PWL

Factor Investing with ETFs

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1 Introduction

There is a better way to build an index fund portfolio than accepting the market cap weights of stocks.

Simplicity is a beautiful thing when it comes to investing. Unfortunately, there is an inevitable trade-off between simplicity and optimization. The dialogue on ETF investing in Canada has shifted heavily toward simplicity. In the process, some of the most important research on asset pricing and portfolio management has been cast aside. This paper is designed to bring attention back to that research.

Certain types of stocks have been proven to deliver higher expected returns due to their exposure to additional risks. A traditional market-cap weighted index fund only offers exposure to market risk. Market risk is an important risk, but there are other risks that are at least as likely to deliver excess returns.

Combining several of these risks in a portfolio has another benefit: not all of the risks will perform the same way over time. Diversifying across different risk factors may be even more beneficial than diversifying across geographic regions[1].

Unfortunately, it is not as easy as purchasing a nicely packaged factor ETF. The race to the bottom for pricing on market-cap weighted ETFs has forced ETF companies to come up with ways that they can attempt to add value. The result has been the proliferation of ETFs with relatively high fees containing the word "factor" in their product name. The challenge for investors is that calling a fund a "factor fund" does not always deliver on factor premiums, especially after costs.

In this paper we will introduce some of the most common factors and the data supporting their use in portfolios. We will then examine Canadian listed factor ETFs; we will ultimately conclude that they are not worth their fees (sorry to give away the ending of that section). Finally, we will look at alternative methods to capturing factor premiums using carefully selected low-cost small cap and value ETFs, and we will propose an ETF model portfolio using these funds.

[1] Ilmanen, Antti S. and Kizer, Jared, "The Death of Diversification Has Been Greatly Exaggerated (2012)". Journal of Portfolio Management, Vol. 38, No. 3, pp. 15-27, 2012. Available at SSRN: https://ssrn.com/abstract=2998754

2 Asset Pricing Models

Asset pricing models generally depend on the Efficient Market Hypothesis, as explained by Eugene Fama in 1970[2]. In an efficient market, asset prices reflect available information. The information in prices, then, can be used to gain insight into the expected returns of securities. Expected returns are related to risk. Risk is reflected in prices. Asset pricing models have evolved over time as more independent risks have been identified. These independent risks are commonly known as factors – this is where we will begin.

2.1 Market Beta

Any discussion on factor investing has to start with market beta – the original factor. Financial market research has come a long way since the 1960s. At that time, the primary asset pricing model was the Capital Asset Pricing Model, or CAPM. The CAPM looks at the measure of sensitivity between an asset or portfolio and the risk of the overall market. The measure is referred to as market beta. A market cap weighted equity index fund would have a market beta of 1. A Portfolio consisting of 50% market cap weighted equity index fund and 50% cash would have a market beta of 0.5. If the market goes up 10%, the portfolio with a beta of 1 would go up 10%, while the portfolio with a beta of 0.5 would go up 5%.

In its time, market beta was the only way that we could compare two portfolios. If two portfolios had different returns but the same beta, the difference in returns would be attributed to the portfolio manager's ability to select securities and time the market, or to some as-yet undefined factor. A portfolio that can take the same amount of risk while delivering a higher return is desirable. That excess risk-adjusted return is known as alpha, the holy grail of investing.

The CAPM was the foundation of asset pricing models, but it is severely flawed. It is only able to explain about 2/3 of the differences in returns between diversified portfolios. The CAPM was proven to be flawed when Rolf Banz wrote his 1981 paper *The Relationship Between Return and Market Value of Common Stocks*[3]. He showed that small stocks had consistently higher average returns that could not be explained by their market beta. In other words, viewed through the CAPM lens, small stocks were generating alpha.

In 1985, the CAPM took another blow when Barr Rosenberg, Kenneth Reid, and Ronald Lanstein[4] found that stocks with a high book value relative to their market price (value stocks) had higher average returns that were not explained by market beta. Their paper *Persuasive Evidence of Market Inefficiency* was further evidence that market beta does not tell the full story.

[2] Fama, Eugene F. "Efficient Capital Markets: A Review of Theory and Empirical Work." The Journal of Finance, vol. 25, no. 2, 1970, pp. 383–417. JSTOR, www.jstor.org/stable/2325486.

