

# Leverage in portfolios

March 2021

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## Summary

*This paper hopes to shed light on one segment of today's investment challenge, the benefits and risks associated with using leverage. This paper finds that for investors with sufficient capital to leverage market opportunities and allocate to a wide range of asset classes, and with an appropriate Enterprise Risk Tolerance to accept the range of outcomes involved, modest leverage may be responsibly employed to provide greater diversification of risk while maintaining a similar return target.*



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## Introduction

With bond yields near all-time lows and equity market projections continuing to dampen, meeting a traditional return target has never felt so challenging. Institutional investors are finding themselves in between a rock of responsible risk positioning and a hard place representing ever more difficult to achieve performance objectives. Investors are constantly looking for ways to increase their risk-adjusted return expectations, and to that end, must select which risks they are comfortable taking. The options are many, from illiquid investments, esoteric hedge funds, aggressive alpha objectives, taking portfolio bets, or the use of explicit leverage; there seems no end to the ability to add complexity to a portfolio; but there is often little focus on the risks engaged by that choice. This paper hopes to provide some of that focus.

First, it is important to understand what leverage really is.



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## Leverage – it is what it is

Nearly all investors have leverage embedded in their portfolios – why?

Back in 1963, Professors Modigliani and Miller proposed that the tax deductibility of interest payments creates a tax shield which adds value to the firm, and therefore, a firm's weighted average cost of capital is minimized when the firm is 100% debt financed. However, the professors did not account for the fact that companies with high leverage levels face higher risk of not being able to service their debts if faced with deteriorating business conditions. The static trade-off capital structure theory was later introduced, which recognized that firms should seek to employ leverage only until the marginal benefit of the tax shield equaled the marginal cost of financial distress.

Opinions differ on how to determine a firm's optimal capital structure – many theories exist, and our goal is not to fall into those weeds here. Our goal is to recognize that every company will have an optimal level of leverage utilization, based on its own unique circumstances.

But, for most companies the decision not to use leverage results in suboptimal capital costs, and therefore, companies should not be afraid of taking on leverage in the interest of efficient capital allocation. This leverage, taken on at the company level for good reason, is still embedded in every portfolio – it is just well hidden.

## It is what it is, but where is it?

When a stock is purchased, that stock represents a claim in that company and participates in that company's profit or loss. When a S&P 500 tracking exchange-traded fund is purchased, the result is a weighted average claim on all of the income streams of that index's constituents, and a proportional weighted average exposure to the financial leverage of the constituents, based on the leverage taken on by the underlying companies. While this technicality is not often considered by institutional investors (who don't make the choice to buy a "de-levered" S&P 500 Index tracking fund) it is an important one to be aware of. For example, the total debt-to-equity ratio of the S&P 500 Index is about 1.20, meaning the weighted average of the companies in the index have about \$1.2 dollars in debt for every \$1.0 in equity, or an embedded leverage of 20%. If an investor in the S&P 500 Index then decided to apply 10% explicit leverage to their position, the actual leverage of the underlying position would not just be shifted 10% higher, as that explicit leverage would be multiplied by the underlying leverage already embedded in the position.<sup>1</sup>

Of course, leverage levels, and acceptable ranges for leverage levels vary significantly by sector<sup>2</sup>, and therefore, by region<sup>3</sup>. Private equity, which is essentially levered, more-concentrated equity ownership, also (definitionally) contains embedded leverage. Looking outside of traditional equity exposures, our research indicates that core real estate and REIT exposures tend to carry with them embedded leverage levels of 23% and 36% respectively.

What about fixed income? Investing one dollar in the Bloomberg Barclays Aggregate Index

would represent roughly a \$0.27 investment in U.S. investment-grade companies, all of which have their own leverage levels, and a significant investment in U.S. Treasury securities, whose underlying leverage levels could be tied to the fiscal position of the United States government. One could also argue that the “price” of a company or government’s debt accounts for that issuer’s creditworthiness, and therefore, the leverage of the underlying issuer is already embedded in the exposure.

Essentially, leverage is likely already embedded in most pockets of most investors’ portfolios. The risks and benefits associated with using explicit leverage on those investors’ portfolios, however, will depend on how that leverage is deployed. We consider a simple example in the next section.

