The Recent Decade of Drawdown in Value: A Diagnosis and an Enhancement

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Executive Summary

The canonical book-to-price based value strategy has been in a drawdown in the US since the global financial crisis of 2008 (the "GFC"), leading many market commentators to question whether value investing was still alive. We present empirical evidence suggesting that part of the story of the recent decade-long drawdown of this canonical value strategy is that book value is an incomplete fundamental valuation model for firms in the modern era.

Our first finding is that the average profitability and operating efficiency of the US stocks identified as "overvalued" by the canonical book-to-price strategy has increased since the GFC, and vice versa for stocks identified as "undervalued". This makes it reasonable to expect some degree of underperformance from the strategy since the crisis. We show that significant improvements to the performance of the canonical strategy can be made if market participants complement their use of book-to-price ratios with measures of firm profitability and operating efficiency to most effectively capture the value effect.

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1. Introduction

The value effect, most popularly defined as the spread between the performance of stocks with high book-to-price ratios and those with low book-to-price ratios, has experienced returns that are lower than expected since the GFC. Its post-GFC performance stands out in contrast to its performance over the decade just before, as shown in Figure 1, leading many to ask if value investing's days were over ([6]).

Figure 1: Cumulative daily returns of the value effect.

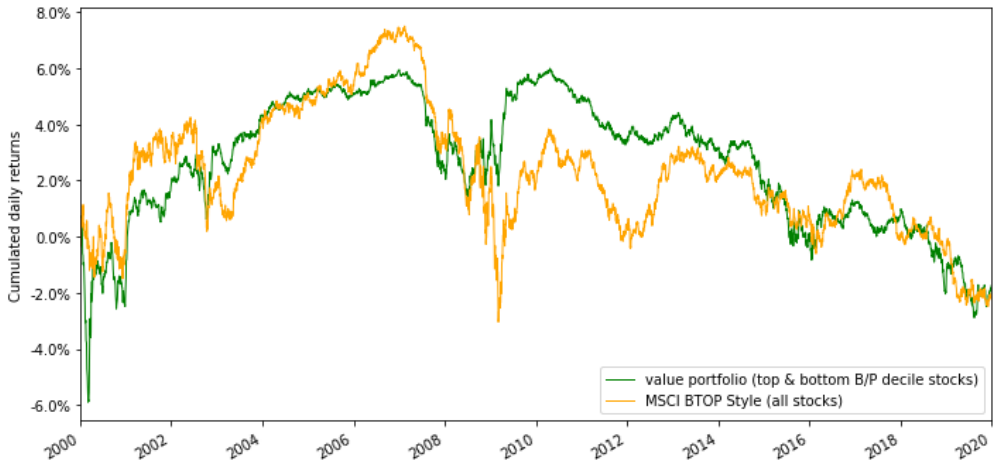

Figure 1: The returns to the value portfolio are generated as follows: Each day, we rank all the stocks in MSCI USA Investable Market Index by their book-to-price ratios in ascending order. We then form two equal weighted portfolios consisting of stocks in the top and bottom deciles of the above ranking. We call the top decile Value portfolio (as it consists of underpriced, high book-to-price stocks), and the bottom decile Glamour portfolio (as it consists of overvalued, low book-to-price stocks). We then create a market neutral combination that goes long Value portfolio and short Glamour portfolio. We call this market neutral portfolio the value portfolio, and its returns are shown in the figure.

MSCI Barra USE4S BTOP (Book-to-Price) Style factor[1] is an equity style factor whose returns are computed by constructing a market neutral long-short portfolio of all the stocks in MSCI USA Investable Market Index where a stock's holding is proportional to its book-to-price ratio normalized across all the stocks in the index.

Time period: 2000-01-01 to 2019-12-31.

To harvest the value effect most profitably, one needs to reliably identify overvalued and undervalued stocks. The traditional approach has been to sort the stocks based on their book-to-price ratios,[2] and go long the stocks with high ratios and short the stocks with low ratios. The implicit bet is that stocks with high book-to-price ratios are undervalued relative to the fundamental value of their business and mispriced, and should appreciate in future, and vice versa.

To the extent that book value is an appropriate measure of a firm's true fundamental value, the above strategy should be profitable. However, academics have recently argued (see [3] and [4]) that the traditional measure of book value does not fully reflect fundamental value in the modern economy. In the past, corporate investments were primarily in physical assets such as property, plant, and equipment. Over the past decade, corporate business models have changed in a way that the role of non-physical, intangible assets in driving the revenue and profitability has significantly increased. These intangible assets include things such as investments in R&D, advanced IT systems, brands, unique business processes (*e.g.*, customer recommendation algorithms), and a highly skilled workforce (see [3]).

[1] The returns to this factor are a good proxy for the canonical value strategy implemented by quantitative equity investment managers.
[2] This is the ratio of accounting book value to the market capitalization of a firm.

