Finding an Ideal Trading Strategy for *Mom-and-Pop* Investors

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Validere Data Consultant - Take Home Assignment

Content Overview

Defining the Problem

Who are “mom-and-pop” investors?

DEFINITION

Mom-and-pop investors (a.k.a. retail investors) are individuals who self-manage investments, with limited resources and experience.[1]

KEY CHARACTERISTICS

- **Middle-class savers:** Median income between $50,000 and $100,000 per year[2]
- **Long-term focused:** Investing for retirement, children’s education, or major purchases
- **Self-directed:** 74% manage their own portfolios without professional help, often relying on online tools or personal research[2]

TARGET USER PERSONA

Susan is a mom-and-pop investor who wants a simple and reliable way to grow her savings and retire comfortably.

NEEDS AND MOTIVATIONS

- Achieve a comfortable retirement by 2025
- Save for children's education or major life expenses
- Maintain peace of mind by minimizing the risk of large losses

PAIN POINTS

- Limited financial knowledge and time
- Feels overwhelmed by market noise and options
- Worries about making the wrong investment decision

TYPICAL INVESTMENT BEHAVIOURS

- Buys and sells trending stocks impulsively, sometimes panic selling
- Gets most investment ideas from news headlines or friends
- Checks their portfolio often but doesn't follow a consistent plan

Susan Miller

A 52-year-old elementary school teacher from suburban Toronto with moderate savings primarily in an RRSP, earning a household income of $85,000 per year, and able to contribute $1,000 monthly toward investments.

Mom and pop persistently fall behind

A Dalbar study found that over a 20-year period, the average retail investor earned just 2.6% annually, while the S&P 500 returned 7.8%. This **5.2% gap** compounds substantially, amounting to nearly **$864,000 in lost gains** over 30 years on a $100,000 investment.[3]

INEXPERIENCE LEADS TO LOSSES

- **Emotional decision-making:** Fear and greed can drive investors to buy at market highs and sell during downturns. The worst performers replace their entire portfolio **>2.5x** annually and underperform buy-and-hold by **>7%.**[4]
- **Poor stock selection:** Individual investors systematically pick the wrong stocks, selling winning stocks and buying losing stocks **55%** of the time.[4]
- **Lack of diversification:** Many retail investors concentrate their portfolios in just a few stocks, increasing risk and volatility.[4]

What mom and pop need from advisors

CLIENT REQUIREMENTS

1. **Performance:** Consistent returns that outperform the market (S&P 500: 6.5% average annual return after adjusting for inflation)[5]
2. **Risk-appropriate:** Matches conservative retail investor profiles (12% maximum downturn)[6]
3. **Transparency:** Evidence-based strategy that they can understand and trust*
    - ***74% of retail investors don't use advisors*** primarily due to lack of trust and confidence in financial advisors and "black-box" approaches[2]

** This presents a key opportunity for financial advisors to **differentiate their services** with **client-focused, evidence-based strategies** to both current and **prospective clients.***

STUDY OBJECTIVE

This study aims to analytically identify an **optimal investment strategy** that financial advisors can offer to **balance risk and return** for typical mom-and-pop investors, while meeting their needs for **transparency and trust.**

By combining **rigorous data analysis** with **client-focused insights,** we aim to empower advisors to offer evidence-based solutions that build confidence, improve outcomes, and strengthen client relationships.

Approach

Solution Scope

Investment strategies are highly personal, with success varying greatly by individual. This analysis focuses on identifying a generalizable strategy based on the following simplifying assumptions:

ASSUMPTIONS

- Middle-class, 50-year-old client starting with no prior investments, aiming to grow savings for retirement by 2025
- **Dollar-cost averaging approach:** able to invest 30% of monthly income (approximately $3,000/month) to catch up
- **Discretionary account setup:** client approves trades monthly, so strategies must remain straightforward and manageable

Solution Scope

REQUIREMENTS

- Achieve an annualized **internal rate of return (IRR)** that exceeds the S&P 500 average of 6.5%
- Maximize IRR subject to risk constraints (drawdown and sequence risk)

