The Impact of Negative Cash Flow on Asset Allocation Decisions

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NEGATIVE CASH FLOWS

Challenges and potential remedies

CHALLENGES	POTENTIAL REMEDIES
FUNDING	• LIQUID PROXIES • BALANCED RISKS • ALTERNATIVE RISK PREMIA
LIQUIDATING LIQUID ASSETS	
RISK IN ILLIQUID PORTFOLIOS	
DRAWDOWN	

LIQUIDITY

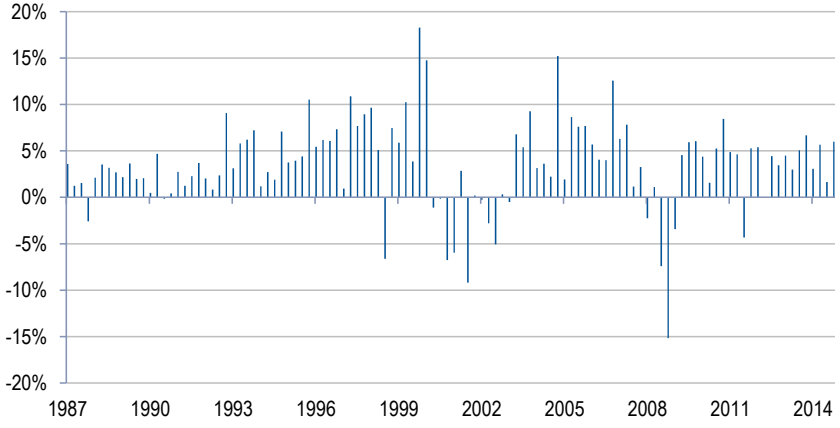
RISKS OF ILLIQUID ASSETS

Not marked to market ~ price fluctuations do not reflect actual risk

CAMBRIDGE ASSOCIATES PRIVATE EQUITY INDEX

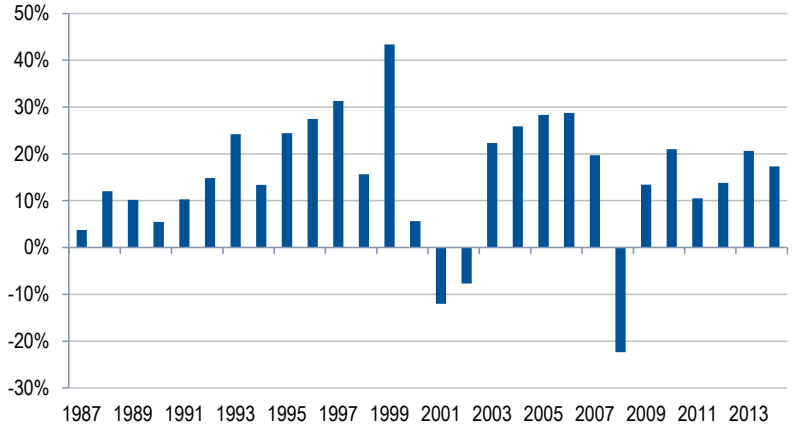
QUARTERLY RETURNS

ANNUALIZED VOLATILITY = 9.6%



CALENDAR YEAR RETURNS

ANNUALIZED VOLATILITY = 13.7%



WHAT WAS THE REALIZED VOLATILITY OF PRIVATE EQUITY:
9.6%, OR 13.7% OR 14.5%?

DECOMPOSING PRIVATE EQUITY RETURNS

Based on cash flows from 4,403 investments made by global private equity houses from 1975 to 2007

Global Private Equity (Gross)	=	Risk-free	+	0.65 * Illiquidity Premium	+	1.3 * Market Premium	+	Value Premium	
	=	5.8%	+	3%	+	10%	+	5%	(1)
Net of fees return	≤	12% (consistent with Kaplan & Schoar, 2005)							(2)

Its 0.65 loading on the Illiquidity Premium puts it in top 15% among the most illiquid stocks in the CRSP database

