Teza

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The $1 Trillion Problem

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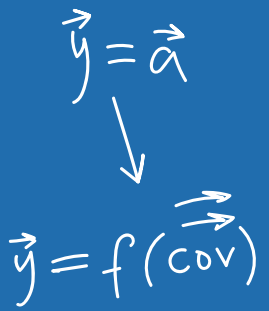
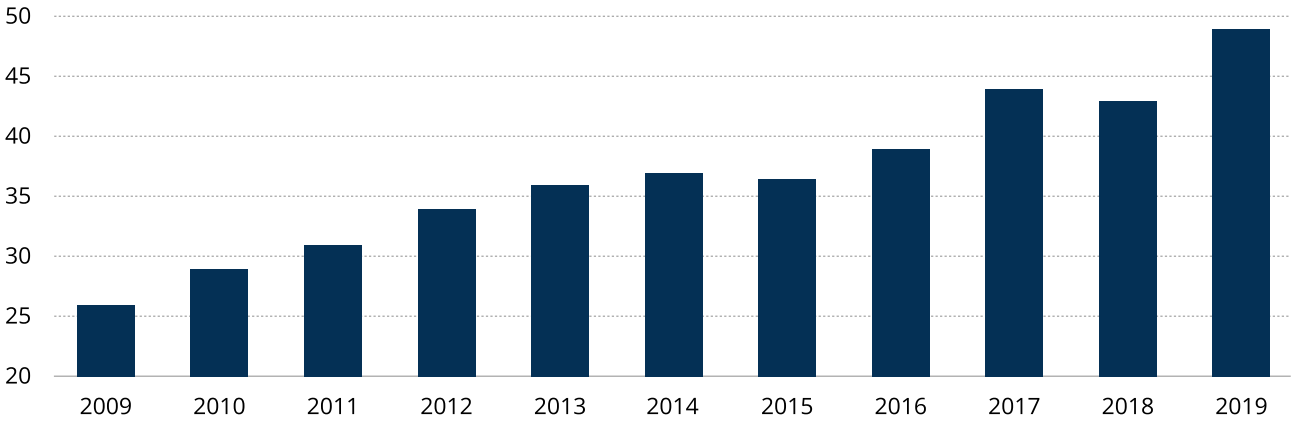


The Rise of the Mega-Allocator

Over the past decade the institutional investing world has borne witness to exponential growth in a class of investors dubbed "mega-allocators" — a grouping that includes sovereign wealth funds, public pensions, and the largest institutional asset managers.

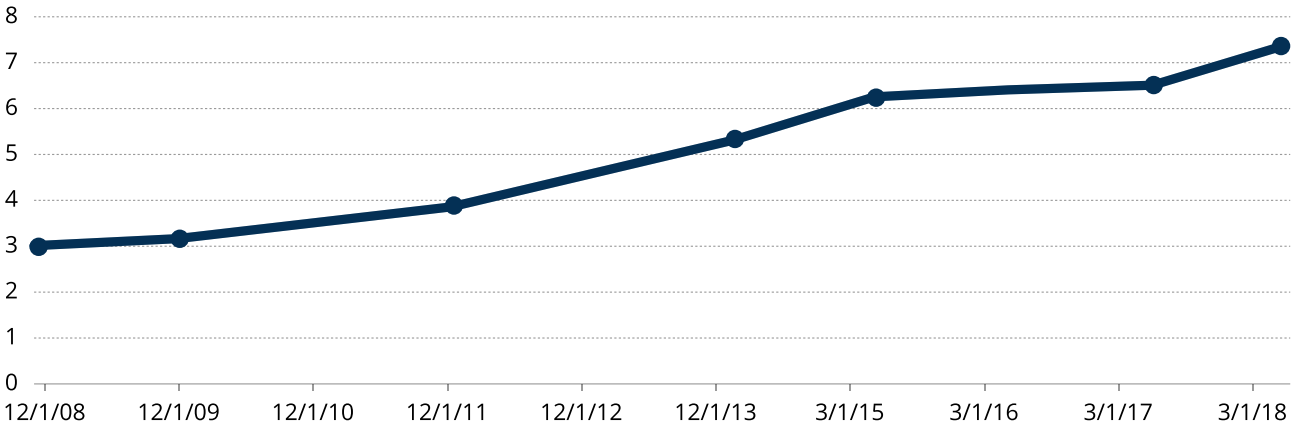
Loose monetary policies following the Global Financial Crisis and friendly markets helped fuel an upward trajectory in AUM, with global pension assets hitting the $50 trillion mark for the first time in 2019 (nearly doubling over the course of the preceding decade).[1] From 2008 through 2018, sovereign wealth funds grew from a $3 trillion segment with around 30 players to a group of 80 allocators with a combined AUM of around $8 trillion.[2]

Figure 1. Growth in pension assets - OECD jurisdictions 2009-2019 (in $Trillions)



Source: OECD Global Pension Statistics data.