CONSTRAINTS

- **Low risk tolerance:** Maximum drawdown = 12%
- **Limit to simple strategies** that are accessible through financial advisors
  - i.e. no algorithmic trading or advanced models
- **Limit to ETFs** for ensured diversification and lower management overhead (no individual stock picking + automatic rebalancing of assets)
- Strategy must remain **viable up to 5 years** before retirement to mitigate sequence risk

Methodology

01

Strategy Selection

Four contrasting investment strategies were chosen based on **simplicity**, **accessibility** for typical investors, and **coverage** of different risk-return profiles.

02

Data Extraction & Transformation

A consistent set of ETFs was used across all strategies to ensure comparability. Historical price data was retrieved via API, then cleaned and processed into returns suitable for modeling.

03

Portfolio Simulation (Backtesting)

Each strategy's real-world performance was simulated over the historical period using portfolio optimization and backtesting to generate **evidence of expected returns and risks.**

04

Evaluation & Comparison

Strategies were assessed using a comprehensive set of **financial metrics** to measure **risk-adjusted returns, drawdowns, and overall viability for the target investor** profile.

Balancing Risk and Return: Four Practical Investment Strategies

60/40 Equities to Bonds

A classic mom-and-pop portfolio with a 6.7% average return since 1997.[7] Bonds help absorb shocks when stocks fall.

Risk level:	Low
VTI	36%
VXUS	24%
BND	28%
BNDX	12%

100% Equities

A high-growth portfolio that invests only in broad market ETFs. It lacks diversification across asset classes and is more volatile, but has strong return potential.

Risk level:	High
VTI	60%
VXUS	40%

100% Momentum

A trend-following portfolio that invests in an ETF which buys rising stocks and sells falling ones. It aims for high returns but tends to be riskier.

Risk level:	High
MTUM	100%

Vanguard Target 2025 Fund

A set-it-and-forget-it portfolio in a retirement-dated ETF. It starts high-risk and automatically becomes more conservative as 2025 approaches.

Risk level:	High
VTTVX	100%

Implementation

Using Historical Price Data

PREPROCESSING STEPS

- **Daily adjusted close prices** were retrieved using the `quantmod` API from Yahoo Finance. Adjusted close prices account for dividends and splits, ensuring return calculations reflect actual investor gains or losses.
    - **Selected ETFs:** VTI, VXUS, BND, BNDX, MTUM, and VTTVX (see Appendix for details)
    - **Date range:** June 5, 2013 to June 30, 2025, based on the most recent inception date across all assets.
- **Daily returns** were calculated as the log of the ratio between consecutive adjusted close prices. Log returns are standard in financial modeling due to their statistical properties and are required by the PortfolioAnalytics simulation engine.
- The dataset was clean — no missing values or outliers required correction.

Simulating Portfolio Performance

OPTIMIZATION + BACKTESTING

- The `PortfolioAnalytics` package in R was used to simulate how different investment strategies might perform in the real world over time.
- At the core of the simulation is a **mathematical optimization model** that determines the best way to allocate funds across assets (e.g., stocks, bonds, cash) to achieve two key objectives:
    - **Make as much profit as possible** (maximize average return),
    - **While reducing the chance of large losses** (minimize expected shortfall, a risk measure that focuses on worst-case scenarios).
- This process is a form of **backtesting**, where we assess how well the strategies would have worked **in the past.** This is our best proxy of potential future results, since future market behaviour cannot be predicted with high certainty.

Simulating Portfolio Performance

HANDLING CHANGING MARKETS

- Because market conditions evolve over time, the system doesn't calculate a single investment mix. Instead, it:
    - **Recalculates the portfolio allocation at regular intervals** (a process known as rebalancing) to ensure the portfolio remains aligned with the strategy's goals.
    - At each rebalancing point, it uses recent historical data to **reassess risk and return** expectations and adjust the allocation accordingly.
- Over a 9-year period with monthly rebalancing, this resulted in 109 distinct portfolio weightings, each representing the optimal allocation at that point in time.

