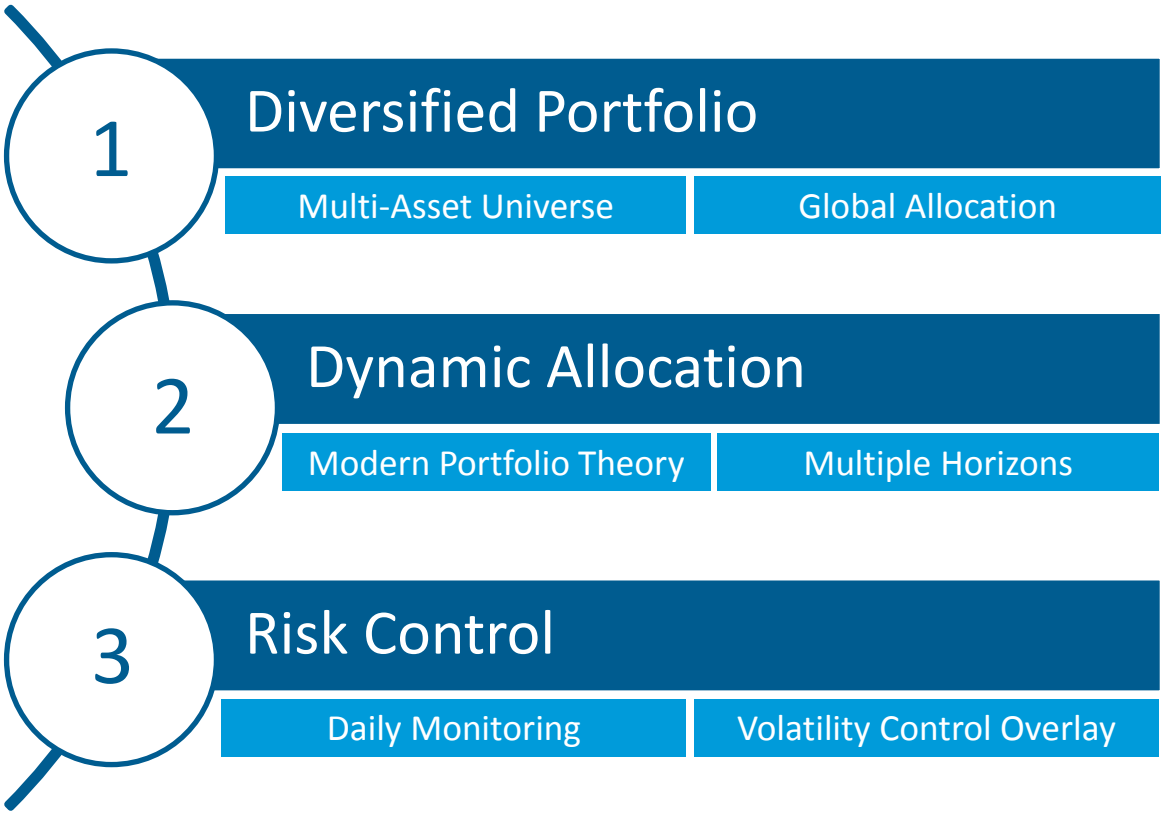
Morgan Stanley

Morgan Stanley Dynamic Contribution Index

Accessing Global Exposure in a Diversified and Risk-Controlled Way

The Morgan Stanley Dynamic Contribution Index ("MSDC Index", or the "Index") attempts to invest dynamically using modern portfolio theory concepts in order to create a diversified, global portfolio that seeks to maximize potential returns for a given level of desired risk.



Diversified Portfolio - The Index seeks to gain broad exposure to a diversified universe of asset classes representing global equities, government bonds and major commodities.

Dynamic Allocation - The Index uses modern portfolio theory principles to target the highest possible return for a given level of risk, rebalancing daily to account for changes in market conditions over both short-term and long-term horizons.

