



# Improving the Risk-Adjusted Return of Your Ultra-High-Net-Worth Clients' Portfolios

Two case studies highlighting the investment advantage of property and casualty insurance



The two case studies in this report first appeared in slightly different form in the following 2021 research paper:

## Does Wealth Change the Way You Think?

Risk Tolerance, Tangible Assets, and Risk Management: Observations for Prosperous Families and Their Advisors

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# Key finding

Adequate liability insurance and property coverage can enable you to improve the risk-adjusted return of the portfolios of your UHNW clients.

# Liability insurance

Wharton School researchers tested the hypothesis that an appropriate level of liability insurance coverage, under certain circumstances, can enhance the expected risk-adjusted return on assets of a \$30 million “Total Balance Sheet” (TBS) portfolio over a 40-year period.

This TBS portfolio includes liquid assets plus an illiquid private family business. The case study shows that the cost of insuring against a liability loss is worth incurring, given certain assumptions for size of insured loss, probability of loss, cost of coverage, and Capital Market Expectations for the performance of the portfolio over 40 years.

## Portfolio assumptions

The case study assumes a hypothetical ultra-high-net-worth (UHNW) family has a TBS portfolio with \$30 million of net assets spread between a family business and non-business assets, such as stocks, bonds, real estate, commodities, and other investments. The illiquid family business represents 38.5% of assets and cannot be rebalanced.

The case study’s model portfolio represents average allocations based on data previously collected by the Wharton Global Family Alliance.<sup>1</sup> The total portfolio has greater volatility than the portfolio of liquid assets only due to the lack of diversification arising from the inclusion of the family business.

The non-business portfolio relies on data from the Federal Reserve Survey of Consumer Finances (2016). Capital Market Expectations for the above assets are based on the 2020 Horizon Survey of Actuarial Expectations 2020 Edition (Horizon Actuarial Services, LLC, July 2020).

1. Amit, Rafi, (2018). “Wharton Global Family Alliance 2018 Family Office Benchmarking Report Executive Summary. Available at [https://wgfa.wharton.upenn.edu/wp-content/uploads/2018/03/WGFA-2018-Benchmarking\\_EXEC-SUMMARY.pdf](https://wgfa.wharton.upenn.edu/wp-content/uploads/2018/03/WGFA-2018-Benchmarking_EXEC-SUMMARY.pdf)

# Earnings and loss expectations

Under these assumptions, the Average Wealth Allocation has an expected return of 7.48%, an expected volatility of 22%, and an expected Sharpe ratio of 0.29. The case study also assumes that the investor is subject to infrequent, severe left-tail liability events; for example, there is a 1% per year probability that the investor will

lose 50% of her wealth due to an accident-related lawsuit award in the duration of her investment horizon, 40 years. The following figure depicts the distribution of her wealth at the end of her 40-year career, under two assumptions: with and without the left-tail event.<sup>2</sup>

## A summary of an UHNW investor's portfolio

Assets	Average Wealth Allocation	Expected Volatility	T-Bill Return	Expected Return	Expected Sharpe Ratio	Lower Bound	Upper Bound	US Equity Large Cap	US Corporate Bonds Core	Real Estate	Hedge Fund	Commodity	Private Equity	Business	Left Tail	Insurance
<b>US Equity Large Cap</b>	20.1%	16.2%	1.0%	7.1%	0.37	0%	100%	1.0	0.2	0.5	0.6	0.3	0.7	0.7	0.0	0.0
<b>US Corporate Bonds Core</b>	15.1%	5.5%	1.0%	3.6%	0.47	0%	100%	0.2	1.0	0.2	0.2	0.1	0.0	0.0	0.0	0.0
<b>Real Estate</b>	17.6%	16.8%	1.0%	6.6%	0.33	0%	100%	0.5	0.2	1.0	0.4	0.2	0.5	0.5	0.0	0.0
<b>Hedge Fund</b>	3.0%	8.0%	1.0%	5.7%	0.59	0%	100%	0.6	0.2	0.4	1.0	0.4	0.6	0.6	0.0	0.0
<b>Commodity</b>	3.0%	17.6%	1.0%	4.0%	0.17	0%	100%	0.3	0.1	0.2	0.4	1.0	0.3	0.3	0.0	0.0
<b>Private Equity</b>	3.0%	22.0%	1.0%	9.9%	0.40	0%	100%	0.7	0.0	0.5	0.6	0.3	1.0	1.0	0.0	0.0
<b>Business</b>	38.3%	44.0%	1.0%	9.9%	0.20	38%	38%	0.7	0.0	0.5	0.6	0.3	1.0	1.0	0.0	0.0
<b>Left Tail</b>	100.0%	7.0%	0.0%	-0.45%	-0.06	100%	100%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	-1.0
<b>Insurance</b>	-	7.0%	0.0%	0.23%	0.03	0%	100%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.0	1.0