[3] Banz, R. "The relationship between return and market value of common stocks." Journal of Financial Economics, 9(1), 1981, pp. 3-18.

[4] Fama, Eugene F. "Efficient Capital Markets: A Review of Theory and Empirical Work." The Journal of Finance, vol. 25, no. 2, 1970, pp. 383–417. JSTOR, www.jstor.org/stable/2325486.

These findings, at the time, seemed to be proof that markets were not efficient. If some types of stocks could have consistently higher returns without any additional risk, then the market is mispricing those types of stocks. If that is in fact the case then markets are, by definition, not efficient.

2.2 The Fama-French Three-Factor Model

In 1992, Eugene Fama and Kenneth French[5] pulled together the anomalies that had apparently been disproving the Efficient Market Hypothesis and brought everything back to reality. They showed that the market was still efficient, but we needed to account for additional types of risk in our asset pricing models. Adding in the independent risks of small and value stocks alongside market beta significantly increased the explanatory power of the model. Instead of explaining 2/3 of the difference in returns between diversified portfolios, the Three-Factor Model explains 90% of the difference. At this point we have three independent risk factors that explain the majority of differences in stock returns. While the Three-Factor model was a leap forward in asset pricing, there were still some anomalies that it could not explain.

2.3 The Fama-French Five-Factor Model

Since 1992, further advances have been made in asset pricing. In 2012, Robert Novy-Marx[6] documented the finding that profitability, measured by gross profits-to-assets, adds further explanatory power to asset pricing models. He found that controlling for gross profitability explains most earnings-related anomalies that the Three-Factor model had been unable to explain. Finally, in 2013, Aharoni, Grundy, and Zeng[7] documented a weaker but statistically reliable relationship between investment and average returns.

[5] Fama, Eugene F. "The Cross-Section of Expected Stock Returns." The Journal of Finance, vol. 47, no. 2, 1992 https://www.ivey.uwo.ca/cmsmedia/3775518/the_cross-section_of_expected_stock_returns.pdf.

[6] Novy-Marx, Robert. "The Other Side of Value: The Gross Profitability Premium." 2012 http://rnm.simon.rochester.edu/research/OSoV.pdf

[7] Aharoni ,Gil, Grundy, Bruce, Zeng , Qi. "Stock returns and the Miller Modigliani valuation formula: Revisiting the Fama French analysis." Journal of Financial Economics Vol. 110, Issue 2, 2013, pp. 347-357 https://doi.org/10.1016/j.jfineco.2013.08.003

3 Historical Premiums

Factors do more than explain returns. Remember, small cap and value stocks broke the CAPM because they had higher average returns than would have been expected based on their market beta. Those higher average returns have been persistent through time and pervasive across markets. This makes adding in the risk of small cap and value stocks to a portfolio compelling.

Factors are technically defined as a portfolio that is long one thing and short another. The market factor is the portfolio that is long the stock market and short one-month US treasury bills. The size premium is the portfolio that is long small stocks and short large stocks. Mathematically that's the return of small stocks minus the return of big stocks. That's how the size factor gets the name SmB (small minus big). Likewise, the value factor is defined as high book-to-market stocks minus low book-to-market, or HmL (high minus low); the profitability factor is firms with robust profitability minus firms with weak profitability, or RmW (robust minus weak). These are four of the five factors that make up the Fama-French Five-Factor model, and they are generally the factors targeted in factor investing. While it is not generally targeted in investment portfolios at this time, the investment factor, the fifth factor in the Five-Factor model, is firms that invest conservatively minus firms that invest aggressively, or CmA (conservative minus aggressive). We will see CmA in the regression coefficient tables throughout the rest of the paper, but it will not be a focus of the discussion.

The premiums have not been small, making them hard to ignore. We have three factor data going back to 1926 in the US:

	MKT	SmB	HmL
US Annualized Three Factor Premia 07/1926 - 12/2018 (%)	6.28	1.88	3.78

Data source: Ken French Data Library

For five factor data we are more limited, but there is still meaningful US data going back to 1963, through 2018:

	MKT	SmB	HmL	RmW	CmA
US Annualized Five Factor Premia 07/1963 - 12/2018 (%)	5.09	2.35	3.48	2.84	3.19

Data source: Ken French Data Library

To be clear, what we are seeing is that the market beat treasury bills by 5.09% per year on average; small stocks beat big stocks by 2.35% per year on average etc.