Figure 2. Growth in global sovereign wealth fund assets 2000-2018 (in $Trillions)



Source: Preqin Special Report: Sovereign Wealth Funds, Aug 2018.

For all the benefits of scale, these mega-allocators encounter unique challenges in achieving above-benchmark returns.

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[1] "Markets in Focus No. 17, 2020." OECD Global Pension Statistics.
[2] "The Rise of Sovereign Wealth Funds." Government of Singapore Investment Corporation. 26 Feb., 2020

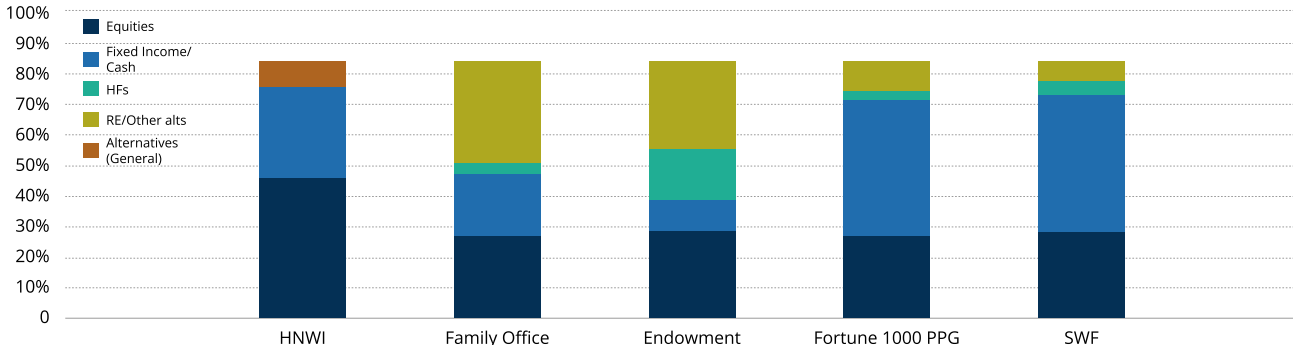
Alpha Scarcity — The One Trillion Dollar Problem

In the hunt for yield, mega-allocators rely heavily on alternative investments such as private equity, infrastructure, real estate, and hedge funds. A 2017 study published by the International Forum for Sovereign wealth funds found that these investors have poured $168 billion into alternatives since 2009, reaching a high in 2015 — a year in which a whopping $27 billion was allocated.[3] Similarly, the recent movement of global pensions into alternative assets is extensively covered by the financial media. A widely-circulated 2020 Willis Towers Watson report indicated that, in the 22 major pension markets (the P22), the average fund increased its allocation to alternatives by 15.2% over the 2019 calendar year.[4]

Since this trend is likely to continue, capacity constraints and alpha decay in the alternative space are increasingly a focus, especially for the largest allocators. The compelling returns that a skillful, yet capacity-constrained manager could generate on a $250 million investment are negligible in the context of a $500 billion portfolio. On the other hand, when managers begin to accept large sums of money (a tempting proposition from a management fee perspective), returns often decline. This phenomenon[5], long anecdotally observed, was corroborated by a 2008 study of over 8,000 funds by researchers at Pennsylvania State University and Rutgers Business School. Their research confirmed a negative relationship between fund size and the upper quantiles of alpha. To put the concern around capacity into simple terms: there is just not enough alpha in the world for mega-allocators.