2. Loss Equivalence: The log final wealth distributions are approximately Gaussian, and the wealth in the Left Tail appears as if it is shifted by an approximate constant which might be interpreted as a negative "alpha" or drag on performance. Assuming that the log of the final wealth in both cases ~ Gaussian( $\mu - \sigma^2/2T, \sigma\sqrt{T}$ ), by measuring the mean and volatility of both cases, it can be estimated that the mean and variance of an equivalent Gaussian distribution — the negative "alpha" — will have the same impact on the final wealth as the Left Tail (Loss Equivalence). In this example, the negative alpha distribution is Gaussian with annual mean of -0.45%, annual Volatility of 7%, and a Sharpe ratio of -0.064. The negative alpha is a continuous drag on portfolio returns. Under this liability scenario, the Average Wealth Allocation expected return has dropped to 7.03%, the expected Volatility has increased to 23.11%, and the expected Sharpe ratio has dropped to 0.26.



## Modeling portfolio allocations with the possibility of left-tail events

To model the impact of a left-tail event, the Wharton researchers introduced two additional “Assets”:

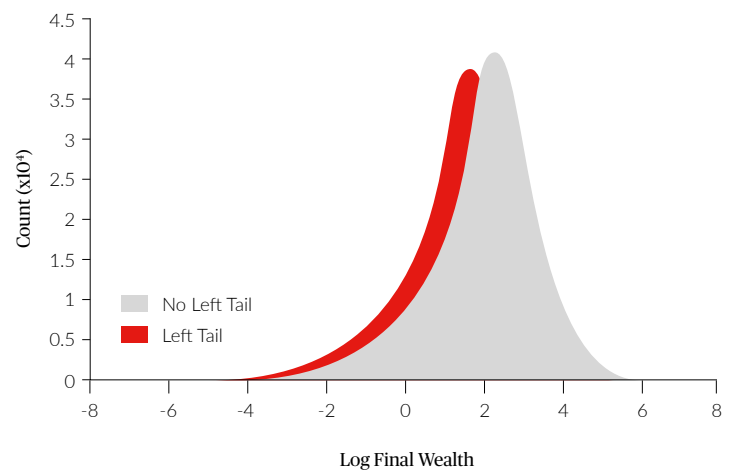
### 1. The Loss-Equivalent Negative Alpha Asset:

This asset, with a mean of  $-0.45\%$  and a volatility of  $7\%$ , is the expression of the impact of the left-tail event-induced loss in the portfolio. The weight of the Left Tail in the portfolio will be either  $100\%$ , if the Left Tail is present, or  $0\%$  if the Left Tail does not exist.

### 2. Liability Umbrella Asset:

This asset may exist if the Left Tail is insurable in the market, i.e., if a short position can be bought against it. The Liability Umbrella asset has a volatility of  $7\%$  and is  $-100\%$  correlated with the Left Tail.<sup>3</sup>

Histogram of final wealth



The following table summarizes the assumptions, which enable the use of the Mean-Variance Portfolio optimization framework.

Maximum Sharpe Ratio Portfolios	Average Wealth Allocation	No Liability Exposure (Left Tail Risk)	Underinsured Liability (No Insurance)	Optimally Insured
Portfolio Volatility	22.00%	21.14%	28.56%	21.09%
Portfolio Return	7.45%	7.41%	8.72%	7.11%
Portfolio Sharpe Ratio	0.29	0.30	0.27	0.29
US Equity Large Cap	20%	3.8%	5.3%	3.9%
US Corporate Bonds Core	15%	10.2%	0.6%	11.0%
Real Estate	18%	12.9%	9.0%	12.9%
Hedge Fund	3%	27.0%	4.1%	26.4%
Commodity	3%	2.7%	0.9%	2.8%
Private Equity	3%	5.1%	41.9%	4.7%
Business	38%	38.3%	38.3%	38.3%
Left Tail Risk / Liability	None	None	Full	Full
Insurance	None	None	None	Optimal (78%)

3. It is assumed here that the mean of Liability Umbrella is  $-50\%$  of the Left-Tail mean, due to insurance costs. The weight of the Liability Insurance asset will be allowed to vary.