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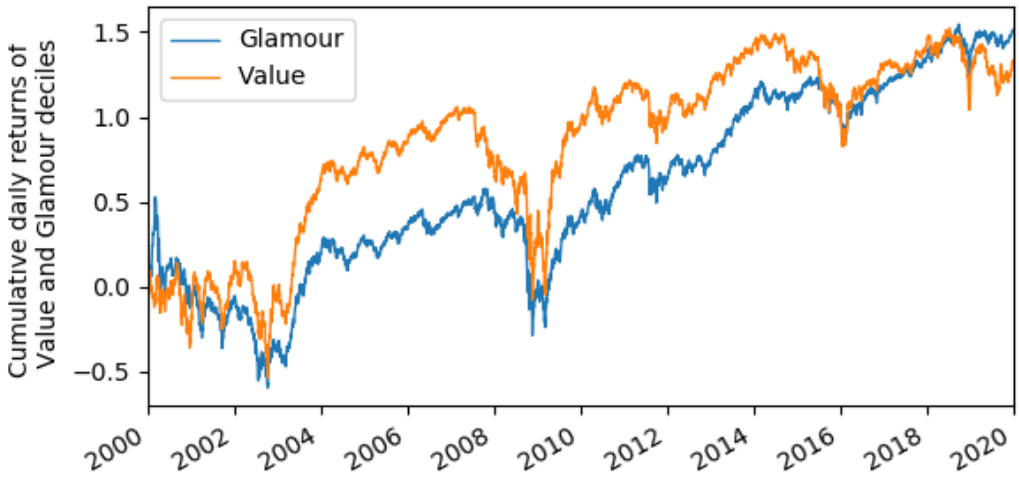
While these intangible assets tend to drive the profitability and operating efficiency of a company, they are not considered physical assets that are capitalized on the books of the business under standard accounting practice. Companies that are heavily invested in intangibles may artificially appear to be overvalued under a book-to-price ratio based measure of relative valuation and may not make a good candidate for shorting. Figure 2 shows the performance of the top (Value) and bottom (Glamour) deciles of stocks by book-to-price ratio; we see that the stocks identified as Glamour have done fairly well. This is contrary to what we would expect from the value effect. Furthermore, notice that while both the top (Value) and bottom (Glamour) deciles appear to be trending upwards post-GFC, the spread between the two is shrinking, implying that the returns to the canonical value strategy have been negative since the GFC.

Figure 2: Cumulative daily returns of top (Value) and bottom (Glamour) deciles of stocks by book-to-price. Construction methodology for the returns is the same as described in Figure 1.



2. Book-to-Price and Profitability

If the traditional measure of book value does not fully account for all the assets that contribute to a firm's profitability and operating efficiency, then, similar to the argument made by Piotroski and So [1], the profits from a book-to-price based value strategy should be concentrated among the subset of firms where book-to-price valuations[3] are incongruent with valuations implied by profitability and operating efficiency.[4] Put simply, firms with very high book-to-price ratios (i.e., value stocks) that have high profitability and operating efficiency are more likely to undergo a correction in their perceived undervaluation (i.e., an appreciation in their prices); and conversely, firms with very low book-to-price ratios (i.e., glamour stocks) that have low profitability and

[3] Note that if the market is pricing a stock at a higher (lower) book-to-price ratio, it is implying that the firm's future prospects are worse (better), and expects its stock to fall (rise).
[4] Note that a higher profitability and operating efficiency implies a higher valuation.

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operating efficiency are more likely to undergo a correction in their overvaluation (i.e., a depreciation in their prices).

As a result, times when this incongruence is more acute — when highly profitable and operationally efficient firms are more undervalued by traditional book-to-price metrics and unprofitable and operationally inefficient firms are more overvalued by book-to-price — would result in higher returns to the value effect, and vice versa.

In this Thematic Research white paper, we build upon this observation to study whether the apparent regime change in the performance of a book-to-price based value strategy around the 2007-2008 period coincides with any regime change in the above incongruence. In other words, we look at how the average profitability and operating efficiency of firms, traded by a book-to-price based value strategy, changed after the GFC relative to the period before. If we find the period after 2008 to be of lower incongruence, on average, relative to the period before 2008, we should have found *an* explanation for the poor performance of book-to-price based value strategy since 2008.

The rest of the white paper is structured as follows: Section 3 describes the stock universe and data utilized in this study. We then describe the measure of the incongruence in Section 4. Section 5 describes this report's regime change detection methodology and presents findings. We conclude the white paper by showing how incorporating firm profitability and operating efficiency could have significantly improved the performance of a simple book-to-price based value strategy over the last decade.

3. About the Data

The stock universe utilized in this report consists of all the stocks underlying the MSCI USA Investable Market Index.[5] As a result, the analysis in this white paper focuses on the U.S. public equity market.

For value loadings, this report uses the MSCI Barra USE4S risk model's BTOP (i.e., Book-to-Price) factor. A loading for a given firm is defined as the ratio of its last reported book value to its current market capitalization. A firm having a higher ratio is assigned a higher loading. We use these loadings as our proxy for book-to-price ratios of all the stocks in this analysis universe.

[5] The MSCI USA Investable Market Index (IMI) is designed to measure the performance of the large, mid and small cap segments of the US market. With 2,376 constituents, the index covers approximately 99% of the free float-adjusted market capitalization in the US.

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For profitability loadings, this report uses the MSCI Barra USSLOWL risk model, which has a Profitability factor whose loading for a given firm is defined as a weighted average of (a) asset turnover, (b) gross profitability, (c) gross margin, (d) return on assets, and (e) return on equity. A firm having a higher loading is considered to have a higher profitability and operating efficiency. This report uses these loadings as a proxy for profitability and operating efficiency of the firms whose stocks are included in this analysis universe.

Let us now quantitatively define the concept of incongruence that we introduced in Section 2.

4. Defining Incongruence

If the profitability and operating efficiency of a firm are represented by its loading to MSCI Barra USSLOWL Profitability factor, and its book-to-price ratio by its loading to MSCI Barra USE4S BTOP factor,[6] then, on any day *t*, the regression beta obtained from regressing that day's BTOP factor loadings onto Profitability factor loadings across the cross-section of stocks can be interpreted as a measure of that day's average incongruence between the market's expectations for firms' future returns as implied by the book-to-price ratios and those implied by their profitability and operating efficiency.[7] Furthermore, measuring this incongruence in excess of the average incongruence, should help in capturing the temporal changes in incongruence that the traditionally defined value strategy has experienced.

