The Devil in HML's Details

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Abstract

This paper challenges the standard method for measuring "value" used in academic work on factor pricing and behavioral finance. The standard method calculates book-to-price (B/P) at portfolio formation using lagged book data, aligns price data using the same lag (ignoring recent price movements), and holds these values constant until the next rebalance. We propose two simple alternatives that use more timely price data while retaining the necessary lag for measuring book. We construct portfolios based on the different measures for a US sample (1950-2011) and an International sample (1983-2011). We show that B/P ratios based on more timely prices better forecast true (unobservable) B/P ratios at fiscal yearend. Value portfolios based on the most timely measures earn statistically significant alphas ranging between 305 and 378 basis point per year against a 5-factor model itself containing the standard measure of value, as well as market, size, momentum and a short term reversal factor.

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Admittedly, few papers are written focusing solely on something as seemingly innocuous and un-exciting as how timely and how frequently you update price (P) in calculations of book-to-price (B/P). But, we also submit that rarely is so innocuous a choice worth 305 basis points annually in the US since 1950 (and 378 bps ex-US since 1983, both from Table VI), of statistically significant alpha against a 5-factor model, itself containing the standard measure of value.

Value investing has long been shown to be efficacious (Rosenberg, Reid, and Lanstein (1995), Fama and French (1992, 1993, 1996), Lakonishok, Shleifer, and Vishny (1994)). So have momentum strategies (Jegadeesh and Titman (1993), Asness (1994)). The extra benefit of doing them together, as they are negatively correlated, has also been explored (Asness, Moskowitz, and Pedersen (2011)).

This paper focuses on a seemingly small detail in the most common construction of value measures, while keeping the standard method of updating book value annually using a minimum 6-month gap. The most common construction, as pioneered by Fama and French (1992), uses book-to-price (B/P) as the proxy for value, and forms a portfolio long high B/P firms and short low B/P firms. A high B/P means a stock is cheap (or high risk to efficient market fans) and high expected return. A low B/P means the opposite. In calculating B/P for each stock and forming a value strategy this method updates value once a year on June 30th using book and price as of the prior yearend's December 31st, and then holds those values constant until rebalanced the following June 30th. In other words, both the book and price data used to form B/P and value portfolios are always between 6 to 18 months old.

Fama and French (1992) made these construction choices to be conservative (making sure book value would actually be available at the time of portfolio construction/rebalance). They then presumably chose to use price from the same date as book based on common sense. If you want book-to-price, it may seem clear you would want book and price from the same date. We will argue that while this was entirely reasonable, particularly in the early days of the literature when, among other things, momentum was not a factor (literally or figuratively); it is now seen to be suboptimal.

Most of this paper focuses on whether we really should lag price in this construction of valuation ratios. Unlike book value we know with certainty that June 30th's price is available on the June 30th rebalance date, so we have a choice of computing valuation ratios based on fiscal yearend or current prices. We show that using more up to date price is superior to the standard method of using prices at fiscal yearend for proxying for true book-to-price, and superior in five-factor model regressions. In other words, the standard method of constructing HML can be improved by using more timely price data.

We next examine whether we should be updating our value measures and portfolios annually as is the standard practice, or more often. We find, again most clearly in context of the momentum strategy (i.e., using a five-factor model), that, updating monthly is superior to updating annually. The upshot is that the industry (academic and practitioner) should move to using value with up-to-date, not lagged price, and move to updating this measure closer to monthly. Again, this all has small importance if not considering value in context of the momentum strategy. But, when considered along with momentum, either for an investor allocating to both value and momentum strategies or a researcher using a 4- or 5-factor model, the advantages of not lagging price in constructing value, and of more frequent updating, are substantial.

For simple intuitive motivation, consider the case of a stock (with a December fiscal yearend date) whose price has fallen 75% between December 31st and the June 30th rebalance date. You are trying to decide if this is a "value" stock on June 30th. Do you think the fall in price of 75% makes it more likely, less likely, or has no effect on whether it should be considered "value"? The answer depends on how much variation in B/P ratios is due to expected returns and how much is due to changes in future book values. Our findings show that this fall in price makes it much more likely to be a true value stock, and a measure that takes this fall in price into consideration, as our proposed method does, is superior to one that ignores it, as the standard method does.

The rest of the paper proceeds as follows. Section I describes our data and construction methodology. Section II examines whether the standard method of constructing book-to-price, or using more timely updated price, does a better job of approximating the true desired unobservable book-to-price. Section III moves on to returns, using multi-factor regressions to examine whether standard or timely HML (including first using annual breakpoints but with updated prices, then going beyond the standard approach of refreshing breakpoints once a year to monthly refreshing) is superior. Section IV briefly considers some practical issues. Section V concludes.

I. Data, Methodology, and Terminology

Data Sources

We obtain stock returns and accounting data from the union of the CRSP tape and the XpressFeed Global database. Our US equity data include all available common stocks on the merged CRSP/XpressFeed data between July 1950 and March 2011. Our global equity data include all available common stocks on the XpressFeed Global database for 19 developed markets. The international data run from January 1983 to March 2011. We assign individual issues to the corresponding market based on the location of the primary exchange. For international companies with securities traded in multiple markets we use the primary trading vehicle identified by XpressFeed. We give summary statistics of our sample in Table I.

To obtain shareholders' equity we use we use Stockholders' Equity (SEQ) but if not available, we use the sum of Common Equity (CEQ) and Preferred Stocks (PSTK). If both SEQ and CEQ are unavailable, we proxy shareholders' equity by Total Assets (AT) minus the sum of Total Liability (LT) and Minority Interest (MIB). To obtain book equity, we subtract from shareholders' equity the preferred stock value (PSTKRV, PSTKL or PSTK depending on availability). Finally, to compute book value per share (B) we divide by common shares outstanding (CSHPRI). If CSHPRI is missing, we compute company-level total shares outstanding by summing issue-level shares (CSHOI) at fiscal yearend for securities with an earnings participation flag in the security pricing file. Following Fama and French (1992) we assume that accounting variables are known with a minimum 6-month gap and align book price of the firm at the end of the firm's fiscal year ending anywhere in calendar year $t-1$ to June of calendar year t. In order to be included in any of our test we require a firm to have a non-negative book price and non-missing price at fiscal yearend as well as in June of calendar year t.

Constructing Value measures

Much of this paper focuses on a seemingly small modification to standard practice that we will argue is not so small in impact. We compute three measures of book-to-price (B/P). The first is the standard approach to calculating book-to-price as pioneered by Fama and French (1992) equal to the book value per share (B) divided by price at fiscal yearend (P_{fye}) both in local currency:

$$bp_t^{annual,lagged} \equiv bp_t^{a,l} = \log(B/P_{fye})$$

Throughout the paper we use lowercase letter to indicated logs: $bp = \log(BP)$. Using logs only matters in tables II and III, as other tests are on sorted returns and taking logs has no effect. We label this measure *annual* (indicated by the superscript *a*) as it is updated once a year, and *lagged* (indicated by the superscript *l*) as upon update it uses the price from 6 to 18 months ago, not the current price[1].

The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price P_t both in local currency:

$$bp_t^{annual,current} \equiv bp_t^{a,c} = \log(B^*/P_t)$$

where $B^* = B \times Adj_t/Adj_{fye}$ and Adj is the cumulative adjustment factor. This alternative measure holds the method of Fama and French (1992) constant save for what date to use for

[1] For firms with fiscal year ending in December this is the same measure as Fama and French (1992). For firms with fiscal year not ending in December, we use prices at the fiscal yearend date while Fama and French (1992) use December prices for all firms thus introducing a slight mismatch. Our results are unchanged if we adopt Fama and French (1992) convention or if we restrict our sample to December fiscal yearend firms.

price. We call this measure *annual* as it is updated once a year (indicated by the superscript a) and *current* since it uses the most recent available price as of the June 30th rebalance date (indicated by the superscript c). Note that "current" refers only to price at time of portfolio formation, not to book value, which is always lagged in all our measures.

An alternative measure to our per share analysis is to compute total book equity (BE) divided by current total market value of equity (ME):

$$bm_t = \log(BE/ME_t)$$

The choice matters when book and price are not aligned since bm is equal to bp minus net issuance between fiscal yearend and portfolio formation date

$$bm_t = bp_t - log\ (S_t^*/\ S_{fye}^*)$$

where S^* is the split-adjusted number of shares outstanding. Since net issuers (repurchasers) tend to have lower (higher) subsequent returns (see for example Daniel and Titman (2006)) using bm will tend to bias our returns, when forming portfolios on $bp_t^{a,c}$, upwards since portfolios based on current bm contain both value and issuance effects. While one can argue that bm is an equally sensible measure to use when computing valuation ratios we prefer to use bp to keep a clean comparison between the different ways of updating prices (the per share and aggregate measures are equivalent when using the standard method of matching the dates for book and price). Thus, our measure avoids variation in valuation ratios due to corporate issuance. Had we chosen to use bm over bp all the results of this paper would be strengthened, thus we chose to report the more conservative findings. Similarly, we focus on ratios computed in local currency to avoid inducing variation due to currency movements between fiscal yearend and portfolio formation[2].

Finally, our last measure is equal to book value per share divided by current price, updated monthly:

$$bp_t^{monthly,current} \equiv bp_t^{m,c} = \log(B^*/P_t)$$

The *monthly* in our naming convention (indicated by the superscript *m*) only applies to price, again our convention for book remains the same as the standard for all measures. This measure, is equal to $bp_t^{a,c}$ in June of each year but it is updated every month using current prices as opposed to being kept constant thorough the year. Through the paper we will maintain this notation convention: the first superscript indicated the refreshing frequency (annual *a* or monthly *m*), the second superscript indicated the lag used to update price (lagged *l* or current *c*).

Figure 1 illustrates the three approaches for a firm with fiscal year ending in December 2000. To summarize each of 3 measures use the same measure of book value (lagged at least 6 months at portfolio formation date then held constant for one year) but differ in the lag used to update price. Note that $bp_t^{a,l}$ is the widely used method in academic finance and we refer to it often as the *standard method*. $bp_t^{a,c}$ is the same measure using price as of June 30th not as of the prior December 31st and $bp_t^{m,c}$ is the same ratio with price updated each month. Finally, the 3 measures are mechanically related:

$$bp_t^{a,c} = bp_t^{a,l} - r_{fye \to t}$$

[2] A minor detail: in a small subset of our international sample the company's reporting currency is different than its security's trading currency. In these cases we convert both book and all prices to USD using FX rates at fiscal yearend, thus keeping the ratio unaffected by exchange rate movements.

$$bp_{t+k}^{m,c} = bp_{t}^{a,c} - r_{t \to t+k}$$

where $r_{t \to s} = \log(1 + R_{t \to s})$ is equal to the total log return between date t and date $s > t$. Hence the choice between the different measures is equivalent to choosing whether we should ignore or include recent returns when building value portfolios. This matters most when combining these portfolios with a momentum or short term reversal portfolios which are themselves direct bets on recent past returns. We'll form value strategies using all three methods for estimating book-to-price. We describe the details of portfolio construction in the next subsection.

Portfolios

Our portfolio construction closely follows Fama and French (1992, 1993, 1996). Our global factors are country neutral. That is, we form one set of portfolios in each country and compute a global factor by weighting each country's portfolio by the country's total (lagged) market capitalization.

The market factor MKT is the value-weighted return on all available stocks minus the one-month Treasury bill rate.