### Everyone loves soybeans

Imagine a farmer who invests all her capital and resources in the production of soybeans to be harvested at some point in the future.

Because the solvency of this business is dependent on the future price of soybeans, the farmer may have two approaches for managing her business. On one hand she can expand her soybean fields and grow more product, using her physical property (say, the farm itself) as collateral. On the other, she can use that same collateral to finance a futures contract which fixes the price at which she can sell her soybeans in the future.

In the first case, the farmer is using leverage to amplify her risk as she would be even more sensitive to the future price of soybeans, for better or worse. In the second, the farmer is using leverage to mitigate her risk profile as the future sale price of soybeans becomes fixed and, presumably, of sufficient value to keep her business a going concern.

Leverage itself, as shown in this example, is not necessarily a risk enhancing strategy. It is a tool, like many others which can be used to increase the risk profile of a portfolio, or to assist in diversifying it.

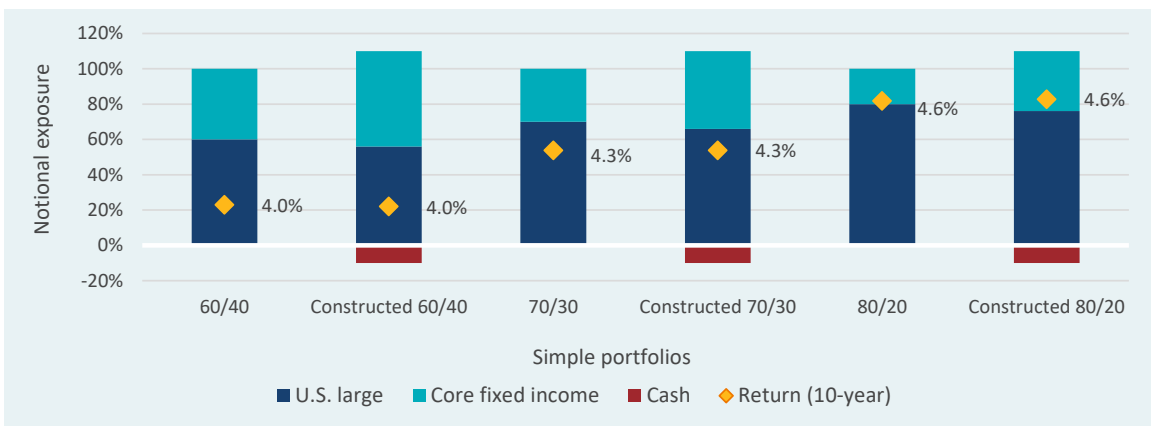
### But where’s the beef?

To understand the risks associated with using leverage we have created six portfolios displayed in Figures 1 and 2: a 60/40<sup>4</sup>, a 70/30, and an 80/20, as well as their “constructed equivalents”. The constructed portfolios are portfolios which have a lower equity allocation but an equivalent return target as their parent portfolio by using explicit leverage of 10 percent. In other words, although the Constructed 60/40 portfolio has the same return expectation as a 60/40 portfolio, it achieves this through a lower weighting to equity (56%, not 60%), but through including 10% leverage.

Figure 1:

		<u>Simple Portfolio</u>					
		60/40	Constructed 60/40	70/30	Constructed 70/30	80/20	Constructed 80/20
Asset Allocation	US Large	60.0%	56.0%	70.0%	66.0%	80.0%	76.0%
	Core Fixed Income	40.0%	54.0%	30.0%	44.0%	20.0%	34.0%
	Cash	0.0%	-10.0%	0.0%	-10.0%	0.0%	-10.0%
Total Notional Exposure		100%	110%	100%	110%	100%	110%
Explicit Leverage		0%	-10%	0%	-10%	0%	-10%
Return (10Yr)		4.0%	4.0%	4.3%	4.3%	4.6%	4.6%

Figure 2:



In this example we find that a portfolio beginning with a domestic 60/40 faces a few choices. First, if it wants to shift its risk profile away from equity risk and toward, say, the bond market; it can do so by investing in core fixed income, financed by explicit leverage such that the total expected return remains the same.