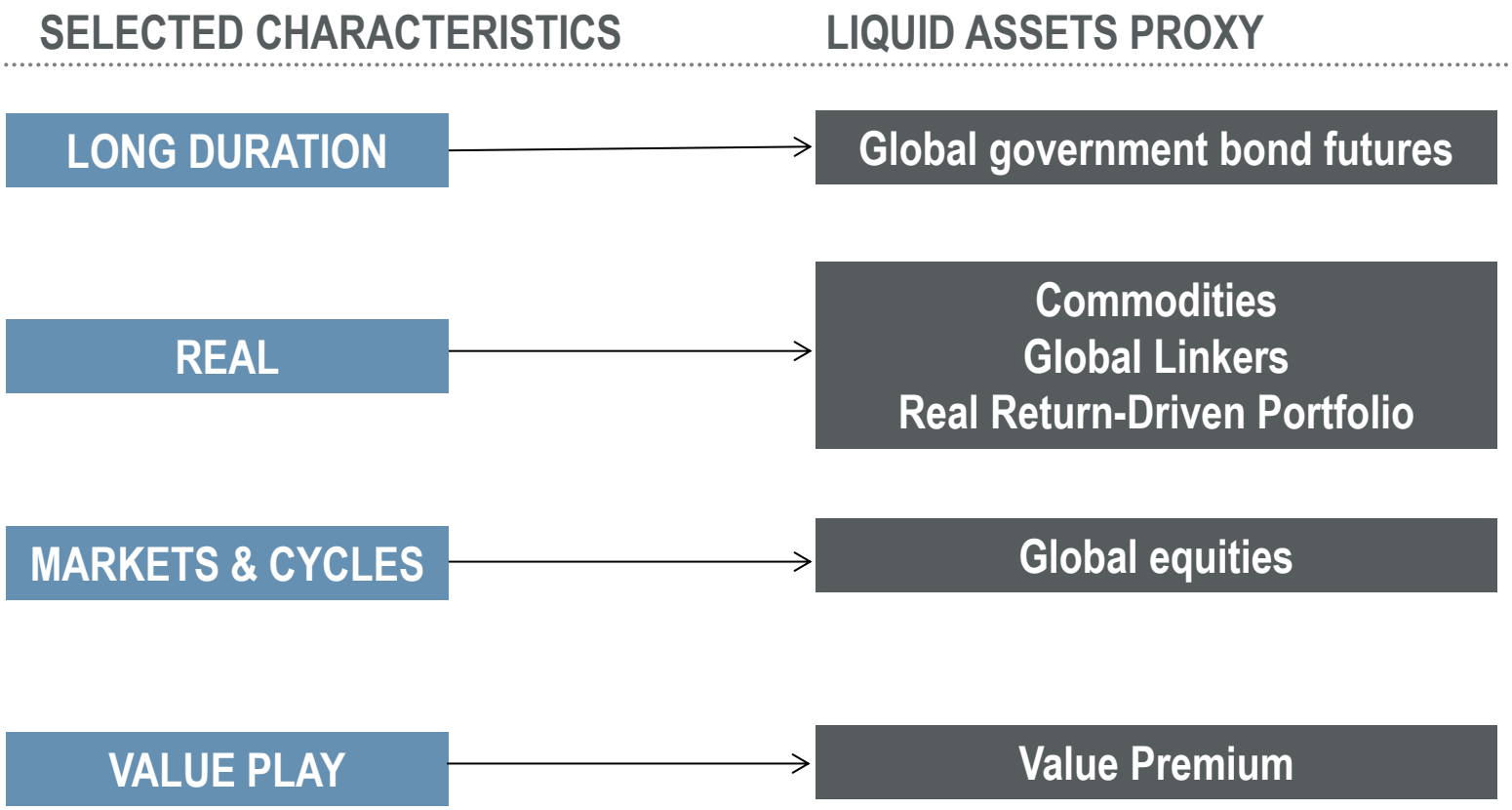
Exposure to small stocks is statistically insignificant

(1) "Private Equity Performance and Liquidity Risk," Francesco Franzoni, Eric Nowak, and Ludovic Phalippou, Journal of Finance, 2012. The numbers shown in equation (1) are the results of a regression analysis conducted by the authors of this paper

(2) "Private Equity Performance: Returns, Persistence, and Capital Flows," Steven N. Kaplan and Antoinette Schoar, Journal of Finance, 2005.

POSSIBLE LIQUID PROXIES FOR UNLISTED ASSETS

Infrastructure, property & private equity/debt share some common characteristics



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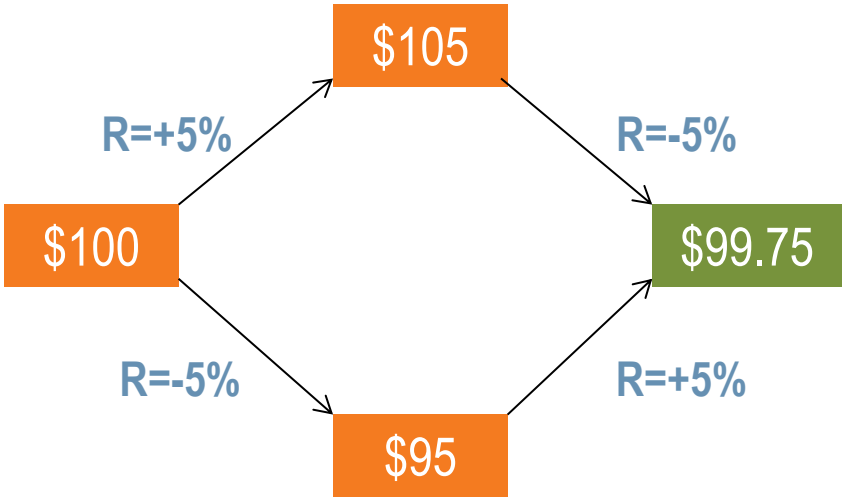
VARIANCE DRAG AS A HEADWIND

