

Integrating Whole Life into the Efficient Frontier

An empirical analysis of participating whole
life cash value within modern portfolio theory

Abstract

Modern portfolio theory is a theoretical framework designed to help investors determine the highest expected return of a portfolio of assets for a given level of risk. This paper examines participating whole life insurance (WL) cash value as a distinct portfolio component that could offer substantial benefits in this context as an asset class with a long-term yield profile similar to bonds, but with much lower overall volatility. Because there is no publicly available market index for WL cash value, this analysis is achieved by constructing a composite index for product performance over time using the historical Dividend Interest Rate (DIR) from The Guardian Life Insurance Company of America (Guardian) as a basis for comparison for the 30 calendar years from 1996 through 2025, further reduced by a general cost assumption spread for mortality and company costs to create a proxy for how the asset category behaves over time.

The data set reports a 6.84% arithmetic average gross DIR for 1996–2025, which is then reduced by a hypothetical company cost of 1.35% annually (a number derived from the actuarial Generally Reasonable Expense Table (GRET) data) as well as a mortality cost assumption of 0.95% (derived from relative company experience) for a total expense load of 2.30%. After applying the model's

standardized 2.30% expense-load assumption, the average net annual crediting-rate proxy is 4.54%.

Using the actual annual 1996–2025 DIR-spread results, it is then possible to interpolate the monthly crediting required to produce the monthly values required to produce the annual returns, creating a monthly return data set comparable to other asset classes via their associated indexes like stocks, bonds, and Treasuries. The calculated standard deviation for the 30-year data set as measured monthly was just 0.29%, significantly lower than other comparable asset classes such as the leading intermediate bond index, which had a comparable 4.25% standard deviation during the same period.

This fact of a bond-like yield with extremely low volatility offers numerous potential advantages to policyholders when WL is owned in conjunction with other assets on the balance sheet, and across efficient frontier (EF) models, essentially “raising the curve” and presenting the opportunity for far more efficient asset combinations than otherwise possible in a traditional stock and bond portfolio.

Important context: The primary purpose of whole life insurance

Whole life insurance is fundamentally a life insurance product and should be evaluated first and foremost within the context of its primary purpose: providing death benefit protection. Individuals and families typically purchase whole life insurance to help address protection needs, including income replacement, legacy objectives, business succession planning, estate considerations, and other financial risks associated with premature death. Policies may also be used to pursue a combination of protection and long-term accumulation objectives.

The purpose of this paper is not to suggest that whole life insurance should be purchased primarily as an investment or as a substitute for its core protection function. Rather, this analysis explores how the cash value component of a properly structured participating whole life policy may behave when viewed through a portfolio-management lens. Because policy cash value can represent a meaningful balance sheet asset over time, it is worthwhile to examine its historical risk and return characteristics alongside other assets commonly evaluated within modern portfolio theory. Any decision to purchase life insurance should be based on an individual's overall financial objectives, with potential accumulation and portfolio-related benefits viewed as secondary considerations within a broader planning framework.

1 Introduction: Rethinking the volatility buffer

Cash and short-term instruments can provide liquidity, while intermediate- and long-term bonds can provide income and diversification. Both remain subject to their own risks, including inflation risk, reinvestment risk, interest-rate risk, and market-value fluctuation.

Participating whole life cash value follows different mechanics. Policy values reflect contractual guarantees, declared dividends, policy charges, funding design, and other contract provisions rather than daily public-market pricing. For portfolio-analysis purposes, this paper evaluates a standardized historical DIR-based proxy. The proxy is not a policy illustration, a security return, or a representation of any individual policy's realized performance.

2 Methodology: Net crediting-rate proxy

The empirical window is 1996 through 2025, inclusive, providing 30 annual observations. For each year, the model subtracts a constant 2.30% expense-load assumption from the annual DIR to obtain a net annual proxy rate. The 2.30% load is comprised of two components: mortality cost and company cost. Publicly available data from GRETs compiled by the Society of Actuaries' Committee on Life Insurance Company Expense was used to arrive at a company cost assumption of 1.35% applied to each annual return. Mortality cost data was derived by using recent Guardian experience of roughly 0.90% mortality cost for females and 1.0% mortality cost for males, resulting in an average mortality cost of 0.95%.