The following data [Figure 3] bluntly illustrates this point. As an allocator's assets increase, the sophistication of their approach to portfolio construction and their access to investment resources follow suit. Larger investors can afford skilled sourcing and due diligence teams, armies of external consultants, and the selective deal access that comes with size. While these resources undoubtedly serve as an advantage, the evidence suggests that a typical mega-allocator is actually in the same boat as the average high net worth investor when it comes to allocation to alpha-oriented investments. Figure 3 shows that the percentage of alpha-focused strategies in the mega-allocator's portfolio is very similar to that of a smaller investor who cannot afford the same level of sophistication, access, etc.[6] In fact, the winners in this alpha-scarce landscape are mid-sized institutional investors of $5-20 billion who sit in the sweet spot between sophistication and capacity. Unfortunately for the mega-allocator, limited access to alpha-generating investment opportunities means it is back to square one of unconstrained investment choices: stocks and bonds, a.k.a. good old beta.

Figure 3. Asset class percent allocation by investor type



Source: Teza analysis of Preqin data (global scope, as of April 2021).

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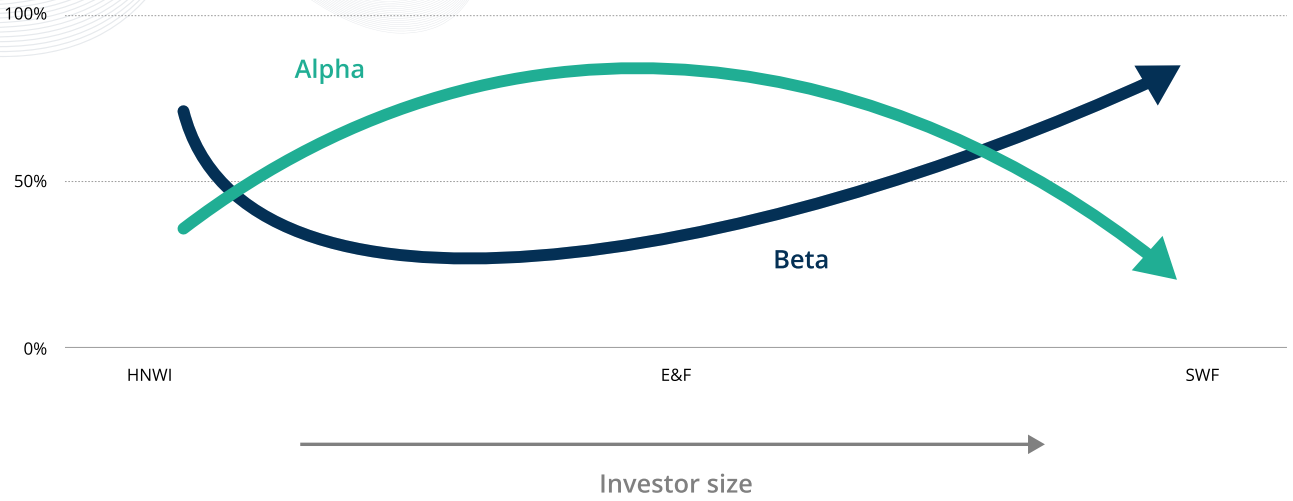
[3] Bortolotti, B., M. "Coming of Age: The Evolution of Global SWF Equity Investment." IFSWF Annual Review. 2017.
[4] "Global Pension Assets Study – 2020." Thinking Ahead Institute, Willis Towers Watson, 2020.
[5] Zhong, Z. "Why Does Hedge Fund Alpha Decrease Over Time? Evidence from Individual Hedge Funds." 2008.
[6] We have assumed that the Fixed Income/Cash and Equities categories in Figure 3 broadly represent "beta," though it is, of course, possible to have alpha-focused strategies within those categories.

Focus on Beta



Once a mega-allocator realizes that the "exciting" alpha portion of their portfolio carries a relatively small influence on overall returns, where are they to turn? The only choice remaining is the largest, most liquid portion of the portfolio — beta. In fact, at the mega-allocator's level of beta allocation, it is efficiency and dynamism within the constraints of the existing allocation that determines the quality and returns of the portfolio.

Simply put, if mega-allocators focused their time on optimizing (or, in the parlance of this article, "harvesting") existing beta, opportunities for meaningful, portfolio-level outperformance would outweigh relatively smaller allocations to alternatives like venture capital, private equity, or hedge funds. Beta is, in fact, the most flexible asset in the portfolio, but one that has been given relatively short shrift — and therein lies the opportunity.

Make Your Beta Work (Harder) for You

At first, most allocators built their beta approach as a 60/40 stock/bond split (in notional dollar terms). Effectively, the 60/40 split is an efficient frontier solution to portfolio construction that allows for unlevered stocks and bonds and assumes a static correlation between these asset classes.