Volatility becomes a drag on performance through compounding



$(1+R)(1-R) = 1-R^2$

$(1-R)(1+R) = 1-R^2$

Results are the same

SEQUENCE OF RETURNS DOES NOT MATTER IN THE ABSENCE OF CASH FLOW

For illustrative purposes only

IMPACT OF NEGATIVE CASH FLOWS

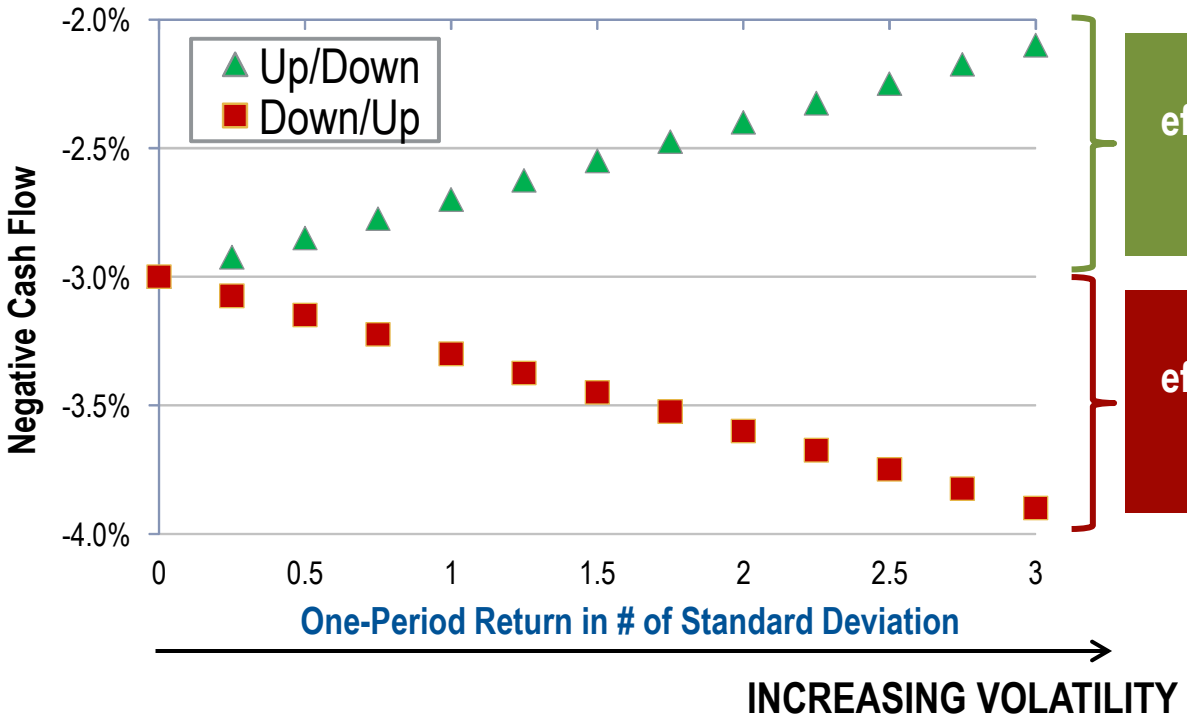
Negative cash flows make the variance drag even worse

SEQUENCE OF RETURNS DOES MATTER WITH CASH FLOW (C% OF PLAN'S ASSET)

For illustrative purposes only

CASH FLOW COMPLICATIONS

As volatility increases, the variance drag can reduce or amplify negative cash flow



As volatility increases, the effect of negative cash flow is reduced with up/down sequencing

As volatility increases, the effect of negative cash flow is amplified with down/up sequencing

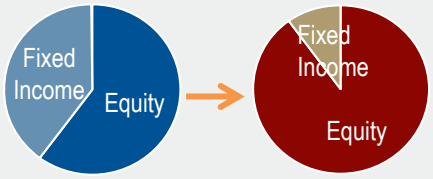
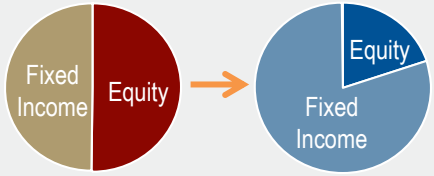
For illustrative purposes only Assumptions: 10% annualized volatility; 3% negative cash flow

MANAGING VOLATILITY

INTRODUCING RISK PARITY

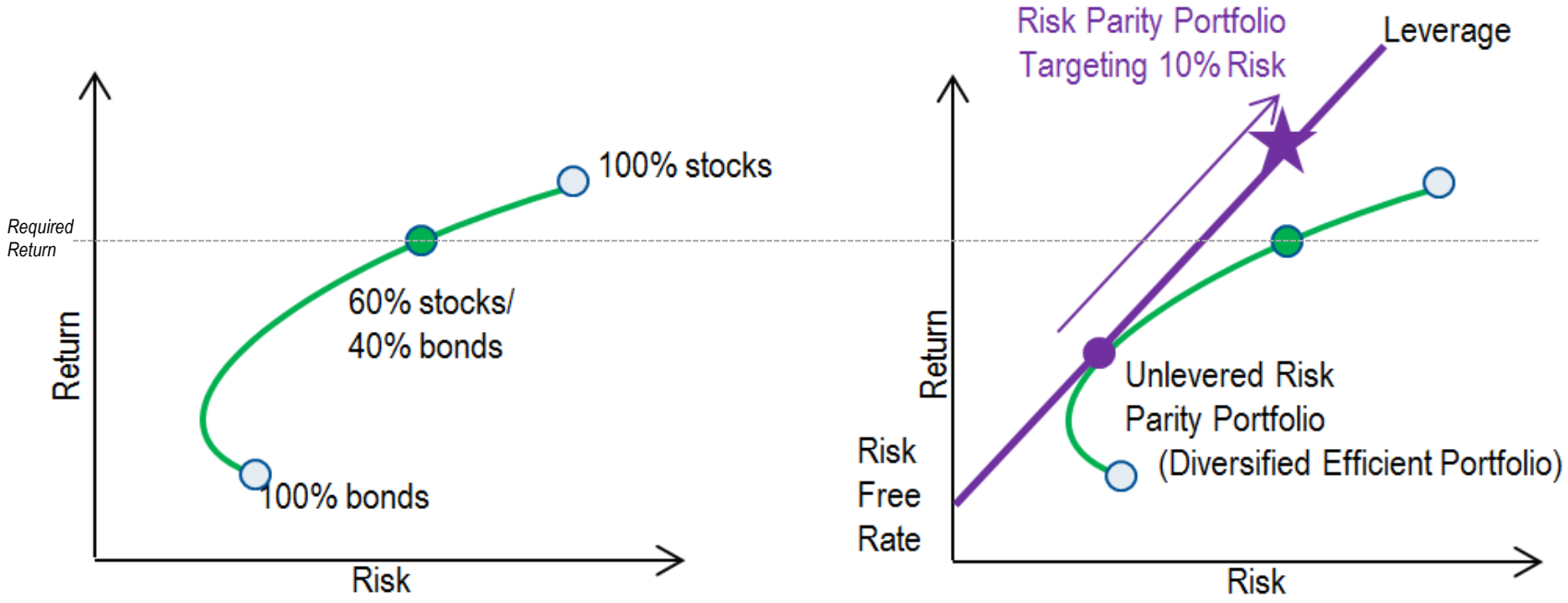
Risk parity is a risk-balanced approach to strategic asset allocation