The size and value factors are constructed using 6 value-weighted portfolios formed on size and book-to-market. At the end of June of year t, stocks are assigned to two size-sorted portfolios based on their market capitalization. For the US, the size breakpoint is the median NYSE market equity. For the international sample the size breakpoint is the 80th percentile by country. Since some countries have a small cross section of stocks in the early years of the sample period, for the international sample we use conditional sorts (first sorting on size , then on book-to-price) in order to ensure we have enough securities in each portfolio (the USA sorts are always independent). Portfolios are value-weighted, refreshed every June, and rebalanced every calendar month to maintain value weights. The size factor SMB (Small Minus Big) is the average return on the 3 small portfolios minus the average return on the 3 big portfolios[3]:

$$\text{SMB} = \quad 1/3 \text{ (Small Value + Small Neutral + Small Growth)}$$
$$- 1/3 \text{ (Big Value + Big Neutral + Big Growth)}$$

The value factors HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios:

$$\text{HML} = 1/2 \text{ (Small Value + Big Value)} - 1/2 \text{ (Small Growth + Big Growth)}$$

We construct a version of HML for each annual measure: $\text{HML}^{\text{annual,lagged}} \equiv \text{HML}^{\text{a,l}}$ and $\text{HML}^{\text{annual,current}} \equiv \text{HML}^{\text{a,c}}$. Finally we construct a version of HML for our monthly B/P measure $\text{HML}^{\text{monthly,current}} \equiv \text{HML}^{\text{m,c}}$ in the same manner with the exception that this portfolio is refreshed monthly. Note the terminology: all our portfolios are rebalanced monthly (to keep value weights). "*Refreshed*" refers to the date that value and size breakpoints are updated (once a year in for the annual measures, every month for the monthly measure) not to the rebalancing frequency for value-weighting which is the same for all three[4].

[3] We use the standard annual lagged method to compute SMB. Using either of the alternative methods of computing B/P has a negligible impact on SMB returns and on our main results.

[4] $HML^{a,l}$ corresponds to the standard HML factor used in the literature. From Table IV, over our sample $HML^{a,l}$ returned 4.0% per year with an annualized volatility of 9.3% per year. For comparison, over the common sample period, returns of the HML factor from Ken French's data library were 4.5% per year with 9.5% volatility and the correlation between the two series was 0.95. The small (and statistically insignificant) discrepancy between the two series is due to our choice of using price at fiscal yearend (as opposed to December price for all firms as in Fama and French (1992)) and the fact that our portfolio skips 1 trading day between rebalancing and investment.

The momentum and short term reversal portfolios are constructed in a similar way. We use 6 value-weighted portfolios formed on size and prior returns. The portfolios are the intersections of two portfolios formed on size and three portfolios formed on prior returns. We use one year return (in local currency) skipping the most recent month for momentum (UMD) and (minus) the local currency return in the most recent month for short term reversal (STR):

$$UMD = 1/2\,(\text{Small High} + \text{Big High}) - 1/2(\text{Small Low} + \text{Big Low})$$

$$STR = 1/2\,(\text{Small Low} + \text{Big Low}) - 1/2(\text{Small High} + \text{Big High})$$

Both portfolios are refreshed every calendar month, and rebalanced monthly to maintain value weights.

All portfolio returns are in USD and excess returns are above the US Treasury bill rate. We include delisting returns when available in CRSP[5]. Finally, since some of our variables are computed from closing prices we skip 1 trading day between portfolio formation and investment in all portfolios, both when refreshing the breakpoints and when rebalancing stocks in the portfolio. This serves two purposes: First, it ensures that our portfolios are implementable in that they use only information available at portfolio formation. Second, it avoids mechanic negative autocorrelation in returns induced by bid-ask bounce (which would tend to overstate returns to STR and both $HML^{a,c}$ and $HML^{m,c}$).

[5] Unfortunately, delisting returns are not available for our international sample. If a firm is delisted but the delisting return is missing, we investigate the reason for disappearance. If the delisting is performance-related, we follow Shumway (1997) and assume a -30 percent delisting return. This assumption does not affect any of the results.

What Proxies Best For the True Unobservable Book-to-Price ?

In this section we run a horse race using cross sectional regressions of current book-to-price on lagged book-to-price and highlight the relative forecasting power of the different measures. Imagine you're standing at Dec 31st 2000 and you want to form a value portfolio based on book-to-price. The measure you would like to have is:

$$BP_{as\ of\ Dec\ 2000}^{Unobservable} \equiv BP_t^{a,l} = \text{Book(December 31st 2000) / Price(December 31st 2000)}$$

but, alas, that measure isn't available to you as December 31st 2000's book value is not known until sometime after that date (hence the standard 6 month lag and our "*Unobservable"* superscript). The "t" in $BP_t^{a,l}$ here refers to June 30th 2001 when the standard book-to-price measure will be calculated. In other words, standing at Dec 31st 2000, we'd like to have the standard measure of book-to-price that will be available in six months. But as of December 31st 2000 you do get to observe these two:

$$BP_{t-1}^{a,l} = \text{Book(December 31st 1999) / Price(December 31st 1999)}$$

$$BP_{t-1}^{a,c} = \text{Book(December 31st 1999) / Price(June 30th 2000)}$$

To the extent past valuation ratios predict future valuation ratios, you can use either one or any combination of both to form a *forecast* of $\text{BP}^{\text{U}nobservable}$. Formally, we are going to directly test, with the benefit of hindsight, whether the standard method that aligns price and book, or our proposed method that uses more current prices (thus incorporating recent returns) does a better job of proxying for the unobservable book-to-price we desire. We run Fama and MacBeth (1973) regressions of the unobservable B/P on past lagged B/P plus an error correction term equal to the difference between the two competing measures:

$$bp_t^{a,l} = \gamma_0 + \gamma_1 bp_{t-1}^{a,l} + \gamma_2\left(bp_{t-1}^{a,c} - bp_{t-1}^{a,l}\right) + \epsilon_t$$

Note again that as of December 31st $bp_t^{a,l}$ is unobservable, it will be observable the next June 30th. We are testing which of two observable proxies does a better job as right prior to December 31st.[6]

The cross sectional regressions are run each year for all firms in our universe. The left-hand side is the unobservable "true" book-to-price for which we'd like to get the closest proxy. The coefficient γ_1 has the interpretation of the weight we would put on the standard version of book-to-price used in the literature. The coefficient γ_2 has the interpretation of how much we would then move away from this standard version towards our new version which differs by its more timely less-lagged use of price. With some re-arranging, γ_2 and $\gamma_1 - \gamma_2$ have the interpretation of the linear weights we'd put on the different measures in a linear forecast:

$$\widehat{bp_{t+1}^{a,l}} = \gamma_0 + (\gamma_1 - \gamma_2) bp_t^{a,l} + \gamma_2 bp_t^{a,c}$$

Tables II reports the time-series averages of the cross sectional estimates of γ_1, γ_2, and $\gamma_1 - \gamma_2$ and the corresponding t-statistics of the time-series of point estimates. We also report γ_2/γ_1, interpreted as the fraction of linear forecast attributed to $bp^{a,c}$ (the remainder attributed to the standard method $bp^{a,l}$).

We focus on the All Sample results for the US in the first row of Table II panel A, but report quite a few robustness checks across fiscal year, industry, size, and time. The point

[6] We run annual regression using annual measures in order to put both forecasting variables on equal footing. In practice on December 2000 you also observe Book(December 31st 1999) / Price(November 29th 2000) corresponding to the latest observed monthly book-to-price measure as of December 2000. Regressions using our monthly measure yield even stronger results but we prefer to report results based on the annual measure in order to keep a clean comparison between the two alternatives.

estimate for γ_2 is 0.86, meaning you'd move 86% of the distance from the standard lagged B/P towards our proposed current B/P. The t-statistic on this move is a gigantic 38.9. Alternatively, although we can reject the null hypothesis of no incremental value of lagged B/P versus our proposed current B/P, as measured by $\gamma_1 - \gamma_2$, the effect is negligible (0.05 with a t-statistics or 3.14). The rightmost column gives a more intuitive way of looking at the results: scaled to 100%, you'd base 94% of your linear forecast of the unobservable goal on our proposed current B/P and only 6% on the standard method. All robustness checks are reasonably close to the All Sample results. Essentially, in a simple evaluation of what measure best proxies for the clear but unobtainable goal (true timely book-to-price) our proposed change is a clear winner.

We next extend our results globally in Table II Panel B. The international results are strikingly consistent with our US results and highly supportive of our proposed method of computing B/Ps over the standard specification (although based on a shorter sample). The point estimate of for γ_2 range across countries from 0.69 to 1.02 meaning that scaled to 100%, in our international sample you'd base between 75% and 110% of your forecast of the unobservable goal on our more current method. For the full sample we can safely reject the null hypothesis of no incremental power of the current method versus the standard with t-statistics north of 37 and the significance levels for the other specifications are in line with the US results.[7]

We report a series of robustness checks (controlling for size, different time periods, separating firms with December and non-December fiscal yearend, adding industry fixed effects

[7] We also run a slightly different version of these forecasting regressions: we run Fama-MacBeth (1973) regressions on current B/P as of June of each year on past B/Ps plus an error correction term. These regressions have a slightly different interpretation: suppose you stand on June 29th right prior to building a value portfolio with observable variables, what's your best guess of the stock's valuation ratio that you'll be able to observe tomorrow? Results are almost identical to those of Table II: recent returns matters: a measure that ignores recent returns (as the standard method does) has lower forecasting power for current valuation ratios than a measure that incorporates most recent price movements. For brevity, we do not report these results.

and running separate regressions for each country). All the results tell a consistent story: recent returns matters, i.e. to proxy for the unobservable true book-to-price, our new more timely measure is superior to the standard measure that unnecessarily lags price to match the necessary lag in book.

Table III provides some intuition behind why standard B/P is a worse proxy for the true unobservable B/P. In Table III we run Fama MacBeth (1973) regressions of log changes in book price per share on log returns over the past three years (the first of which is contemporaneous, the other two being lagged)

$$\Delta b^{*}_{t-12\to t} = \theta_0 + \theta_1 r_{t-12\to t} + \theta_2 r_{t-24\to t-12} + \theta_3 r_{t-36\to t-12} + \epsilon_t$$

where lowercase indicates logs, * indicates that the quantity is adjusted for splits between the two dates and lags are in months. In other words, we study how much, on average, a given change in price translates into a change in book value. Looking at the All Sample results, shows that in a given year on average somewhere around 22% of a move in price in the prior 12 months is reflected in a contemporaneous change in book price. Eventually, including all three lags, this total rises to the mid-40s. Looking at the international sample we find similar results, with the three year totals almost hitting 50%[8]. While there is certainly variance across size, time and geography internationally, all the results in Table III tell a consistent story, current and prior returns predict future changes in book value, but in an attenuated fashion (coefficients well below 100%).

How does this provide intuition for our results from Table II? Depending on whether you're interested in one or three plus year impacts, between 20% and 40% of movements in price

[8] For brevity we do not report results for lags over three years as the coefficients tend to be insignificant.

seem to be currently or eventually reflected in book value. Therefore, if you were told about a large move in price, your first guess would *not* be that true book-to-price was unaffected. Your first guess would be that, for instance, if price fell sharply, true book-to-price would rise sharply (though not quite to the full extent of the price move). Thus, the standard method of measuring book-to-price, that unnecessarily lags price to match the necessary lag in book, is not our best guess of true book-to-price. Our best guess of true book-to-price would use most of any observed price move even if not aligned with the latest observable book value.

II. Does the Standard or New More Timely B/P Form a Better Value Portfolio?

Results:Univariate Returns and Alphas Controlling for Selected Factors

We have shown, with convincing statistical power, that our proposed more timely measure is a better proxy for true "value" than the traditional measure, using any intuitive sense of what we mean by "value". If the goal is value investing, one could advocate using our more timely proxy on first principles. The rest of this paper can be viewed as trying to see how much this change really matters. We build up to our result step by step but the impatient reader can jump directly to the next section.