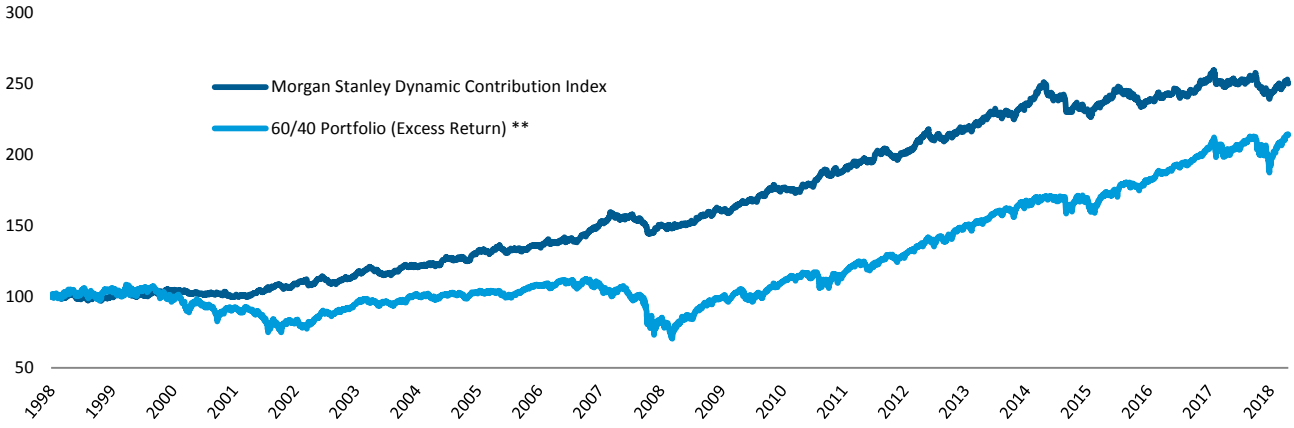
Risk Control - The Index attempts to reduce risk and smooth returns through daily monitoring and rebalancing, targeting an overall 5% volatility level.

This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy. This material was not prepared by the Morgan Stanley Research Department. Please refer to important information and qualifications at the end of this material. The information contained herein does not constitute advice. Morgan Stanley is not acting as your advisor (municipal, financial or otherwise) and is not acting in a fiduciary capacity.

Morgan Stanley Dynamic Contribution Index Performance*

The Morgan Stanley Dynamic Contribution Index seeks to provide steady, positive growth through a variety of market environments by using strategic allocation between broadly diversified equities, government bonds and major commodities.

Index Performance



**The 60/40 Portfolio is defined as the portfolio consisting of 60% S&P 500 (Excess Return) and 40% Barclays US Aggregate Bond Index (Excess Return).
Source: Morgan Stanley.

MSDC Index	Return	Annualized Volatility	Sharpe	Maximum Drawdown
1999	1.14%	4.74%	0.24	4.75%
2000	2.85%	5.04%	0.57	3.93%
2001	-3.91%	5.06%	-0.77	4.71%
2002	9.32%	4.48%	2.08	4.94%
2003	5.88%	4.96%	1.18	4.90%
2004	4.86%	4.82%	1.01	5.04%
2005	8.63%	4.69%	1.84	2.58%
2006	3.32%	4.63%	0.72	4.03%
2007	11.04%	4.93%	2.24	2.49%
2008	-0.19%	5.25%	-0.04	9.54%
2009	5.95%	4.48%	1.33	5.74%
2010	10.70%	4.24%	2.52	2.72%
2011	6.97%	4.25%	1.64	2.39%
2012	6.79%	4.46%	1.52	4.03%
2013	8.22%	4.66%	1.76	3.99%
2014	7.68%	4.58%	1.68	3.25%
2015	-1.85%	5.10%	-0.36	8.41%
2016	2.77%	4.87%	0.57	7.92%
2017	6.29%	3.70%	1.70	4.24%
2018	-4.48%	5.33%	-0.84	7.81%
10 Year Trailing *	4.80%	4.59%	1.05	9.82%
3 Year Trailing *	1.43%	4.69%	0.30	7.92%
1 Year Trailing *	-4.46%	5.33%	-0.84	7.81%

* From December 31, 1998 to December 31, 2018. Trailing data as of December 31, 2018.
The Index came into existence on April 19, 2019. All data prior to that are simulated.
All returns are annualized returns.