The concentration of equity risk in a "typical" 60/40 portfolio is a result of required returns, investor constraints, and industry convention

	TRADITIONAL APPROACH	RISK WEIGHTED APPROACH
APPROACH	Maximize return for a given risk tolerance	Select asset class weights to balance risks
WEIGHTS	**CAPITAL** weights drive **RISK** 	**RISK** weights drive **CAPITAL** allocation 
OBSERVATIONS	• Approach is widely used • Requires estimation of returns • May be overly concentrated in equity risk	• Resulting risk should be well diversified • Requires estimation of risk, which is relatively easier • Anticipated return is too low without leverage

IMPROVING PORTFOLIO EFFICIENCY

Risk parity may improve efficiency as well as volatility and drawdown management



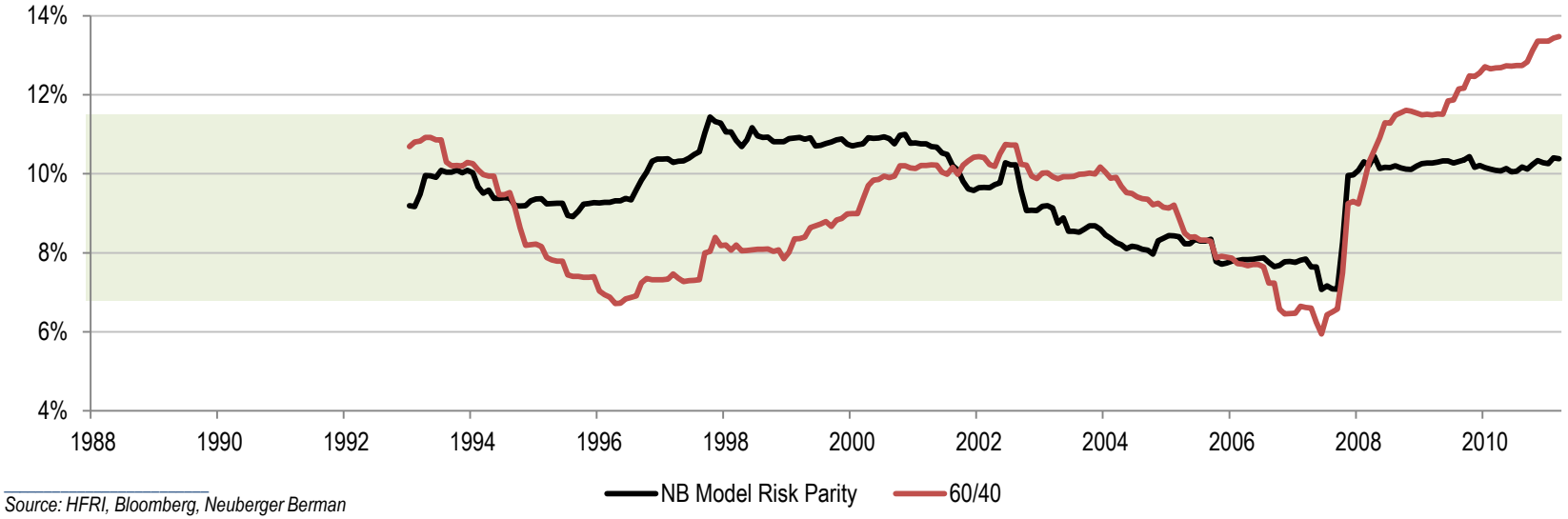
RISK STABILIZATION

Taking risk within a range likely improves Sharpe Ratio

Perold (2012), "Risk Stabilization and Asset Allocation," examines properties of risk-conditioned strategies

Risk parity targets a specific level of volatility, resulting in a tighter range of realized volatility than a 60/40 portfolio

HYPOTHETICAL BACKTESTED ROLLING 5 YR VOLATILITY



Source: HFRI, Bloomberg, Neuberger Berman
Data from Jan 1, 1989 to February 28, 2012.