Beyond achieving a historical net of cost-return proxy, to create a data set comparable to those of other asset classes, monthly returns were required. Unlike stock or bond market indexes, which have price levels that are marked to market at the close of every trading period, whole life is a packaged financial product with guaranteed increases credited monthly and non-guaranteed dividends payable on an annual basis. For most mature WL policies, this results in a staircase effect in which values move up consistently and equally for the first 11 months of a policy year,

with a slightly higher increase in the 12th month, reflecting the payment of the annual dividend. The size of those stairsteps then increases for the following 12 months and so on based on policy guarantees. For purposes of this analysis, the annual return of the DIR minus cost spread is simply separated into 12 equal interpolated returns, which when compounded over 12 months produces the exact same annual return. It was these interpolated monthly returns year-over-year which were then used to calculate the standard deviation of 0.29%.

It should be noted that this fact of how WL policy values credit on a consistent, predictable monthly basis is a material difference in behavior compared to other market-based asset classes, including bonds. As a counterexample while a bond market index may produce a positive result by the end of a calendar year, the actual monthly returns may have been extremely volatile, including several months that actually produced large and/or negative price swings. Whole life cash value, on the other hand, only produces positive month-to-month increases, with highly predictable changes in value.

Average net proxy = 6.84% gross DIR average - 2.30% standardized expense load = 4.54%

Table 1: Updated empirical metrics

Metric	Value	Interpretive note
Measurement period	1996–2025	30 annual observations
Arithmetic average gross DIR	6.84%	Simple average of annual DIR values
Standardized expense-load assumption	2.30%	Constant total deduction used in the model
Arithmetic average net annual proxy	4.54%	Simple average of annual net proxy rates
Modeled ending index value	3,783.33	Starting index of 1,000 compounded by 30 annual net proxy rates
Modeled annualized volatility proxy	0.29%	Population standard deviation of derived effective monthly rates, annualized by sqrt(12)

Important framing: These figures are outputs of the standardized DIR-based model. They are not policy-specific returns, guaranteed future results, or observed market-price returns.

3 Risk-return interpretation

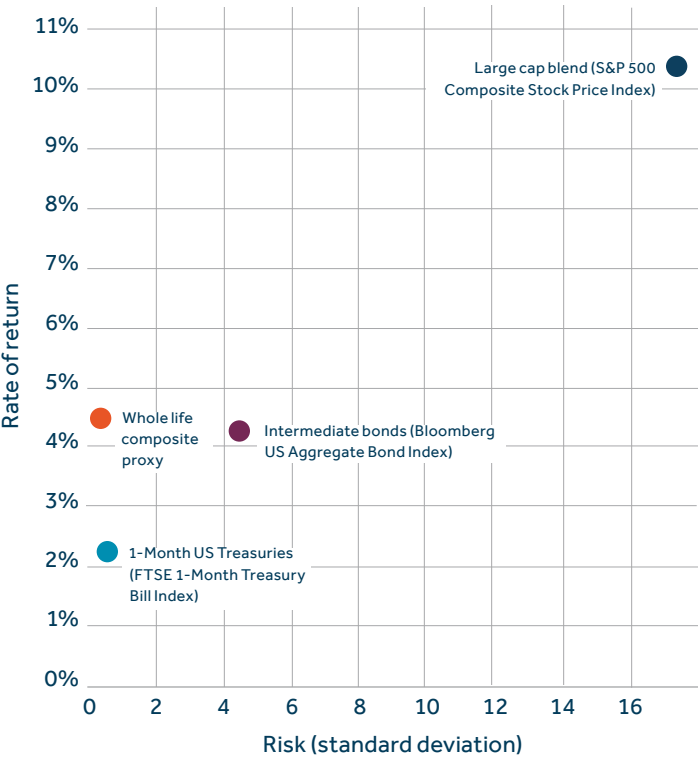
The 1996–2025 analysis produces a 6.84% gross average and a 4.54% net average. The modeled annualized volatility proxy is approximately 0.29%.