It is worth noting here that by deciding to employ leverage through the use of derivatives, there is a “cost drag” that is involved in derivative contracts. In other words, the investor must pay for that leverage. Typically, the cost of leverage is equal to the yield of cash (more specifically, the 3-month Treasury bill rate). The pricing of all derivatives includes this “cost drag”, and although today this drag is very close to zero, historically the drag has been notable.

If the 60/40 plan needs to increase its expected return, then it has two options.

Option 1: It can increase portfolio risk the traditional way by selling from core fixed income and purchasing US Large (the 70/30 portfolio).

Option 2: It can deploy leverage by holding some of its assets as collateral (the cost of which is represented as negative cash) and instead target a 66/44 allocation.

A similar situation applies for moving toward an 80/20 portfolio. However, note that while using leverage may diversify away from equity risk, it enhances other risks. As always, additional expected return is never free, which Figure 3 below illustrates.

Figure 3:

Portfolio	Return (10-year)	Total risk (%)	Sharpe Ratio	Beta	Effective duration (MAC)
60/40	4.0%	9.4%	0.43	0.63	2.51
Constructed 60/40	4.0%	8.9%	0.45	0.60	3.38
70/30	4.3%	10.9%	0.41	0.73	1.88
Constructed 70/30	4.3%	10.4%	0.43	0.70	2.75
80/20	4.6%	12.5%	0.40	0.83	1.25
Constructed 80/20	4.6%	11.9%	0.41	0.79	2.12

Figure 3 displays the impacts of using leverage. In the current environment, increasing the risk profile of the portfolio will likely increase its beta and return expectations, and deploying leverage to invest in more risk-hedging assets may increase its Sharpe ratio by maintaining the portfolio's return expectation while reducing its total risk profile. This effect will depend on the risk-adjusted return expectations of the underlying assets involved which may change in the future. However, the constructed portfolio will have increased its duration, and therefore, its exposure to a rate or spread shock.

If the plan wants to move from a 4% to a 4.3% expected return it has two choices, either it can do traditional re-risking and move toward a 70/30 (increasing risk, increasing beta, and decreasing duration) or it can move into the constructed 70/30 portfolio which still has increased risk but relative to the 70/30 allocation, less total risk and more duration.

The choice between 70/30 and constructed 70/30 is a balancing act between the types of risks a plan sponsor is comfortable taking and the way in which that leverage is deployed. However, most institutional investors have a range of asset classes available to them in which to deploy leverage, unlocking increased risk diversification benefits in the process. We analyze a more complex set of portfolios next.

### Let's introduce a more complex portfolio

This exercise is repeated in Figures 4 and 5 below which show the same statistics but with a more complicated portfolio using a broader range of asset classes including private equity, real estate, and emerging market equity.

Figure 4:

		Complex Portfolio					
		Constructed		Constructed		Constructed	
		60/40	60/40	70/30	70/30	80/20	80/20
Asset Allocation	US Large	25.0%	23.0%	28.0%	27.0%	30.0%	29.0%
	International Developed	25.0%	22.0%	28.0%	26.0%	30.0%	28.5%
	Emerging Markets	5.0%	5.0%	7.0%	5.0%	10.0%	7.0%
	Private Equity	5.0%	5.0%	7.0%	5.0%	10.0%	9.0%
	US TIPS	5.0%	6.0%	5.0%	5.0%	0.0%	2.0%
	US Treasury	5.0%	12.0%	4.5%	8.0%	0.0%	5.5%
	Core Plus Fixed Income	10.0%	16.0%	8.0%	14.0%	8.0%	10.0%
	Long-Term Credit	5.0%	5.0%	2.5%	5.0%	2.0%	5.0%
	Emerging Market Debt (Hard)	2.5%	3.0%	1.0%	2.5%	1.0%	2.0%
	Emerging Market Debt (Local)	2.5%	3.0%	1.0%	2.5%	1.0%	2.0%
	Core Real Estate	5.0%	5.0%	4.0%	5.0%	4.0%	5.0%
	REITS	5.0%	5.0%	4.0%	5.0%	4.0%	5.0%
	Cash	0.0%	-10.0%	0.0%	-10.0%	0.0%	-10.0%
		Risk Assets	60%	55%	70%	63%	80%
	Hedging Assets	40%	55%	30%	47%	20%	37%
	Total Notional Exposure	100%	110%	100%	110%	100%	110%
	Explicit Leverage	0%	-10%	0%	-10%	0%	-10%
	Return (10Yr)	5.1%	5.1%	5.3%	5.3%	5.8%	5.8%