To measure the average and excess incongruences, we run the following regression on day *t*:

$$l_{i,t}^{BTOP} = \alpha + \beta_t \cdot l_{i,t}^{PROFIT} + \beta_{G,t} \cdot 1_{\{i \in Glamour\}} \cdot l_{i,t}^{PROFIT} + \beta_{V,t} \cdot 1_{\{i \in Value\}} \cdot l_{i,t}^{PROFIT} + \epsilon_{i,t} \qquad \text{(R.1)}$$

Here, $l_{i,t}^{BTOP}$ and $l_{i,t}^{PROFIT}$ denote on day *t*, firm *i*'s loadings to, respectively, MSCI Barra USE4S BTOP and MSCI Barra USSLOWL Profitability factors. The indicator variables $\mathbf{1}_{\{i \in Glamour\}}$ and $\mathbf{1}_{\{i \in Value\}}$ take the value of 1 if stock *i* is, respectively, a Glamour stock or a Value stock, where stock *i* on day *t* is said to be a Glamour (Value) stock if it lies in the bottom (top) decile of that day's MSCI Barra USE4S BTOP factor loadings. The regression coefficient $\boldsymbol{\beta_t}$ denotes the average level of incongruence while $\boldsymbol{\beta_{G,t}}$ and $\boldsymbol{\beta_{V,t}}$, respectively, denote the excess incongruence of Glamour and Value firms beyond what the $\boldsymbol{\beta_t}$ would predict. Figure 3 shows the time series of the three regression coefficients estimated over the period spanning 2000-01-01 to 2019-12-31.

[6] The higher the loading, the higher the book-to-price ratio, and thus the higher the undervaluation along that metric.

[7] Note that if on a day t, the loadings of MSCI Barra USE4S BTOP factor and MSCI Barra USSLOWL Profitability factor were to align perfectly, resulting in a regression beta of ~1.0, then, this would mean that the most (least) profitable and operationally efficient firms are the most undervalued (overvalued) firms as well. This would imply maximum incongruence. Therefore, the regression beta does act as a measure of incongruence.

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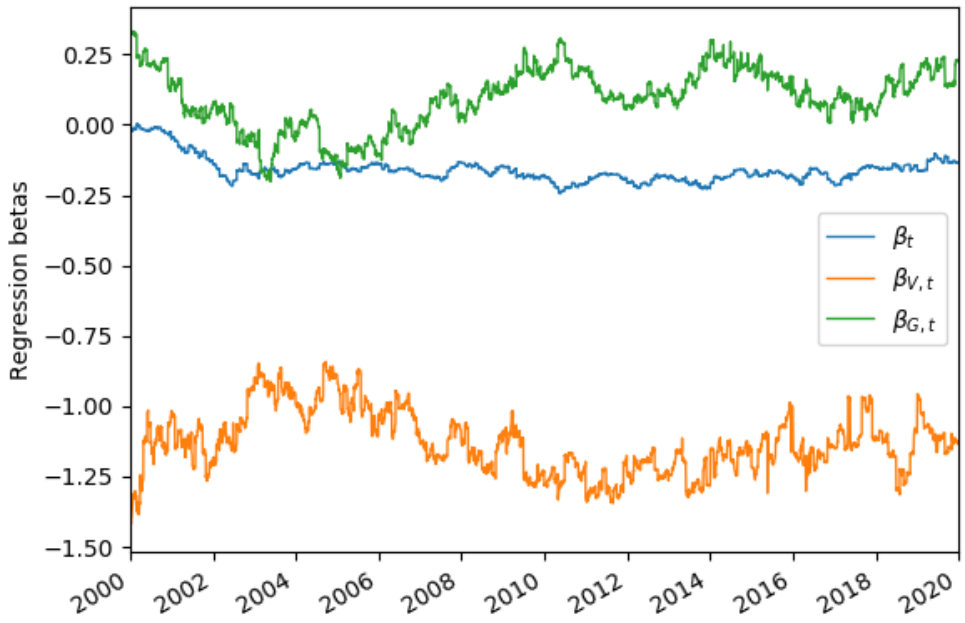
Notice that the average incongruence, measured by β_t (the blue line) is always negative.[8] This is expected as firms with low profitability and operating efficiency would generally be the ones having high book-to-price ratios, and vice versa.

The excess incongruence, $\beta_{G,t}$, of bottom decile Glamour stocks, denoted by the green line, is almost always positive, implying that a firm with a very low book-to-price ratio, on average, has much higher profitability and operating efficiency than a linear relationship would predict. The apparent upward trend in the green line since 2006 points to the possibility that the profitability and operating efficiency have been gradually increasing for the so called "overvalued firms", *i.e.*, firms with very low book-to-price ratios (which we examine more formally in the next section). If this is indeed the case, then the high valuations of several firms in this category may be justified.

The *excess* incongruence, $\beta_{V,t}$, of top decile Value stocks, denoted by the orange line, is always negative, implying that firms with a very high book-to-price ratio, on average, have a lower profitability and operating efficiency than a linear relationship would predict.

Figure 3: Estimated betas for regression R.1
Time period: 2000-01-01 to 2019-12-31



Having defined the incongruence and plotted it through time, let's now see if we can detect a regime change in it. If we find that a regime change in the incongruence has occurred contemporaneously with the turn in value factor performance, we will have some evidence in

[8] A negative incongruence level over the full sample essentially means that MSCI Barra USE4S BTOP and MSCI Barra USSLOWL Profitability factors are generally congruent, i.e., a higher book-to-price firms are, on average, less profitable and operationally efficient.

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favor of the possibility that this is what drove the regime change in the performance of the book-to-price based value strategy (Figure 1).

The next section presents this report's regime change analysis.