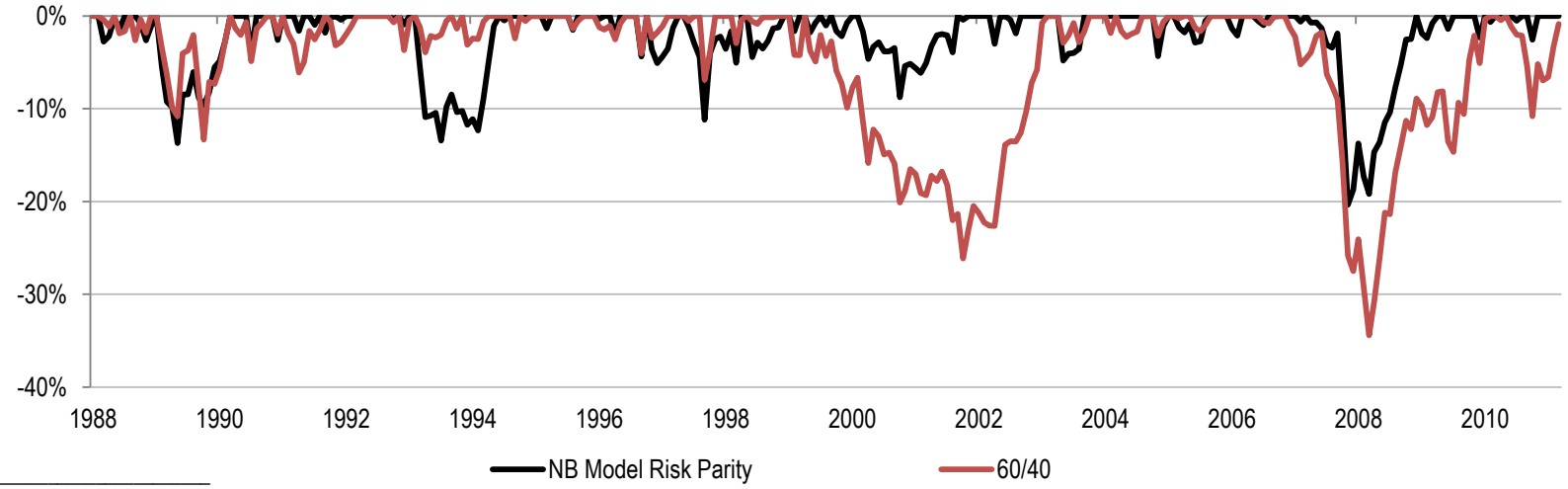
PLEASE SEE "HYPOTHETICAL BACKTESTED PERFORMANCE DISCLOSURES" AT THE END OF THIS MATERIAL FOR IMPORTANT DISCLOSURES REGARDING THE HYPOTHETICAL BACKTESTED PERFORMANCE SHOWN IN THIS PRESENTATION. *The hypothetical data shown is based on back-tested model portfolios and is shown for illustrative and discussion purposes only. The results are shown on a supplemental basis and do not represent the performance of any Neuberger Berman managed account or product and do not reflect the fees and expenses associated with managing a portfolio. Hypothetical performance has certain inherent limitations. As with all back-tested results, the results reflect the retroactive application of models designed with the benefit of hindsight. Unlike actual investment performance, hypothetical model results do not represent actual trading and accordingly they may not reflect the impact that material economic and market factors might have had on decision making if assets were actually managed during the relevant period. Investing entails risks, including possible loss of principal.* ***Past performance is no guarantee of future results.***

DRAWDOWN OF TYPICAL PORTFOLIO

Risk parity balances risk contributions better than 60/40, which has more concentrated equity risk

Risk parity has more frequent, but smaller drawdowns, as the risks of assets are more balanced

HYPOTHETICAL BACKTESTED DRAWDOWN



Source: Bloomberg, Neuberger Berman
Data from Jan 1, 1989 to February 28, 2012.

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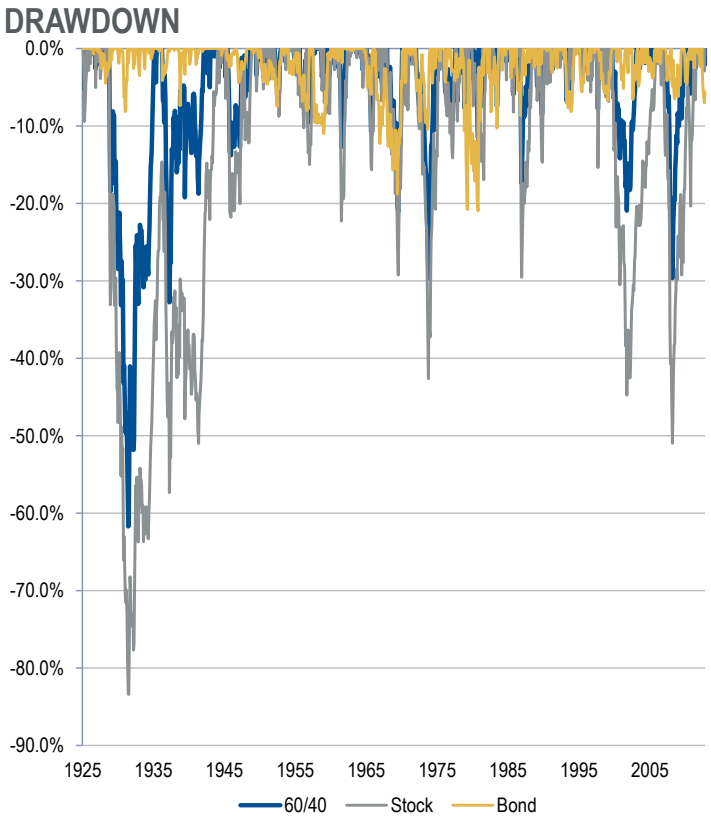
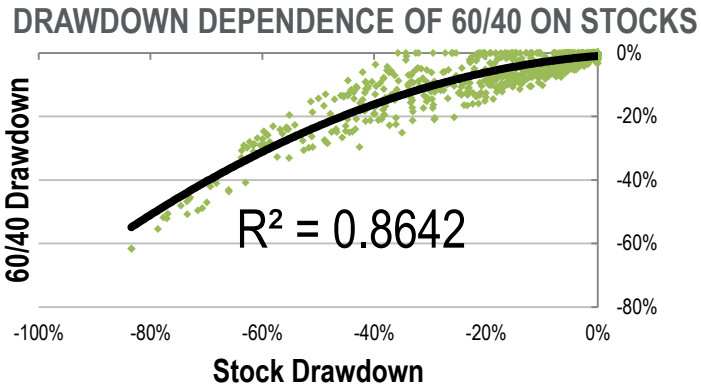
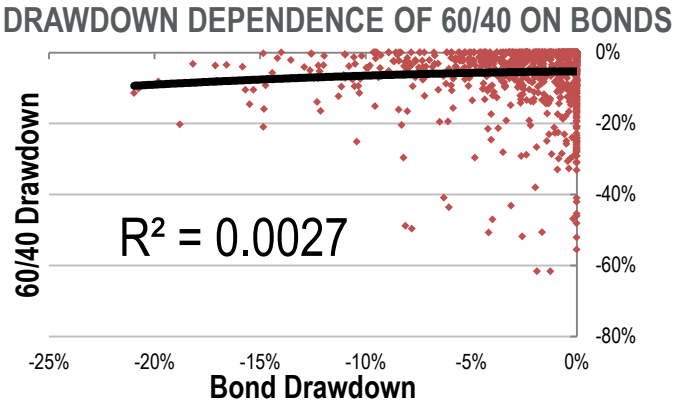
DRAWDOWN OF TYPICAL PORTFOLIO