Globally, we have five factor data going back to 1990:

	MKT	SmB	HmL	RmW	CmA
Global ex-US Annualized Factor Premia 07/1990 - 12/2018 (%)	2.31	1.02	4.29	4.06	2.03

Data source: Ken French Data Library

These are meaningful numbers. Keep in mind that a regular market capitalization weighted index fund only gets exposure to the market factor; all of the other factor premiums, which have delivered significantly positive premiums over time, are being cast aside in favor of low costs and simplicity. There is merit to low costs and simplicity, but the evidence of persistent risk premiums in stock returns cannot be ignored.

3.1 Persistence

So far, we have looked at the full period data sets that we have available to us. Looking at the full period means that we are not observing the periods where the factor premiums have been negative. Premiums come and go over time, but over enough time they have tended to be positive. If we look at 10-year rolling periods for US stocks going back to 1963 through 2018, SmB has been positive in 73% of rolling 10-year periods; HmL has been positive in 89% of 10-year rolling periods; RmW has been positive in 86% of 10-year rolling periods; the market has beaten treasury bills in 80% of rolling 10-year periods. Over 20-year periods the data are even more compelling. The following table summarizes the percent of historical rolling 10 and 20-year time periods where factor premiums were positive in the US between 1963 and 2018.

	US MKT	US SmB	US HmL	US RmW
10-year rolling	80%	73%	89%	86%
20-year rolling	100%	82%	100%	100%

Data source: Ken French Data Library

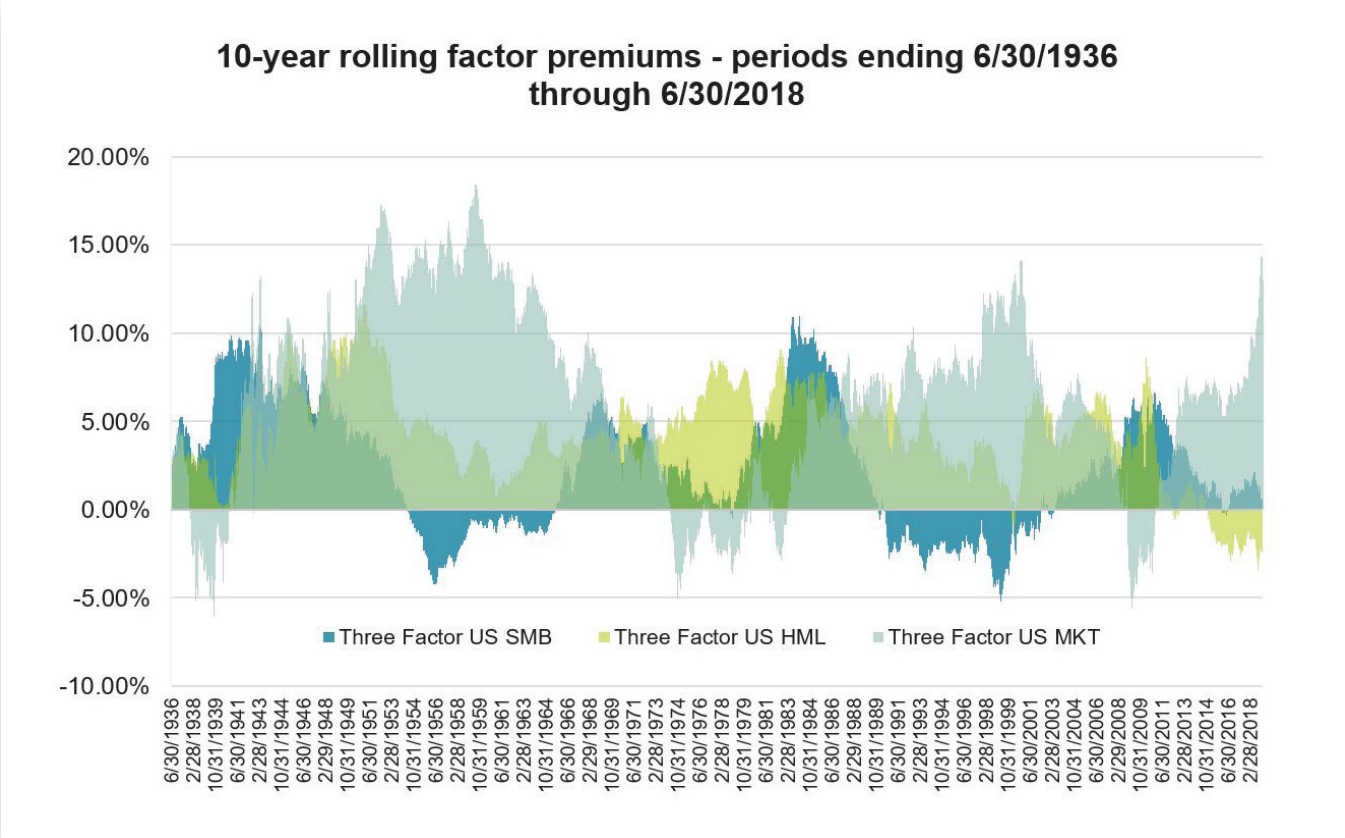
Let's take a second to reflect on that. HmL and RmW have been more consistent than the market premium over both 10 and 20-year rolling historical periods. Also keep in mind that the SmB factor includes small cap growth stocks, which we know drag down the returns (more on this in Section 3.2).