5. Regime Change Detection

In order to detect a regime change in a time series over a given time period, one intuitive thing to do is to pick a day *T* and divide the time period into two subperiods — one before and one after T, and then compare the average levels of the time series in the two subperiods. If the difference between the two averages is found to be statistically significantly different from zero, one could say that the two subperiods represent different regimes for the time series.[9] Building on this idea, in order to identify when a regime shift occurred in a time series, we run this calculation on every day T in the time period of interest, and call the day on which this difference is found to be most statistically significant to be the day when the time series has most likely undergone a regime change. In other words, the day T would be the day that separates the given time period into most different regimes.[10]

We put this idea to work in order to find a regime change in the excess incongruences of Value and Glamour stocks: For a given day T in the time period spanning Jan 1, 2000 to Dec 31, 2019, we split the time period into two subperiods and compute the sample means for $\beta_{G,t}$ ($\beta_{V,t}$) for the period before and after T. Let us call the mean over the period ending at T to be $Pre\beta_{G,t}$ ($Pre\beta_{V,t}$) and the mean over the period starting at T to be $Post\beta_{G,t}$($Post\beta_{V,t}$). We then compute the difference-of-means[11] statistics for the difference $Pre\beta_{G,t} - Post\beta_{G,t}$ ($Pre\beta_{V,t} - Post\beta_{V,t}$), denoted by $X_{G,t}$ ($X_{V,t}$). Time series of the statistics $X_{G,t}$ and $X_{V,t}$ will have the following properties:

1. The point where $X_{G,t}$ reaches a minimum will correspond to the most likely date of regime change in $\beta_{G,t}$, implying that firms identified as Glamour firms based on their book-to-price ratios are, on average, more profitable and operationally efficient in the subperiod starting at T than they were over the subperiod ending at T.

2. The point where $X_{V,t}$ reaches a maximum will correspond to the date of regime change in $\beta_{V,t}$, implying that firms identified as Value firms based on their book-to-price ratios are, on average, less profitable and operationally efficient in the subperiod starting at T than they were over the subperiod ending at T.

[9] What is described here is akin to a difference-of-means test in Statistics. For reference, see: https://statistics.berkeley.edu/computing/r-t-tests

[10] The definition of regime change utilized in this report is quite narrow in the sense that it only looks at the first moment of the distribution of a given time series. For the particular case at hand, it is unclear if studying a regime change in the higher moments of the incongruence would result in interpretable insights. As always, we invite readers to share their comments.

[11] For reference, see: https://statistics.berkeley.edu/computing/r-t-tests

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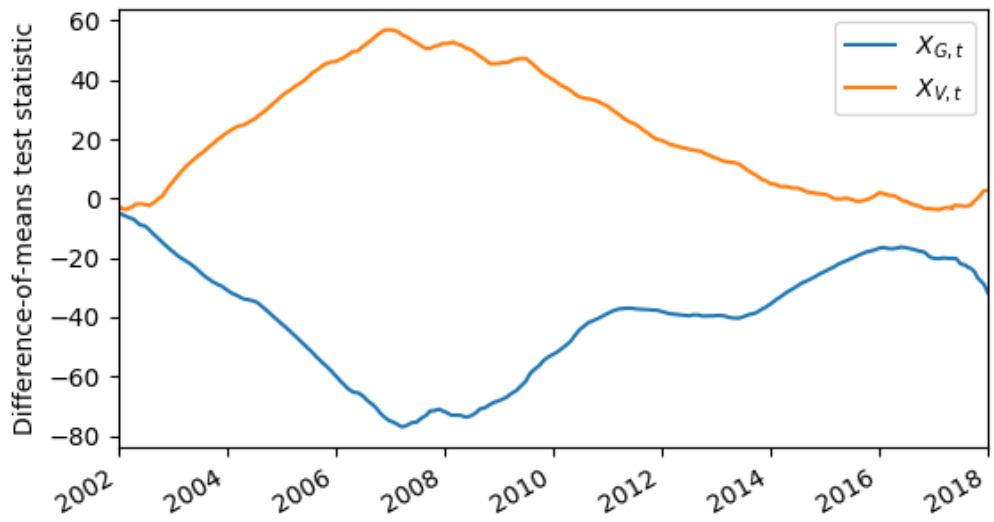
Figure 4 shows the plot of time series of $X_{G,t}$ and $X_{V,t}$.

Figure 4: Time series plot of $\mathbf{X_{G,t}}$ and $\mathbf{X_{V,t}}$.[12]



We see that somewhere around the middle of year 2007 is when $X_{G,t}$ and $X_{V,t}$ achieve a minimum and a maximum respectively. The fact that the plot is quite monotonically decreasing (increasing) for $X_{G,t}$ ($X_{V,t}$) before mid-2007 and then increasing (decreasing) afterwards indicates a gradual, as opposed to an abrupt, regime change in mid-2007.

Let us also construct the same time series as $X_{G,t}$ and $X_{V,t}$ but for the two returns series shown in Figure 1. For brevity, let's call the one obtained for the returns to Value/Glamour anomaly portfolio to be $Y_{V/G,t}$ and the one for the returns to MSCI Barra USE4S BTOP Style factor to be $Y_{BTOP,t}$. Figure 5 shows the time series plots of all the four difference-of-means metrics computed.

[12] The first and last two years from the full sample spanning 2000-01-01 to 2019-12-31 have been dropped from this plot, and are not considered when analyzing the various difference-of-means statistics as these two two-year periods do not contain sufficient data points to give a meaningful difference of means test statistics.

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Figure 5: Time series plot of the four difference-of-means statistics. (Left): $\mathbf{X_{V,t}}$ and $\mathbf{X_{G,t}}$; (Right): $\mathbf{Y_{V/G,t}}$ and $\mathbf{Y_{BTOP,t}}$. Time period: 2002-01-01 to 2017-12-31.[13]

Notice that the period over which $Y_{V/G,t}$ and $Y_{BTOP,t}$ attain their maxima more-or-less coincides with the one over which $X_{V,t}$ and $X_{G,t}$ attain their extrema. All this points to the possibility that the regime change in the returns of the book-to-price based value strategy could have been driven by the forces that also drove the regime change in incongruence of the Value and Glamour stocks.