This worked for a while, when bond yields were higher and equities less volatile. A State Street Global Advisors analysis of the 60/40 portfolio from 1981 through 2020 shows long-term median returns of 9.9% over the past few decades.[7]

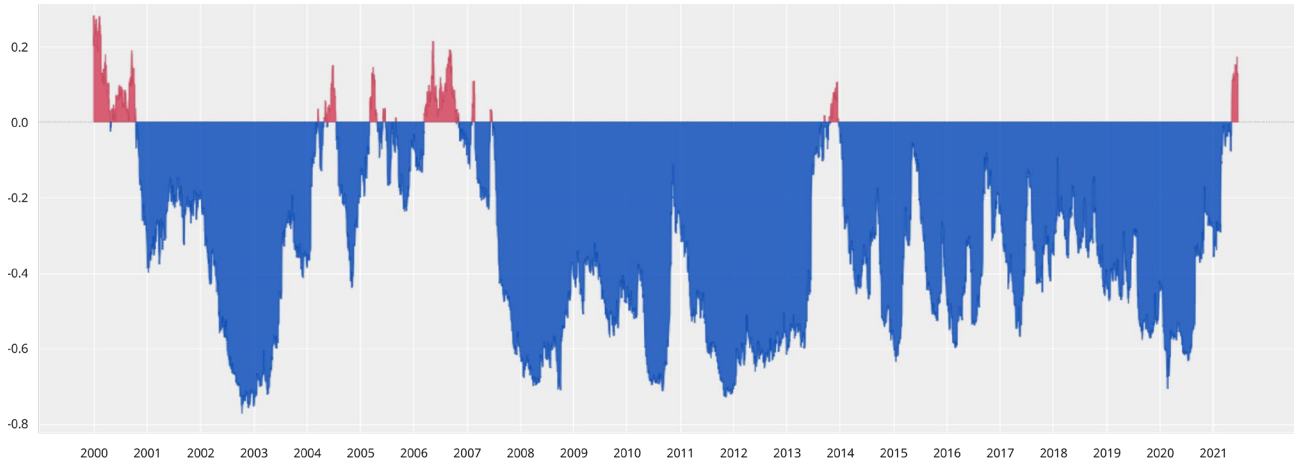
Many large 60/40 cash portfolios were replaced or augmented over time with variations of 60/40 products in the futures space. A typical cash 60/40 portfolio is dominated by the risk of the equity portion (as it is 50% overweight with respect to bonds and the equities risk levels are higher). To create more balanced portfolios and increase their returns through leveraging, many asset managers developed strategies, often dubbed "risk parity," to improve the traditional 60/40 allocation. These strategies allocate capital to equities and bonds on a risk-weighted basis, accounting for the volatility of each asset class. As a result, such portfolios significantly overweight bonds (the asset class that exhibits lower volatility) as compared to the traditional 60/40 portfolio allocated on the basis of notional exposure.

[7] "Portfolio Construction in and out of the Core for the Next Decade." State Street Global Advisors. 8 March 2021.

Risk parity over the last 20 years performed even better than the 60/40 portfolio. There were two main drivers of this outperformance:

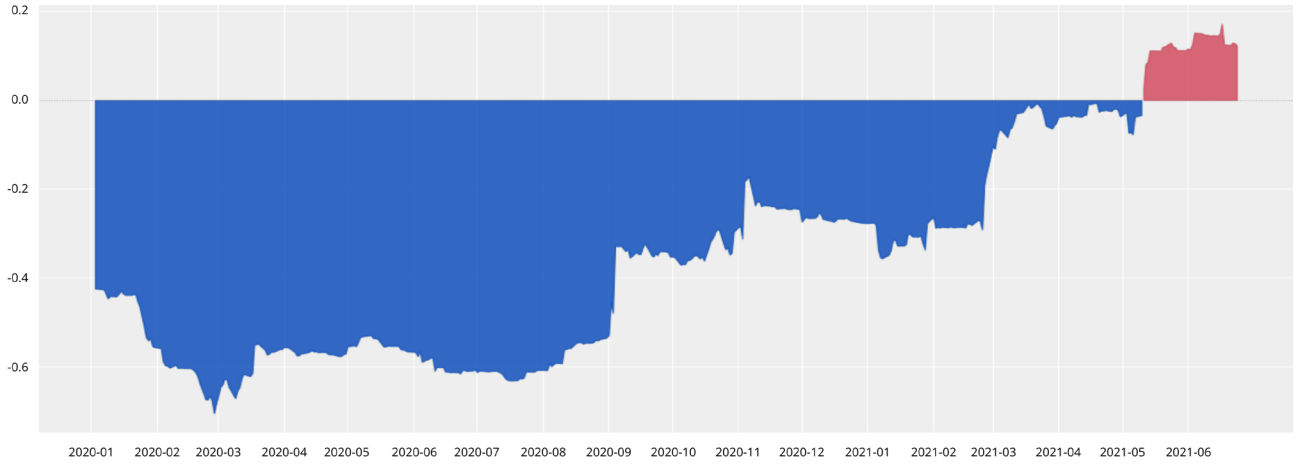
1. Bull markets for *both* stocks *and* bonds
2. A very healthy level of *anti*-correlation of returns of stocks and bonds throughout most of the last 20 years as shown in Figure 4.