Table IV examines the univariate returns to the standard HML strategy and our proposed more timely strategies (and also includes momentum). We focus the discussion on the US full-sample results, as it is our longest time series and since the results for the international sample and the break-up into subperiods are very similar, but of course serve as a useful robustness check.

Well, our newer measures do worse. The full-period Sharpe ratios of our annual-current and monthly-current HML are 0.35 and 0.27 while HML constructed using the standard method has a Sharpe ratio of 0.43. So, while one can prefer our new measures on reasonable grounds of fidelity to value investing, you would have given up return and Sharpe ratio by doing so. Thankfully, we are not quite done yet.

Table V goes beyond the univariate results by running time-series regression of both annual HMLs on a set of explanatory factors. Column (1) and (2) regress each competing HML strategy on the market (MKT), a size factor (SMB) and a short term reversal factor (STR)[9]. Examining the intercepts we find that little is changed from the univariate results. As prior research has shown, the value factors have strong economic and statistical power net of the market, size and reversal factors. But, again, the standard 6-18 month lagged value measure in column (1) is statistically and economically stronger than our more timely value measure used in column (2). Column (3) and (4) add the competing value factor to the right-hand-side of the regression. The intercept is now a direct test of whether the left-hand-side value factor adds return net of exposure to the market, size, reversal and competing value factor. Viewed this way the standard highly lagged approach to value adds 169 basis points of statistically significant annualized return vs. the others, while the newer more up-to-date value factor subtracts 96 basis points without quite breaching traditional statistical significance levels.

So, at this point, things look pretty bad, in the practical world of generating return, for our "better" more timely value measure. Let us re-examine Table IV taking note of the "correlation

[9] See Jegadeesh (1990). We augment the usual 4-factor model with a reversal factor (STR) since our new value measures are computed using current price, therefore our value portfolios are likely to purchase (sell) stocks that have gone down (up) in price over the past month. Not accounting for this factor exposure tends to make our results stronger. We prefer to report the more conservative results and use a STR factor in all our return tests. To the extent the STR strategy is achievable, and recall we are using value-weight portfolios and lagging a day, we are understating intercepts and the general strength of our results.

with UMD" entries. For the US, the standard value portfolio $HML^{a,l}$ is -0.13 correlated with UMD over the full sample, but for our more timely $HML^{a,c}$ this correlation rises in magnitude to -0.39 (again similar results hold for the sub periods or outside the US). The US UMD strategy has a 0.63 Sharpe ratio over the full period. Having a -0.39 correlation with such a successful strategy is quite a drag on $HML^{a,c}$ viewed alone. Table V columns (5) and (6) test this impact formally by adding UMD to the right-hand-side of the regressions. While both $HML^{a,l}$and $HML^{a,c}$ load negatively on UMD, consistent with their univariate correlations, the loading of our more timely $HML^{a,c}$ is far more negative. Of course, loading negatively on a positive mean factor like UMD will increase the economic and statistical significance of the intercept. The intercept is now interpreted as the return net of this additional factor exposure. Effectively it's more impressive to make money while negatively loading on a positive mean factor like UMD. Similarly if the loading was positive the intercept would be penalized. Finally, we see a reversal of fortunes. The intercept for $HML^{a,c}$ is now 92 basis points higher than that of $HML^{a,l}$ with a larger t-statistics associated to it.

Results for our International sample are reported in column (7) to (12) and they are consistent with the US results: Stand-alone, value portfolio constructed using the standard method have higher returns but lose this advantage once you hedge out momentum exposure.

Results: Value controlling for the Full Set of Factors and for the "Other" Value

Table VI reports our most central return results: we add the full set of regressors to the right hand side and test whether each version of HML adds value in the presence of the other competing HML, and the other standard Fama and French (1993) and Carhart factors (1997) (market, size, momentum plus an added short term reversal factor). As before we discuss results for the US but also report tests for our International sample, as well for the full set of countries aggregated in a global portfolio[10]. Note that our international sample is quite short (starting in 1983 for Canada but the full set of countries it not available until the early 1990s), since we are estimating expected returns we tend to emphasize US and Global results that are based on a longer time series.

Column (1) and (2) reports results for our two annual measures tested against each other. When fully controlling for factor exposure, the standard $HML^{a,l}$ approach subtracts -58 bps annually (but statistically insignificantly) while conversely our more timely $HML^{a,c}$ factor adds 143 basis points (and does so statistically significantly) over the traditional Fama-French-Carhart 4-factor model augmented with short term reversal (including short-term reversal hurts the intercept for our more timely factor, and helps the intercept for the standard measure). In other words, while on a standalone univariate basis, the standard approach to calculating HML is mildly better than our newer approach, in the presence of the other factors, particularly of course momentum, our newer more timely approach is clearly better than the standard lagged approach.

In section II we showed that without examining returns, but only focusing on proxying for true ex post book-to-price, our more timely measure is superior. In this section we add that in the presence of momentum our more timely measure of value also outperforms the more standard lagged measure. This outperformance is about to get more serious.

[10] As shown in Table I, this global portfolio is on average 40% US and 60% international stocks, with less weight in the US in the most in the recent period.

Columns (3) and (4) show results for our monthly updated measure. Again we are looking at the standard HML measure, but unlike columns (1) and (2), in columns (3) and (4) we put it in competition with our monthly updated measure. In column (3) we see a strong positive loading on UMD and a negative intercept, -161 bps a year precisely, with a t-statistics of 2.92. In other words, the standard measure economically and statistically subtracts return given 5-factor exposure including our monthly measure of value. The results are more dramatic going the other way. Regressing our very timely $HML^{m,c}$ on MKT, SMB, UMD, and standard $HML^{a,l}$ we see the large negative loading on UMD that we've come to expect (as our timely measure is far more negatively correlated with momentum than the standard measure), and a very significant positive intercept of 305 bps a year with a +5.92 t-statistic. Essentially, in the presence of MKT, SMB, standard value, and by far most importantly, UMD, our most timely measure of value is clearly superior.

The International and Global results are consistent with the US. Using a monthly updated version of value with current prices adds between 336 and 378 basis points' worth of alpha even after controlling for the standard measure of value. Using our annual, but six months more timely HML leads to statistically significant more returns than the standard measure in all but the International portfolio (column 6) where we are unable to reject the null hypothesis of no value added (again, column (8) still shows very significant results for the international sample when the monthly HML is employed). Figure 2 summarizes the results, by plotting the global cumulative alphas from Table VI, column (10), (11) and (12). Cumulative alphas are the monthly alpha each month plus the error term from the regression. The figure shows the large advantage from updating price when constructing value portfolios and combining with other known factors. The figure also shows that while gains to our new factors were only small (but the right sign) pre-1970, they have been steady and not period specific post-1970.

Table VII reports a battery of robustness checks. We run time series regression of each value measure on the full set of factors, including the “other” measure of value. For each sample (US, International and Global) we report results separately for firms with fiscal year ending and not ending in December, we split the sample into large and small firms (based on the NYSE median market cap for the US sample or the top 80th percentile by country for the International sample) and we report results for different time periods. Finally in Figure 3 we plot the t-statistics of the 5-factor alphas (for both our more timely but still annual measure and our monthly measure each vs. the standard measure) in each country in our sample. The robustness checks are consistent with our main results: value portfolio constructed using more current prices earn higher abnormal returns even after controlling for the “other” lagged standard value measure. Averaging all numbers in Table VII , using an annual or monthly version of value with current prices adds around 121 and 346 basis points’ worth of 5-factor alphas. The monthly version in particularly is quite robust to any division of sample (by decade, size, fiscal year end, and geography) we can throw at it.

Intuition: Why does a value portfolio based on more current prices do so much better when combined with momentum and other factors?

The short answer is that failing to update prices when computing book-to-price ratios is actually an indirect inefficient way to load on momentum in your portfolio. The longer answer is that, as shown early, the standard lagged $HML^{a,l}$ uses prices lagged anywhere from 6 months upon portfolio formation on June 30th, and up to 18 months right before the same portfolio formation the next year. On the other hand, $HML^{a,c}$ uses price with a lag from 0 to 12 months. Right after rebalance on June 30th standard $HML^{a,l}$ is constructed to use prices from 6 months ago, in essence artificially avoiding price movements that make up ½ of UMD, and greatly reducing negative correlation to UMD. We say "artificially" as UMD is a natural measure of momentum, and as we've shown earlier, $HML^{a,l}$ is a less natural measure of value than $HML^{a,c}$. Again, if price has fallen sharply in the last 6 months it is natural and empirically clear that the stock usually is cheaper (more attractive on value measures). Also, even more naturally, if the price has fallen sharply in the last 6 months momentum has almost always worsened. In other words, skipping 6 months as done in the standard $HML^{a,l}$ unnaturally reduces the *natural* negative correlation of value and momentum. On the other hand, as of June 30th, our more timely value measure $HML^{a,c}$ fully accounts for the negative correlation with momentum including the impact of the prior 6 months.

Now consider 6 months later on Jan 1st. The lag in price implied in $HML^{a,l}$ is now 12 months. It now has no overlap with the period over which we measure and construct UMD, and the natural negative correlation between whether a stock is cheap and whether it has good momentum is mostly lost. Our proposed more timely $HML^{a,c}$ has also lost half its overlap. You cannot fully preserve this natural negative correlation in any value factor rebalanced only annually when momentum is rebalanced monthly. Finally, right before the next rebalance period (say in late June), both are reduced to no overlap with momentum.

The standard value factor $HML^{a,l}$ was originally lagged to make sure book was available, with price lagged matter-of-factly to match book. Correlation or overlap with UMD was not a decision factor at that point as the research on momentum was still to come. From today's perspective we could argue the lag in price was unjustified on first principles (again, when price falls, book falls but not nearly as much, and our best guess is the stock has cheapened). But, if momentum were never discovered, the choice would have been innocuous. As it is, the choice is anything but innocuous. Effectively, the standard $HML^{a,l}$ removes some of the negative correlation of value and momentum in a rather haphazard way (by having the construct of $HML^{a,l}$ overlap with UMD by 6 months at portfolio formation and having that fall to zero over the next 6 months). It looks like a portfolio of a more timely HML plus UMD plus noise. In fact, running this regression, for both our candidates for more timely HML, directly, without the other factors, results in:

$$HML^{a,l} = \underset{(-1.86)}{-0.77} + \underset{(74.64)}{0.96} \times HML^{a,c} + \underset{(19.18)}{0.18} \times UMD \qquad R2 = 89\%$$

$$HML^{a,l} = \underset{(-4.59)}{-2.51} + \underset{(55.20)}{0.95} \times HML^{m,c} + \underset{(29.30)}{0.42} \times UMD \qquad R2 = 89\%$$

Effectively, the first regression, of course, loads very positively on the highly correlated (but more timely) $HML^{a,c}$ and also very positively on UMD, really in a statistical attempt to reduce the highly negative correlation of our more timely $HML^{a,c}$ with UMD. If we accept, as our earlier evidence showed, that $HML^{a,c}$ is a better, purer proxy for true value, then we can view the standard $HML^{a,l}$ as a portfolio of more accurately measured value, momentum, and noise. Furthermore, examining the intercept, it's a somewhat inferior portfolio (a little or a lot depending on which current method you use, annual or monthly). We can only suppose this inferiority (and clear superiority of $HML^{a,c}$ and $HML^{m,c}$) comes from the fact that ignoring 6-18 months of returns is not the best way to account for momentum. It is not the same as the clean addition of a momentum factor.

Intuition: Comparing our own proposed two measures now, why does a portfolio refreshed monthly, based on current prices do so much better (in 5-factor tests) than refreshing annually?