To recap the analysis thus far, in Section 1, we presented the argument that the standard book value metric may no longer correctly reflect the fundamental value of a firm as it does not take into account the increasing role of intangibles in determining firms' profitability and operating efficiency in the new economy. We then hypothesized in Section 2 that the times when very high book-to-price firms also have a very high profitability and operating efficiency and vice versa will be the times when the value effect is most strongly observed. Using this conjecture, we set out to explain the stark contrast in the pre-GFC and post-GFC performances of the book-to-price based value strategy by examining changes through time in the profitability and operating efficiency of stocks traded by the strategy. The analysis in Section 5 provided evidence in favor of our hypothesis.

In the next section, we consider another measure of fundamental value that is less likely to suffer from the deficiency that accounting book value does.

[13] The first and last two years from the full sample spanning 2000-01-01 to 2019-12-31 have been dropped from this plot, and are not considered when analyzing the various difference-of-means statistics as these two two-year periods do not contain sufficient data points to give a meaningful difference of means test statistics.

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6. Incongruence and Another Definition of Value

An alternative measure of value is earnings yield, which is the ratio of a firm's earnings to its market capitalization. Earnings of a firm should take into account the contribution of all the assets — tangible or intangible — to its revenue, profitability and operating efficiency. As a result, we should expect a value strategy that goes long stocks with very high earnings yield (i.e., undervalued stocks) and short stocks with very low earnings yield (*i.e.*, overvalued stocks) to perform better than the book-to-price based value strategy. This was indeed the case over the last two decades as is shown in Figure 6 below. Furthermore, we should expect average incongruence (Section 4) for earnings yield to be higher than that for book-to-price. Figure 7 shows this to be the case: the blue line (denoting the average incongruence for earnings yield) to be higher than the orange line (denoting the average incongruence for book-to-price) throughout the time period of our study, indicating earnings yield to be a better measure of true underlying firm profitability than book-to-price.

Figure 6: Cumulative daily returns of an earnings yield based value strategy.

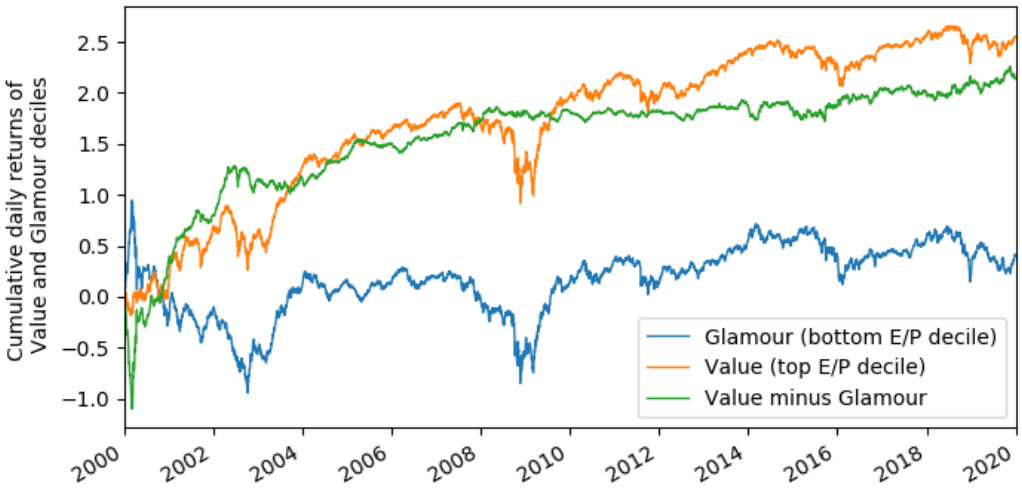

Figure 6: The construction methodology followed is the same as described in Figure 1 with earnings yield (E/P) replacing book-to-price.

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Figure 7: Time series plot of β_t — the average incongruence — as defined in regression R.1.

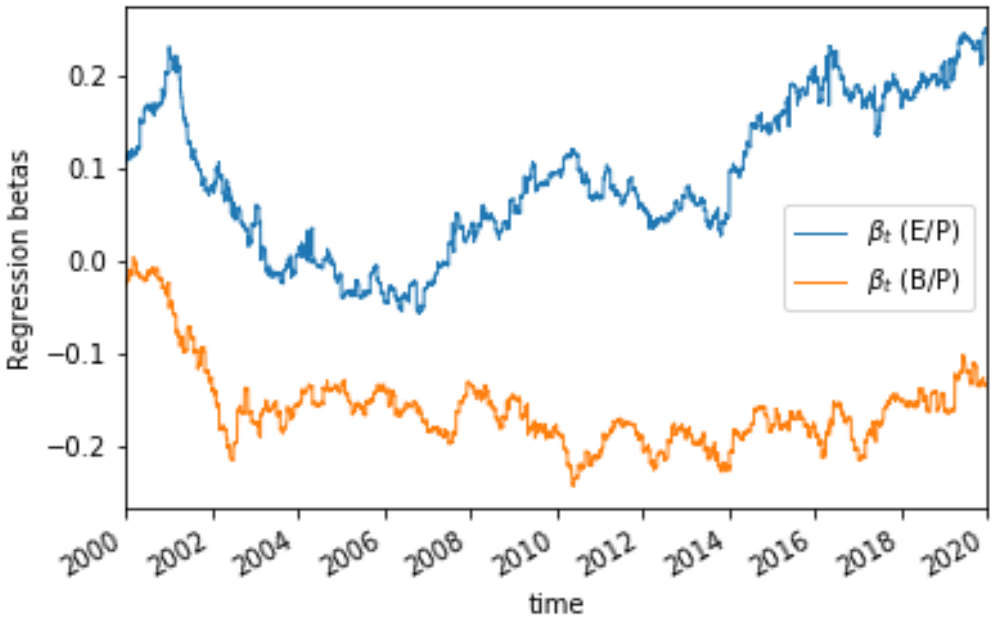

Figure 7: β_t (E/P): the average incongruence obtained by using MSCI Barra USE4S Earnings Yield factor loadings (our proxy for earnings yield of firms in our data sample) as the response variable in regression R.1.