Figure. 4. Correlation of returns of stocks and bonds. 2000-Present.
Correlation of daily returns of S&P500 e-mini futures contract and 10-year Treasury Note futures contract, smoothed with 40-day center of mass window.



Source: Teza analysis.

Figure 5. Correlation of returns of stocks and bonds. 2020-Present.
Correlation of daily returns of S&P500 e-mini futures contract and US Treasury Note futures contract, smoothed with 40-day center of mass window.



Source: Teza analysis.

This effect of *anti*-correlation of the returns of stocks and bonds was key for risk parity portfolio construction. It smoothed the overall portfolio return, allowing the holders of futures contracts in the risk parity space to lever up safely to achieve higher returns at the same amount of risk.

While the past 20 years were wonderful for risk parity investors, recent returns have not been nearly as strong. The situation has grown especially gloomy over the past year with historically low bond yields and significantly inflated stock prices. While equities markets have continued to surge higher, bond prices have suffered. In addition, the key benefit of bonds (being a somewhat effective hedge against shocks in stocks) seems to be disappearing lately, as correlations between stocks and bonds have switched from negative to positive [See Figure 5 above].

If bonds no longer present either a good investment on their own or as a stock market hedge, allocators are left with two reasonable options:

1. Significantly decrease the bond portion of the portfolio in lieu of equities and look for *Equity Tail Risk Protection* or *Equity Market Timing* (as a mitigator of risk in the absence of hedging bonds)

OR

2. Optimize the returns of these two liquid assets (stocks and bonds), to which allocators are already captive through *Risk-Managed Dynamic Beta*.

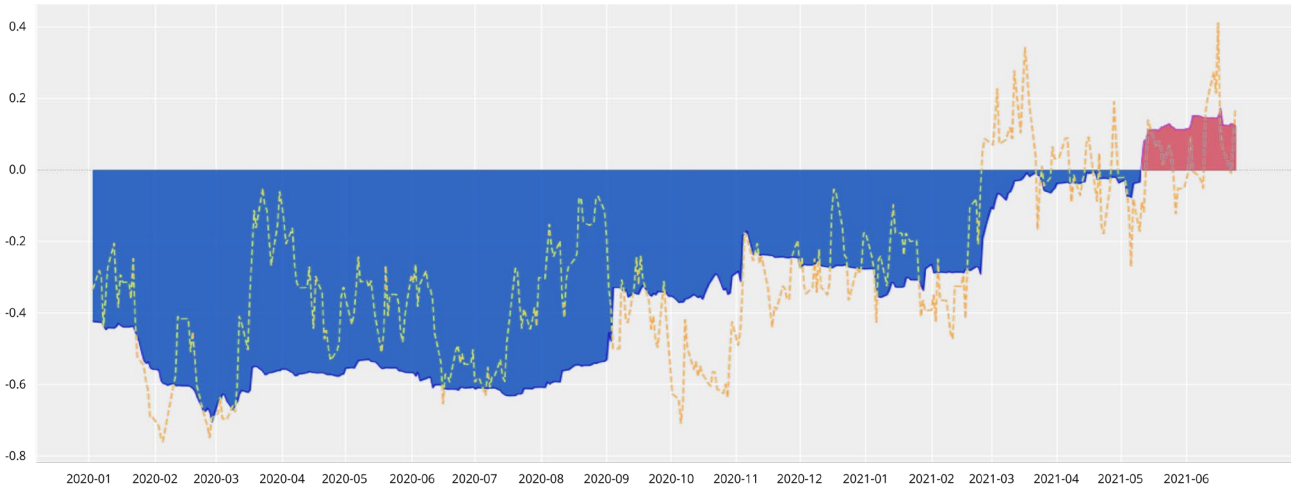
Recently, Equity Tail Risk Protection solutions have become very popular especially after the stock market crash at the beginning of COVID-19 pandemic. These strategies are typically based on a variety of alpha indicators that would trigger an alarm for an investor and call for local risk reduction in an equities portfolio.