Similar data are observed for global ex-US stocks going back to 1990, though there is not enough data for a meaningful 20-year rolling period comparison.

	ex-US MKT	ex-US SmB	ex-US HmL	ex-US RmW
10-year rolling	89%	77%	80%	100%

Data source: Ken French Data Library

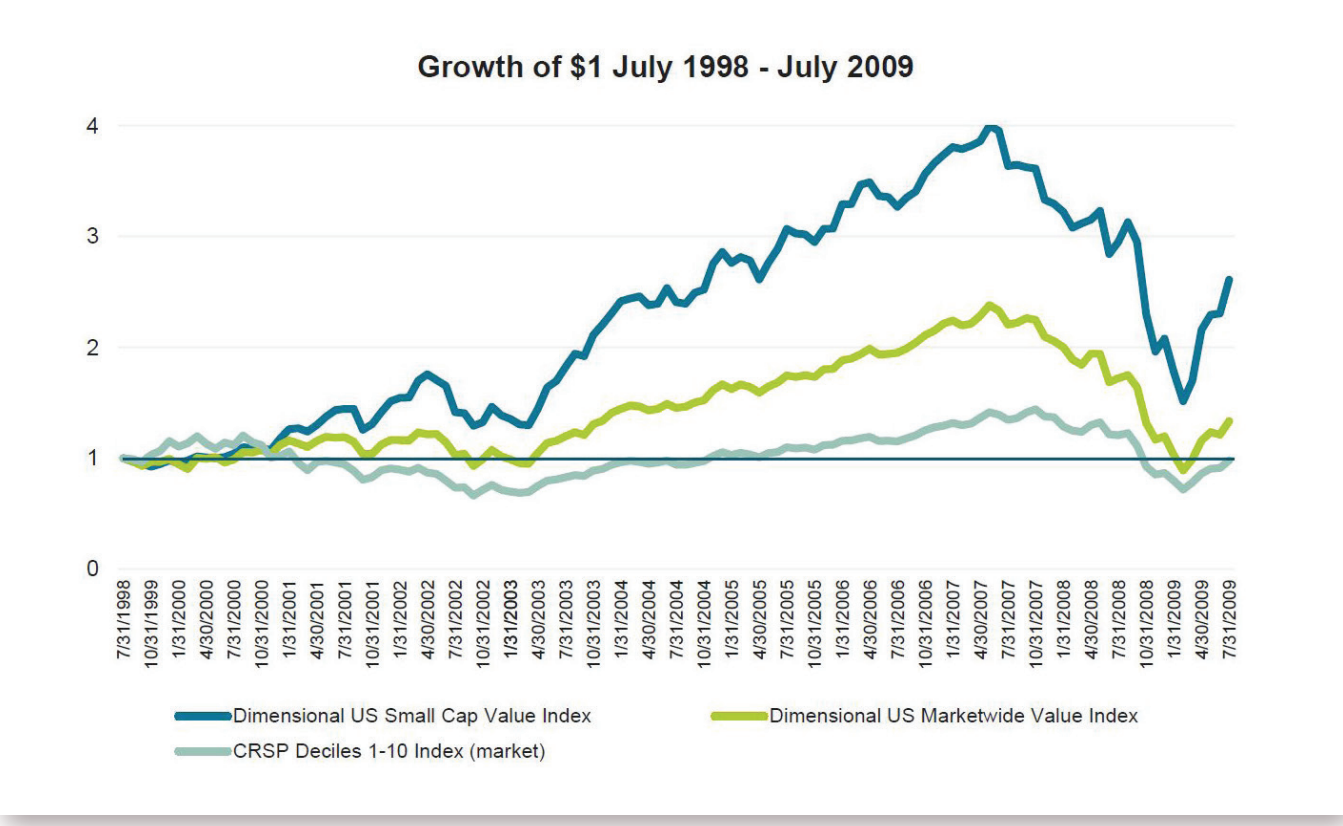
What is most interesting about the data is that when one factor risk premium is negative, at least one of the others tends to be positive. The chart below shows the 10-year rolling market, SmB, and HmL premiums for US stocks going back as far as we have data.



