Hillsdale
INVESTMENT MANAGEMENT INC.®

March 31, 2023   **Research Paper**

Revisiting Low Volatility Strategies

Chris Guthrie, CFA
President, CIO, Senior Portfolio Manager

Selwyn Yuen, MASc, MFin, Ph.D., CFA
Head of Research, Senior Portfolio Manager

Harry Marmer, MBA, CFA
Executive Vice President

Jesse Barke, MA, MFin, CFA
Manager, ESG Deliverables

Table of Contents

I. Introduction and Sources

We collected papers that cover the theoretical foundations of low volatility (Low Vol) and papers in other categories that we view as essential. For ease of reference, we bolded the years for more recent papers in the literature review in the first section.

Articles were sourced via searching google scholar and SSRN and include publications from reputable journals, as well as white papers and publications by practitioners and academics. We have also included an opinion piece from the Financial Times.

II. Addressing Client Concerns

- *How valid is the concern that the low vol algorithms have been decaying?*
- *What confidence do we have in the efficacy of those algorithms going forward?*

Internal Evidence

To tackle these questions, we first review Hillsdale's research. Our backtest (see **Figure 1** below) of the Hillsdale Canadian Low Volatility Equity Strategy indicates that Low Vol outperforms in periods of extreme market declines and underperforms during extreme market upswings. This evidence suggests that Low Vol performance correlates with distinct market conditions. For example, in 2020, the underperformance of Low Vol corresponded with the sharp market rebound after the initial short-lived bear market decline at the onset of the Pandemic. There is no factual evidence that Low Vol decayed as an ongoing or future occurrence. Relative performance trends tend to be largely consistent across various market conditions.

Figure 1: Quarterly Backtest Performance of Hillsdale's Canadian Low Volatility Equity Strategy

Outperformance During Extreme Market Declines
Backtest Analysis

Backtest Quarterly Excess Returns by Market Performance
Quarterly, Canadian Low Volatility Equity Strategy, January 31st, 1986 – March 31st, 2023

Q1 2020

Best Quarterly Excess Return: Q4 2000: 28.2% CLV: +15%, TSX Comp: -13.6%

Worst Quarterly Excess Return: Q4 1999: -26.1% CLV: -5%, TSX Comp: 21.4%

All Regimes	
Mean	0.4%
Stdev	5.7%

Q4 2020   Q2 2020

Extreme Decline	
Mean	11.0%
Stdev	6.9%

Negative Market	
Mean	3.4%
Stdev	4.1%

Sideways Market	
Mean	0.9%
Stdev	3.4%

Positive Market	
Mean	-1.1%
Stdev	2.9%

Extreme Upswing	
Mean	-5.7%
Stdev	6.8%

Extreme Market Decline → Negative Market → Sideways Market → Positive Market → Extreme Market Upswing

Benchmark Represented by the TSX Composite TRI.
Market scenarios are defined as following: "Extreme Market Decline" <= -10%; "Negative Market" (-10%, -3%]; "Sideway Market" (-3%, 3%]; "Positive Market" (3%, 10%]; "Extreme Market Upswing" >10%. Sources: See Footnote 1. Analysis based on backtest. See Footnote 2. Backtest based on 20 stock portfolio.

🌲Hillsdale
INVESTMENT MANAGEMENT INC.

Recent Publications on Low Vol

Since the seminal work of Haugen and Heins (1972) and Black et al. (1972) illustrating that Low Vol in U.S. stocks performed better than more volatile stocks, there has been a plethora of articles taking different views on the underlying drivers of what is referred to as the low volatility anomaly. Three articles addressing the client's first two questions are:

1) Bellone and Carvalho (2020) revisit BNP Paribas's Low Vol investment philosophy, which emanates from research published 10 years prior (in 2011). They initially found that the Sharpe ratios of Low Vol stocks were higher than most of their more volatile peers. They find that the low volatility anomaly across sectors is even more pronounced now than in the preceding decade. This paper displays confidence in Low Vol strategies and does not espouse the view of any sustained decay.