Even if you update price in June, since momentum is a monthly refreshed factor, failing to update prices in the subsequent months is not an efficient way to load on momentum in your portfolio. Consider Figure 4, drawn for our global sample. Here we regress $HML^{a,c}$ (we do not examine the standard $HML^{a,l}$ as only 6 of the months have any overlap with the momentum measurement period at all) separately on UMD for each calendar month. The far left is July (as that is the month immediately after HML is rebalanced with June 30th price data). The far right is June (when price data starts at 11 and ends at 12 months old). We graph the regression coefficients. The pattern is clear. Immediately after HML rebalances on June 30th the correlation with momentum is clearly negative. But, that negative correlation is also clearly moving towards zero as the distance from rebalance grows (viewed as a regression with dummies for the months, the R-squared is 52%). In other words, the correlation of $HML^{a,l}$ and UMD is not very stable intra-year. If one is combining value with momentum, and using an annually rebalanced value measure, even one like our $HML^{a,c}$ which we argue is superior to the standard method $HML^{a,l}$, along with a monthly rebalanced momentum factor, it is still an odd and suboptimal beast. On the other hand, updating prices monthly keeps the negative exposure of HML to momentum constant.

While the general intuition is useful, and we have already shown the result is strong and robust over time and geography, it is still useful to examine some specific examples.

Example 1 –The 2009 Momentum "Crash"

After being battered by the financial crisis, markets sharply reversed in March of 2009 and momentum greatly suffered. UMD has been a 14% annual volatility series since 1950 yet the three month additive spread return on UMD from March-May was -56%. While very painful this did little to change momentum's record of long-term efficacy, but it's instructive to look at how much of that pain was borne by a value *plus* momentum investor. Looking at the standard value portfolio $HML^{a,l}$, our more timely but still annual $HML^{a,c}$, and our very timely $HML^{m,c}$, we see spread returns of +2%, +7%, and +34% respectively over the same three months. In other words, the standard value portfolio didn't help at all, while our $HML^{m,c}$ offset much of the momentum pain (if one were 50/50 weighted among value and momentum). This can be seen in Figure 5 where we plot total returns of the different HML measures and UMD for our Global sample**.** This is not an accident. March to May of 2009 saw a momentum debacle as momentum tends to severely underperform when the world reverses its actions of the last year (See Daniel (2011)) and this particular reversal was epic in size. The standard annual and lagged method of calculating HML does not lead to significant negative correlation with momentum, and intuitively the standard value measure did little to help when momentum suffered. But with the simple and intuitive act of updating price in a timely way, our $HML^{m,c}$ value was in fact there to offset much of the pain.

Example 2 – Value and Momentum in Japan

Japan is a particularly constructive place to examine as it is widely known as a country where the momentum strategy has "failed" (Asness (2011)).

Consider Table VIII. In panel (A) we examine the univariate results. As expected, we see weak results for UMD. We also see strong results for each HML. Looking across the competing HMLs we see expected returns increasing as we move from the standard method to our annual method to our monthly method, and Sharpe ratios fairly level. Importantly we also see correlations to UMD getting far more negative as we move first to timely annual and then, especially, to monthly updating.

Panel (B) moves on to factor regressions. In column (1) we see Japanese UMD adjusted for only the market model. The result is 23 years of economically small and statistically insignificant alpha In column (2) we run UMD against the other three factors of the traditional four-factor model, using the standard definition (lagged and annual) of HML, and also including the short-term reversal factor. The results are a bit better for UMD but still quite weak. The intercept is only a 0.68 t-statistic. Furthermore, while momentum is intuitively negatively correlated with short-term reversal, it is actually marginally positively correlated with standard HML. That is not intuitive. Recall that one of the problems with standard HML is it artificially radically reduces the natural negative correlation of a true value and true momentum strategy. Column (3) replaces standard HML with our annual but unlagged HML, and column (4) with our monthly unlagged HML. We focus on (4) as the story is stronger and clearer, but column (3) shows an attenuated version of the same narrative. In column (4) we see an economically and statistically rather large positive intercept for UMD in Japan (> 12% annually). When adjusted for the very strong negative correlation of UMD with monthly unlagged HML we see tremendous value added.

This is all quite intuitive. In Japan, from 1988-2011, univariate value was quite strong, and univariate momentum a complete dud (around zero univariate return). When using the standard measure of HML, which artificially downplays the negative correlation of momentum and true value, UMD remains a dud. But, when using monthly unlagged value, itself a very strong strategy in Japan over this period, UMD is resurrected. Being very negatively correlated with a strong strategy like monthly HML in Japan, but not losing, is indeed value-added, as risk can be reduced at low cost in expected return. This reality in Japan is masked by the standard measure of value but shown very clearly by our much more timely measure of true value, namely $HML^{m,c}$.

III. Practical Considerations

Let's start out by considering some turnover statistics. It's beyond the scope of this paper to do a full analysis of transactions costs and taxes, but we can get a little insight with just a few measurements. Table IX reports turnover for the three alternative HML portfolios. We also report turnover of UMD and a 50-50 portfolio of HML and UMD. We only report US results as results for the International sample are analogous.

We measure turnover as total dollars traded divided by the size of the long side. The units are monthly, in percent. Since all portfolios are $1 long and a $1 short, this is a number between 0 and 200%. For example a 50% turnover per month indicates that the portfolio buys about $0.25 and sells $0.25 every month.

For the standard approach $HML^{a,l}$, the average monthly turnover has been 21.8% since 1950. Switching to our $HML^{a,c}$ the figure comes in at 21.1%, essentially the same, as you would expect given this measure still uses annual refreshing. Our most timely $HML^{m,c}$ brings with it higher turnover at 44.4% annualized, almost twice its annual refreshed counterpart. And of course UMD is the highest at 105% per month.

Consider 50/50 portfolios of each of our three candidate HML portfolios with UMD, shown in the last 3 columns of Table IX. The turnover of standard $HML^{a,l}$ when combined 50/50 with UMD is 59.5% (note that this number is a bit lower than the average of the separate turnovers). Moving out to $HML^{a,c}$ turnover is essentially the same at 58.5%. Finally, moving all the way to the higher turnover $HML^{m,c}$ it grows to 67.1%. Our monthly measure has (additively) 22.6% more turnover than the standard method (44.4% vs. 21.8%). Yet our 50/50 value momentum portfolios shows only 7.6% more turnover using monthly vs. standard value (67.1% vs. 59.5%). What is happening, aside from value being only half the portfolio, is that even though $HML^{m,c}$ is substantially higher turnover than standard $HML^{a,l}$, it also has much more negative correlation with UMD, and negative correlation aids in turnover very similarly to how it aids in volatility (though less so as positions are not as negatively correlated as returns). Some trades are never placed because the desired trades of $HML^{m,c}$ and UMD offset.[11]

So, essentially, once one has decided to add momentum to a value portfolio, there is a very small turnover cost to using our superior (in principle and in multi-factor regressions) $HML^{m,c}$. Even though monthly HML has considerably higher turnover than standard annual

[11] The point is somewhat exaggerated here because the 50/50 combination with our monthly HML is actually less of a momentum portfolio than the 50/50 combination with standard HML (as again, standard HML is really an 80/20 value/momentum portfolio). Future in-depth work on practical implementation should consider this effect (though it’s not likely large).

HML, viewed each alone, it is far more negatively correlated with UMD, and this somewhat reduces turnover in diversified portfolios. Furthermore, the practical turnover difference is likely to be overstated since we are using a completely naïve trading strategy with no effort at all to minimize turnover. A real-world implementation should be able to do better.

While we leave further exploration of this to another day, it seems those wanting to argue against momentum on the grounds of turnover have an easy road even using the standard version of HML (comparing reasonable turnover costs to the returns and risk-reduction from adding UMD to HML). But, once one agrees to add momentum, arguing against moving to $HML^{m,c}$ based on turnover seems impossible. The additional turnover to a diversified portfolio is simply not that economically large.

Consider next the investor who does not believe the historical momentum results. Despite the consistent evidence across geography and asset class, and across time since discovery, this investor believes it is just some world class data mining and then outrageous out of sample luck. Surely this investor will stick with the standard $HML^{a,l}$ no? After all, Table IV showed $HML^{a,l}$ to be empirically superior to $HML^{a,c}$ (we won't even consider monthly updating in the absence of momentum). Well, no. The only reason $HML^{a,l}$ is empirically superior to $HML^{a,c}$ is that it is less negatively correlated to the very successful UMD strategy. If you believe UMD was just luck, you also believe the superiority of the standard $HML^{a,l}$ was just luck as its victory is from the same source. In that case, our results in section II hold. More timely updating of price is a better measure of value on first principles, and $HML^{a,c}$ would naturally be favored.

Finally, consider an investor who wishes to control the amount of "value" and "momentum" in their portfolio themselves. The standard $HML^{a,l}$ is, as we've shown, a portfolio of about 80% value and about 20% momentum, plus significant harmful noise. Furthermore, it's likely that this mix varies through time. Rather than this, using our $HML^{m,c}$ and UMD directly, allows a much more precise decision about "value" and "momentum" exposure.

So, in practical terms, it is easy to build a strong case that one would add momentum to any of these value strategies, and if one does add momentum, our evidence shows that one should use something like our most timely $HML^{m,c}$ as the value measure. And, even if one fully rejects momentum, despite all evidence, one would still move from $HML^{a,l}$ to something much more like our $HML^{a,c}$.

IV. Conclusion

The standard approach to calculating HML, itself the standard value strategy, updates the portfolio once a year, using prices lagged 6 months upon update. Thus by the time of the next update the price used to determine "value" is 18 months old.

We first show on that if the goal is approximating the true unobservable (in a timely fashion) book-to-price, one comes much closer using un-lagged price. That is, we recommend a change to the standard approach based only on this idea and test without examining returns. We then show that in the context of a 5-factor model including momentum, this logically superior value measure is actually superior in terms of returns. We further extend this to a monthly updated value strategy and find that, for precisely analogous reasons, the return advantage grows far stronger.

Finally, we consider some practical questions. Whether one should add momentum to value might be disputed on turnover grounds, though the case against seems weak given the large gains and small increment in turnover when going from pure value to 50/50 value/momentum portfolios. However, if one is to include momentum, the case to use our un-lagged monthly updated HML versus the standard approach is overwhelming. And, doing so, the very argument about whether to add momentum to value at all gets far stronger as the value plus momentum combination is that much better.

The bottom-line is that the standard approach to value was a reasonable and conservative choice that has served the field well. But, it is not the best possible choice. Moving in very simple ways based on first principles to the choices we study here can make a big difference.

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Table I
Summary Statistics

This table shows summary statistics as of June of each year. The sample includes all commons stocks on the CRSP/XpressFeed data between 1950 and 2011 and all common stocks on the XpressFeed Global data between 1983 and 2011. "Number of stocks – mean" is the average number of stocks per year. "Mean ME" is the average firm's market value of equity, in billions USD. Means are pooled averages (firm-year) as of June of each year.

