	0.070	-0.016	-0.172
01/1975	(-1.30)	(0.45)	(-0.33)	(-0.76)
Pastor-Stambaugh levels	-0.064	0.106	0.021	-0.170
1/1975-12/2006	(-1.94)	(2.89)	(0.98)	(-3.10)
Pastor-Stambaugh innovations	-0.042	0.095	0.027	-0.137
1/1975-12/2006	(-1.02)	(1.82)	(1.21)	(-1.65)
Sadka transitory	0.329	0.730	0.530	-0.402
3/1/1983-12/2005	(0.54)	(1.14)	(1.23)	(-0.45)
Sadka permanent	-0.698	1.414	0.358	-2.113
3/1/1983-12/2005	(-3.53)	(5.00)	(2.36)	(-5.53)
Acharya-Pedersen illiquidity	0.018	-0.034	-0.008	0.053
1/1/1975-12/2005	(1.78)	(-2.91)	(-1.59)	(2.66)
Pastor-Stambaugh VW factor	-0.194	0.141	-0.026	-0.335
1/1/1975-12/2004	(-3.72)	(2.02)	(-1.33)	(-2.86)
Pastor-Stambaugh EW factor	-0.243	0.235	-0.004	-0.478
1/1/1975-12/2004	(-4.17)	(3.23)	(-0.17)	(-3.86)
Adrian-Shin quantity growth	0.214	-0.016	0.099	0.229
08/1990	(1.94)	(-0.18)	(2.56)	(1.25)
AAA-Treasury yield spread	-0.210	0.123	-0.044	-0.333
01/1975	(-1.47)	(1.42)	(-0.57)	(-1.86)
Illiquidity index	-0.020	0.033	0.006	-0.052
01/1990	(-3.26)	(5.84)	(2.98)	(-4.85)
ΔIlliquidity index	-0.003	0.015	0.006	-0.018
02/1990	(-1.23)	(3.97)	(2.67)	(-3.78)
Illiquidity index (subset)	-0.013	0.016	0.002	-0.029
01/1975	(-1.57)	(1.53)	(0.49)	(-1.62)
Illiquidity index (subset)	-0.016	0.027	0.006	-0.043
01/1990	(-2.64)	(5.36)	(2.99)	(-4.15)

Table 7:
Dynamics of Value and Momentum

Reported are Sharpe ratios and correlations among the value, momentum, and 50/50 value/momentum combination strategies during different environments. We report the Sharpe ratio and correlations among the strategies prior to and after August, 1998, for the top and bottom half of observations based on our illiquidity index series both pre- and post-August,1998, for the 20% worst and best months of MSCI World Equity index monthly excess returns, and for the top and bottom 20% of *absolute returns* on our all asset selection value and momentum factor returns. Panel A reports results on average for the stock selection strategies globally and Panel B for the non-stock selection strategies.