Index Performance* (Simulated and Actual)

Back-testing and other statistical analyses provided herein use simulated analysis and hypothetical circumstances to estimate how the Index may have performed between December 31, 1998 and April 19, 2019, prior to its actual existence. The results obtained from such "back-testing" should not be considered indicative of the actual results that might be obtained from an investment in the Index. The actual performance of the Index may vary significantly from the results obtained from back-testing.

Unlike an actual performance record, simulated results are achieved by means of the retroactive application of a back-tested model itself designed with the benefit of hindsight and knowledge of factors that may have possibly affected its performance. Morgan Stanley provides no assurance or guarantee that any product linked to the Index will operate or would have operated in the past in a manner consistent with these materials. Calculation based on simulated performance is purely hypothetical and may not be an accurate or meaningful comparison. Past performance (actual or simulated) is not necessarily indicative of future results.

This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy. This material was not prepared by the Morgan Stanley Research Department. Please refer to important information and qualifications at the end of this material. The information contained herein does not constitute advice. Morgan Stanley is not acting as your advisor (municipal, financial or otherwise) and is not acting in a fiduciary capacity.

1 – Diversified Portfolio: Global Multi-Asset Universe

The Index seeks to provide a diversified exposure across multiple asset classes representing global equities, government bonds and major commodities. A second source of diversification is the generally varied nature of returns across major developed markets: the U.S., Germany and Japan.

Diversification through a Global Multi-Asset Portfolio

Multi-Step Allocation of Index Components

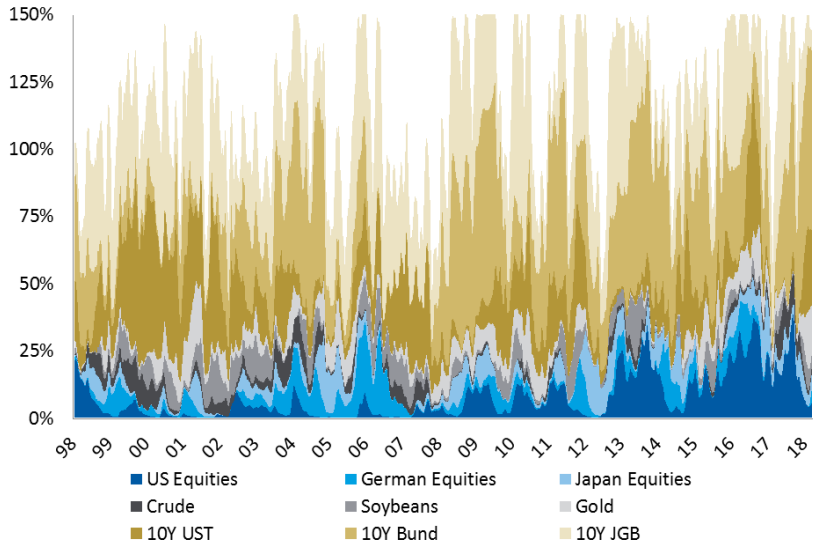
- The Index seeks to gain exposure to an optimal allocation of **9 diverse assets** across global equities, government bonds and major commodities.
- On a daily basis, the Index **computes recent returns and realized volatilities** for each asset over two time horizons: short-term and long-term.
- All combinations are then screened to **identify the highest return portfolio for 5% target volatility**, subject to allocation constraints.

ASSET CLASS	INDEX COMPONENT	MAX ALLOCATION
EQUITIES		**50%**
	US Equities	30%
	German Equities	30%
	Japan Equities	30%
FIXED INCOME		**80%**
	10-Year US Treasury Note	50%
	10-Year German Bund	50%
	10-Year Japanese Bond	50%
COMMODITIES		**30%**
	Crude Oil	20%
	Soybeans	20%
	Gold	20%

How Diversified has the Index been Historically?

The below chart shows the average exposure the Index would have taken to the different asset classes over different years historically. The shifts in allocations over time demonstrate how the Index would have reacted to different market environments, and reallocated accordingly, for example:

- During the market rally of 2003 – 2007, the Index would have had over 105% average exposure to equities, bonds and commodities.
- However, in the 2008 – 2009 credit crisis, the Index would have had an average allocation of 77% to bonds and only 10% to equities.
- In the post-crisis recovery period from 2010 to present, the Index would have increased its exposure to equities, bonds and commodities once more.