Simulating Portfolio Performance

BEHIND THE SCENES

- Optimization is solved using **CVXR**, a convex optimization engine in R that can handle complex objective functions and constraints more flexibly than standard quadratic solvers.
- Each optimization uses a **rolling window of past returns** (e.g. 3 years of data) to estimate asset behavior. This helps the model adapt to changing market conditions while avoiding overfitting.
- The model **follows specific rules** (“constraints”) for each strategy, such as investing all available cash and maintaining target asset allocations (e.g., 60% stocks, 40% bonds), to reflect realistic portfolio guidelines.
- The system evaluates thousands of possible weight combinations at each time step and selects the one that best balances return and risk, given the strategy’s rules.

Simulating Portfolio Performance

DOLLAR-COST AVERAGING

- To generate long-term gains, the strategy assumes regular cash contributions over time. This is implemented using **Dollar-Cost Averaging (DCA)** — an investment approach where a fixed dollar amount is invested at set intervals, regardless of market conditions.
    - When prices are low, the fixed amount buys more shares; when prices are high, it buys fewer → **averaging out the cost of entry** over time.
    - Unlike lump-sum investing, which can experience large losses during downturns, DCA introduces measured exposure to risk over time.
- In this simulation, **$3,000** was **invested monthly,** using the optimized portfolio weights on each of the 109 rebalancing dates. This allowed the model to track how portfolio value would grow over time under realistic, ongoing investment behavior.

Evaluating Strategies

RISK METRICS

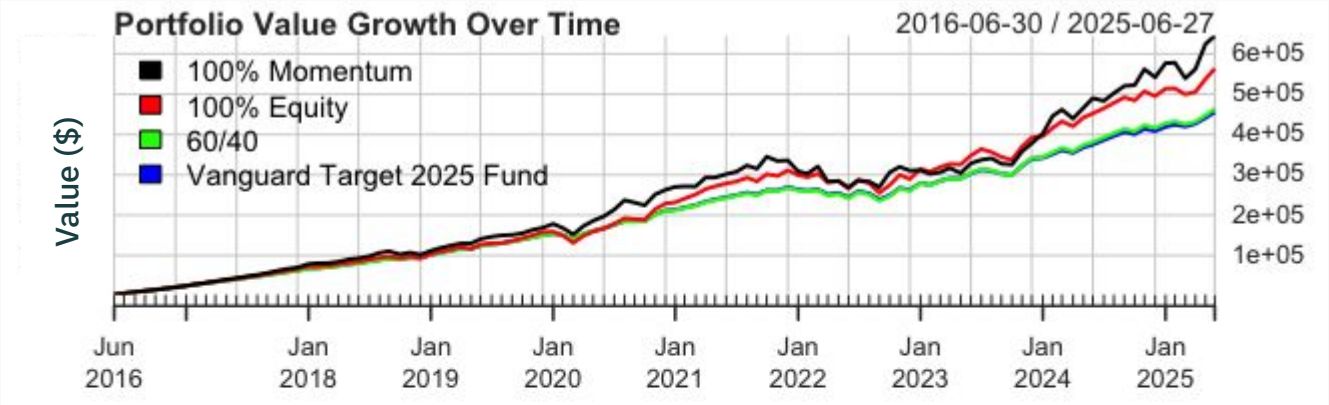
Alongside raw portfolio value and IRR (money-weighted return), the following risk metrics were employed to provide a balanced assessment of performance and risk.

METRIC	DEFINITION
Maximum drawdown	The largest peak-to-trough decline in portfolio value during a period.
Time in drawdown	The total duration the portfolio spends below its previous peak value.
Sharpe ratio	Measures risk-adjusted return using total volatility as the risk metric.
Sortino ratio	Measures risk-adjusted return but considers only downside volatility.
Calmar ratio	Measures return relative to the maximum drawdown, showing reward per unit of worst loss.