Data source: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

One of the arguments against adding additional risk factors to portfolios is that they may take a long time to pay off. That is true. The current time period is an example. Value stocks have underperformed growth stocks for the past 10 years in the US. This is not a reason to avoid value stocks. The market has similarly had 10-year periods of underperformance in the past, and when the market went through those periods, the size and value premiums were generally positive. This can be observed in the preceding chart in the 1930's, the 1970's, and the late 2000's.

A recent example of the market going through a prolonged period of underperformance is US stocks for the 10-year period ending July 2009. Over that time period US stocks represented by the CRSP 1-10 index lost an annualized 0.19% per year while the Dimensional US Small Cap Value index gained an annualized 10.07% per year, and the Dimensional US Marketwide Value Index returned an annualized 2.94% per year. That should be staggering to read. You lost money for 10 years investing in the US stock market as a whole, but US small cap value and US value stocks delivered meaningfully positive returns over the same period.



Data Source: CRSP, Dimensional Fund Advisors, via Dimensional Returns Web

This recent example is far from the only one. There have been 50 10-year periods going back to 1937 where the CRSP 1-10 Index has had negative absolute returns, while the Dimensional US Small Cap Value Index has experienced 40 10-year periods of negative returns, and the Dimensional US Marketwide Value Index has experienced 42 of the same.

The statement that factors can take a long time to deliver their premiums is absolutely true, but the market is not immune to those periods of underperformance. In fact, the market has historically been less reliable at delivering positive returns than small cap and value stocks. Combining multiple risk premiums together diversifies the risk away from any one factor affecting the long-term outcome of an investment strategy.

3.2 The Small Cap Growth Anomaly

The higher average returns of small cap stocks are not shared across the entire small cap universe. Small cap growth stocks with weak profitability have had poor risk-adjusted returns – poor enough to drag down the returns of the whole small cap universe. If small cap growth stocks are removed from the data, the results improve dramatically. If small cap growth stocks cannot be removed it calls into question the ability of an investor to get any benefit from targeting small caps at all. This is clearly a problem for index investors; most small cap index funds capture the small cap universe, including small cap growth stocks.

If we think back to SmB, it has been 1.88% per year on average going back to 1926 for US stocks, and 1.02% going back to 1990 for global ex-US stocks. If we remove small cap growth stocks from the calculation, we see a size premium of 3.39% in the US. Removing small cap growth stocks from the global ex-US small cap data produces a similar result. We want to access the size premium, but we need to be extremely careful about small cap growth stocks. This is one of the most important aspects of implementing a small cap tilt in an ETF portfolio.

4 Evaluating "Factor" ETFs

It's one thing to look at index data, but we as investors need to know if the data translate to live investment portfolios.

In order to evaluate ETFs as candidates for capturing factor premiums we will look at three characteristics.

- Factor exposure as determined through regression
- Fees and costs
- Index construction

We will use five-factor regressions based on the Fama-French Five Factor model to determine factor exposure. Based on this we will determine whether or not ETFs that have been designed to capture factor premiums are reasonably likely to deliver factor premiums after fees and costs.