Country	Number of stocks - total	Number of stocks - mean	Mean ME (firm , billions USD)	Average weight in international portfolio	Average weight in global portfolio	Start Year	End Year
Australia	2,951	808	0.56	0.031	0.018	1989	2011
Austria	207	76	0.72	0.004	0.002	1990	2011
Belgium	421	132	1.88	0.017	0.010	1989	2011
Canada	5,560	709	0.71	0.039	0.023	1983	2011
Switzerland	541	200	2.90	0.043	0.025	1989	2011
Germany	2,048	662	2.43	0.109	0.065	1989	2011
Denmark	412	137	0.79	0.008	0.005	1989	2011
Spain	415	141	2.66	0.026	0.016	1991	2011
Finland	288	105	1.38	0.010	0.006	1989	2011
France	1,765	555	2.09	0.084	0.049	1989	2011
United Kingdom	6,006	1,811	1.19	0.167	0.099	1988	2011
Hong Kong	1,670	602	1.13	0.046	0.027	1989	2011
Italy	600	219	2.09	0.034	0.020	1990	2011
Japan	4,952	2,847	1.21	0.291	0.172	1987	2011
Netherlands	407	167	3.25	0.040	0.024	1989	2011
Norway	648	148	0.74	0.007	0.004	1989	2011
New Zealand	312	94	0.79	0.005	0.003	1993	2011
Singapore	1,026	342	0.60	0.016	0.009	1989	2011
Sweden	997	243	1.28	0.022	0.013	1989	2011
United States	23,320	3,087	0.95		0.409	1950	2011

Table II
Cross Sectional Regressions: Forecasting Book-to-Price Ratios

This table reports Fama-MacBeth regressions of book-to-price ratios on past ratios and an error correction adjustment. The left-hand side is equal to book value per share divided by price at fiscal yearend. The right-hand side is prior period book value divided by price at fiscal yearend and prior period book value divided by current price as of the previous June:

$$bp_t^{a,l} = \gamma_0 + \gamma_1 bp_{t-1}^{a,l} + \gamma_2\left(bp_{t-1}^{a,c} - bp_{t-1}^{a,l}\right) + \epsilon_t$$

The first superscript indicated the refreshing frequency (annual *a* or monthly *m*), the second superscript indicated the lag used to update price (lagged *l* or current *c*). The right-hand side variables are windsorized at 1% level and cross sectional regressions are run every fiscal year. The rightmost column reports γ_2/γ_1, the fraction of the linear forecast attributed to $bp^{a,c}$. Panel A reports results for our US sample. "All sample" reports results for the full sample. "(Non) December fye" report results for firms with fiscal year (not) ending in December. "Industry Fixed Effect" reports results for regression including industry fixed effects based on 49-industry classification from Ken French's website. "ME-1" to "ME-10" reports results for each NYSE-based size deciles. The last rows reports results by sample period. The sample period for the US sample runs from 1950 to 2011. Panel B reports results for our International sample. "All sample" reports results for the full sample. "Large (Small) Cap" report results for firms above (below) the 80th percentiles (by country). The remaining rows report results by sample period and by country. The sample period for the International sample runs from 1983 to 2011. T-statistics are reported next to the coefficient estimates and 5% statistical significance is indicated in bold.

Panel A: US results	γ_1		γ_2		$\gamma_1 - \gamma_2$		R2	γ_2/γ_1
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat		
All sample	**0.91**	101.3	**0.86**	38.9	**0.05**	3.14	0.73	0.94
December FYE only	**0.91**	86.2	**0.89**	35.7	0.02	1.14	0.72	0.98
Non-December FYE only	**0.92**	115.6	**0.83**	41.2	**0.09**	5.97	0.76	0.90
Industry Fixed Effects	**0.90**	97.9	**0.84**	41.3	**0.06**	3.87	0.69	0.93
ME-1 (small)	**0.89**	92.1	**0.79**	29.4	**0.10**	3.86	0.67	0.89
ME-2	**0.86**	78.2	**0.81**	34.8	**0.05**	2.48	0.71	0.94
ME-3	**0.87**	74.2	**0.85**	36.3	0.02	0.94	0.72	0.98
ME-4	**0.88**	75.2	**0.90**	29.6	-0.02	-0.64	0.74	1.02
ME-5	**0.90**	69.6	**0.91**	28.3	-0.01	-0.23	0.75	1.01
ME-6	**0.92**	69.5	**0.97**	33.6	**-0.05**	-1.99	0.77	1.05
ME-7	**0.91**	85.5	**0.97**	32.8	**-0.06**	-1.97	0.77	1.06
ME-8	**0.94**	75.0	**1.03**	33.8	**-0.09**	-3.16	0.76	1.10
ME-9	**0.94**	93.6	**1.03**	31.2	**-0.08**	-2.86	0.79	1.09
ME-10 (large)	**0.95**	86.4	**1.06**	31.4	**-0.11**	-3.63	0.80	1.12
1950 - 1970	**0.98**	87.1	**1.06**	45.6	**-0.09**	-4.08	0.81	1.09
1971 - 1990	**0.91**	78.7	**0.78**	38.8	**0.13**	7.99	0.75	0.86
1991 - 2000	**0.88**	61.5	**0.75**	37.8	**0.13**	7.85	0.64	0.86
2001 - 2011	**0.84**	47.2	**0.74**	21.0	**0.11**	2.48	0.65	0.87

Table II (Continued)
Cross Sectional Regressions: Forecasting Book-to-Price Ratios

Panel B: International Results	γ_1		γ_2		$\gamma_1 - \gamma_2$		R2	γ_2/γ_1
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat		
All sample	**0.88**	68.9	**0.75**	37.3	**0.12**	5.92	0.67	0.86
Large Cap	**0.90**	66.4	**0.87**	33.3	0.04	1.66	0.72	0.96
Small Cap	**0.86**	61.1	**0.73**	31.8	**0.14**	6.14	0.65	0.84
1983 - 1990	**0.82**	26.8	**0.79**	14.1	0.03	0.66	0.64	0.96
1991 - 2000	**0.93**	73.8	**0.78**	31.4	**0.15**	6.58	0.73	0.84
2001 - 2011	**0.87**	80.8	**0.71**	25.3	**0.16**	5.52	0.65	0.82
Australia	**0.82**	61.7	**0.69**	31.4	**0.13**	8.30	0.64	0.84
Austria	**0.83**	17.8	**0.75**	8.2	0.08	1.14	0.59	0.90
Belgium	**0.91**	25.0	**0.89**	3.2	0.02	0.06	0.68	0.98
Canada	**0.82**	65.1	**0.71**	31.3	**0.12**	4.68	0.59	0.86
Switzerland	**0.96**	43.5	**0.93**	20.5	0.03	0.66	0.67	0.97
Germany	**0.85**	39.6	**0.80**	21.1	0.04	1.08	0.61	0.95
Denmark	**0.98**	25.0	**1.02**	12.2	-0.04	-0.52	0.62	1.04
Spain	**0.84**	33.7	**0.92**	11.1	-0.08	-0.85	0.70	1.10
Finland	**0.93**	21.3	**0.81**	11.5	0.12	1.76	0.67	0.87
France	**0.88**	44.2	**0.87**	20.4	0.01	0.30	0.67	0.99
UK	**0.88**	54.9	**0.74**	17.7	**0.14**	4.16	0.66	0.84
Honk Hong	**0.92**	64.5	**0.80**	19.8	**0.12**	2.46	0.69	0.87
Italy	**0.90**	44.9	**0.73**	10.0	**0.17**	2.44	0.69	0.81
Japan	**0.95**	108.9	**0.72**	38.2	**0.23**	11.19	0.82	0.75
Netherlands	**0.92**	27.6	**0.95**	10.7	-0.03	-0.42	0.66	1.03
Norway	**0.83**	23.1	**0.69**	8.5	0.14	1.90	0.49	0.84
New Zealand	**0.91**	23.9	**0.70**	12.2	**0.21**	3.64	0.73	0.77
Singapore	**0.88**	47.4	**0.84**	19.5	0.04	0.94	0.68	0.96
Sweden	**0.91**	24.4	**0.91**	15.0	0.00	0.01	0.58	1.00

Table III
Cross Sectional Regressions: Forecasting Changes in Book per Share

This table reports Fama-MacBeth regressions of changes in log book per share on log returns over the prior three years.

$$\Delta b^*_{t-12\to t} = \theta_0 + \theta_1 r_{t-12\to t} + \theta_2 r_{t-24\to t-12} + \theta_3 r_{t-36\to t-12} + \epsilon_t$$

The left-hand side is equal changes in book value per share where lowercase indicates logs $= \log(B)$, the asterisk * indicates that the quantity is adjusted for splits between the two dates and $r_{t\to s} = \log(1 + R_{t\to s})$ is equal to the total log return between date t and $s > t$. The lags are in months. Cross sectional regressions are run every fiscal year. Panel A reports results for our US sample. "All sample" reports results for the full sample. "(Non) December fye" report results for firms with fiscal year (not) ending in December. "Industry Fixed Effect" reports results for regressions including industry fixed effects based on 49-industry classifications from Ken French's website. "ME-1" to "ME-10" reports results for each NYSE-based size deciles. The last rows report results by sample period. The sample period for the US sample runs from 1950 to 2011. Panel B reports results for our International sample. "All sample" reports results for the full sample. "Large (Small) Cap" reports results for firms above (below) the 80th percentiles (by country). The remaining rows report results by sample period and by country. The sample period for the International sample runs from 1983 to 2011. T-statistics are reported next to the coefficient estimates and 5% statistical significance is indicated in bold.

Panel A: US Results	Coefficient			t-statistics			R2
	θ_1	θ_2	θ_3	θ_1	θ_2	θ_3	
All sample	**0.22**	**0.15**	**0.08**	17.42	19.38	15.24	0.15
December FYE only	**0.22**	**0.15**	**0.08**	16.04	16.92	12.60	0.14
Non-December FYE only	**0.22**	**0.16**	**0.08**	20.21	19.10	13.29	0.19
Industry Fixed Effects	**0.20**	**0.15**	**0.05**	12.29	12.19	3.99	0.38
ME-1 (small)	**0.24**	**0.15**	**0.08**	19.86	14.82	8.54	0.19
ME-2	**0.21**	**0.14**	**0.05**	15.06	10.50	4.47	0.16
ME-3	**0.18**	**0.16**	**0.07**	15.22	12.63	7.93	0.17
ME-4	**0.16**	**0.14**	**0.07**	13.71	12.36	6.55	0.16
ME-5	**0.20**	**0.13**	**0.06**	12.01	10.64	5.80	0.18
ME-6	**0.18**	**0.13**	**0.09**	12.65	9.48	8.39	0.20
ME-7	**0.17**	**0.14**	**0.08**	9.43	8.24	5.82	0.20
ME-8	**0.17**	**0.13**	**0.07**	10.43	9.39	3.87	0.16
ME-9	**0.12**	**0.13**	**0.10**	6.89	7.42	7.16	0.13
ME-10 (large)	**0.13**	**0.13**	**0.10**	8.23	11.08	6.75	0.13
1950 - 1970	**0.11**	**0.09**	**0.05**	10.39	11.72	6.49	0.09
1971 - 1990	**0.22**	**0.16**	**0.08**	14.26	14.41	12.91	0.15
1991 - 2000	**0.30**	**0.20**	**0.10**	40.80	28.04	9.63	0.17
2001 - 2011	**0.31**	**0.22**	**0.11**	28.04	24.73	9.06	0.22

Table III (Continued)
Cross Sectional Regressions: Forecasting Changes in Book per Share