# Understanding optimal portfolios and insurance

The case study considers the optimal portfolio allocations for three different situations of the above investor:

- **No Liability** — shows the allocations of the investor if she is not exposed to the risk of a Left-Tail event like that associated with the liability.
- **No Insurance** — shows the allocations if the investor is exposed to the potential of the Left-Tail event but is underinsured. Here she is exposed to the chance of a potentially disastrous outcome but effectively chooses to remain underinsured.
- **Insurance** — is similar to the second case except that she decides to insure the risk entirely.

The following table shows the total budget and Asset Upper and Lower Bounds for all three situations, reflecting traditional asset mixes appearing in a high-level asset allocation. In portfolio construction, Monte Carlo resampling was used to obtain robust asset allocations. The simulations are based on the distributions above.

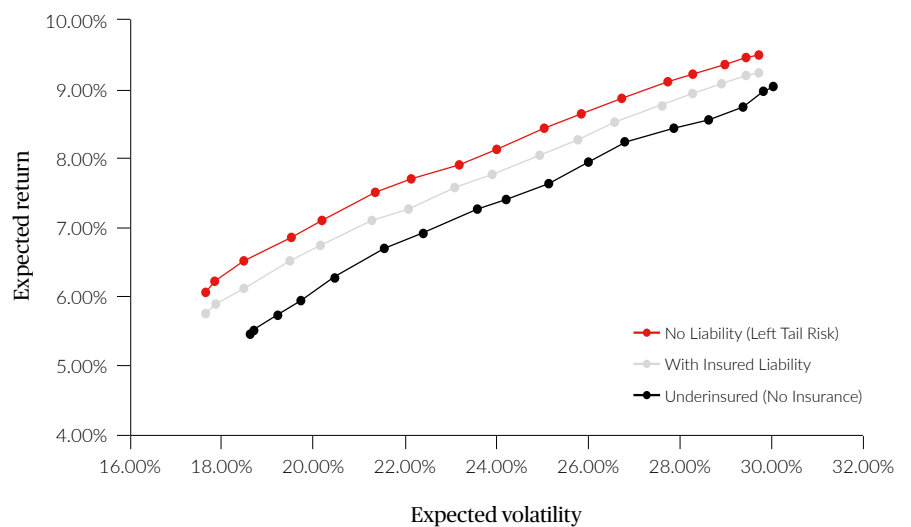
Assets	No Liability LB	No Liability UB	No Insurance LB	No Insurance UB	Insurance LB	Insurance UB
US Equity Large Cap	0%	100%	0%	100%	0%	100%
US Corporate Bonds Core	0%	100%	0%	100%	0%	100%
Real Estate	0%	100%	0%	100%	0%	100%
Hedge Fund	0%	100%	0%	100%	0%	100%
Commodity	0%	100%	0%	100%	0%	100%
Private Equity	0%	100%	0%	100%	0%	100%
Business	38.3%	38.3%	38.3%	38.3%	38.3%	38.3%
Left Tail	0%	0%	100%	100%	100%	100%
Insurance	0%	0%	0%	0%	0%	100%



## Mean-Variance frontiers shows insurance supports strong results and lower risk.

The following graph depicts the expected Mean-Variance frontiers for the three cases above. By comparing the No Liability and the No Insurance (but with liability) frontiers, it can be seen that the left-tail risk reduces the expected returns and increases the risk of the achievable allocations. In other words, the No Liability expected frontier is more efficient at all levels of expected returns—expected risk is lower for each expected return due to the absence of the liability. In the underinsured case, our investor is exposed to the realistically calibrated liability but chooses to do nothing about it via the purchase of insurance specifically targeting the risk. Critically, the Insurance case allows the investor to operate a lower risk portfolio if desired.

Expected return-expected volatility efficient frontiers





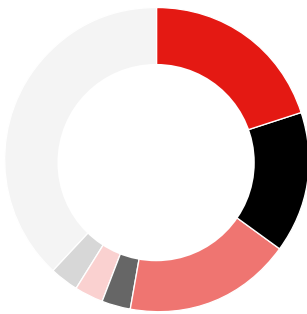
The Maximum Sharpe Ratio Allocations for the three cases are shown here and are compared with the Average Wealth Allocation from earlier.