β_t (B/P): the average incongruence obtained by using MSCI Barra USE4S BTOP factor loadings (our proxy for book-to-price ratios of firms in our data sample) as the response variable in regression R.1.

Time period: 2000-01-01 to 2019-12-31

Furthermore, because earnings of a firm measure the contribution of all its assets — tangible and intangible — to its bottom line, an earnings based measure of value — i.e., earnings yield — should not result in a value strategy that undergoes a regime change in the profitability and operating efficiency of the stocks it trades as was found to be the case with the book-to-price based value strategy (in Sections 4 and 5). Figure 8 shows this to indeed be the case: the plots of $X_{V,t}$ and $X_{G,t}$ do not exhibit a gradual achievement of extrema around any date during the period studied, which is in contrast to what we see in Figure 4 and points to the possibility of earnings based measures of value not to suffer from the deficiency that book-value based measures suffer.

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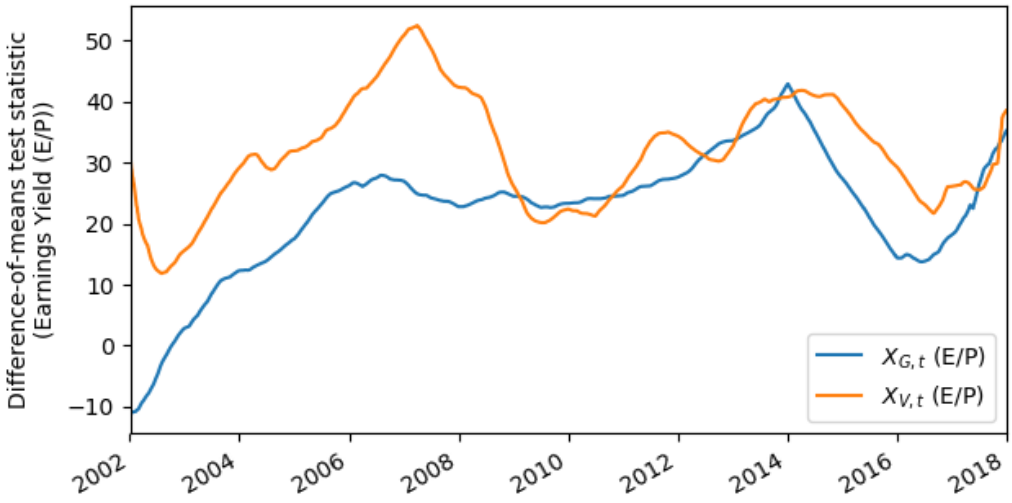
Figure 8: Time series plot of $\mathbf{X_{G,t}}$ and $\mathbf{X_{V,t}}$ obtained when using USE4S Earnings Yield (E/P) factor's loadings[14] as the response variable in regression R.1.



So far, we have found evidence that suggests that stocks that are identified as under- and over-valued by book value should not necessarily be expected to undergo a correction in their pricing. With that being said, can the traditional book-to-price value strategy be saved? In the next section, we study an investment strategy that tries to make up for the incompleteness of book value by taking into account firm profitability and operating efficiency to identify mispriced stocks that are more likely to undergo a correction.

7. Finding Value Where Incongruence Is

We use the insight of Piotroski and So [1] to attempt to improve upon the performance of a book-to-price based value strategy by identifying stocks where the incongruence (Section 2) is the highest. Specifically, on each day, we assign two labels to each stock — one being its tertile based on its book-to-price ratio (specifically, its loading to the MSCI Barra USE4S BTOP factor), and the other being its tertile based on its profitability and operating efficiency (specifically, its loading to the MSCI Barra USSLOWL Profitability factor). The stocks that lie in the top tertile by their loadings to the MSCI Barra USE4S BTOP factor and top tertile by their loadings to the MSCI Barra USSLOWL Profitability factor and vice versa will be those stocks where the incongruence is the highest.[15] We then form two equal-weighted portfolios of stocks thus identified as undervalued (call them Congruent Value) and overvalued (call them Congruent Glamour), and create a market-neutral combination that goes long the Congruent Value portfolio and goes short the Congruent Glamour portfolio. We call this new long-short market neutral portfolio the Congruent value strategy. Figure 9 shows the cumulative daily returns from the value[16] and Congruent value strategies, and Table 1 shows their realized Sharpe ratios. A simple modification

[14] MSCI Barra USE4S risk model has a Earnings Yield factor whose loading for a given firm is defined as a weighted average of (a) predicted earnings to price ratio, (b) cash earnings to price ratio, and (c) trailing 12 months earnings to price ratio. A firm having a higher loading is considered to have a higher earnings relative to its market capitalization, and can be interpreted to be undervalued by the market.

[15] Per the hypothesis presented in Section 2, these are also the stocks with the highest likelihood of a price reversion.

[16] This is the same value strategy whose returns are shown in Figure 1.

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to the book-to-price based value strategy results in a very significant performance benefit as measured by the annualized Sharpe ratios shown in Table 1.[17]

Figure 9: Cumulative daily returns to the value and Congruent value strategies.