However, for the rest of this white paper we will be focusing on a different type of solution that we believe may be more powerful but has not yet been implemented widely in the industry: **Risk-Managed Dynamic Beta.**

What is Risk-Managed Dynamic Beta?

Risk-Managed Dynamic Beta (RMDB) is a mean-variance (or any other variance decreasing) solution to the portfolio of stocks and bonds that employs a full covariance matrix, with the off-diagonal elements being calculated dynamically using intraday data. In simple terms, it is a tool that reacts (by adjusting the risk) to fast flips in correlation regimes of stocks and bonds. Figure 6 illustrates this point.

Figure 6. Fast and slow correlations of returns of stocks and bonds. 2020-Present.
Solid shape: correlation of daily returns of S&P500 e-mini futures contract and 10-year US Treasury Note futures contract, smoothed with 40-day half-life window; Dashed blue line: 2-day EMA of intraday correlation measurements.

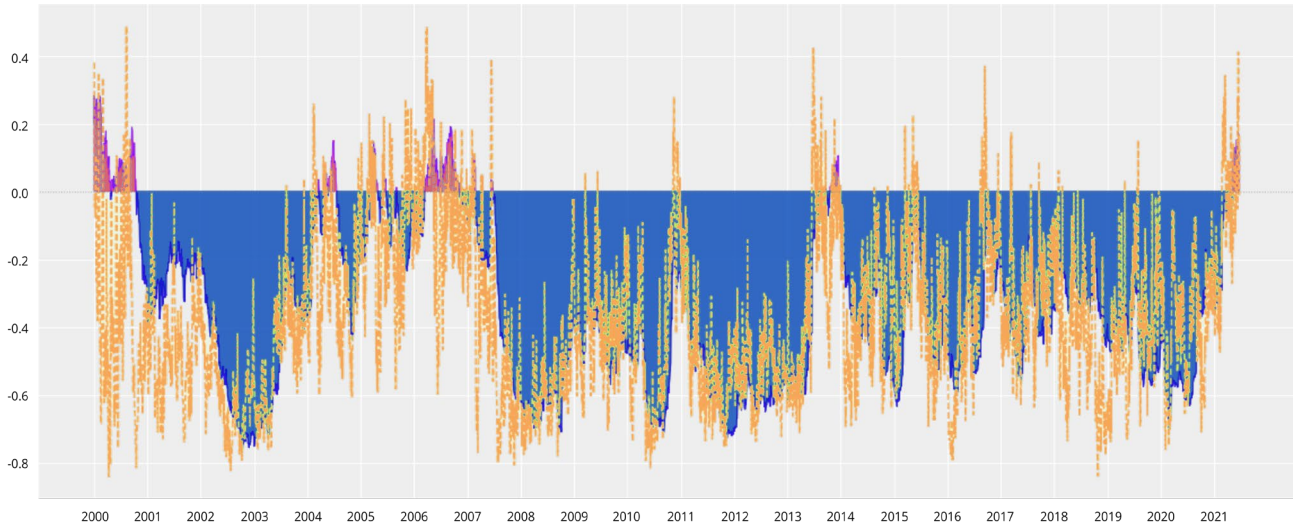


Source: Teza analysis.

As one can see, during the equity market crisis of March of 2020, the fast correlation measure was effectively zero while the slow (daily-based) correlation showed a healthy level of protection of stocks by bonds. In reality, bond movements for a period of time decoupled from stock market

movements and, while orthogonal, they were certainly not the "insurer/protector" that they were in February of 2020. Similarly, at the end of February 2021, while the slow measure of correlation showed a negative number, the fast measure flipped to positive. Meaning, bonds were actually exacerbating the risk of stocks in the portfolio as opposed to offsetting it.