Figure 5:

Portfolio	Return (10-year)	Total risk (%)	Sharpe Ratio	Beta	Effective duration (MAC)
60/40	5.1%	11.8%	0.45	0.70	2.45
Constructed 60/40	5.1%	11.1%	0.47	0.66	3.49
70/30	5.3%	12.9%	0.44	0.76	1.72
Constructed 70/30	5.3%	12.2%	0.46	0.73	2.92
80/20	5.8%	14.8%	0.44	0.85	0.91
Constructed 80/20	5.8%	14.0%	0.45	0.83	2.19

Figure 4 and 5 show that there are benefits to portfolio complexity such as a higher expected return; but this comes at the cost of additional risk and similar trade-offs to the simple portfolios earlier. However, because the complex portfolios are more risk diversified then they experience greater return to volatility benefits versus their simple portfolio counter parts.

### All roads lead to Rome, except for a few

Leverage comes with its own unique set of risks and costs. Specific types of risk in a constructed portfolio are amplified because the portfolio becomes increasingly sensitive to the value of not just what leverage was deployed for, but also to the changing market value of the collateral itself. The soybean farmer example from the prior section used the collateral provided by the farm itself to purchase either an expanded soybean field or a futures contract. But no matter the choice made by the farmer; the changing value of the collateral is

a new risk embedded in the farmers assets which was previously inconsequential. If one week after the farmer decided to use the value of the farm as collateral to expand the soybean farm, a nuclear power plant was built a mile away from the farm, the farmer could face a margin call as a result of the potential impairment of the value of her collateral.

Leverage in these example portfolios is taken by using high quality fixed income as the collateral by which to invest in more high-quality fixed income. Figure 6 below shows a risk decomposition of complex portfolios displayed earlier, showing as a percentage the amount of total volatility in the portfolio coming from various factors (equity, rates, credit, etc.).

Figure 6:

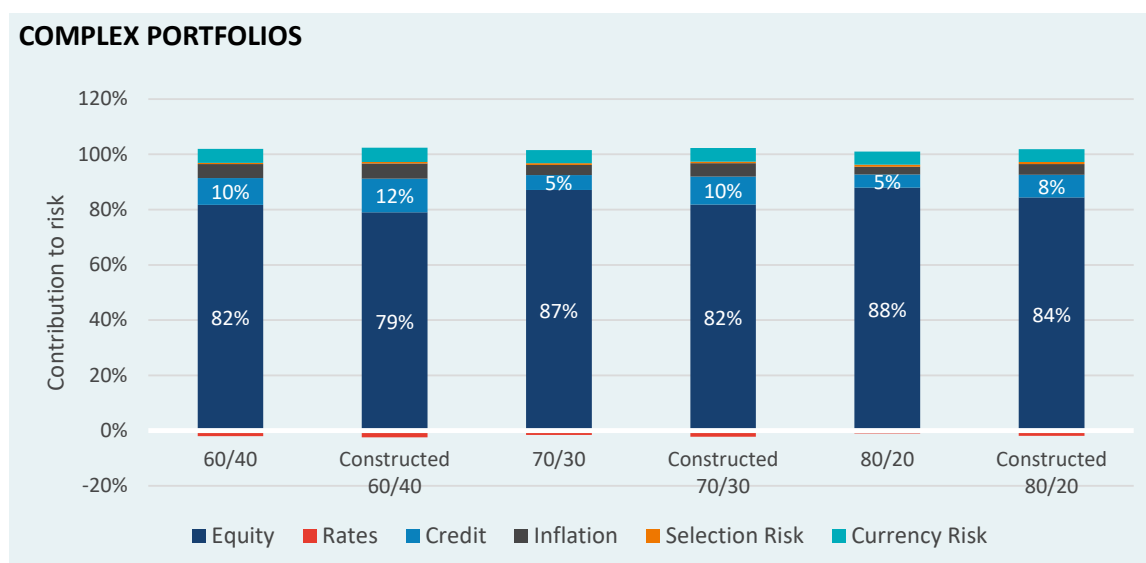


Figure 6 shows the risk diversification benefits gained by using leverage to invest in non-equity assets. While equity risk decreases from 82% of total volatility in the 60/40 portfolio to 79% in the constructed equivalent, that diversification is amplified in the riskier allocation of 80/20 (a 4% difference). While total volatility is reduced by using leverage in this manner (see Figure 5), the risk profile of these portfolios shifts to having noticeably more rates and credit risk.