### Maximum Sharpe Ratio Asset Allocations

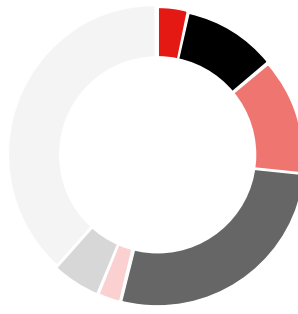
Maximum Sharpe Ratio Portfolios	Average Wealth Allocation	No Liability Exposure (Left-Tail Risk)	Underinsured Liability (No Insurance)	Optimally Insured
Portfolio Volatility	22.00%	21.14%	28.56%	21.09%
Portfolio Return	7.45%	7.41%	8.72%	7.11%
Portfolio Sharpe Ratio	0.29	0.30	0.27	0.29
US Equity Large Cap	20%	3.8%	5.3%	3.9%
US Corporate Bonds Core	15%	10.2%	0.6%	11.0%
Real Estate	18%	12.9%	9.0%	12.9%
Hedge Fund	3%	27.0%	4.1%	26.4%
Commodity	3%	2.7%	0.9%	2.8%
Private Equity	3%	5.1%	41.9%	4.7%
Business	38%	38.3%	38.3%	38.3%
Left-Tail Risk/Liability	None	None	Full	Full
Insurance	None	None	None	Optimal (78%)

## Maximum Sharpe Ratio Asset Allocations

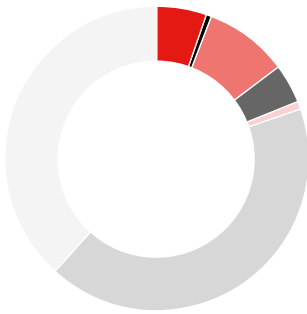
Average Wealth Allocation



No Liability



Underinsured (No Insurance)



Optionally Insured



### Key

- US Equity Large Cap
- US Corp. Bonds Core
- Real Estate
- Hedge Fund
- Commodity
- Private Equity
- Business

In the No Liability case, the Maximum Sharpe Ratio Allocations are relatively close to the Average Wealth Allocation, with the only exception being the under-weight of Hedge Funds and over-weight of Equities in the Average Wealth Allocation. The allocation when No Insurance is available is also intuitive; given the significant and disastrous possibility of losing 50% of her NAV, the investor maximizes the volatility of her investments in an effort to achieve a high final NAV, even after the left-tail event.

In other words, the investor adopts riskier asset allocations while holding expected return constant, resulting in a lower Sharpe ratio. When insurance is obtained, the optimal allocation becomes almost identical to the No Liability case, and we see a rise in the efficiency of the allocation frontiers across the entire spans of risk and reward. The optimal allocation does not need to completely hedge the left-tail liability; it hedges almost 80% of it. The savings from the 20% lower insurance premiums can be invested for higher returns, compared to the marginal return of a complete liability hedge.



# Liability insurance serves as a valuable investment tool

The tables on the following pages show the asset allocations for the Insurance case. At all risk levels, the Mean-Variance Optimization never chooses to hedge more than 90% of the left-tail liability; the more risk-tolerant the investor, the less left-tail insurance in her portfolio.

Insurance provides the investor with the ability to avoid the impact of the left-tail event, at a cost, albeit minor. In our current example, the cost is provided by the difference in returns between the No Liability and Insurance Maximum Sharpe Ratio portfolios, i.e.,  $7.45\% - 7.11\% = 34$  bps for 80% of NAV. For \$30 million in wealth, this is equivalent to \$84,000 annual premium.<sup>4</sup>

The investment implication, possibly missed by investors, is that if an idiosyncratic but substantial liability exists, and insurance is available at a reasonable cost, for the same level of expected overall volatility, higher expected returns may be available, as in this case. In other words, for the same level of expected return for the overall balance sheet, risk can be lower. The benefit is the ability to hedge the liability risk, and thus more of a “risk budget” may exist for financial investments.

4. Even though our example is fictitious, it is reasonable. Quotes from the industry price a liability umbrella policy for a \$30 million portfolio at approximately one-third of the above cost. There are three cost components that will influence the cost of insurance, namely: the frequency of the left tail—1% per year in our example; the severity of Loss award—50% of NAV in our example; and the industry's competitiveness—50% of Liability alpha charged in our example.