Results & Interpretation

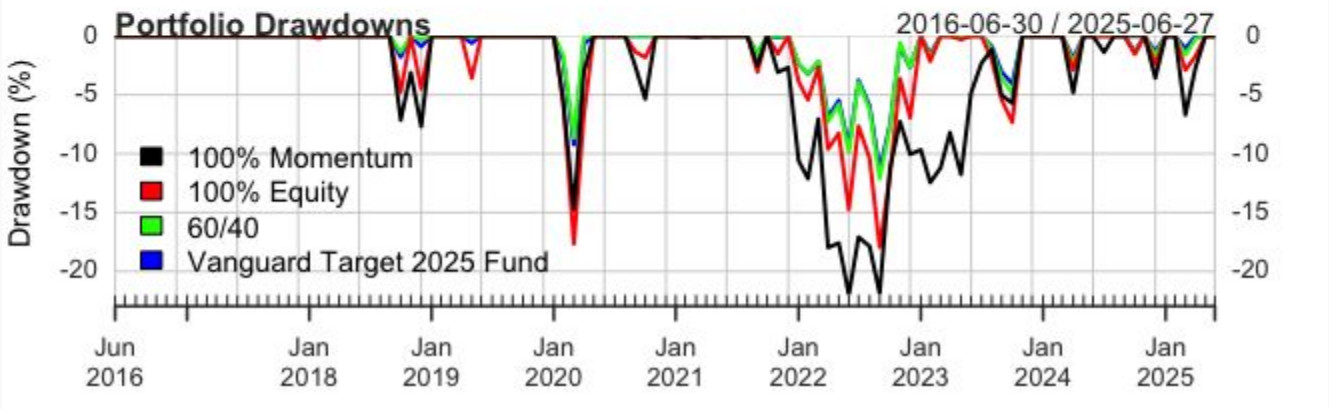
Aggressive strategies are rewarded ...

The more aggressive, stock-heavy momentum strategies unsurprisingly delivered the highest growth, driven by the post-financial crisis recovery (2013–2017), tech boom (2017–2021), and pandemic rebound (2020–2021). The top performer (100% MTUM) grew from $0 to over $600,000 in just 9 years.



… but suffer worse drawdowns.

As expected, aggressive strategies experience larger and longer losses due to lack of diversification (no alternative asset classes to “absorb shock”). In mid-2022, the 100% MTUM portfolio dropped about $77,000 and took over a year to recover, while the 60/40 strategy lost roughly $30,000 and rebounded in under six months.



All strategies outperform the S&P 500

IRR declines as risk tolerance decreases across strategies. Although slower-growing, the 60/40 and Vanguard Target Fund strategies still exceed the average annualized return of 6.5%. (Note: IRR accounts for cash inflows but does not adjust for risk.)

STRATEGY	IRR (%)
100% Momentum	14.76
100% Equity	11.91
60/40	7.76
Vanguard Target Fund	7.38