Source: Morgan Stanley.
Data represent trailing 1-month average allocations through December 31, 2018.. The Index came into existence on April 19, 2019. All data prior are simulated.

This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy. This material was not prepared by the Morgan Stanley Research Department. Please refer to important information and qualifications at the end of this material. The information contained herein does not constitute advice. Morgan Stanley is not acting as your advisor (municipal, financial or otherwise) and is not acting in a fiduciary capacity.

2 – Dynamic Allocation: Modern Portfolio Theory

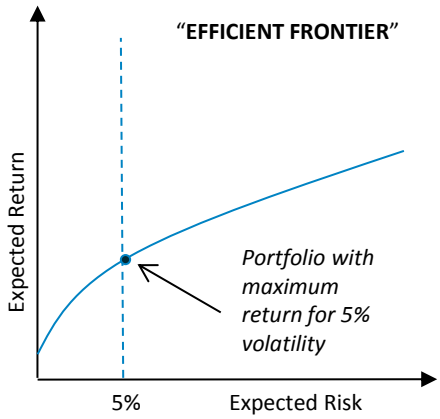
"Efficient Frontier" Philosophy: Generating Maximum Returns for a Given Risk Level

Deriving from modern portfolio theory and the efficient frontier philosophy, the Index uses a Mean-Variance Optimization ("MVO") algorithm, among the most widely used tools for asset allocation.

On a daily basis, historical returns and volatilities are used to determine the Index Component weights in a manner that seeks to maximize historical risk-adjusted returns of the asset portfolio, given a 5% target risk level and other allocation constraints. By design, implementing an asset allocation process incorporating the MVO algorithm increases weights to historically better performing assets and decreases weights to historically poor performing assets.

Reference Market Data

- Historical returns
- Historical volatility
- Historical correlation



Portfolio Weights

- Equities A%
- Fixed Income B%
- Commodities C%
- Cash D%

MSDC Index Methodology

- Asset Universe
- Investment Constraints
  - max/min weights for each component
  - max/min weights for each market sector
- Re-allocation frequency: daily MVO rebalancings for 5% target risk and daily volatility target of 5%

On each business day, the Methodology determines the optimal weightings of each component in the Portfolio by analyzing historical returns and volatility for each Index Component and the historical correlation between each pair of components. In particular, the Methodology seeks to determine the Portfolio that had the maximum historical return with 5% annualized volatility. The exposure of the Index to each market sector and the weighting of each Index Component are subject to specific limits.

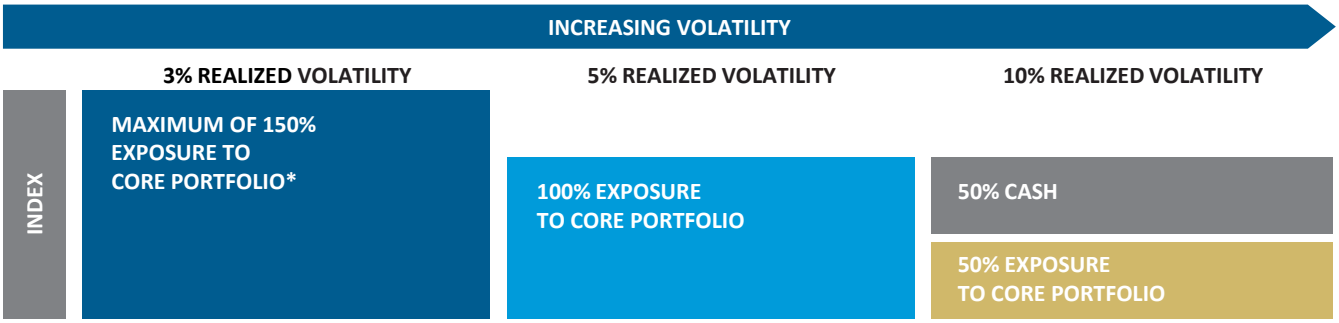
This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy. This material was not prepared by the Morgan Stanley Research Department. Please refer to important information and qualifications at the end of this material. The information contained herein does not constitute advice. Morgan Stanley is not acting as your advisor (municipal, financial or otherwise) and is not acting in a fiduciary capacity.