Because the risk profile of the constructed portfolio has changed, its sensitivity to various drawdowns will change. Figure 7 below puts the complex portfolios through a few market-driven stress tests - in it one finds that leverage being deployed to hedge equity risk has the benefit of reducing the portfolio's sensitivity to equity-driven shock events, but even during an equity drawdown credit and rates can be equally impacted.

Figure 7:

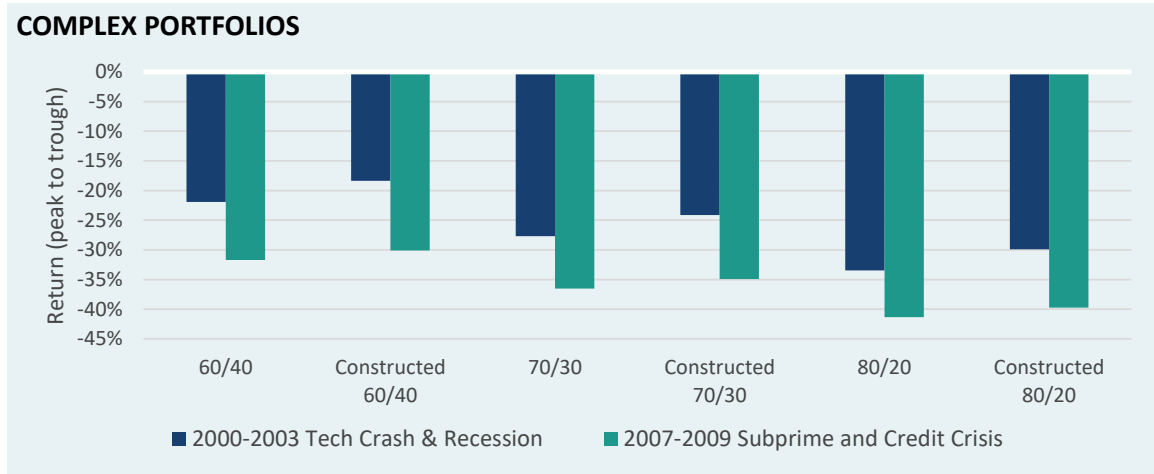


Figure 7 shows two market driven stress tests from peak to trough. The 60/40 portfolio lost approximately -32% during the subprime and credit crisis, whereas its constructed equivalent performed only marginally better at a -30% loss. This is because of the added shock to credit assets which were used in the leverage. In the case of the 07-09 subprime crisis, there were few assets in which to protect the portfolio from the drawdown. Therefore, while constructed portfolios were more risk diversified because of their investments in credit and rates (which reduced some of the losses), the benefits of that diversification were muted in a scenario in which nearly every asset class suffered substantial loss. However, for more equity-driven shocks, like the 2000-2003 Tech Crash, the constructed portfolio's diversification benefits were more substantial.

Figure 8 then compares the same portfolios against a set of interest rate shocks to better understand the risks embedded in the strategy.



Figure 8:

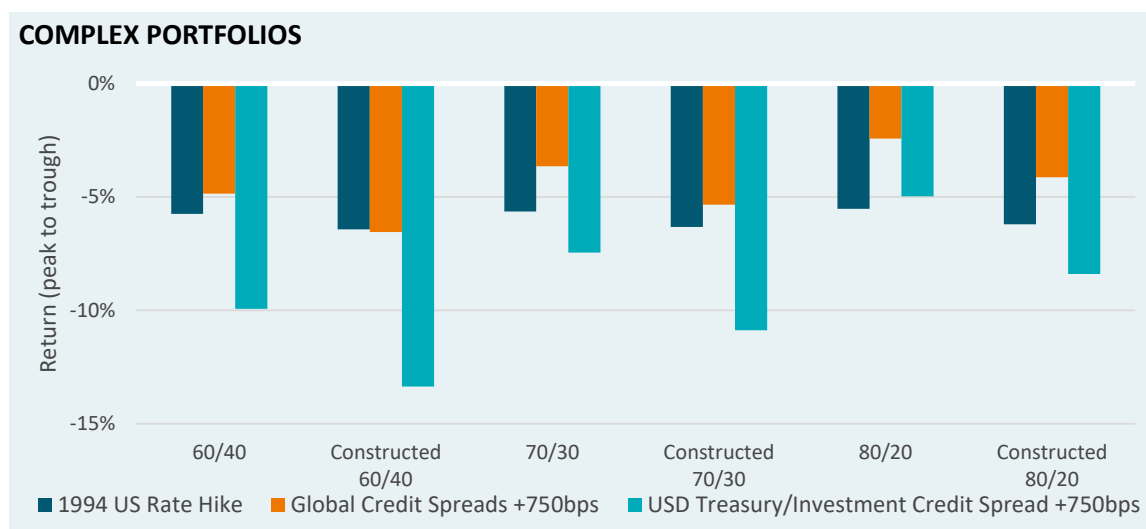


Figure 8 displays three different scenarios. The first uses U.S. market experience during the 1994 rate hike. The other two, global credit spreads increase by 750bps and USD Treasury/Investment Credit Spreads increase by 750bps are manufactured to show an extreme shock targeting the leverage of the portfolios.

In each case, the usage of leverage increases the drawdown experienced by any given portfolio and its constructed equivalent, but scale is important. While having leverage during the 1994 rate hike wouldn't have materially impacted the performance of the portfolio, during a broad treasury/credit spread hike such differences become material and significant.

Finally, the analysis shown in this paper focuses on leverage being used as a risk diversifier (the farmer buys a futures contract) rather than a risk amplifier (the farmer purchases more farmland). Using leverage to boost return-seeking assets means investing in asset classes which are, practically speaking, equity driven. The risk movements of which are analogous (but not necessarily equivalent) to changing the allocation from a non-levered 60/40 to a non-levered 70/30 or 80/20.

## Conclusions

Leverage is one of many tools in an investor's toolkit. Just as a company's CFO endeavors to use leverage up until its marginal benefit equals its marginal cost, today's institutional investor might consider using leverage up until the benefits of its risk diversification match its costs in terms of potentially-higher rates, credit, and collateral risk. As the 2007-2009 financial crisis showed, a risk-hedging leverage strategy is primarily based on protecting against yesterday's crisis. In market conditions where rates and credit asset classes are increasingly losing their diversification benefits, there is no free lunch with respect to the risk an investor must endure to achieve a sustainable return for its stakeholders. But for investors

with sufficient capital to leverage market opportunities and allocate to a wide range of asset classes, modest leverage might be responsibly employed to provide greater diversification of risk while maintaining a similar return target.

For additional information regarding our insights into leverage and its potential application within the investment process, please reach out to your Verus consultant.

## Notes & Disclosures

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- 1 To demonstrate this effect, imagine finishing dinner at your favorite local restaurant post-COVID, and realizing that the 20% tip you left was based on a sub-total which included 18% gratuity. In this case, the wait staff benefitted from the leverage embedded in the built-in gratuity mechanic.*
- 2 Financials, utilities, consumer staples, and other sectors characterized by higher capital needs and more stable income often have much higher leverage ratios, partly because their lower risk allows for cheaper borrowing.*
- 3 Sector allocations vary widely based on the region in which you are invested. The S&P 500 Index has embedded leverage of around 20%, while the MSCI EAFE Index, an international developed equity benchmark, has embedded leverage near 73%. Much of this divergence is attributed to the relatively high concentration of technology companies in U.S. indices, relative to Europe. The embedded leverage of the MSCI Emerging Markets Index is around 5%, and access to debt financing might also play a role in the region's relatively low leverage levels.*
- 4 Meaning a portfolio in which 60 percent of the assets are invested in U.S. equities (S&P 500 Index) and the remaining 40 percent of the assets are invested in core fixed income (Bloomberg Barclays U.S. Aggregate Index).*

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