## Portfolio allocations with an insurable risk that is optimally insured

Assets	Allocations across various levels of risk																
	Portfolio 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Portfolio 17
Portfolio Volatility	17.5%	17.8%	18.4%	19.2%	20.2%	21.1%	22.0%	23.0%	23.9%	24.9%	25.8%	26.7%	27.5%	28.2%	28.8%	29.2%	29.5%
Portfolio Return	5.8%	5.9%	6.2%	6.5%	6.8%	7.1%	7.4%	7.6%	7.9%	8.1%	8.4%	8.6%	8.8%	9.0%	9.1%	9.2%	9.3%
Portfolio Sharpe Ratio	0.27	0.28	0.28	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.28	0.28	0.28	0.28	0.28	0.28
US Equity Large Cap	0%	0%	1%	1%	2%	4%	5%	7%	8%	8%	8%	7%	5%	4%	3%	2%	2%
US Corporate Bonds Core	59%	53%	42%	29%	19%	11%	7%	4%	3%	2%	1%	1%	1%	0%	0%	0%	0%
Real Estate	1%	2%	4%	7%	10%	13%	15%	17%	17%	16%	14%	12%	10%	8%	7%	5%	5%
Hedge Fund	2%	6%	13%	21%	25%	26%	23%	19%	15%	12%	9%	6%	4%	3%	2%	1%	1%
Commodity	0%	1%	1%	2%	3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%
Private Equity	0%	0%	0%	1%	3%	5%	8%	12%	17%	22%	28%	34%	40%	45%	49%	52%	54%
Business	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%
Left Tail	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Insurance	88%	87%	85%	83%	80%	78%	76%	74%	73%	72%	71%	70%	69%	68%	67%	65%	64%

## Portfolio allocations with an insurable risk that is underinsured

Assets	Allocations across various levels of risk																
	Portfolio 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Portfolio 17
Portfolio Volatility	18.7%	18.8%	19.0%	19.5%	20.3%	21.2%	22.2%	23.1%	24.1%	25.0%	26.0%	26.9%	27.8%	28.6%	29.2%	29.7%	30.1%
Portfolio Return	5.5%	5.6%	5.7%	5.9%	6.3%	6.6%	6.9%	7.2%	7.5%	7.8%	8.0%	8.3%	8.5%	8.7%	8.9%	9.0%	9.1%
Portfolio Sharpe Ratio	0.24	0.24	0.25	0.25	0.26	0.26	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
US Equity Large Cap	0%	0%	0%	1%	1%	3%	4%	6%	7%	8%	8%	8%	7%	6%	4%	3%	3%
US Corporate Bonds Core	61%	59%	54%	44%	32%	21%	12%	7%	4%	3%	2%	1%	1%	0%	0%	0%	0%
Real Estate	0%	0%	1%	3%	6%	10%	13%	15%	16%	16%	15%	13%	11%	9%	7%	6%	5%
Hedge Fund	0%	1%	5%	12%	19%	24%	25%	23%	19%	15%	12%	9%	6%	4%	3%	2%	1%
Commodity	0%	0%	1%	1%	2%	2%	3%	3%	3%	3%	2%	2%	1%	1%	1%	1%	0%
Private Equity	0%	0%	0%	0%	1%	2%	5%	8%	13%	18%	24%	30%	36%	42%	47%	50%	53%
Business	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%
Left Tail	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Insurance	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

# Property insurance

Case study 2 uses the same techniques as case study 1 to model the impact of property insurance on the risk/reward of the TBS portfolio of a UHNW family.

Personal real estate (e.g., primary residences) — including its high-value contents — may account for a substantial portion of a prosperous investor's personal assets.

This case study, using industry statistics, assumes 17.5% of a UHNW family's assets are in the form of tangibles. Specifically, if a family has a net worth of \$30 million and a \$3 million primary residence, the case study follows the assumption that contents are worth \$1.5 million and that uncovered fine art are worth \$750,000.<sup>5</sup> This value, \$5.25 million, represents approximately 17.5% of family assets.

This abstraction is realistic given the very real and common insurance gaps arising from the difference between market value and higher replacement cost and the corresponding content limits driven from replacement cost. For example, a typical homeowner policy may give a policy holder 50% of dwelling value for personal contents. If the dwelling value is low, the policy will potentially underinsure the personal contents as well.

The Mean-Variance decision framework is again used to estimate the optimal amount of property insurance the investor may acquire as a function of her risk aversion. As above, the frequency of loss remains at 1% per year and the insurance cost is unchanged at 50% of Liability alpha.