3 – Risk Control: How Does the Volatility Control Work?

The Index aims to maximize returns across the dynamic portfolio of asset classes for a defined level of risk. On a daily basis, the Index methodology monitors the volatility of this portfolio and adjusts the exposure so that the targeted annualized volatility of the Index remains around 5%.

This means that in higher volatility environments, the Index will take less exposure to the Core Portfolio of Equities, Bonds and Commodities, and more exposure to cash. As volatility falls, the Index will take more exposure to the Core Portfolio (up to the maximum limit of 1.5x the Index level) and reduce exposure to cash. The overall goal of this "volatility target" mechanism is for the returns of the Index to be smoother than they would be otherwise.

What is the Exposure to the Portfolio of Index Components in Different Market Conditions?



*Core Portfolio means global equities, government bonds and major commodities.
Source: Morgan Stanley, illustrative only.

Volatility Target Mechanism

The aim of the volatility target mechanism is to stabilize the realized volatility of the Index at approximately 5%, by adjusting the allocation between the Core Portfolio of equities, bonds and commodities, and cash.

The maximum exposure of the Index to the Core Portfolio of equities, bonds and commodities is 1.5x the Index level. The allocation to cash will be the difference between 100% and the actual exposure to the Core Portfolio.

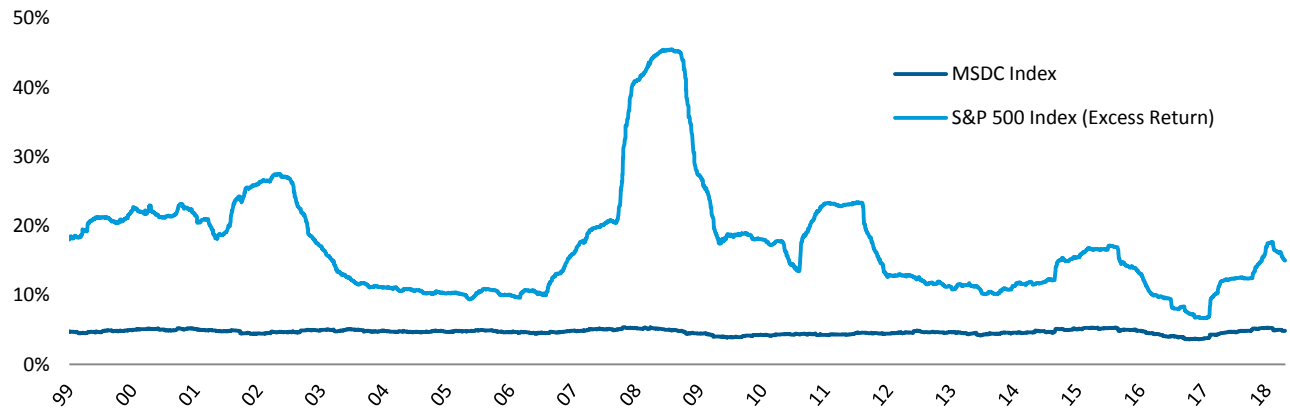
Historically, volatility tends to be higher when markets are falling. Volatility of a portfolio can be decreased by reducing the allocation to volatile assets and replacing it with exposure to cash.

What is Volatility?

Volatility is a measure for how much the price of an asset has changed over time. An asset with low volatility will typically have a stable price, whereas an asset with high volatility will have a price that can fluctuate quite frequently and sharply. Higher volatility is therefore typically associated with higher risk.

Historic volatility (also called "realized volatility") is calculated by looking at historical prices for an asset over a set period, and measuring how much these historical prices vary from the average historical price over that same period.

Dynamic Contribution Index 1-Year Realized Volatility vs. Portfolios without Volatility Target



This material is not a solicitation of any offer to buy or sell any security or other financial instrument or to participate in any trading strategy. This material was not prepared by the Morgan Stanley Research Department. Please refer to important information and qualifications at the end of this material. The information contained herein does not constitute advice. Morgan Stanley is not acting as your advisor (municipal, financial or otherwise) and is not acting in a fiduciary capacity.