Panel B: International Results	Coefficient			t-statistics			R2
	θ_1	θ_2	θ_3	θ_1	θ_2	θ_3	
All sample	**0.26**	**0.15**	**0.09**	13.25	9.29	3.79	0.11
Large Cap	**0.17**	**0.12**	**0.10**	8.61	6.34	7.40	0.11
Small Cap	**0.28**	**0.16**	**0.09**	**12.91**	9.29	3.18	0.12
1983 - 1990	**0.29**	**0.17**	0.10	6.86	5.83	1.75	0.13
1991 - 2000	**0.24**	**0.13**	**0.08**	**14.13**	8.07	6.26	0.10
2001 - 2011							
Australia	**0.31**	**0.18**	**0.12**	**9.67**	11.66	5.15	0.23
Austria	**0.20**	**0.35**	0.10	2.63	3.18	0.90	0.06
Belgium	**0.32**	-0.02	**0.25**	**4.38**	-0.24	2.49	0.09
Canada	**0.33**	**0.19**	**0.09**	**15.25**	10.85	4.82	0.21
Switzerland	**0.41**	0.06	**0.08**	**5.07**	0.79	2.66	0.13
Germany	**0.31**	**0.17**	**0.09**	**14.00**	7.35	3.50	0.11
Denmark	**0.25**	**0.18**	0.02	6.16	4.75	0.58	0.10
Spain	0.11	**0.18**	**0.28**	**1.56**	3.25	3.83	0.17
Finland	**0.22**	0.05	**0.11**	**2.05**	0.84	2.45	0.21
France	**0.21**	**0.16**	0.05	6.74	5.63	1.27	0.09
UK	**0.19**	**0.18**	**0.10**	**3.53**	5.88	2.40	0.12
Honk Hong	**0.16**	**0.15**	**0.08**	**2.65**	6.98	3.62	0.13
Italy	**0.42**	0.12	**0.30**	**4.53**	1.01	2.18	0.15
Japan	**0.16**	**0.12**	**0.07**	**12.88**	12.30	6.81	0.08
Netherlands	**0.23**	**0.21**	**0.11**	**6.02**	4.71	2.36	0.14
Norway	**0.37**	**0.27**	0.03	6.39	7.85	0.73	0.20
New Zealand	**0.32**	**0.18**	-0.01	6.13	4.71	-0.14	0.19
Singapore	**0.17**	**0.15**	**0.04**	**9.67**	6.46	2.87	0.09
Sweden	**0.30**	**0.20**	**0.12**	**7.62**	6.90	5.34	0.29

Table IV
HML: Univariate Results, 1950 – 2011

This table reports returns of value portfolios (HML). The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as $HML^{annual,lagged}$. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{annual,current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{monthly,current}$. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US and International sample. The sample period runs from 1950 to 2011. Country portfolios are aggregated into Global portfolios using the country's total market capitalization as of the prior month. Returns, volatilities and Sharpe ratios are annualized, t-statistics are reported below the coefficient estimates and 5% statistical significant is indicated in bold.

	US				International				Global			
Measure	HML	HML	HML	UMD	HML	HML	HML	UMD	HML	HML	HML	UMD
Refreshing frequency	Annual	Annual	Monthly	Monthly	Annual	Annual	Monthly	Monthly	Annual	Annual	Monthly	Monthly
Method to lag price	Lagged	Current	Current	Current	Lagged	Current	Current	Current	Lagged	Current	Current	Current
Full Sample												
Mean	**4.04**	**3.44**	**3.10**	**8.70**	**6.65**	**6.07**	**6.99**	**6.97**	**4.92**	**4.42**	**4.32**	**8.71**
t-statistics	3.35	2.70	2.09	4.83	4.53	3.50	3.48	2.65	4.76	3.94	3.36	5.49
Volatility	9.32	9.84	11.44	13.91	7.66	9.05	10.47	13.72	7.99	8.68	9.93	12.26
SR	0.43	0.35	0.27	0.63	0.87	0.67	0.67	0.51	0.62	0.51	0.44	0.71
Corr with UMD	-0.13	-0.39	-0.64	1.00	0.01	-0.27	-0.61	1.00	-0.09	-0.36	-0.62	1.00
1951 - 1989												
Mean	**4.60**	**4.31**	**3.34**	**10.04**	6.22	7.07	4.47	7.14	**4.72**	**4.54**	**3.62**	**9.79**
t-statistics	3.62	3.12	2.23	6.05	1.74	1.59	0.92	1.52	3.71	3.28	2.40	5.91
Volatility	7.89	8.57	9.30	10.30	8.75	10.86	11.86	11.52	7.89	8.58	9.37	10.27
SR	0.58	0.50	0.36	0.97	0.71	0.65	0.38	0.62	0.60	0.53	0.39	0.95
Corr with UMD	-0.15	-0.42	-0.56	1.00	-0.17	-0.29	-0.47	1.00	-0.14	-0.40	-0.55	1.00
1990 - 2011												
Mean	3.04	1.87	2.65	6.27	**6.77**	**5.79**	**7.70**	**6.92**	**5.28**	**4.21**	**5.58**	**6.75**
t-statistics	1.22	0.73	0.84	1.54	4.25	3.14	3.53	2.23	2.98	2.18	2.37	2.05
Volatility	11.49	11.81	14.56	18.76	7.34	8.50	10.06	14.30	8.19	8.88	10.87	15.22
SR	0.26	0.16	0.18	0.33	0.92	0.68	0.77	0.48	0.65	0.47	0.51	0.44
Corr with UMD	-0.12	-0.37	-0.70	1.00	0.06	-0.27	-0.66	1.00	-0.04	-0.33	-0.70	1.00

Table V

HML: Time Series Regressions, Controlling for Selected Factors, 1950 – 2011

This table reports portfolio returns and multivariate loadings. We run time series regressions on monthly excess returns of value portfolios (HML) on monthly excess returns on a set of explanatory portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as HML^{Annual}_{Lagged}. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{Annual}_{Current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US and International sample. The sample period runs from 1950 to 2011. Country portfolios are aggregated into International and Global portfolios using the country's total market capitalization as of the prior month. Alpha is the intercept in a regression of monthly excess returns. The explanatory variables are market excess returns (MKT), a size portfolio (SMB), a momentum portfolio (UMD) and a short term reversal (STR) portfolio. Alphas are annualized, t-statistics are reported below the coefficient estimates and 5% statistical significant is indicated in bold.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	US						International					
Refreshing frequency	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual
Method to lag price	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current
Alpha	**5.01**	**3.86**	**1.69**	-0.96	**6.23**	**7.15**	**7.01**	**6.27**	**2.48**	-0.97	**7.25**	**7.94**
	(4.32)	(3.14)	(3.48)	-(1.86)	(5.27)	(6.16)	(4.84)	(3.62)	(3.33)	-(1.07)	(4.93)	(4.73)
MKT	**-0.15**	**-0.15**	-0.02	-0.01	**-0.15**	**-0.17**	**-0.08**	**-0.06**	**-0.04**	**0.03**	**-0.09**	**-0.09**
	-(6.07)	-(5.82)	-(1.82)	-(0.71)	-(6.47)	-(7.28)	-(3.59)	-(2.02)	-(3.63)	(2.10)	-(3.71)	-(3.45)
SMB	**-0.17**	**-0.14**	**-0.05**	0.02	**-0.16**	**-0.13**	0.05	0.09	-0.02	0.04	0.05	0.08
	-(4.74)	-(3.67)	-(3.33)	(1.50)	-(4.70)	-(3.76)	(0.96)	(1.49)	-(0.65)	(1.31)	(0.93)	(1.39)
STR	**0.11**	**0.21**	**-0.07**	**0.11**	0.06	**0.08**	-0.02	0.05	**-0.06**	**0.07**	-0.03	-0.02
	(3.26)	(5.96)	-(5.06)	(7.14)	(1.69)	(2.23)	-(0.51)	(1.07)	-(2.84)	(3.00)	-(0.74)	-(0.38)
UMD					**-0.11**	**-0.29**					-0.03	**-0.21**
					-(4.26)	-(11.69)					-(0.94)	-(5.70)
$HML^{annual, lagged}$				**0.96**						**1.03**		
				(58.25)						(30.78)		
$HML^{annual, current}$			**0.86**						**0.72**			
			(58.25)						(30.78)			
R2	0.10	0.10	0.84	0.84	0.12	0.24	0.03	0.01	0.75	0.75	0.03	0.10

Table VI
HML: Time Series Regressions, Controlling for Full Set of Factors, 1950 – 2011

This table reports portfolio returns and multivariate loadings. We run time series regressions on monthly excess returns of value portfolios (HML) on monthly excess returns on a set of explanatory portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as $HML^{annual,lagged}$. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{annual,current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{monthly,current}$. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US and International sample. The sample period runs from 1950 to 2011. Country portfolios are aggregated into International and Global portfolios using the country's total market capitalization as of the prior month. Alpha is the intercept in a regression of monthly excess returns. The explanatory variables are market excess returns (MKT), a size portfolio (SMB) a momentum portfolio (UMD) and a short term reversal (STR) portfolio. Alphas are annualized, t-statistics are reported below the coefficient estimates and 5% statistical significant is indicated in bold.

	US				International				Global			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Refreshing frequency	Annual	Annual	Annual	Monthly	Annual	Annual	Annual	Monthly	Annual	Annual	Annual	Monthly
Method to lag price	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current	Lagged	Current
Alpha	-0.58	**1.43**	**-1.61**	**3.05**	1.05	0.56	-1.24	**3.78**	-0.43	**1.51**	**-1.72**	**3.36**
	-(1.35)	(3.42)	-(2.92)	(5.92)	(1.52)	(0.71)	-(1.59)	(4.58)	-(1.07)	(3.69)	-(3.48)	(7.14)
MKT	0.01	**-0.03**	**-0.02**	-0.01	-0.02	0.00	**-0.03**	0.01	0.00	**-0.03**	-0.02	-0.01
	(0.93)	-(3.38)	-(2.09)	-(0.82)	-(1.38)	-(0.30)	-(2.36)	(0.63)	(0.26)	-(3.20)	-(1.87)	-(1.53)
SMB	**-0.04**	0.02	**-0.04**	0.01	-0.02	0.03	-0.01	0.03	**-0.03**	0.02	-0.02	0.00
	-(3.32)	(1.78)	-(2.50)	(0.46)	-(0.67)	(1.22)	-(0.33)	(0.91)	-(2.48)	(1.77)	-(1.28)	(0.31)
STR	-0.01	0.02	**-0.07**	**0.08**	-0.02	0.01	**-0.07**	**0.07**	-0.02	0.03	**-0.08**	**0.10**
	-(1.13)	(1.85)	-(4.19)	(5.58)	-(0.88)	(0.61)	-(3.22)	(3.28)	-(1.25)	(1.92)	-(5.13)	(6.52)
UMD	**0.17**	**-0.19**	**0.38**	**-0.43**	**0.14**	**-0.18**	**0.35**	**-0.45**	**0.17**	**-0.20**	**0.37**	**-0.42**
	(17.24)	-(21.46)	(26.12)	-(39.28)	(8.68)	-(10.68)	(17.33)	-(25.38)	(16.42)	-(20.37)	(25.99)	-(38.00)
$HML^{annual, lagged}$		**0.92**		**0.85**		**1.02**		**0.95**		**0.94**		**0.87**
		(70.41)		(53.14)		(35.17)		(31.50)		(65.58)		(52.83)
$HML^{annual,current}$	**0.95**				**0.78**				**0.91**			
	(70.41)				(35.17)				(65.58)			
$HML^{monthly,current}$			**0.94**				**0.80**				**0.91**	
			(53.14)				(31.50)				(52.83)	
R2	0.89	0.90	0.82	0.89	0.80	0.81	0.76	0.85	0.87	0.89	0.82	0.89

Table VII
Robustness Checks: 5-Factor Alphas Controlling for Full Set of Factors

This table reports portfolio returns. We run time series regressions on monthly excess returns of value portfolios (HML) on monthly excess returns on a set of explanatory portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as $HML^{annual,lagged}$. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{annual,current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{monthly,current}$. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US and International sample. The sample period runs from 1950 to 2011. Country portfolios are aggregated into International and Global portfolios using the country's total market capitalization as of the prior month. Alpha is the intercept in a regression of monthly excess return. The explanatory variables are market excess returns (MKT), a size portfolio (SMB) a momentum portfolio (UMD), a short term reversal (STR) portfolio and the value measure (HML) indicated in the table. Alphas are annualized, t-statistics are reported next to the coefficient estimates and 5% statistical significant is indicated in bold.