> **Bellone, B. and R.L.D., Carvalho. "The Low Volatility Anomaly in Equity Sectors–10 Years Later!" 2020,** *Available at SSRN 3697914.*

2) Alquist et al. (2020) adopt a fact or fiction narrative to reinforce some of the generally accepted theoretical and practical views on Low Vol investing. They tackle Low Vol skepticism which they

call 'fiction' in their analysis. 'Facts' that they confirm include the following: 1) Low Vol has historically delivered better risk-adjusted returns, 2) Low Vol strategies have done well out-of-sample since the factor discovery, and 3) Low Vol could underperform in down markets. They dispel misconceptions or 'fictions' by illustrating that 1) low-risk factors are empirically stronger than other standard factors, 2) low-risk investing does not require a high turnover, 3) Low Vol strategies are not just an industry (or bond market) bet, and 4) the strategies are not so expensive as to hinder performance.
The authors indeed display confidence in Low Vol strategies.

> **Alquist, R., A. Frazzini, A. Ilmanen, and L.H Pedersen. "Fact and Fiction about Low-Risk Investing."** ***The Journal of Portfolio Management***, ***46***(6), 2020 pp.72-92.

3) Flint and Vermaak (2021) find that Low Vol, along with pure Value and Quality factors, are generally quite similar in terms of overall distribution shape and evolution over time, unlike other factors (e.g., Momentum) that decay significantly faster on average and show markedly different distributional shapes. They find that Value is the slowest decaying factor on average, followed closely by Low Vol.

> **Flint, E. and R. Vermaak. "Factor Information Decay: A Global Study." 2021** ***Available at SSRN***.

- *How difficult is it to replicate these strategies with a smart beta algorithm?*
- *What improvements are necessary to implement to make those algorithms more robust?*

There is extensive literature (both older and recent) on smart beta strategies, their robustness, and which factor-based approaches outperform. Replicating any particular strategy is not in itself the most challenging task, which is why a healthy dose of understanding factor exposures, both explicit bets and cross exposure to other factors, is essential.

Although stock returns and the performance of Low Vol strategies garner much attention, it's important to underscore how well Low Vol correlates well with **low business risk** and low business risk factors. Indeed, Hillsdale considers and evaluates factors such as Sales Variability Rank and Current Year Coefficient of Variation in EPS Estimates in our Canadian strategies and various Earnings variability measures in our U.S. strategies. Hillsdale skillfully employs these factors, as is evidenced by our offerings and the demand for our customized strategies. For further discussion on low fundamental risk, see Alquist et al. (2020).

> **Alquist, R., A. Frazzini, A. Ilmanen, and L.H Pedersen. "Fact and Fiction about Low-Risk Investing. "** ***The Journal of Portfolio Management***, ***46***(6), 2020 pp.72-92.

The answers to the two questions above are therefore more nuanced. Below are some articles that touch on these questions. We will start with more classic perspectives on implementing Low Vol from Clarke, de Silva and Thorley (2006) and then progress to a few more recent articles that show the nuances to consider when implementing such strategies.

4) Clarke et al. (2006) conducted an empirical analysis of various minimum variance portfolios and found that minimum-variance strategies perform better on a risk-adjusted basis than market cap-weighted strategies. They find minimum-variance portfolios typically portray both Value and small Size bias. They make the case that the right approach to Low Vol can be effective.

   Clarke, R., H. de Silva, and S. Thorley. "Minimum-Variance Portfolios in the U.S. Equity Market." *The Journal of Portfolio Management***, 2006, pp. 1-14**.

5) Barber et al. (2015) show that investment managers can resort to combining factor exposures (value, momentum, quality, and low volatility in a 4-factor approach) to achieve excess performance. Thus, tackling the question about potential improvements of Low Vol algorithms.

   Barber, J., S. Bennett, and E. Gvozdeva. "How to Choose a Strategic Multifactor Equity Portfolio?" *The Journal of Index Investing***,** *6***(2), 2015 pp.34-45.**

6) Amenc et al. (2018) argue that the market beta of a strategy leads to highly conditional performance profiles. In line with Hillsdale's internal research (discussed above), they find that Low Vol and low investment factors, which have negative market exposure in dollar-neutral form, exhibit poor performance in extreme bull markets and good performance in extreme bear markets. This, they contend, is a direct consequence of their negative exposure to the market factors. Thus, the answer to the client's question is not so much about whether Low Vol has lost its efficacy or whether it requires more robust algorithmic tweaks. The underlying concern might better be addressed under a different paradigm, namely the consideration of a conditional framework that is intrinsically linked to market conditions.