Summary of the Index

The Morgan Stanley Dynamic Contribution Index (the "**Index**") has been developed by and is calculated, published and maintained by Morgan Stanley & Co. LLC. The Index was established on April 19, 2019, and employs a rules-based quantitative strategy (the "**Index Methodology**") that combines a risk-weighted approach to portfolio construction with a mean-variance optimization asset allocation methodology to construct a notional portfolio. In addition, the strategy imposes an overall volatility targeting feature upon the resulting portfolio. The goal of the Index is to maximize returns for a given level of risk based upon recent historical returns and realized volatilities of the underlying assets. The investment assumption underlying the allocation strategy is that historical performance and realized volatility are likely to continue to be good indicators of future performance and realized volatility of each asset in the portfolio.

The Components of the Index consist of (i) rolling futures of 9 asset classes representing global Equities and government Bonds and major Commodities, and (ii) cash. The Dynamic Contribution Index is subject to a maximum exposure cap of 150%. The targeted volatility for the Index is 5% ("Volatility Target"). The Index is subject to a 0.50% per annum servicing fee, incurred on a daily basis.

The Index is rebalanced each Strategy Business Day ("**Daily Rebalancing**"). Upon each Daily Rebalancing for the Index, the Index Methodology uses a Mean-Variance Optimization approach and computes recent historical return and realized volatility for each asset class over two look-back horizons: long-term and short-term. The Index screens all possible combinations and identifies an optimal portfolio for 5% target volatility level.

The magnitude of each position taken by the Index following the Mean-Variance Optimization is then scaled to the Volatility Target of 5% based on a prorata volatility-scaling, subject to the 150% maximum, which seeks to achieve a balanced level of volatility in the Index's exposure to each of the asset classes.

Risk Factors

The following is a non-exhaustive list of key risk factors related to the Index. If you are considering purchasing or investing in a product linked to the performance of the Index, you should read and be aware of the risks inherent to this Index. You should also consult with your investment, legal, tax, accounting and other advisors prior to investing or purchasing such products.

- The Index level may decrease due to a number of factors including trends in the markets for the underlying components.
- The Index's volatility scaling mechanism may dampen the performance of the Index and a different volatility estimation methodology may provide better risk management.
- It is possible that the Index may be composed of a very small number of index components at any time.
- Products linked to the Index involve risks associated with global equities markets, currency exchange rates, interest rates, commodities and precious metals.
- The Index has a limited performance history and past performance is no indication of future performance.
- The Index level is adjusted for costs associated with trading the underlying futures contracts, which will reduce returns on the Index.
- Purchasers of products linked to the index will have no access to the assets underlying the Index.

Disclaimer

Any product that is linked to the performance of the Index is not sponsored, endorsed, sold or promoted by Morgan Stanley & Co. LLC, or any of its affiliates (collectively, "Morgan Stanley"). Neither Morgan Stanley nor any other party (including without limitation any calculation agents or data providers) makes any representation or warranty, express or implied, regarding the advisability of purchasing this product. In no event shall Morgan Stanley have any liability for any special, punitive, indirect or consequential damages including lost profits, even if notified of the possibility of such damages. The Index is the exclusive property of Morgan Stanley. Morgan Stanley and the Index are service marks of Morgan Stanley and have been licensed for use for certain purposes. Neither Morgan Stanley nor any other party has or will have any obligation or liability to owners of this product in connection with the administration or marketing of this product, and neither Morgan Stanley nor any other party guarantees the accuracy and/or the completeness of the Index or any data included therein. No purchaser, seller or holder of this product, or any other person or entity, should use or refer to any Morgan Stanley trade name, trademark or service mark to sponsor, endorse, market or promote this product, without first contacting Morgan Stanley to determine whether Morgan Stanley's permission is required. Under no circumstances may any person or entity claim any affiliation with Morgan Stanley without the prior written permission of Morgan Stanley. In calculating the performance of the Index, Morgan Stanley deducts, on a daily basis, a servicing cost of 0.50% per annum. This reduces the positive change or increase the negative change in the Index level and thus decreases the return of any product linked to the Index. The volatility control calculation applied by Morgan Stanley as part of the Index's methodology may decrease the Index's performance and thus the return of any product linked to the Index. In addition, because the volatility control calculation is expected to reduce the overall volatility of the Index, it will also reduce the cost of hedging certain products linked to the Index.