Figure 7. Fast and slow correlations of returns of stocks and bonds. 2000-Present.
Solid shape: correlation of daily returns of S&P500 e-mini futures contract and 10-year US Treasury Note futures contract, smoothed with 40-day half-life window; Dashed blue line: 2-day EMA of intraday correlation measurements.



Source: Teza analysis.

There were many more instances like this over the entire 20-year period [see Figure 7 above] where the risk portion of the so-called risk parity portfolio was materially mispriced with respect to either the slow-moving view on the covariance matrix and — even more so — with respect to the static view on the covariance matrix.

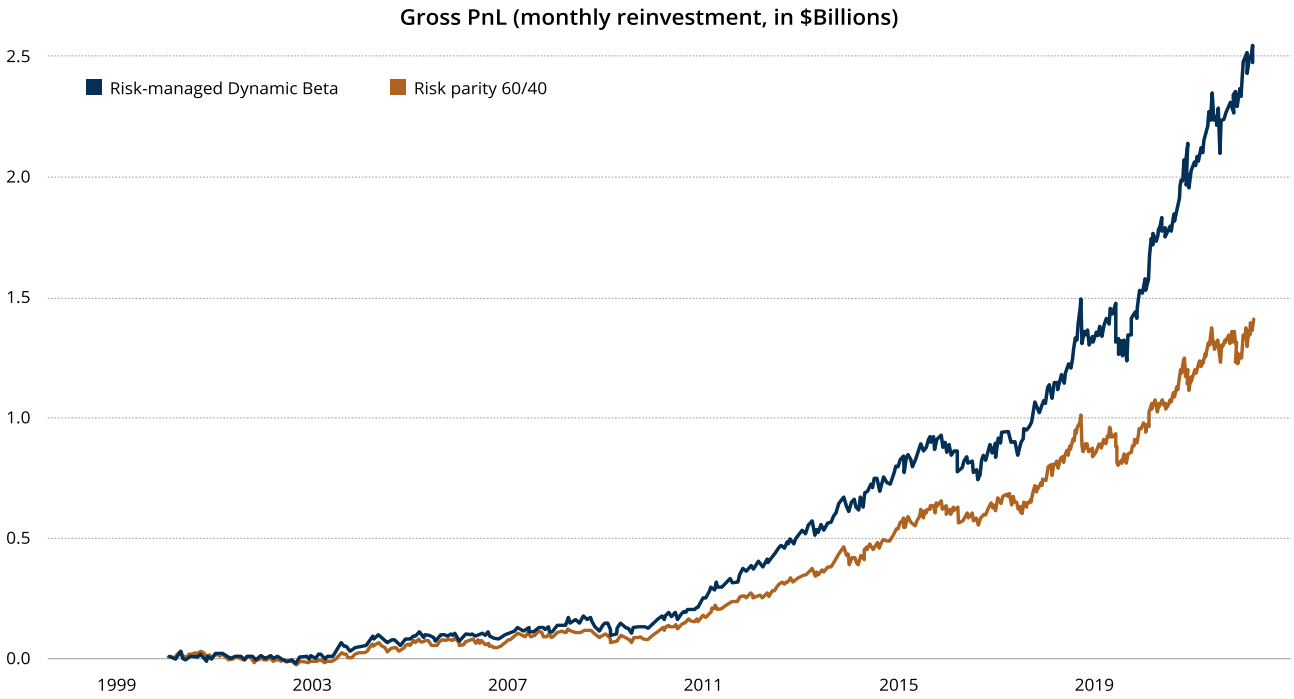
The primary factor differentiating RMDB from risk parity is that the latter is oblivious to these regime changes. In a mathematical sense, traditional risk parity reacts slowly (monthly) to changes in *only* diagonal elements of the stock-bond return covariance matrix (the individual variance of these asset classes). RMDB reacts daily to *all* changes in the covariance matrix and reacts to these changes fast.