Drawdowns in a 60/40 portfolio can be largely explained by stocks





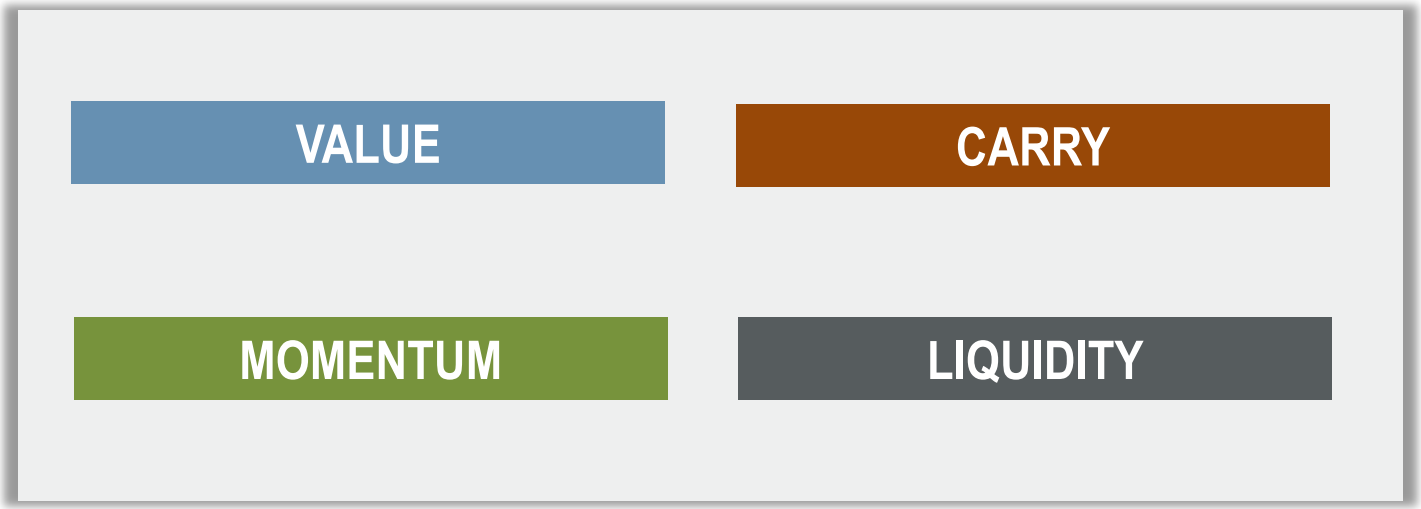


Sources: Ibbotson, Stocks: Large US Stocks; Bonds: Large US bonds

ALTERNATIVE RISK PREMIA

Introducing alternative risk premia may further improve portfolio efficiency

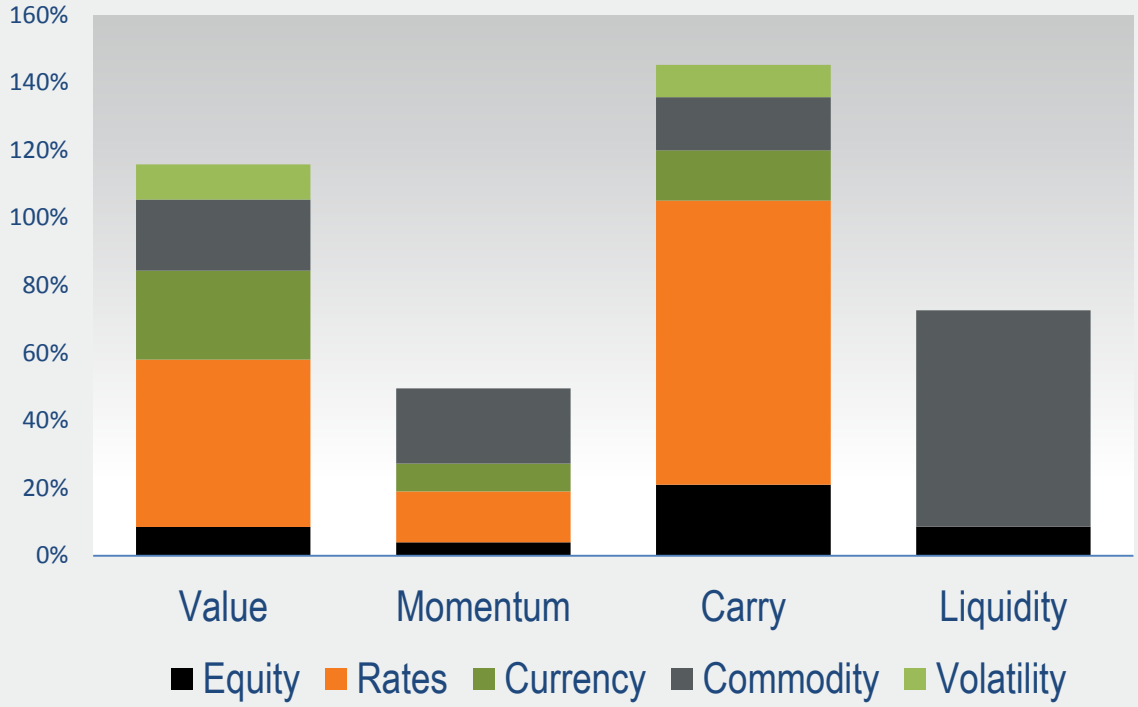
Introducing uncorrelated risk premia into a portfolio improves diversification and the risk/reward profile



MODEL SIMPLE RISK PREMIA PORTFOLIO

A diversifying set of alternative risk premia

HYPOTHETICAL PORTFOLIO WEIGHTS*



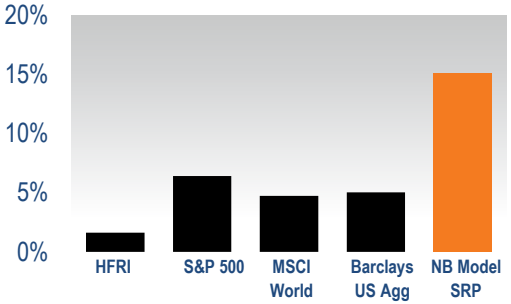
A hypothetical portfolio of "Simple Risk Premia" can enhance performance and diversification of a traditional portfolio

Weights are for a Hypothetical Simple Risk Premia portfolio with 10% realized volatility. For illustrative purposes only. Investing entails risks, including possible loss of principal. ***Past performance is no guarantee of future results.***

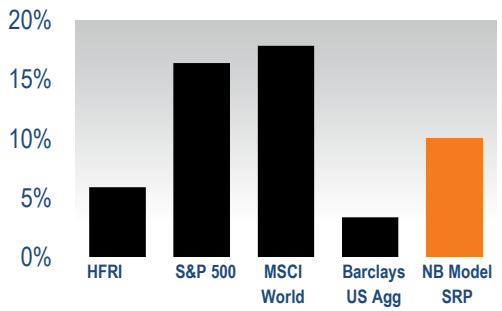
MODEL RISK PARITY PORTFOLIO

Hypothetical Backtested Summary Statistics

ANNUALIZED RETURN