	Sharpe ratios			Average correlations, ρ		
	Value	Momentum	Combo	ρ(val,val)	ρ(mom,mom)	ρ(val,mom)
Panel A: Stock selection strategies						
pre-08/1998	0.51	1.46	2.51	0.32	0.35	-0.65
post-08/1998	0.68	0.70	1.47	0.52	0.50	-0.52
Illiquid pre-08/1998	0.39	1.94	2.92	0.34	0.37	-0.65
Liquid pre-08/1998	0.84	0.60	1.63	0.31	0.33	-0.69
Illiquid post-08/1998	0.50	1.20	1.72	0.53	0.50	-0.46
Liquid post-08/1998	0.98	-0.21	0.95	0.51	0.50	-0.61
Worst 20% MSCI returns	1.70	1.69	2.26	0.37	0.44	0.11
Best 20% MSCI returns	0.47	0.20	1.25	0.44	0.50	-0.86
Top 20% value abs(returns)	1.02	0.17	1.45	0.63	0.59	-0.65
Bottom 20% value abs(returns)	-0.30	2.55	2.75	-0.11	0.25	-0.09
Top 20% momentum abs(returns)	0.55	0.96	1.69	0.60	0.57	-0.55
Bottom 20% momentum abs(returns)	1.53	0.57	1.81	0.22	-0.07	-0.19
Panel B: Non-stock selection strategies						
pre-08/1998	0.85	0.60	1.34	0.19	0.28	-0.43
post-08/1998	0.07	0.44	0.63	0.17	0.28	-0.65
Illiquid pre-08/1998	0.79	0.69	1.31	0.21	0.32	-0.37
Liquid pre-08/1998	0.91	0.52	1.36	0.18	0.25	-0.47
Illiquid post-08/1998	-0.17	0.74	0.67	0.16	0.28	-0.58
Liquid post-08/1998	0.49	-0.11	0.53	0.21	0.26	-0.75
Worst 20% MSCI returns	1.83	-0.38	1.11	0.14	0.34	-0.38
Best 20% MSCI returns	0.06	0.40	0.50	0.23	0.30	-0.51
Top 20% value abs(returns)	1.16	-0.15	1.43	0.28	0.30	-0.71
Bottom 20% value abs(returns)	0.50	0.61	0.69	-0.17	0.29	-0.10
Top 20% momentum abs(returns)	0.32	0.51	0.98	0.19	0.40	-0.67
Bottom 20% momentum abs(returns)	0.75	-0.36	0.68	0.20	-0.13	-0.08

Table 8:
Seasonal Patterns to Value and Momentum Performance and Correlation

Reported are annualized Sharpe ratios of the value, momentum, and value/momentum combination strategies across markets and asset classes in the months of January and the other months of the year separately. The last two columns report the correlation between value and momentum within each market and asset class in January and non-January months. Panel A reports results for the global stock selection strategies and Panel B reports results for the non-stock selection strategies, along with the average of all strategies within and across groups. Panel C reports the average individual correlations (from monthly returns) across asset classes and markets in January and non-January months.

	Annualized Sharpe ratio							
	Value		Momentum		Combo		Cor(val,mom)	
	Jan.	Feb.-Dec.	Jan.	Feb.-Dec.	Jan.	Feb.-Dec.	Jan.	Feb.-Dec.
Panel A: Stock Selection								
U.S.	0.53	0.21	-0.10	0.61	0.22	1.00	-0.67	-0.52
U.K.	-0.57	0.19	1.53	0.86	1.46	1.32	-0.78	-0.60
Continental Europe	0.65	0.48	1.41	0.95	2.90	1.51	-0.42	-0.45
Japan	0.42	0.85	0.96	0.20	1.83	1.20	-0.70	-0.60
Global stock selection	**0.31**	**0.58**	**0.96**	**1.04**	**1.63**	**1.64**	**-0.58**	**-0.56**
Panel B: Non-Stock Selection								
Equity country selection	0.85	0.15	1.38	0.23	2.21	0.38	-0.55	-0.42
Currency selection	0.09	0.53	0.11	0.27	0.12	0.74	-0.05	-0.45
Bond country selection	0.65	0.59	-0.05	0.07	0.41	0.47	-0.08	-0.02
Commodity selection	-0.06	0.19	-0.08	0.58	-0.15	0.74	-0.50	-0.51
All non-stock selection	**0.44**	**0.43**	**0.54**	**0.59**	**0.96**	**1.03**	**-0.31**	**-0.52**
All asset selection	**0.39**	**0.60**	**0.98**	**0.94**	**1.83**	**1.94**	**-0.70**	**-0.61**

Panel C: Correlation of Average Return Series								
	Monthly return correlations in January				Monthly return correlations Feb.-Dec.			
	Stock selection, value	Non-stock selection, value	Stock selection, momentum	Non-stock selection, momentum	Stock selection, value	Non-stock selection, value	Stock selection, momentum	Non-stock selection, momentum
Stock selection, value	0.38	0.45	-0.67	-0.53	0.44	0.03	-0.60	-0.18
Non-stock selection, value		0.13	-0.34	-0.50		0.19	-0.12	-0.48
Stock selection, momentum			0.28	0.58			0.44	0.32
Non-stock selection, momentum				0.19				0.28