Panel A: US sample

Left hand side: HML	Annual Lagged		Annual Lagged		Annual Current		Monthly Current	
HML measure on right hand side	Annual Current		Monthly Current		Annual Lagged		Annual Lagged	
	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat
All sample	-0.58	-1.35	**-1.61**	-2.92	**1.43**	3.4	**3.05**	5.92
December FYE only	-0.68	-1.44	**-1.91**	-3.07	**1.49**	3.4	**3.48**	6.09
Non-December FYE only	1.30	1.75	0.20	0.25	1.05	1.3	**3.21**	3.49
Large Cap	**-1.54**	-2.94	**-2.73**	-4.14	**2.14**	4.3	**3.79**	6.21
Small Cap	0.81	1.54	0.52	0.71	0.74	1.4	**2.74**	3.82
1950 - 1970	-0.89	-1.26	0.65	0.70	**1.97**	2.8	1.00	1.14
1971 - 1990	**-2.22**	-2.90	**-2.83**	-3.67	**3.25**	4.4	**3.86**	5.29
1991 - 2000	**2.30**	2.10	1.84	1.27	-0.75	-0.7	0.82	0.63
2001 - 2010	0.06	0.05	-1.70	-1.12	0.41	0.3	2.70	1.77

Panel B: International sample

Left hand side: HML	Annual Lagged		Annual Lagged		Annual Current		Monthly Current	
HML measure on right hand side	Annual Current		Monthly Current		Annual Lagged		Annual Lagged	
	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat
All sample	1.05	1.52	-1.24	-1.59	0.56	0.71	**3.78**	4.58
December FYE only	0.26	0.31	-1.55	-1.54	**1.78**	2.17	**4.73**	5.04
Non-December FYE only	0.78	0.79	-1.21	-1.05	1.14	1.10	**4.67**	3.88
Large Cap	1.28	1.42	-1.77	-1.89	0.32	0.32	**3.88**	4.04
Small Cap	0.88	1.05	0.35	0.33	1.73	1.89	**4.88**	4.23
1983 - 1990	1.12	0.62	1.33	0.72	1.56	0.70	1.44	0.63
1991 - 2000	0.23	0.27	**-2.88**	-3.22	0.67	0.78	**3.96**	4.77
2001 - 2010	1.43	1.49	-1.36	-1.29	0.35	0.30	**4.61**	3.70

Table VII (Continued)
Robustness Checks: 5-Factor Alphas Controlling for Full Set of Factors

Panel C: Global sample

Left hand side: HML	Annual Lagged		Annual Lagged		Annual Current		Monthly Current	
HML measure on right hand side	Annual Current		Monthly Current		Annual Lagged		Annual Lagged	
	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat	Alpha	t-stat
All sample	-0.43	-1.07	**-1.72**	-3.48	**1.51**	3.69	**3.36**	7.14
December FYE only	0.64	0.75	-0.59	-0.55	1.54	1.81	**4.34**	4.21
Non-December FYE only	1.24	1.20	-0.36	-0.30	1.02	0.92	**4.42**	3.42
Large Cap	**-1.53**	-3.13	**-3.11**	-5.38	**2.39**	4.99	**4.33**	8.03
Small Cap	0.84	1.74	0.50	0.76	0.87	1.74	**2.99**	4.56
1983 - 1990	-1.57	-1.94	**-2.57**	-3.15	**2.94**	3.66	**4.01**	5.04
1991 - 2000	1.19	1.65	-1.05	-1.21	-0.29	-0.39	**2.26**	2.90
2001 - 2010	0.47	0.48	**-2.40**	-2.26	0.52	0.51	**4.16**	3.70

Table VIII
Case Study: Momentum in Japan, 1988 – 2011

This table reports portfolio returns and multivariate loadings. We run time series regressions on monthly excess returns of momentum portfolios (UMD) on monthly excess returns of a set of explanatory portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as HML^{Annual}_{Lagged}. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{Annual}_{Current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{Monthly}_{Current}$. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our Japanese sample. The sample period runs from 1988 to 2011. Alpha is the intercept in a regression of monthly excess returns. The left-hand side is momentum (UMD) returns. The explanatory variables are market excess returns (MKT), a size portfolio (SMB), a value portfolio (HML) and a short term reversal (STR) portfolio. Alphas are annualized, t-statistics are reported below the coefficient estimates and 5% statistical significant is indicated in bold.

Panel A: UMD and HML, Japan , 1988 -2011				
Measure	HML	HML	HML	UMD
Refreshing frequency	Annual	Annual	Monthly	Monthly
Method to lag price	Lagged	Current	Current	Current
Mean	**6.41**	**7.74**	**12.44**	1.56
t-statistics	3.47	3.46	4.70	0.43
Volatility	8.81	10.67	12.62	17.17
SR	0.39	0.32	0.37	0.03
Corr with UMD	0.18	-0.29	-0.60	1.00
Panel B: UMD , Japan , 1988 -2011				
	(1)	(2)	(3)	(4)
Alpha	1.15	2.26	**7.34**	**12.04**
	(0.34)	(0.68)	(2.37)	(4.49)
MKT	**-0.23**	**-0.16**	**-0.27**	**-0.24**
	-(5.34)	-(3.38)	-(6.41)	-(7.13)
SMB		**-0.19**	-0.05	0.03
		-(2.54)	-(0.63)	(0.42)
STR		**-0.32**	**-0.31**	**-0.18**
		-(4.73)	-(4.95)	-(3.34)
$HML^{annual,lagged}$		0.14		
		(1.21)		
$HML^{annual,current}$			**-0.58**	
			-(6.60)	
$HML^{Monthly,current}$				**-0.80**
				-(12.66)
R2	0.09	0.19	0.30	0.49

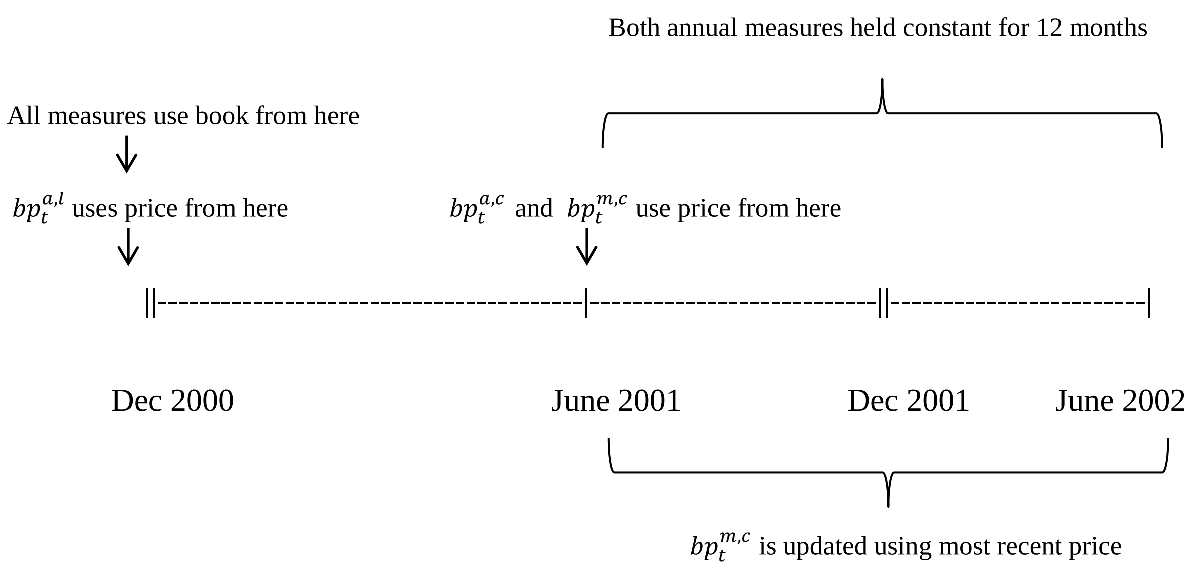
Table IX
HML and UMD Portfolio Turnover: US Sample, 1950 – 2011

This table reports turnover of value (HML) and momentum (UMD) portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as $HML^{annual,lagged}$. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{annual,current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{monthly,current}$. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint is the median NYSE market equity. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US sample. The sample period runs from 1950 to 2011. Turnover is in monthly percent and it is defined as total dollar traded divided by the size of the long side of the portfolio.

Panel A: Turnover, Monthly %	HML			UMD	(HML +UMD)/2		
Refreshing frequency	Annual	Annual	Monthly	Monthly	Annual	Annual	Monthly
Method to lag price	Lagged	Current	Current	Current	Lagged	Current	Current
Rebalacing Frequency	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
All sample	21.8	21.1	44.4	105.5	59.5	58.5	67.1
1950 - 1970	18.9	18.0	41.2	100.5	57.1	56.3	66.6
1971 - 1990	22.9	22.4	45.5	107.2	60.4	59.5	67.9
1991 - 2000	23.4	23.2	46.7	104.7	59.0	58.1	65.7
2001 - 2011	23.8	22.4	46.2	112.6	63.0	61.4	68.1

Figure 1
Example: Book-to-Price Calculation for a Firm with Fiscal Year Ending in December 2000

This figure illustrates the three approaches used to compute book-to-price for a firm with fiscal year ending in December 2000. $bp_t^{a,l}$ is equal to equal to the book value per share (B) divided by price at fiscal yearend (P_{fye}) both in local currency. $bp_t^{a,c}$ is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price P_t both in local currency. $bp_t^{m,c}$ is equal to book value per share divided by current price, updated monthly. In the name convention the first superscript indicated the refreshing frequency (annual *a* or monthly *m*), the second superscript indicated the lag used to update price (lagged *l* or current *c*).



$BP^{a,l}_{June\ 30th\ 2001}$ = Book(December 31st 2000) / Price(December 31st 2000)

$BP^{a,c}_{June\ 30th\ 2001}$ = Book(December 31st 2000) / Price(June 30th 2001)

$BP^{m,c}_{June\ 30th\ 2001}$ = Book(December 31st 2000) / Price(June 30th 2001, updated monthly thereafter)

Figure 2
HML: Global Sample, Cumulative 5-Factor Alphas, 1950 – 2011

This figure plots cumulative portfolio alphas. We run time series regressions on monthly excess returns of value portfolios (HML) on monthly excess returns of a set of explanatory portfolios. The value factors are constructed using our three book-to-price (B/P) measures. This figure includes all available stocks in our US and International sample. The sample period runs from 1950 to 2011. Country portfolios are aggregated into Global portfolios using the country's total market capitalization as of the prior month. Alpha is the intercept in a regression of monthly excess returns. The explanatory variables are market excess returns (MKT), a size portfolio (SMB), a momentum portfolio (UMD) and a short term reversal (STR) portfolio and the competing value measure (the value measures result correspond to table VI columns (12), (10), and (9) from best to worst performance). We plot cumulative alphas.