Regression outputs tell us how much of a factor premium a fund has historically captured. For example, if the HmL coefficient for an ETF is equal to 0.5, and the value premium over the time period was 5%, the fund will capture 2.5% of the premium. To have a regression coefficient of 1 we would need to be long one side of the factor and short the other. In the example of HmL, we would need to buy all of the cheap stocks in the market, and sell short the expensive ones to build a portfolio with an HmL coefficient of 1. In long-only ETF portfolios we will never have a regression coefficient of 1 for any of the non-market risk factors, because there is not shorting.

Alpha in the regressions is the component of fund returns that was not explained by factor exposure. It may have come from fees, costs, security selection, market timing, or exposure to a factor that is not included in the Five Factor model.

To estimate the value of factor exposure, we will assume that future factor premiums will be 50% of past premiums. If a factor ETF has sufficient factor exposure to deliver excess returns after costs based on 50% of past factor premiums, then we will consider it a reasonable candidate for use in a portfolio. We will assume that any regression coefficient with a t Stat below 2 is 0 for this purpose.

4.1 XFS – iShares Edge MSCI Multifactor USA Index ETF

XFS is a fund that tracks the MSCI USA Diversified Multiple-Factor (CAD) Index. The MSCI USA Diversified Multiple-Factor Index targets value, momentum, quality and low size while still maintaining exposure to the broad market. Notably the index includes momentum, which is not included in the Fama-French Five-Factor model. It also includes Quality which is a factor that includes profitability among other metrics. The fund is rebalanced semi-annually.

Factor Exposure

The regression for XFS shows us that it does have meaningful and statistically significant exposure to the market, size, value, and profitability factors.

	Annualized Alpha	MKT	SmB	HmL	RmW	CmA
iShares Edge MSCI Multifactor USA Index ETF (02/2016 – 12-2018)	-2.57%	0.93	0.14	0.10	0.26	-0.11
t Stat	1.86	23.51	2.6	1.86	3.08	-1.24

Data source: Ken French Data Library

Fees and Costs

XFS has an MER of 51 bps; this is clearly substantially higher than a market-cap weighted index fund. The fund turned over 94.08% of its holdings in 2017. Turnover of 100% would indicate buying and selling all of its holdings once over the time period. Transactions incur an implicit cost – the spread on each trade. This cost reduces returns.

Index Construction

An index that is targeting momentum will inherently have a high turnover because momentum is a high turnover strategy. Historically, funds targeting momentum have generally failed to deliver on the momentum premium after costs[8]. Similarly, quality looks at return on equity, the variability of earnings, and leverage to find favourable companies for inclusion in the index. The quality metric does not provide additional information about future expected returns once we control for size, book-to-market, and current profitability. The quality metric results in higher-than-needed portfolio turnover without an increase in expected returns.

Analysis Summary

Based on the regression data, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is 36 bps, resulting in expected underperformance of 15 bps after fees. Combined with high portfolio turnover it seems unlikely that this fund is positioned to deliver factor premiums.

[8] Crill, Wes, Have Investors Benefited from Momentum Strategies? (2018). Dimensional Fund Advisors Research Matters, 2018.

4.2 MULC.B, MUMC.B, MUSC.B – Manulife Multifactor ETFs

Manulife has a suite of ETFs that track the John Hancock Dimensional Indexes, a set of indexes that Dimensional Fund Advisors licenses to John Hancock. These indexes are designed to target the market, size, value, and profitability factors. The funds are rebalanced semi-annually.

Factor Exposure

These funds are relatively new, so we have limited data. The regression for MULC.B shows us that there is little economically meaningful factor exposure, and no statistically significant factor exposure at a 95% confidence level (t Stat > 2). MUMC.B does have more economically meaningful factor exposure with statistically significant exposure to SmB. However, HmL and RmW again fall short of the 95% confidence level. MUSC.B has low exposure to market beta and economically meaningful and statistically significant exposure to SmB. It also has negative but statistically significant exposure to HmL and RmW. The high alpha in the case of MUSC.B is alarming, though not statistically significant.