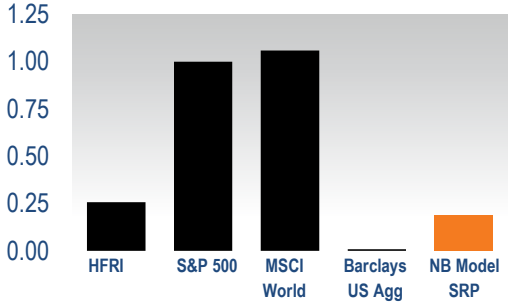


ANNUALIZED STANDARD DEVIATION

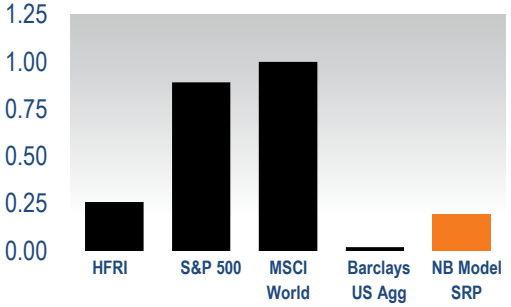


MAXIMUM DRAWDOWN

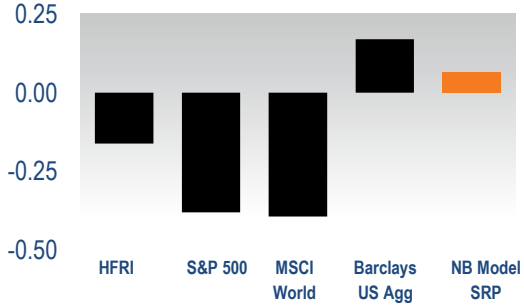
BETA TO S&P 500



BETA TO MSCI WORLD



BETA TO BARCLAYS US AGG



SRP = Simple Risk Premia. Source: HFRI, Bloomberg, Neuberger Berman

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SUMMARY

NEGATIVE CASH FLOWS COMPOUND THE PAIN OF THE "VARIANCE DRAG"

MULTIPLE TYPES OF RISK REQUIRE MULTIPLE APPROACHES TO RISK MANAGEMENT

DIVERSIFICATION REMAINS KEY IN OUR VIEW

DISCLOSURES

Hypothetical Backtested Performance Disclosures

The hypothetical performance results included in this material are of back-tested model portfolios and are shown for illustrative purposes only. Neuberger Berman calculated the hypothetical results by running a variety of model portfolios on a back-tested basis using the stated methodologies and assumptions. The results do not represent the performance of any Neuberger Berman managed account or product and do not reflect the fees and expenses associated with managing a portfolio.