   Amenc, N., F. Goltz, and A. Lodh. "Mind the gap: on the importance of understanding and controlling market risk in smart beta strategies." *The Journal of Portfolio Management***,** *44***(4), 2018, pp.60-70.**

7) Alonzo and Nusinzon (2020) highlight the need for more scrutiny on the different methodologies used to achieve Low Vol exposure by evaluating empirical differences between some common approaches to low volatility. They find that traditional optimizer-based approaches have larger

sensitivities to the risk inputs and show that there are other more robust ways to achieve Low Vol portfolios without the burden of great input sensitivity (e.g., risk balancing approach to Low Vol).

> **Alonso, N. and O. Nusinzon. "The Devil Is in the Details: The Risks Often Ignored in**
> **Low-Volatility Investing."** ***The Journal of Portfolio Management***, *46*(7), **2020, pp.58-70.**

III.   Literature Survey

In the survey that follows, we have bolded the year of publication for more recent articles.

A) Low Vol Theoretical Foundations

– Jiang, Bill. "Volatility Effect." *Investment Strategies: A Practical Approach to Enhancing Investor Returns*. Cham: Springer International Publishing, **2022**. 173-183.
– Behr, P., A. Guttler, and F. Miebs. "Is Minimum Variance Investing Really Worth the While?" Working paper, November 2008.
– Clarke, R., H. de Silva, and S. Thorley. "Minimum-Variance Portfolios in the U.S. Equity Market." *The Journal of Portfolio Management*, 2006, pp. 1-14.
– Haugen, R., and A.J. Heins. "The Efficient Market Inefficiency of Capitalization-Weighted Stock Portfolios." *The Journal of Portfolio Management*, Vol. 17, No. 3 (1991), pp. 35-40.
– Haugen, R., and A.J. Heins. "On the Evidence Supporting the Existence of Risk Premiums in the Capital Market." Wisconsin working paper, December 1972.
– Black, F., M.C. Jensen, and M. Scholes. "The Capital Asset Pricing Model: Some Empirical Tests." *Studies in the Theory of Capital Markets*, edited by M. C. Jensen. New York: Praeger, 1972.

B) Factor Bets

- Gupta, T., J. Raol, and V. Roscovan. "Practical Applications of Factor Investing: From Theory to Practice. *Practical Applications,* **2023**
- Brightman, C., F. Henslee, V. Kalesnik, F. Li, and J. Linnainmaa. "Why Are High Exposures to Factor Betas Unlikely to Deliver Anticipated Returns?" *The Journal of Portfolio Management*, *48*(2), **2021** pp.144-163
- Flint, E. and R. Vermaak. "Factor Information Decay: A Global Study." **2021** *Available at SSRN*.
- Jarrow, R.A., R. Murataj, M.T. Wells, and L. Zhu. "The low-volatility anomaly and the adaptive multi-factor model." **2021** *Available at SSRN 3834026*.