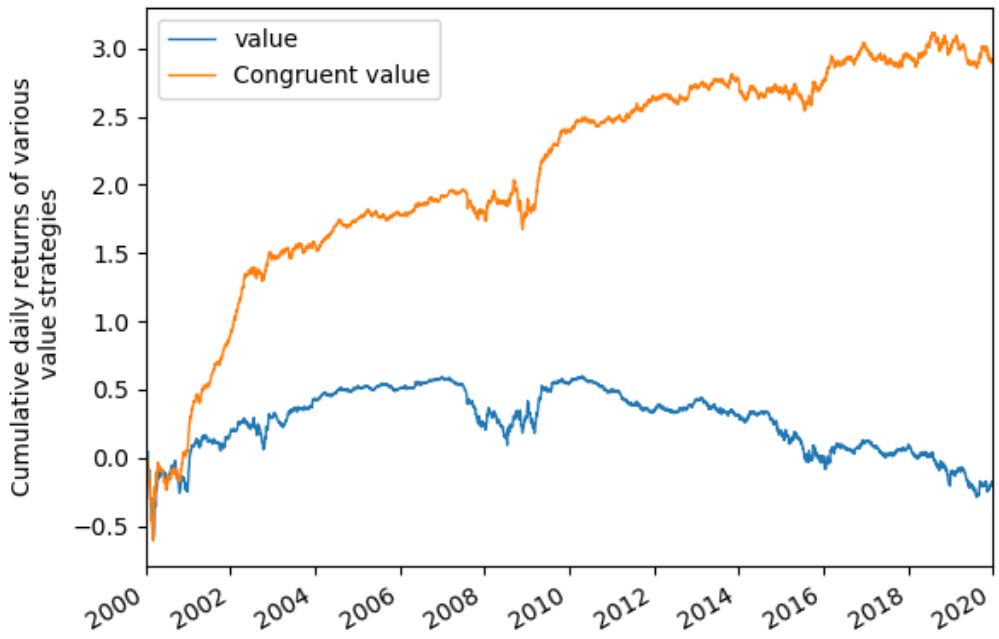

Table 1 | Annualized Sharpe ratios of the two versions of book-to-price based value strategy over three time periods. Full: Jan 1, 2000 to Dec 31, 2019; Pre-2007: Jan 1, 2000 to Dec 31, 2007; Post-2007: Jan 1, 2008 to Dec 31, 2019

	value	Congruent value
Full	-0.07	1.07
Pre-2007	0.22	1.54
Post-2007	-0.31	0.73

Using firm profitability and operating efficiency to improve the traditional book-to-price based value strategy is well known in the finance community (see [2] and [5]); and one would expect quantitative investment managers and certain sophisticated discretionary investors to already be factoring in firm profitability and operating efficiency in their screens for value stocks. So, the decade-long losing streak of the book-to-price based value strategy may not have been of much concern to the sophisticated value investors out there. That being said, even this enhanced implementation has been mostly flat since the beginning of 2017 as Figure 10 and Table 2 show.

[17] We performed a similar profitability based augmentation of the earnings yield based value strategy but did not find any significant pick-up in performance.

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Figure 10: Cumulative daily returns to the value and Congruent value strategies for the last three years (2017-01-01 to 2019-12-31).

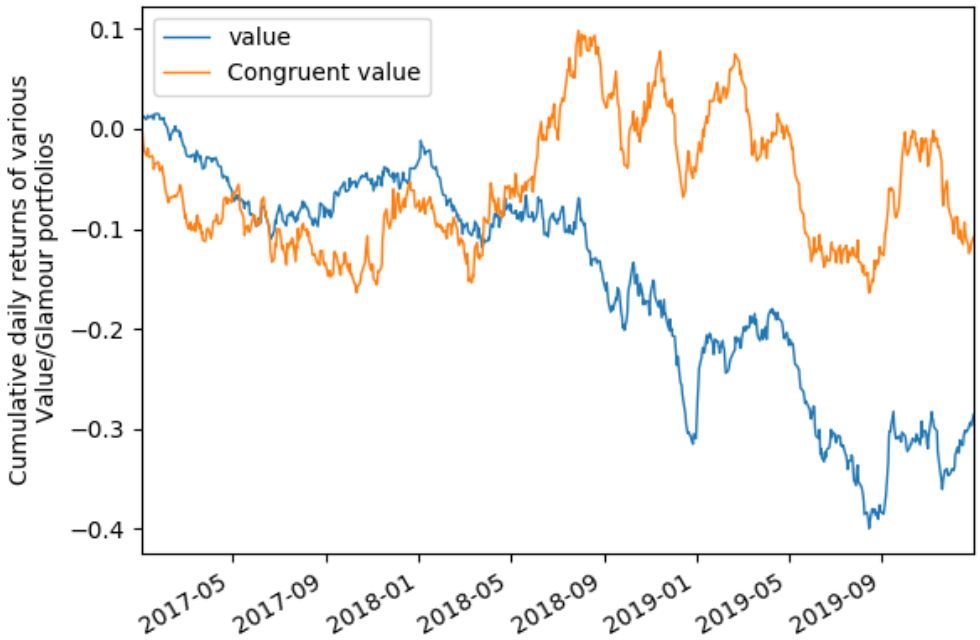

Table 2 | Annualized Sharpe ratio of the two versions of book-to-price based value strategies over the last three years (2017-01-01 to 2019-12-31).

value	Congruent value
-0.88	-0.26

To investigate the recent poor performance of value and Congruent value, we looked at their GICS sector exposures. Figure 11 shows the average sector tilts of value and Congruent value strategies over the last three years. Congruent value has carried a large short exposure to Healthcare over the period which is also the GICS sector where it has incurred the most negative cumulative returns as Figure 12 shows. This points to the possibility that a sector-neutral version of Congruent value may further improve traditional value's performance. Our preliminary analysis shows that residualizing for GICS Sector tilts reduces the drawdown of Congruent value over the last three years and also improves its performance over the last two decades. We will seek to discuss this topic in the next Thematic Research white paper as part of our series on analyzing *value*'s negative performance over the last two decades.

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Figure 11: Average GICS sector tilts of value and Congruent value portfolios over the last three years (2017-01-01 to 2019-12-31).