Model Risk Parity Portfolio: Underlying assets: The universe consists of 43 assets from the asset class categories of equity, fixed income and real assets. The returns used for comparison to a blended reference portfolio of equity and fixed income are a weighted average of monthly returns derived from excess return indices available via Bloomberg.
Backtest methodology: The simulated portfolio is a long only portfolio whose weights are determined by the riskiness and codependency properties of each asset in the portfolio universe. Risk of each constituent asset is defined by their volatility (a measure of deviation from their average) and expected shortfall (average loss beyond monthly value at risk at 5%). Dependence is modeled by historical correlations and tail dependencies (which capture the historical co-movements during extreme profit/loss periods). With liquidity risks taken into account on risk allocation, the portfolio weights are derived by allocating equal risk to each asset class and to each asset within the asset class, and subsequently determining the portfolio weights to each asset that would provide for such a distribution of risk budget. After forming the portfolio, the next period's asset returns obtained from Bloomberg are multiplied by the respective risk parity portfolio weights to get the next period's portfolio return. Each month's return is stored to calculate the performance measures.

Simple Risk Premia portfolio: Underlying assets: The universe consists of 15 assets across asset classes, from the categories of value, momentum, carry and liquidity equity
Backtest methodology: The simulated portfolio was constructed by determining a risk budget for the underlying assets and then applying a risk parity framework to determine portfolio weights. The risk budget was determined by identifying common risk premia from multiple assets, then bundling "similar" strategies into respective risk premia buckets. Risk budgeting was then applied at both the risk premia level as well as within each bucket, at the strategy level. The risk of each constituent asset was defined using historical data with more weight assigned to recent data (i.e. exponentially weighted with 1 year half life). To calculate the covariance matrix, we use an expanding data set with at least 5 years of data. Some shrinkage methods are also applied at this stage. The correlation matrix is a combination of 1) a standard correlation matrix and 2) a correlation matrix that averages correlations both within the asset classes and also across asset classes. The portfolio weights were derived by allocating equal risk to each asset class and to each asset within the asset class, and subsequently determining the portfolio weights to each asset that would provide for such a distribution of risk budget. After forming the portfolio, the next period's asset returns obtained from Bloomberg are multiplied by the respective portfolio weights to get the next period's portfolio return.

There may be material differences between the hypothetical back-tested performance results and actual results achieved by actual accounts. Back-tested model performance is hypothetical and does not represent the performance of actual accounts. Hypothetical performance has certain inherent limitations. Unlike actual investment performance, hypothetical results do not represent actual trading and accordingly the performance results may have under- or over-compensated for the impact, if any, that certain economic or other market factors, such as lack of liquidity or price fluctuations, might have had on the investment decision-making process or results if assets were actually being managed. Hypothetical performance may also not accurately reflect the impact, if any, of other material economic and market factors, or the impact of financial risk and the ability to withstand losses. Hypothetical performance results are also subject to the fact that they are generally designed with the benefit of hindsight. As a result, the back-tested models theoretically may be changed from time to time to obtain more favorable performance results. In addition, the results are based, in part, on hypothetical assumptions. Certain of the assumptions have been made for modeling purposes and may not have been realized in the actual management of accounts. No representation or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the hypothetical results have been stated or fully considered. Changes in the model assumptions may have a material impact on the hypothetical returns presented. There are frequently material differences between hypothetical performance results and actual results achieved by any investment strategy. Neuberger Berman does not manage accounts in this manner reflected in the models.

Neuberger Berman does not represent that the hypothetical performance would be similar to what its experience would have been had it actually been managing accounts in this manner. Since the hypothetical performance is fictional there can be no assurance that a client would have achieved similar rates of return over the same time period. There are frequently material differences between hypothetical performance results and actual results achieved by any investment strategy. The actual performance of actual strategies may vary significantly from the back-tested model portfolio results shown.

Unless otherwise indicated, results shown reflect reinvestment of any dividends and distributions. The hypothetical results are shown gross and/or net of a model highest annual fee of 0.80%, charged monthly, but do not reflect the deduction of transaction costs. If such expenses were reflected, returns shown would be lower. Advisory fees are described in Part 2 of Neuberger Berman LLC's Form ADV. A client's return will be reduced by the advisory fees and any other expenses it may incur in the management of its account. The deduction of fees has a compounding effect on performance results. For example, assume Neuberger Berman achieves a 10% annual return prior to the deduction of fees each year for a period of ten years. If a fee of 1% of assets under management were charged and deducted from the returns, the resulting compounded annual return would be reduced to 8.91%. Please note that there is no comparable reduction from the indices for the fees.

Indexes are unmanaged and are not available for direct investment. Unless otherwise indicated, returns shown reflect reinvestment of dividends and distributions. Investing entails risks, including possible loss of principal. **Past performance is no guarantee of future results.**

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