	Annualized Alpha	MKT	SmB	HmL	RmW	CmA
Manulife Multifactor U.S. Large Cap Index ETF (05/2017 – 12/2018)	-0.27%	0.92	-0.03	0.05	0.12	0.01
t Stat	-0.31	45.50	-0.87	1.13	1.92	0.23

	Annualized Alpha	MKT	SMB	HML	RMW	CMA
Manulife Multifactor U.S. Mid Cap Index ETF (05/2017 – 12/2018)	-1.17%	0.88	0.20	0.10	0.23	-0.11
t Stat	-0.56	17.9	2.57	0.86	1.52	-0.77

	Annualized Alpha	MKT	SMB	HML	RMW	CMA
Manulife Multifactor U.S. Small Cap Index ETF (05/2017 – 12/2018)	-6.30%	0.77	0.43	-0.32	-0.25	0.26
t Stat	-1.12	8.90	2.48	-0.99	-0.67	0.70

Data source: Morningstar Direct, Dimensional Returns Web, Ken French Data Library

Fees and Costs

MULC.B has a management fee of 35 bps, MUMC.B has a management fee of 45 bps, and MUSC.B has a management fee of 50 bps. The funds' MERs will be higher once they are reported. These funds are too new to report on their turnover, but the fund literature claims that the Dimensional indexes are designed to limit turnover.

Index Construction

These indexes follow research which should lead to higher expected returns, and they are created by a company with years of experience in capturing factor premiums. However, the factor exposure appears to be limited. This could be a decision made deliberately by Manulife or John Hancock to reduce tracking error relative to the market. It could also be a limitation of implementing factor portfolios using the ETF structure.

Analysis Summary

Based on the regression data for MULC.B, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is -20 bps, resulting in expected underperformance of 55 bps after fees.

Based on the regression data for MUMC.B, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is -7 bps, resulting in expected underperformance of 52 bps after fees.

Based on the regression data for MUSC.B, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is -8 bps, resulting in expected underperformance of 58 bps after fees.

In all three cases, the relatively light factor exposure and relatively high fees make these products poor candidates for capturing factor premiums.

5 Targeting Factors without "Factor" ETFs

There are low-cost ETF products that have existed for many years which are better positioned to deliver on factor premiums than most so-called factor funds. A fund that is called a factor fund seems to automatically command a higher fee despite not being positioned to deliver on factor returns. We will follow the same framework as the previous section to evaluate these non-"factor" ETFs that may be better-positioned to deliver factor exposure.

We have found that the options for diversifying into small cap and value stocks in Canada are limited and unattractive. There are similarly few products for targeting small cap and value stocks in International Developed and Emerging Markets. For US equities there are a small handful of products that offer reasonable factor exposure at a reasonable cost. We have focused our analysis on those products.

5.1 IJS - iShares S&P SmallCap 600 Value ETF

IJS is a US listed ETF that has been around since 2000. It tracks the S&P 600 Value Index which is an index of US small cap value stocks.

Factor Exposure

The regression for IJS shows us that there is substantial and statistically significant factor exposure. It is notable that the fund has economically meaningful and statistically significant exposure to RmW. This is a side-effect of the index methodology discussed below.

	Annualized Alpha	MKT	SmB	HmL	RmW	CmA
iShares S&P Small-Cap 600 Value ETF (08/2000 –12/2018)	-1.18%	1.02	0.86	0.27	0.20	0.06
t Stat	1.35	50.51	29.54	8.43	5.51	1.30

Data source: Morningstar Direct, Dimensional Returns Web, Ken French Data Library

Fees and Costs

IJS has an expense ratio of 0.25%. Its portfolio turnover tends to hover around 40% annually which is high, but can be expected for a small cap value fund.

Index Construction

The S&P 600 Value index is one of the things that makes IJS such a strong candidate for small cap value exposure. The index methodology used by S&P includes relatively strict eligibility criteria for inclusion; this is in contrast to the FTSE Russell indexes which include stocks based mostly on market cap. S&P looks for liquidity and financial viability before including a stock in the index. They also delay adding IPOs for 12 months after they start trading. Finally, S&P's index constituents are ultimately selected by a committee. Using a committee model as opposed to a pure quantitative model reduces the risk of front-running on index reconstitution.

Analysis Summary

Based on the regression data for IJS, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is 182 bps, resulting in expected outperformance of 157 bps after fees. This fund's economically meaningful and statistically significant factor exposure, and its relatively low fees, make it a strong candidate for use in a factor-tilted portfolio.

5.2 IUSV - iShares Core S&P U.S. Value ETF

IUSV is a US listed ETF that has been around since 2000. It tracks the S&P 900 Value Index which is an index of large and mid cap US value stocks.

Factor Exposure

The regression for IUSV shows us that there is substantial and statistically significant factor exposure. It mirrors the HmL exposure of IJS, but does so through exposure to large and mid cap stocks.