5. Note that standard riders might cover fine art and jewelry up to a point. The figure here references uncovered value.

## The following table and charts show the Maximum Sharpe Ratio Allocations for three cases.

The case studies are labeled as No Liability Exposure, Underinsured Liability (No Insurance), and Optimally Insured. The property liability loss is not as extreme in wealth consequence as the 50% NAV-Net Asset Value loss previously examined.

However, the value of primary residences and their contents is commonly underinsured. Yet with proper risk management, this is a gap that can be closed relatively inexpensively. A large potential cost not specifically modeled here is the cost of time, effort, and psychological pain of those prosperous and successful owners of insured assets in the event of a loss.

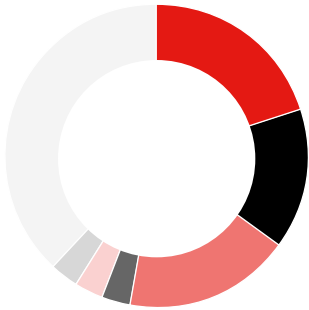
### Maximum Sharpe Ratio Asset Allocations

Maximum Sharpe Ratio Portfolios	Average Wealth Allocation	No Liability Exposure (Left-Tail Risk)	Underinsured Liability (No Insurance)	Optimally Insured
<b>Portfolio Volatility</b>	22.00%	21.14%	21.12%	21.20%
<b>Portfolio Return</b>	7.45%	7.41%	7.20%	7.32%
<b>Portfolio Sharpe Ratio</b>	0.29	0.30	0.29	0.30
<b>US Equity Large Cap</b>	20%	4.2%	3.8%	3.8%
<b>US Corporate Bonds Core</b>	15%	10.5%	11.4%	10.3%
<b>Real Estate</b>	18%	13.6%	12.1%	13.5%
<b>Hedge Fund</b>	3%	25.3%	26.6%	26.1%
<b>Commodity</b>	3%	2.8%	3.0%	2.7%
<b>Private Equity</b>	3%	5.3%	4.7%	5.2%
<b>Business</b>	38%	38.3%	38.3%	38.3%
<b>Left-Tail Risk/Liability</b>	None	None	Full	Full
<b>Insurance</b>	None	None	None	Optimal (67%)

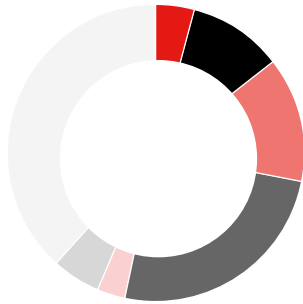


# Maximum Sharpe Ratio Asset Allocations

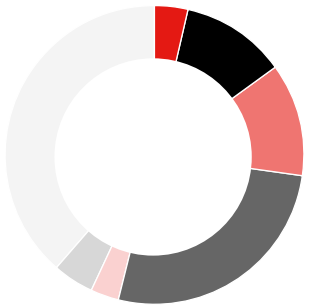
Average Wealth Allocation



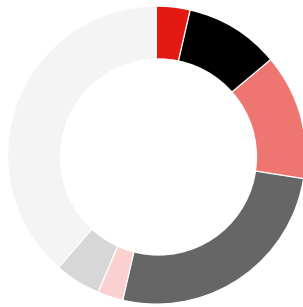
No Liability



Underinsured (No Insurance)



Optionally Insured



## Key

- US Equity Large Cap
- US Corp. Bonds Core
- Real Estate
- Hedge Fund
- Commodity
- Private Equity
- Business



# The value of insurance and the right insurer

As the case studies show, given certain assumptions about loss frequency and insurance industry competitiveness, obtaining appropriate levels of liability and property coverage can help insulate a UHNW investor's portfolio from the consequences of major losses, lowering expected volatility in the long run and improving the expected risk-adjusted return.

The risk to the UHNW client is related to the replacement value of a complex range of properties, and the liability risk that comes with a greater amount of assets. Because of this, it could be important to utilize an insurer who specializes in serving UHNW clients in liability claims, and accurately assessing property such as homes, fine art, and jewelry.

The Wharton researchers underscore the importance of insurance carrier stability, proper home replacement cost coverage, and adequate liability limits. Carrier instability increases the risk that insurance will not be effective, which in turn impairs the overall total balance sheet investment strategy.

5. Note that standard riders might cover fine art and jewelry up to a point. The figure here references uncovered value.

# Learn more and reach out

To learn more about risk management for UHNW families and individuals, visit:

- [chubb.com/wharton](http://chubb.com/wharton)
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Or contact an independent agent or broker specializing in insurance for UHNW clients.

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