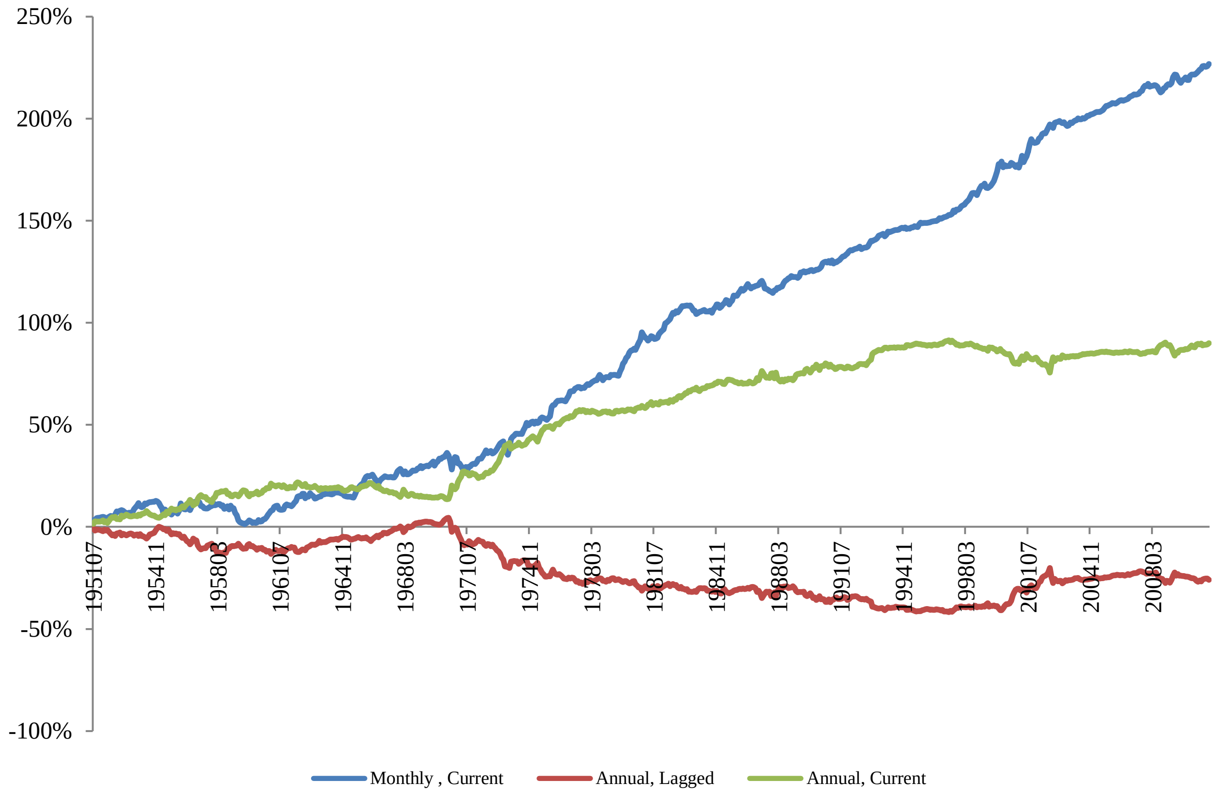


Figure 3
Robustness Checks: T-statistics of 5-Factor Alphas Controlling for Full Set of Factors, by Country

This figure report t-statistics of abnormal portfolio returns. We run time series regressions on monthly excess returns of value portfolios (HML) on monthly excess returns on a set of explanatory portfolios. The value factors are constructed using three book-to-price (B/P) measures: The first measure is equal to book value per share divided by price at fiscal yearend both in local currency. We denote this value portfolio as $HML^{annual,lagged}$. The second measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price. We denote this value portfolio as $HML^{annual,current}$. Both annual measures are refreshed in June. The third measure is equal to book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, updated monthly. We denote this value portfolio as $HML^{monthly,current}$. We construct portfolios within each country in our sample. At the end of June of year t (at the end of each calendar month for the monthly measure), stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint for the US sample is the median NYSE market equity. The size breakpoint for the international sample is the 80th percentile by country. Portfolios are value-weighted, refreshed every June (refreshed every month for the monthly measure), and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US and International sample. We plot t-statistics of 5-factor alphas. Alpha is the intercept in a regression of monthly excess return. The left hand sides are return of the $HML^{annual,current}$ factor or $HML^{monthly,current}$. The explanatory variables are market excess returns (MKT), a size portfolio (SMB) a momentum portfolio (UMD) and, short term reversal (STR) portfolio and the value portfolio $HML^{annual,lagged}$.

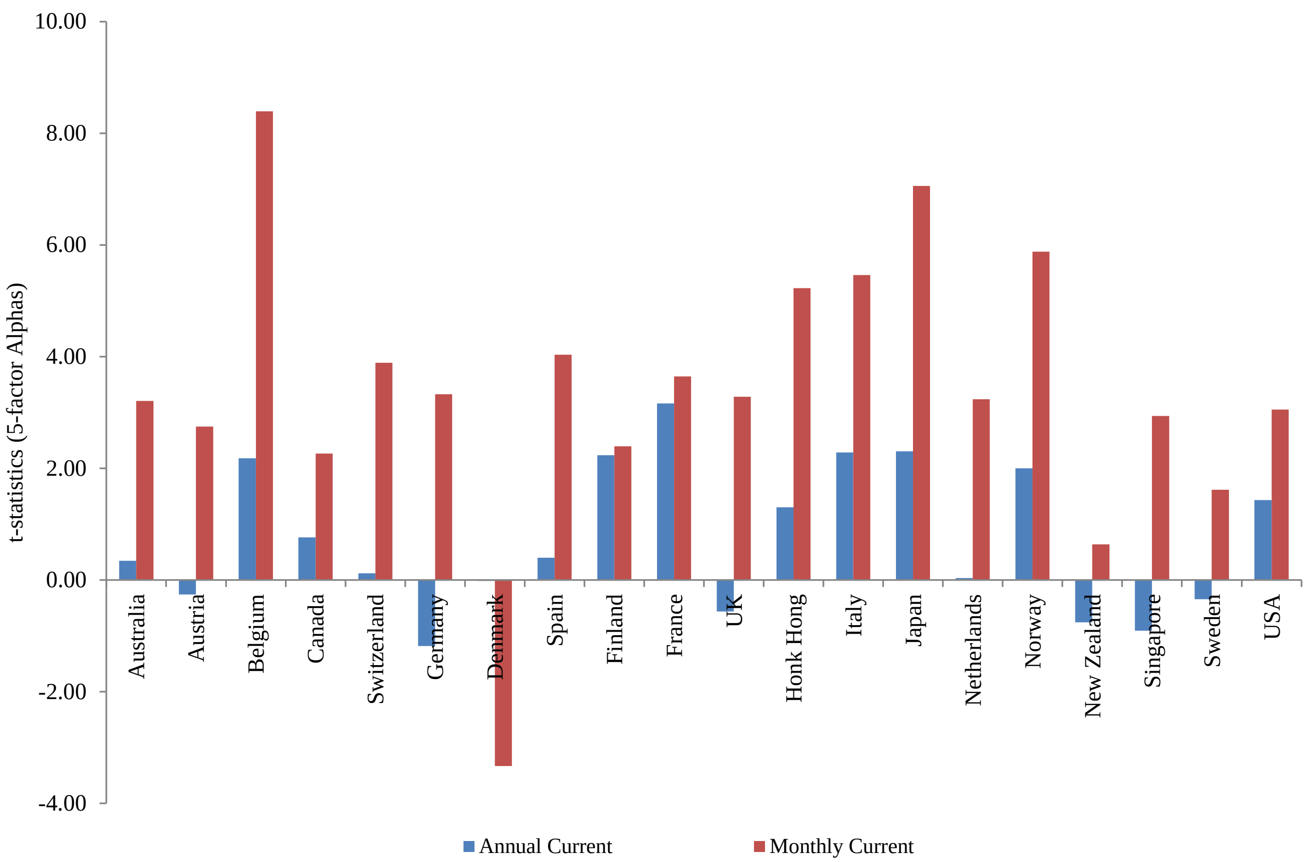


Figure 4
HML $^{Annual}_{Current}$ loading on UMD by Calendar Month, Global Sample, 1950 – 2011

This figure plots factor loadings. We run a time series regression on monthly excess returns of a value portfolio (HML) on monthly excess returns of a momentum (UMD) portfolio. The value portfolio is constructed using book value per share (adjusted for splits, dividends and other corporate actions between fiscal yearend and portfolio formation dates) divided by current price, refreshed in June of each year. We denote this value portfolio as $HML^{annual,current}$. At the end of June of year t, stocks are assigned to two size-sorted portfolios based on their market capitalization. The size breakpoint is the median NYSE market equity. Portfolios are value-weighted, refreshed every June, and rebalanced every calendar month to maintain value weights. The value factor HML is the average return on the two value portfolios minus the average return on the two growth portfolios. This table includes all available stocks in our US sample. The sample period runs from 1950 to 2011. The explanatory variable is the monthly return on the momentum portfolio (UMD). We run a regression for each calendar month and plot the regression coefficient. We also plot the fitted time trend.

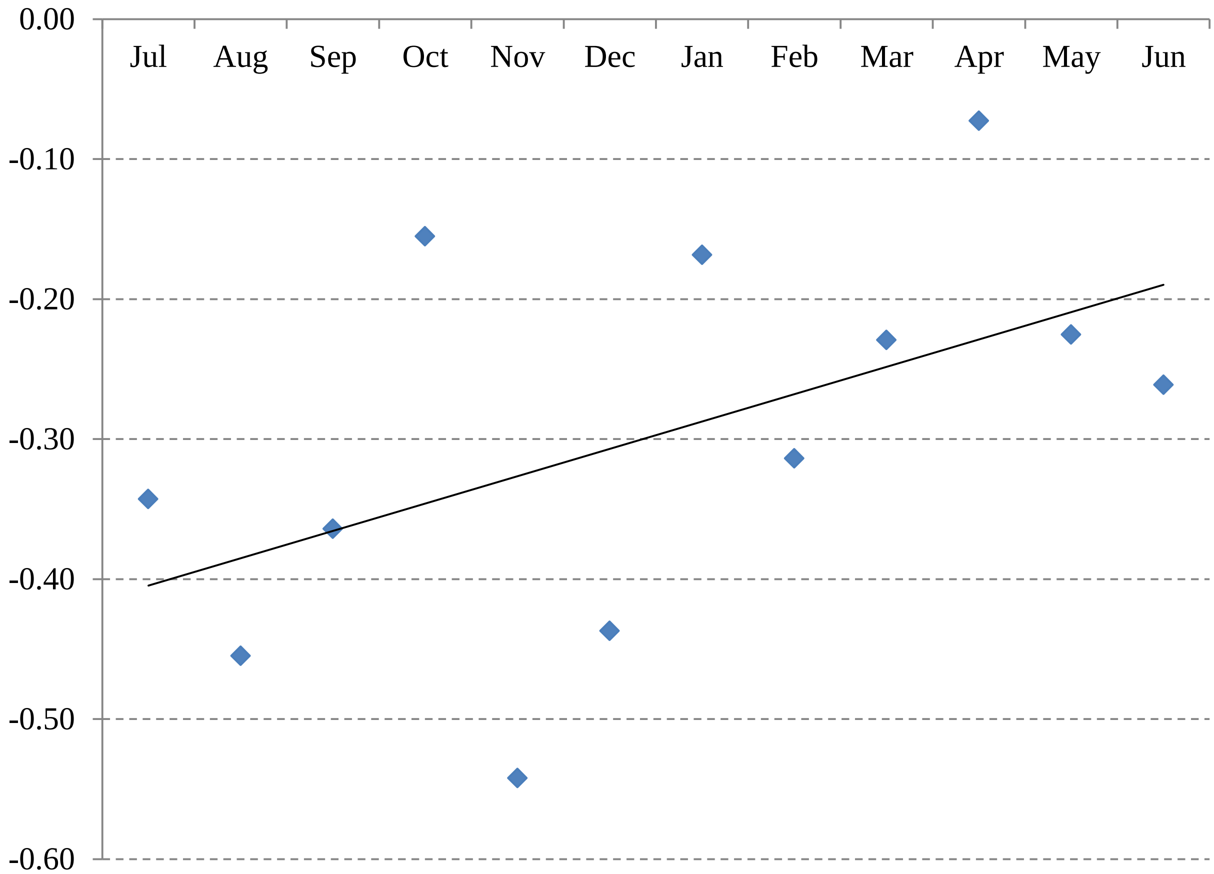


Figure 5
Case Study: HML and UMD in 2009, Global Sample, Total Returns

This figure plots total returns. We plot cumulative returns of value (HML) and momentum (UMD) portfolios between February 2009 and July 2010. Value factors are constructed using our three book-to-price (B/P) measures. This figure includes all available stocks in our US and International sample. Country portfolios are aggregated into Global portfolios using the country's total market capitalization as of the prior month.