- Alquist, R., A. Frazzini, A. Ilmanen, and L.H Pedersen. "Fact and Fiction about Low-Risk Investing." *The Journal of Portfolio Management*, *46*(6), **2020** pp.72-92.
- Qiao, X., S. Yan, and B. Deng. "Downside Volatility-Managed Portfolios." *The Journal of Portfolio Management*, *46*(7), **2020**, pp.13-29.
- Bellone, B. and R.L.D., Carvalho. "The Low Volatility Anomaly in Equity Sectors–10 Years Later!" **2020**, *Available at SSRN 3697914*.
- Amenc, N., F. Goltz, and A. Lodh. "Mind the gap: on the importance of understanding and controlling market risk in smart beta strategies." *The Journal of Portfolio Management*, *44*(4), **2018,** pp.60-70.
- Blitz, D. and M. Vidojevic. "The profitability of low-volatility." *Journal of Empirical Finance*, *43*, **2017**, pp.33-42.
- Beveratos, A., J.P. Bouchaud, S. Ciliberti, L. Laloux, Y. Lempérière, M. Potters, and G. Simon. "Deconstructing the low-vol anomaly". *The Journal of Portfolio Management*, *44*(1), **2017**, pp.91-103.
- Beck, N., J. Hsu, V. Kalesnik, and H. Kostka. "Will Your Factor Deliver? An Examination of Factor Robustness and Implementation Costs". *Financial Analysts Journal*, 72(5), **2016,** 58–82.
- Russo, A. "Low-risk equity investment–From theory to practice." *Journal of Asset Management*, **2016**, *17*(4), pp.264-279.
- Cederburg, S. and M.S. O'Doherty. "Does it pay to bet against beta? On the conditional performance of the beta anomaly." *The Journal of Finance*, *71*(2), **2016**, pp.737-774.
- Barber, J., S. Bennett, and E. Gvozdeva. "How to Choose a Strategic Multifactor Equity Portfolio?" *The Journal of Index Investing*, *6*(2), **2015** pp.34-45.
- Marmer, H.S. "Fire! Fire! Is U.S. Low Volatility a Crowded Trade?" *The Journal of Investing*, *24*(3), 2015, pp.17-37**.**
- Novy-Marx, R. "Understanding defensive equity" (No. w20591). National Bureau of Economic Research, 2014.
- Clarke, R., H. de Silva, and S. Thorley. "The Not-So-Well-Known Three-And-One-Half Factor Model." *Financial Analysts Journal*, *70*(5), 2014, pp.13-23.
- Asness, C., A. Frazzini, and L. Pedersen. "Low-Risk Investing without Industry Bets." *Financial Analysts Journal*, Vol. 70, No. 4 (July/August 2014), pp. 24-41.
- Goldberg, L., R. Leshem, and P. Geddes. "Restoring Value to Minimum Variance." *Journal of Investment Management*, 2nd Quarter 2014, pp. 32-39.
- Bender, J., E. Brandhorst, and T. Wang. "The Latest Wave in Advanced Beta: Combining Value, Low Volatility, and Quality." *The Journal of Index Investing*, Vol. 5, No. 1 (2014), pp. 67-76.

- Blitz, D., and P. van Vliet, "The Volatility Effect: Lower Risk without Lower Return." *The Journal of Portfolio Management*, 2007, pp. 102-113b.

C) Methodology and Portfolio Construction

- Alonso, N. and O. Nusinzon. "The Devil Is in the Details: The Risks Often Ignored in Low-Volatility Investing." *The Journal of Portfolio Management*, *46*(7), **2020**, pp.58-70.
- Blitz, D., P. Van Vliet, and G. Baltussen. "The volatility effect revisited." *The Journal of Portfolio Management*, *46*(2), **2019**, pp.45-63.
- Brzenk, P. and A.M. Soe. "A Tale of Two Low Volatility Indexes." *The Journal of Index Investing*, *8*(2), **2017**, pp.95-107.
- Alighanbari, M., S. Doole, and D. Shankar. "Designing Low-Volatility Strategies." *The Journal of Index Investing*, *7*(3), **2016**, pp.21-33.
- Chow, T.M., J.C. Hsu, L.L. Kuo, and F. Li. "A Study of Low-Volatility Portfolio Construction Methods." *The Journal of Portfolio Management*, *40*(4), **2014**, pp.89-105.
- Blitz, D. "How Smart Is 'Smart Beta' Investing?" Robeco White Paper, December 2012.
- Blitz, D., E.G. Falkenstein, and P. Van Vliet. "Low-Volatility Investing: Collected Robeco Articles." Insight, 2012.
- Maillard, S., T. Roncalli, and J. Teiletche. "On the Properties of Equally-Weighted Risk Contributions Portfolios." *The Journal of Portfolio Management*, Vol. 36, No. 4 (2010), pp. 60-70.
- Behr, P., A. Guttler, and F. Miebs. "Is Minimum Variance Investing Really Worth the While?" Working paper, November 2008.
- Clarke, R., H. de Silva, and S. Thorley. "Minimum-Variance Portfolios in the U.S. Equity Market." *The Journal of Portfolio Management*, 2006, pp. 1-14.