The model-based volatility measure must not be compared directly with observed volatility calculated from market prices without recognizing the different data-generation process. Positive annual values in the modeled net proxy series do not establish that an individual policy will have positive cash-surrender-value returns in every policy year. Policy outcomes

depend on premiums, expenses, guarantees, dividends, surrender values, loans, and contract design.

The chart and table below position WL cash value alongside large cap stocks, intermediate bonds, and 1-month Treasuries on a risk/return basis. Whole life exhibits a rate of return comparable to intermediate bonds while carrying meaningfully lower volatility (standard deviation), reflecting its potential role as a stabilizing, low-volatility asset within a diversified strategy.

Risk/return summary



Asset class	Rate of return	Standard deviation
● Large cap blend (S&P 500® Composite Stock Price Index)	10.35%	17.25
● Whole life composite proxy	4.54%	0.29
● Intermediate bonds (Bloomberg US Aggregate Bond Index)	4.22%	4.25
● 1-month US Treasuries (FTSE 1-Month Treasury Bill Index)	2.24%	0.60

Source: Historical market data for the period 1996–2025 provided by Refinitiv. Rate of return and standard deviation figures represent historical averages by asset category and are not guaranteed. Whole life insurance guarantees, when applicable, are subject to the claims-paying ability of the issuing insurer.

4 Impact on portfolio construction along the efficient frontier

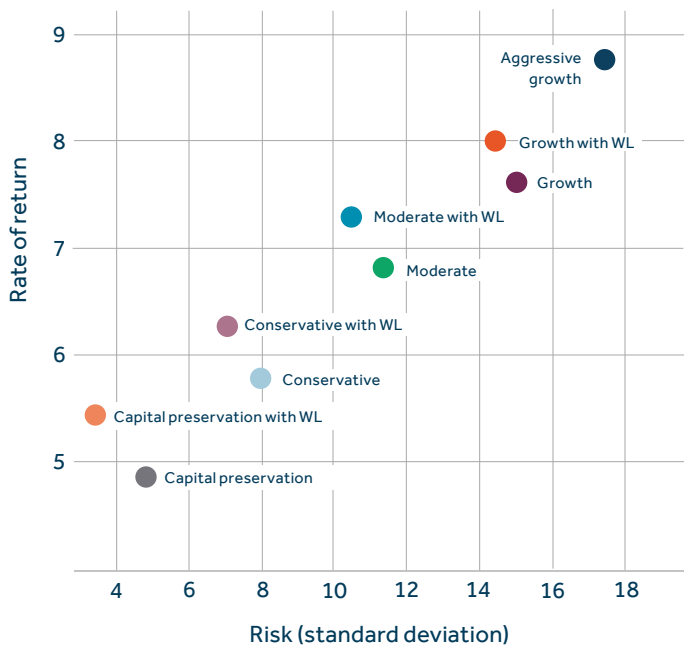
Harry Markowitz’s Nobel Prize-winning research on the concept of the efficient frontier established that it is possible to evaluate various portfolios to identify the highest possible returning combination for a given level of risk assuming two key variables to be true: 1) All investors are risk averse and would prefer a less risky portfolio if the expected return of the alternative was the same, and 2) that the efficient frontier model includes all available asset classes. As portfolios are plotted out on the risk and return axes, plot points further right horizontally indicate higher expected risk and plot points higher vertically indicate higher expected return. If we equalize risk, all possible portfolios below that theoretical line created by stringing together efficient portfolios would be less efficient than optimal. Conversely, if all available asset classes are included, no portfolio could be above that theoretical line.

This last academic assumption is what this analysis challenges by including the new asset class of whole life. As the universe of available asset classes expands, so too does the definition of

efficiency along the EF model. Because whole life cash value has a similar return profile to bonds, but significantly less volatility, when each of the model portfolios in the study below is plotted against a duplicate portfolio with WL used in place of bonds, a new efficient frontier emerges. The inclusion of a more efficient bond alternative allows the possibility of achieving similar return results with less risk, or the capacity to take additional risk elsewhere in the portfolio in pursuit of higher returns, without increasing total risk. In either case, this suggests that WL could play a positive role in contributing to balance sheet efficiency in the context of modern portfolio theory.