Not all strategies are risk-appropriate

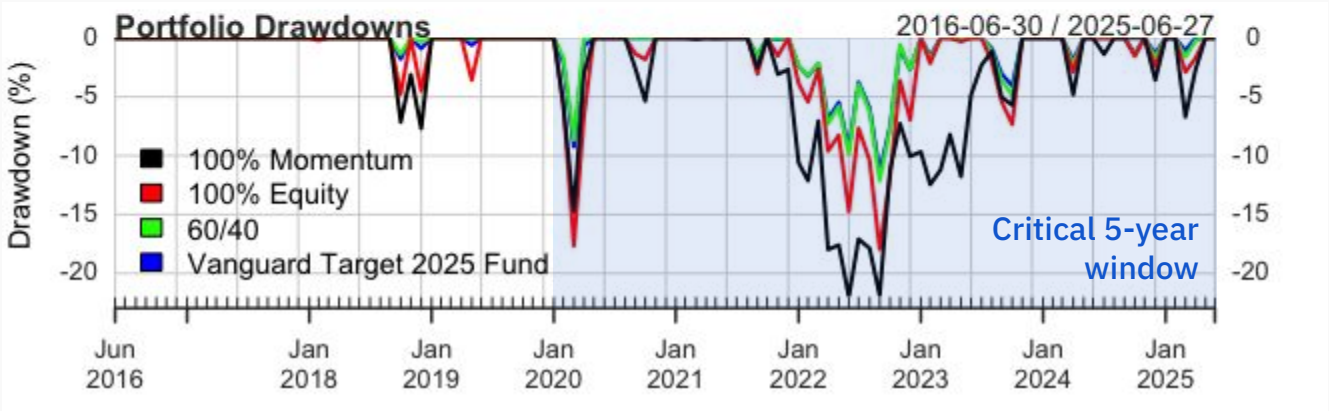
While the aggressive strategies appear attractive, delivering the highest returns and best risk-adjusted metrics, they **severely violate** typical mom-and-pop risk tolerance levels (12% maximum drawdown).

Notably, the relatively similar Calmar ratios across all strategies suggest that the extra risk of aggressive approaches **doesn't provide proportional rewards** for conservative investors.

STRATEGY	MAX DRAWDOWN	TOTAL TIME IN DRAWDOWN	SHARPE RATIO	SORTINO RATIO	CALMAR RATIO
100% Momentum	22%	35%	0.350	1.099	0.671
100% Equity	18%	30%	0.269	0.860	0.664
60/40	12%	24%	0.153	0.698	0.640
Vanguard Target Fund	11%	26%	0.141	0.680	0.649

Sequence risk and viability

While the aggressive strategies' eventual recovery might seem to justify their risk violations, **sequence risk** presents a critical concern. The greatest drawdowns occurred just two years before the 2025 retirement target—*if circumstances forced early retirement, a $77,000 loss from the MTUM strategy would be catastrophic.* Only conservative strategies are viable within five years of retirement, when preserving capital is critical.



Conclusions

CONCLUSION

Based on this analysis, the **60/40 "all-weather" strategy** is the most suitable choice for the typical mom-and-pop investor.

It delivered the **best risk-adjusted returns** through optimization and backtesting, while staying **within critical client constraints.**

✅ Outperforms the S&P 500

Delivers a **7.76% IRR** through steady growth over time, leveraging diversified equity and bond exposure to capture gains while controlling risk.

✅ Stays within low-risk threshold

Limits **maximum drawdown** to **12%** through strategic diversification across uncorrelated asset classes, reducing vulnerability during downturns.

✅ Viable 5 years before retirement (2025)

Offers shallower drawdowns and fast recovery times to minimize the risk of forced losses, providing **stability and peace of mind** for near-retirement investors.

A win-win strategy

BUSINESS IMPLICATIONS

- **For the clients:** The 60/40 strategy offers a reliable path to long-term wealth accumulation, helping typical mom-and-pop investors save confidently for retirement, education, or major expenses. In this scenario, a 50-year-old starting from $0 grows their portfolio to **~$450,000 in 9 years,** with even greater returns possible over a longer horizon. Its simplicity and transparency empower clients to stay engaged and invested.
- **For the advisor:** A consistent, well-performing strategy strengthens trust and deepens advisor-client relationships. Demonstrable results support **client retention** and help advisors **attract new clients,** including the 74% of self-directed investors who remain hesitant to seek professional guidance.

Study Limitations

- **Short backtesting period:** The analysis covers only 9 years due to BNDX's 2013 inception and a 3-year training window for optimization. While this reflects a later-life "catch-up" scenario, the strategy is designed for longer investment horizons, where its benefits are more fully realized.
- **Small selection of strategies:** The analysis focuses on four widely used strategies to represent different risk profiles, but does not include all possible portfolio constructions or variations that could further improve outcomes for specific client needs.
- **Survivorship bias:** Some higher-risk strategies delivered strong historical returns over the last decade, but this may not reflect their long-term averages. Their recent performance may be atypical and should not be overinterpreted.
- **Cannot simulate future behaviour:** Backtesting relies on historical data and cannot capture future market shifts, structural changes, or investor behavior.