At first glance, the speed and critical execution of an RMDB strategy may appear best suited to those pure alpha generators on the higher-frequency spectrum. However, the opportunity set for the mega-allocator is significant when paired with the right partner. It is, in the end, the nuances and intricacies of "beta" behavior that are the key to beta harvesting. Here are two simple, high-level examples:

1. Suppose the *local (fast metric)* value of stocks and bonds returns correlation is +30% (as opposed to the long-term average of -30%). This suggests it would be time to take the (increased) risk down by decreasing the notional positions in stocks and bonds futures. This action would simply bring the *locally* elevated risk down to normal levels, thus protecting the portfolio from large drawdowns.
2. Suppose at the opposite end, the local value of stocks and bonds correlation goes down to -80%, with bonds becoming an extremely effective (*locally!*) hedging tool for stocks. In this situation, it would be beneficial for an investor to increase the (*locally decreased*) risk back to normal by increasing the notional positions of stocks and bonds futures. This would mean that, for risk similar to normal levels, the investor would be exposed to the elevated levels of equity market beta and benefit from levered (while safe) market returns.

Here is the comparison [Figure 8] of returns of risk parity vs RMDB. The red line represents the value of $250 million invested into a 60/40 risk parity strategy, and the blue line represents investment in RMDB where, on average, stocks and bonds allocations are at 60/40 in volatility space while locally they (especially the bonds that are explicitly used as a hedge) are allowed to fluctuate commensurate with the full mean-variance solution of the *locally* measured covariance matrix.

Figure 8. Not all "betas" are born equal. Backtested returns of "standard" 60/40 risk parity and RMDB.



The risk parity 60/40 strategy is a backtest which involves allocating 60% risk to E-mini S&P 500 futures contracts and 40% risk to 10-Year T-Note futures contracts, rebalanced at a daily frequency and scaled to 10% volatility of AUM. The Risk-Managed Dynamic Beta strategy is a backtest which involves allocating, in the long run, close to 60%:40% risks to E-mini S&P 500 futures contracts and 10-Year T-Note futures contracts, respectively, rebalanced at a daily frequency and scaled to 10% volatility of AUM. On a day-to-day basis, the exact risk ratio can be very different from the long-term ratio (60%:40%), and typically depends on factors such as short-term stock-bond correlation, medium-term momentum of bonds, etc. For both strategies, AUM started out at $250MM in 2000/01, and is adjusted at the end of each month for reinvestment. Additional information on these backtests is available upon request. Note that the simulated backtests above are being shown solely as one example of how such sample portolios might have performed. These examples of "Standard" 60/40 and RMDB do not represent a product or service that is available for purchase by any investor. HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM. ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS. Please also see disclosures on p. 10.

Historically, since 1999, RMDB outperforms the static 60/40 volatility-based allocation. Both the daily adjustments to risk allocation based on realized volatility and — more importantly — the use of the current correlation regime (measured locally intraday) between stocks and bonds returns contribute to that outperformance. Investors also benefit from a decent bump in both Sharpe ratio and Calmar ratio.

	Calmar (Monthly)	Sharpe (Monthly)
Risk parity 60/40	0.49	0.90
Risk-managed Dynamic Beta	0.64	1.058

It is worth noting, there is no fitting in this backtest, and the only free parameter is time horizon in hours/days over which the averaging and smoothing of off-diagonal elements measurements is conducted. That lack of fitting ensures robustness of the solution.

Implementation

While a RMDB program is simple in principle, it can prove costly and challenging for allocators to implement internally — the operational knowledge and infrastructure requirements paired with a deep understanding of futures markets means finding the right partner is key. We believe a successful RMDB program should be implemented in futures contracts rather than cash, mainly because of the need for leverage of (primarily bond) risk exposure at times when either volatility is low or correlation between stocks and bonds is negative. In our view, futures can also provide very attractive capital efficiency. Only a small portion of capital (~10-15%) needs to be deployed to run a program, with another small portion available to cover drawdowns. The majority of the capital can be cross-utilized elsewhere. Trading costs can also be dramatically reduced with futures. Although the overall level of extra cost is well justified by the value of dynamic rebalancing, even 25-50bps annual improvement is significant for buy-and-hold investors.

As allocators evaluate external RMDB partners, we recommend a sharp focus on managers who have demonstrated excellence in futures trading and low-cost execution capabilities.

Conclusion

Despite the extensive resources and brainpower available to mega-allocators, the challenges of alpha capture will continue to increase as a function of their success in growing assets over the past decade. Size and scale bottlenecks will constrain excess return, and as correlation regimes shift, managing beta the traditional way looks increasingly risky. Rather than dedicating even more resources to the hunt for shrinking alpha opportunities, mega-allocators need to more closely examine optimizing the beta components of their portfolio in order to generate sufficient returns.

Works Cited

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