The table below summarizes the rate of return and risk (standard deviation) for each model portfolio, both with and without an allocation to whole life cash value. The accompanying chart plots each portfolio's position along the risk/return spectrum, illustrating the leftward shift in risk achieved by incorporating whole life without a proportional sacrifice in return.

Return vs. risk for portfolio analysis



Asset/portfolio	Rate of return	Risk (standard deviation)
Aggressive growth (PAWM, Park Avenue Wealth Management)	8.86%	17.85%
Growth (PAWM) with WL	8.00%	14.26%
Growth (PAWM)	7.87%	14.46%
Moderate (PAWM) with WL	7.13%	10.69%
Moderate (PAWM)	6.87%	11.15%
Conservative (PAWM) with WL	6.27%	7.10%
Conservative (PAWM)	5.88%	8.00%
Capital preservation (PAWM) with WL	5.44%	3.44%
Capital preservation (PAWM)	4.92%	5.20%

5 Structural alpha: Tax efficiency, fees, and liquidity options

Unlike traditional asset classes that are often evaluated on a pre-fee basis and would subsequently be further reduced by advisory, fund, trading, or implementation costs, WL cash value increases generally do not incur tax when policies are owned and managed in accordance with the IRS guidelines for life insurance tax treatment. As a result, portfolio-level comparisons that evaluate taxable and fee-bearing investment assets against policy cash value may benefit from incorporating both tax and fee assumptions when comparing net economic outcomes.

Specifically, it is critical to note that for most other asset classes on the efficient frontier, each return is presented gross of assumed advisory fees, fund expenses, trading costs, implementation costs, taxes, and other applicable charges. In a future study in which all includable assets are evaluated on a net of fee and tax basis, additional efficiencies may be present when comparing the impact of strategies including WL in combination with other asset classes.

Additionally, policy loans involve interest, reduce available policy values and death benefits, and can create adverse consequences if a policy lapses or is surrendered with an outstanding loan. Any tax-equivalent-yield comparison, fee-adjusted comparison, or policy-loan strategy requires policy-specific information and qualified tax and legal guidance.

Model portfolio details

Aggressive growth overall rate of return: 8.86%

Asset class	Rate of return	Percent of portfolio
Large-cap value	9.19%	32%
Large-cap growth	11.02%	32%
Small-cap core	8.55%	6%
International developed markets	6.11%	23%
International emerging markets	6.58%	6%
Total		100.00%

6 Conclusion

The 1996–2025 data set supports a 6.84% arithmetic average gross DIR and, after the standardized 2.30% expense-load assumption, a 4.54% arithmetic average net annual proxy.

The modeled annualized volatility proxy is approximately 0.29%. The accompanying tables provide portfolio-level rate-of-return and standard-deviation assumptions for the selected portfolios, including those portfolios identified as “with WL.” The displayed comparisons are informative, but the labels alone do not disclose all underlying inputs required to recreate or validate an efficient-frontier optimization.

Used with these limitations, the analysis provides a disciplined framework for discussing Whole life cash value as a structurally distinct balance sheet asset. Any implementation decision should be grounded in policy-specific illustrations, client objectives, liquidity needs, funding capacity, and applicable tax, legal, insurance, and investment guidance.

Growth overall rate of return: 7.87%

Asset class	Rate of return	Percent of portfolio
Large-cap value	9.19%	26%
Large-cap growth	11.02%	26%
Small-cap core	8.55%	5%
International developed markets	6.11%	19%
International emerging markets	6.58%	5%
Intermediate bond	4.22%	13%
International bond	3.44%	4%
Short bond	3.07%	3%
Total		100.00%

Growth with WL overall rate of return: 8.00%

Asset class	Rate of return	Percent of portfolio
Whole life cash value	4.54%	20.00%
Large-cap value	9.19%	25.80%
Large-cap growth	11.02%	25.80%
Small-cap core	8.55%	4.80%
International developed markets	6.11%	18.60%
International emerging markets	6.58%	5.00%
Total		100.00%

Moderate overall rate of return: 6.87%

Asset class	Rate of return	Percent of portfolio
Large-cap value	9.19%	19%
Large-cap growth	11.02%	19%
Small-cap core	8.55%	4%
International developed markets	6.11%	14%
International emerging markets	6.58%	4%
Intermediate bond	4.22%	26%
International bond	3.44%	9%
Short bond	3.07%	6%
Total		100.00%