Recommendations I

FOR ADVISORS

- **Tailor strategies to client profiles:** Advisors should tailor the 60/40 framework to individual client goals, risk tolerance, and investment timelines rather than applying it rigidly.
- **Communicate risks and benefits clearly:** Use simple language (e.g. “the 60/40 mix balance splits money between growth (stocks) and safety (bonds), highlight the trade-off and historical context.
- **Reframe returns in relatable terms:** Avoid jargon like “cumulative return” or “drawdown.” Instead, show how $1,000 monthly investments might grow over 10 years using visual aids or dollar-based projections.
- **Manage expectations about volatility:** Explain that even balanced portfolios will go up and down, but they aim to reduce the size of losses and recover more steadily over time.

Recommendations II

FUTURE STUDY IMPROVEMENTS

- **Extend analysis over longer horizons:** Future analyses should explore 20+ year periods to better reflect full investment cycles and retirement planning timelines.
- **Explore more strategy variations:** Incorporating additional strategies, such as glide paths, factor tilts, or dynamic allocation, may reveal further performance improvements.
- **Stress test across market conditions:** Testing strategies under different historical regimes (e.g., high inflation, recessions) can better assess robustness and downside protection.

Thank you for your time and attention.

The technical implementation of this analysis can be found in the attached .qmd/.html files.

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Appendix

Definitions: Core Investment Concepts

TERM	DEFINITION
Stock	A unit of ownership in a company, giving you a share of its profits and losses.
Bond	A fixed-income investment where you lend money to a borrower (e.g. government).
ETF (Exchange-Traded Fund)	A fund that holds a mix of assets (like stocks or bonds) and trades on an exchange like a stock.
Asset	Any resource with economic value, such as stocks, bonds, or cash.
Asset Allocation	The strategy of dividing investments across asset types to manage risk and return.
Diversification	Reducing risk by investing in a variety of assets so no single one dominates your portfolio.

Definitions: Portfolio Mechanics

TERM	DEFINITION
Return	The profit or loss generated by an investment over time.
Risk	The uncertainty or potential for losing money in an investment.
Volatility	How much an asset’s price moves up and down over time.
Downside volatility	A measure of how much an asset drops during negative market periods.
IRR (Internal Rate of Return)	The average annual return accounting for all cash flows into and out of the investment.
DCA (Dollar-Cost Averaging)	Investing a fixed dollar amount on a regular schedule, regardless of market conditions.

Definitions: Market Behaviour & Prices

TERM	DEFINITION
Momentum	A strategy or trend where rising assets tend to keep rising.
Downturn	A significant and prolonged drop in market value.
Rebalancing	Adjusting your portfolio back to its target asset mix after price changes.
Dividend	A portion of a company’s profits paid to shareholders, often regularly.
Adjusted Close Prices	Historical prices that account for dividends, splits, and other events.
Split	When a company increases its number of shares, lowering the share price but not the total value held.

Asset Descriptions

Ticker	Name	Description
SPY	S&P 500	An index of 500 large-cap U.S. stocks representing the U.S. equity market.
VTI	Vanguard Total Stock Market ETF	Covers nearly all U.S. publicly traded stocks.
VXUS	Vanguard Total International Stock ETF	Provides road exposure to non-U.S. equity markets.
BND	Vanguard Total Bond Market ETF	Holds a wide range of U.S. investment-grade bonds.
BNDX	Vanguard Total International Bond ETF	Non-U.S. investment-grade bonds, hedged against currency risk.
MTUM	iShares MSCI USA Momentum Factor ETF	Holds U.S. stocks with strong price momentum.
VTTVX	Vanguard Target Retirement 2025 Fund	A diversified mutual fund that automatically adjusts asset allocation for investors planning to retire around 2025.