D) Behavioral and Other Interpretations of Low Vol

- Zhang, S. "Toward Tax-Efficient Low-Volatility Investing." *The Journal of Portfolio Management*, *48*(2), **2021**, pp.198-207.
- Asness, C., A. Frazzini, N.J. Gormsen, and L.H.Pedersen. "Betting against correlation: Testing theories of the low-risk effect." *Journal of Financial Economics*, *135*(3), **2020**, pp.629-652.
- Driessen, J., I. Kuiper, K. Nazliben, and R. Beilo. "Does interest rate exposure explain the low-volatility anomaly?" *Journal of Banking & Finance*, *103*, **2019**, pp.51-61.
- Li, X., R.N. Sullivan, and L. Garcia-Feijóo, "The low-volatility anomaly: Market evidence on systematic risk vs. mispricing." *Financial Analysts Journal*, *72*(1), **2016**, pp.36-47.

- van Vliet, P. "Low volatility needs little trading." *The Journal of Portfolio Management*, *44*(3), **2018**, pp.33-42.
- Garcia-Feijóo, L., L. Kochard, R.N. Sullivan, and P. Wang. "Low-Volatility Cycles: The Influence of Valuation and Momentum on Low-Volatility Portfolios." *Financial Analysts Journal*, *71*(3), **2015**, pp.47-60.
- Baker, M., B. Bradley, and R. Taliaferro. "The low-risk anomaly: A decomposition into micro and macro effects." *Financial Analysts Journal*, *70*(2), **2014**, pp.43-58.
- Li, X., R. Sullivan, and L. García-Feijóo. "The Limits to Arbitrage and the Low-Risk Anomaly." *Financial Analysts Journal*, Vol. 70, No. 1 (January/February 2014), pp. 52-64.
- Baker, M.P., B. Bradley, and J.A. Wurgler. "Benchmarks as Limits to Arbitrage: Understanding the Low Volatility Anomaly." *Financial Analysts Journal*, Vol. 67, No. 1 (Jan–Feb 2011), pp. 40-54.
- Barberis, N., and M. Huang. "Stocks as Lotteries: The Implications of Probability Weighting for Security Prices." NBER Working Paper w12396, National Bureau of Economic Research, 2007.

E) Global/EM

- Raju, R. "Low-Risk Anomaly: Evidence from India." Available at SSRN 4398656, **2023**
- Blitz, D., M.X. Hanauer. and P. van Vliet. "The Volatility Effect in China." *Journal of Asset Management*, **2021,** pp.1-12.
- Ali, H. "Does downside risk matter more in asset pricing? Evidence from China." *Emerging Markets Review*, *39*, **2019**, pp.154-174.
- Joshipura, M. and N. Joshipura. "The volatility effect: Evidence from India." *Joshipura M., & Joshipura*, (2016), **2016**, pp.12-27.
- Umutlu, M. "Idiosyncratic volatility and expected returns at the global level." *Financial Analysts Journal*, *71*(6), **2015**, pp.58-71.
- Walkshäusl, C. "International low-risk investing." *The Journal of Portfolio Management*, *41*(1), **2014**, pp.45-56.
- Frazzini, A., and L. Pedersen. "Betting Against Beta." *Journal of Financial Economics*, Vol. 111, No. 1 (2014), pp. 1-25.
- Dutt, T. and M. Humphery-Jenner. "Stock return volatility, operating performance and stock returns: International evidence on drivers of the 'low volatility' anomaly." *Journal of Banking & Finance*, *37*(3), 2013, pp.999-1017.
- Blitz, D., J. Pang, and P. Van Vliet. "The Volatility Effect in Emerging Markets." Working paper, April 10, 2012.

- Baker, N., and R.A. Haugen. "Low Risk Stocks Outperform within All Observable Markets of the World." Working paper, April 27, 2012.