	Annualized Alpha	MKT	SmB	HmL	RmW	CmA
iShares Core S&P U.S. Value ETF (08/2000 – 12/2018)	-0.88%	0.99	-0.01	0.27	0.08	0.21
t Stat	-1.57	75.88	-0.57	13.20	3.45	7.38

Data source: Morningstar Direct, Dimensional Returns Web, Ken French Data Library

Fees and Costs

IUSV has an expense ratio of 0.04%. Its portfolio turnover tends to hover around 25% annually.

Index Construction

Similar to IJS, The S&P 900 Value index is one of the things that makes IUSV such a strong candidate for value exposure. The index methodology used by S&P includes relatively strict eligibility criteria for inclusion; this is in contrast to the FTSE Russell indexes which include stocks based mostly on market cap. S&P looks for liquidity and financial viability before including a stock in the index. They also delay adding IPOs for 12 months after they start trading. Finally, S&P's index constituents are ultimately selected by a committee. Using a committee model as opposed to a pure quantitative model reduces the risk of front-running on index reconstitution.

Analysis Summary

Based on the regression data for IUSV, estimated value-added from excess exposure to MKT, SmB, HmL, and RmW, relative to a market-cap weighted index, and based on 50% of the historical factor premia, is 89 bps, resulting in expected outperformance of 85 bps after fees. This fund's economically meaningful and statistically significant factor exposure, and its relatively low fees, make it a strong candidate for use in a factor-tilted portfolio.

6 Proposed Model Portfolio

Factor research cannot be ignored. Historically, HmL and RmW have been positive as often, or more often, than the market premium. SmB has been slightly less reliable in North America, but as reliable as the market premium in developed international and emerging markets. Any factor may go through an extended period of underperformance, the market included. Adding additional independent risk factors in excess of the market to a portfolio increases the reliability of the outcome.

Investment products marketed as factor funds generally provide weak factor exposure for a premium fee. More traditional small cap and value ETFs have lower costs and offer more meaningful factor exposure. The remaining challenge is the lack of well diversified low-cost small cap and value funds for Canadian and International equities. An ETF investor could reasonably target small cap and value stocks for their US equity allocation, which is typically a meaningful portion of the portfolio for Canadian investors. Only targeting small cap and value in the US has the added benefit of simplifying the holdings. A well-diversified factor-tilted portfolio could be built using only 6 ETFs.

The historical results of these factor tilts have been compelling relative to a market capitalization weighted ETF portfolio.

Fund		Factor Tilted	Traditional
FTSE Canada All Cap Index ETF	VCN	33%	33%
iShares Core S&P U.S. Total Market Index ETF	XUU	12%	34%
iShares Core S&P US Value ETF	IUSV	11%	0%
iShares S&P Small-Cap 600 Value ETF	IJS	11%	0%
FTSE Developed All Cap ex North America Index ETF	VIU	25%	25%
FTSE Emerging Markets All Cap Index ETF	VEE	8%	8%
Average Expense ratio		0.14%	0.12%

Portfolio performance as at January 31, 2019		
1-Year Return	-1.33%	-1.00%
3-Year Annualized Return	9.45%	9.39%
5-Year Annualized Return	8.43%	8.75%
10-Year Annualized Return	11.29%	11.40%
20-Year Annualized Return	6.09%	5.65%
Lowest 1-Year Return (3/08 – 2/09)	-34.47%	-33.94%
Lowest 3-Year Annualized Return (4/00 – 3/03)	-12.64%	-15.71%
20-Year Annualized Standard Deviation	11.69%	11.78%

Data sources: Dimensional Returns Web, Vanguard, iShares, S&P Dow Jones, MSCI, FTSE Russell

With the tilted model portfolio, we observe slightly negative tracking error for the past decade, which is exactly what we expect based on the relatively poor performance of US value stocks compared to growth stocks over that time period. However, over 20 years we see 44 bps of excess annualized return – that's an extra $26,000 on an initial $100,000 investment after 20 years.

We also see that the lowest 3-year return is much more favorable for the factor-tilted model portfolio. Finally, the 20-year annualized standard deviation is lower for the tilted model portfolio. Again, this is the anticipated result with factor tilts; higher expected returns with the risk-reduction benefit of risk factor diversification.

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