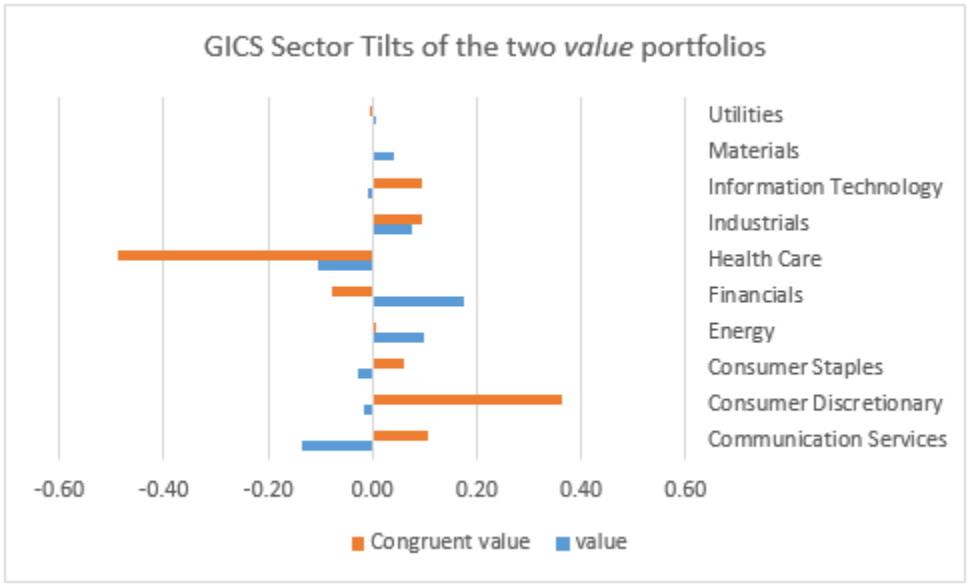
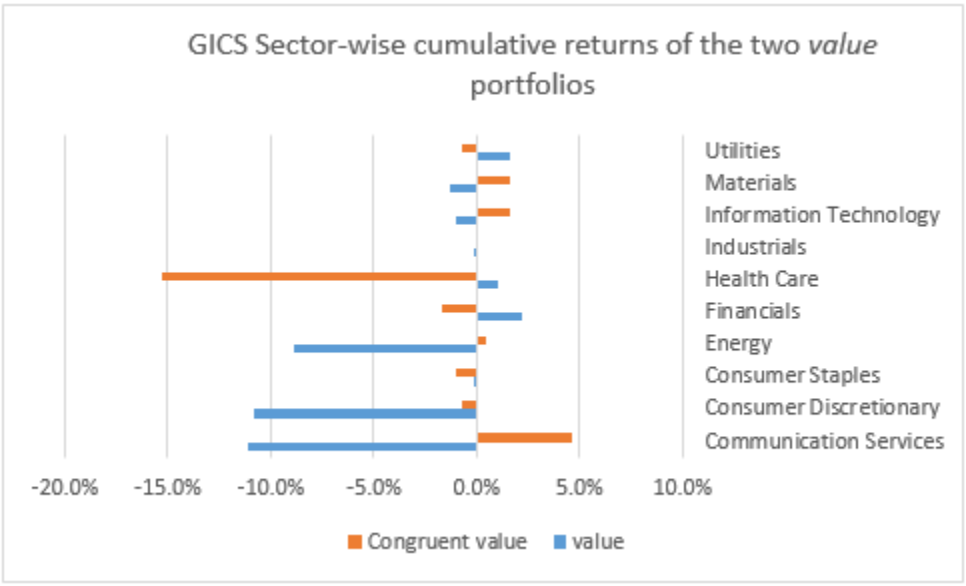


Figure 11: A tilt value of 0.2 to Financials means that in a strategy that has invested $1 in going long an equi-weighted port-folio of value stocks, and $1 in going short an equi-weighted portfolio of glamour stocks, the net market value of stocks belonging to the Financials sector is approx. $0.2.

Figure 12: Cumulative daily returns realized by value and Congruent value portfolios over the last three years (2017-01-01 to 2019-12-31), broken down by sectors.



8. Conclusion

The value strategy based on book-to-price ratio, which is the traditional and most popular identifier of value, was reasonably profitable over the 7-8 years before the GFC but has been in a

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consistent drawdown since. While many were led to question whether value investing's days were over, we have presented evidence in this white paper that the value effect may remain very much alive.

The book-to-price ratio seems to have become less effective over the years at identifying value stocks, and this is probably because the accounting book value does not fully reflect the fundamental value of a company in the new economy (where digital assets and a highly talented workforce have become a dominant force behind firms' profitability and operating efficiency). While such changes in the composition of an economy happen only gradually, we show in Sections 4 and 5 that in the U.S., the average profitability and operating efficiency of value firms most likely underwent a regime change around the GFC: The value firms, on average, appear to be less profitable and operationally efficient since the crisis than they were before. The opposite effect holds for glamour or overpriced firms. This makes it reasonable to expect some degree of underperformance of a book-to-price based value strategy after the financial crisis.

A better expression of the value effect should be expected if one were to use company earnings — representing the contribution to business from all types of assets held by a firm — to identify overvalued and undervalued firms, or, to continue using book-to-price ratios but augment them with measures of firm profitability and operating efficiency. Sections 6 and 7 confirm that both of these approaches result in better performing value portfolios than the one based solely on book-to-price.

Overall, we come to the conclusion that value investing was profitable for investors who used correct fundamental valuation models to arrive at intrinsic value of firms to which they can compare their market valuations to identify over- and under-valued stocks. In this sense, the story of the recent decade-long drawdown of the book-to-price based value strategy may be that of book value being an incomplete fundamental valuation model for firms over the last decade.

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