F) Performance / Attribution

- Kaczmarek, T., B. Będowska-Sójka, P. Grobelny, and K., Perez. "False Safe Haven Assets: Evidence From the Target Volatility Strategy Based on Recurrent Neural Network." *Research in International Business and Finance*, **2022**, p.101610.
- Wigglesworth, R. "A fallen star of the investment world.", *Financial Times*, **2021**, https://www-ft-com.ezp-prod1.hul.harvard.edu/content/c5bc2880-07f0-4998-85c5-be4300a32427
- Blitz, D. "Factor Performance 2010–2019: A Lost Decade?" *The Journal of Index Investing*, *11*(2), **2020**, pp.57-65.
- Peswani, S.G. "Returns to low-risk investment strategy." *Applied Finance Letters*, *6*(01), **2017**, pp.2-15.
- Ge, W. "Assessing Low-Volatility Assets in the LDI Framework." *The Journal of Investing*, *25*(4), **2016**, pp.109-120.
- Li, X., R. Sullivan, and L. García-Feijóo. "The Limits to Arbitrage and the Low-Risk Anomaly." *Financial Analysts Journal*, Vol. 70, No. 1 (January/February 2014), pp. 52-64.
- Chow, T., J. Hsu, V. Kalesnik, and B. Little. "A Survey of Alternative Equity Index Strategies." *Financial Analysts Journal*, 2011, pp. 37-57.

G) ESG

- Ouchen, A. "Is the ESG portfolio less turbulent than a market benchmark portfolio?" *Risk Management*, **2021**, pp.1-33.
- Hanna, M. "The Impact of ESG-Related Industry Exclusions in Minimum-Volatility Portfolios." *The Journal of Impact and ESG Investing*, *1*(2), **2020**, pp.87-103.
- Bender, J., C. He, C. Ooi, and X. Sun. "Reducing the Carbon Intensity of Low Volatility Portfolios." *The Journal of Portfolio Management*, *46*(3), **2020**, pp.108-122.
- Bender, J., X. Sun, and T. Wang. "Thematic Indexing, Meet Smart Beta! Merging ESG into Factor Portfolios". *The Journal of Index Investing*, *8*(3), **2017**, pp.89-101.

IV. Product Methodology: eVestment Universe

In the following section, we present an analysis based on data from the Evestment database. eVestment does not directly categorize Low Vol products by typology. However, the narratives provide some insights into the methodology used. We list the Canadian Low Volatility Products as posted on eVestment, most of which utilize an optimizer. (For this information, please contact Harry Marmer hmarmer@hillsdaleinv.com)

Footnotes and References

Footnote 1
Data Sources: All data presented is from Hillsdale's proprietary database unless indicated otherwise. This open architecture database consolidates information from a variety of selected sources supporting Hillsdale's research, portfolio management, and reporting activities.

Inception Dates, Returns Disclosure: Inception of Hillsdale Canadian Equity Low Volatility is July 31, 2021. All returns are gross of fees and expenses. Past results are not necessarily indicative of future performance.

Footnote 2 – Backtest
Backtest performance data is shown for illustrative purposes only. Backtest performance data is not a guarantee of future performance. No representation is being made that the investment process will achieve similar returns in the future. The backtest results in any presentation are not an indication, assurance, estimate or forecast of future results. Backtest or simulated portfolios are used to test the hypothetical performance of an investment strategy using historical data to analyze its performance and risk characteristics. Backtested returns are based on a quantitative testing process where stocks are selected based on specific investment objectives, including both expected return and risk metrics. All backtested returns are shown gross of investment management fees and are calculated in Canadian dollars or another currency as indicated. Actual returns may differ materially from the returns shown for reasons including, but not limited to, investment restrictions and guidelines, fees and other expenses, cash flows, and trade execution timing. Assumptions are also made as to how often a portfolio is rebalanced (e.g., daily, weekly, monthly, etc.) and how long each position in a security is held. These parameter assumptions are specified in our backtests to closely reflect how the actual portfolio will be managed. Hypothetical investment performance incorporates a percentage slippage cost to every trade the simulation executes, which is based on actual realized costs. Commission fees are also added to every trade. Backtest strategy performance is shown gross of investment management fees.

Registrations: Investment Advisor with the SEC. Portfolio Manager with the OSC (Ontario), AMF (Quebec), NBSC (New Brunswick), NLSC (Newfoundland & Labrador), MSC (Manitoba) & SFSC (Saskatchewan). Exempt Market Dealer with the OSC, AMF, MSC, NBSC, NLSC, SFSC, ASC (Alberta) & BCSC (British Columbia), NS (Nova Scotia) and PEI (Prince Edward Island). Investment Fund Manager with the OSC, NLSC & AMF. Registered as an Investment Manager to Irish authorized Investment Funds by the Central Bank of Ireland.