Moderate with WL overall rate of return: 7.13%

Asset class	Rate of return	Percent of portfolio
Whole life cash value	4.54%	40.00%
Large-cap value	9.19%	19.30%
Large-cap growth	11.02%	19.30%
Small-cap core	8.55%	3.60%
International developed markets	6.11%	14.00%
International emerging markets	6.58%	3.80%
Total		100.00%

Conservative overall rate of return: 5.88%

Asset class	Rate of return	Percent of portfolio
Large-cap value	9.19%	13%
Large-cap growth	11.02%	13%
Small-cap core	8.55%	2%
International developed markets	6.11%	9%
International emerging markets	6.58%	3%
Intermediate bond	4.22%	39%
International bond	3.44%	13%
Short bond	3.07%	9%
Total		100.00%

Conservative with WL overall rate of return: 6.27%

Asset class	Rate of return	Percent of portfolio
Whole life cash value	4.54%	60.00%
Large-cap value	9.19%	12.90%
Large-cap growth	11.02%	12.90%
Small-cap core	8.55%	2.40%
International developed markets	6.11%	9.30%
International emerging markets	6.58%	2.50%
Total		100.00%

Capital preservation overall rate of return: 4.92%

Asset class	Rate of return	Percent of portfolio
Large-cap value	9.19%	7%
Large-cap growth	11.02%	7%
International developed markets	6.11%	5%
Intermediate bond	4.22%	52%
International bond	3.44%	17%
Short bond	3.07%	11%
Total		100.00%

Capital preservation with WL overall rate of return: 5.44%

Asset class	Rate of return	Percent of portfolio
Whole life cash value	4.54%	80.00%
Large-cap value	9.19%	7.35%
Large-cap growth	11.02%	7.35%
International developed markets	6.11%	5.30%
Total		100.00%

Asset class index reference

The following indexes were used to represent the rate of return for each asset class shown throughout this document.

Asset class	Representative index
Large-cap value	S&P 500 Composite Stock Price Index
Large-cap growth	Russell 1000 Growth Index
Small-cap core	Russell 2000 Index
International developed markets	MSCI EAFE Index
International emerging markets	MSCI Emerging Market Free Price Index
Intermediate bond	Bloomberg US Aggregate Bond Index
International bond	Bloomberg Global Aggregate Index
Short bond	Bloomberg US 1–3 Year Treasury Bond Index

Disclosures

All investments involve risks that you will lose value including the amount of your initial investment. Investments that offer the potential for higher rates of return generally involve greater risk of loss. Note: Reinvestment transactions that involve selling existing investments may involve transaction costs associated with the sale of those assets as well as transaction costs associated with the purchase of new investments and may also generate a taxable event.

International investing: There are special risks associated with international investing, such as political changes and currency fluctuations. These risks are heightened in emerging markets.

Small/mid-capitalization investing: Investments in companies with small or mid-market capitalization ("small/mid-caps") may be subject to special risks given their characteristic narrow markets, limited financial resources, and less liquid stocks, all of which may cause price volatility.

High-yield investing: Investments in high-yielding debt securities are generally subject to greater market fluctuations and risk of loss of income and principal, than are investments in lower-yielding debt securities.

Inflation-protected bond investing: Interest rate increases can cause the price of a debt security to decrease. Increases in real interest rates can cause the price of inflation-protected debt securities to decrease. Interest payments on inflation-protected debt securities can be unpredictable.

Interest-rate risk: This risk refers to the risk that bond prices decline as interest rates rise. Interest rates and bond prices tend to move in opposite directions. Long-term bonds tend to be more sensitive to interest rate changes and therefore may be more volatile.



**The Guardian Life Insurance
Company of America**

guardianlife.com

The Guardian Life Insurance Company of America (Guardian), New York, New York. GUARDIAN® is a registered trademark of The Guardian Life Insurance Company of America. © Copyright 2026, The Guardian Life Insurance Company of America.

Pub13166 (09/26) 8337030.32 (Exp. 09/2028)