Indexing Liquid Alternatives

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INTRODUCTION

Alternative investment strategies, including absolute return long-short, risk parity, global macro, or relative value, have historically been used only by the most sophisticated market participants, such as institutional investors and hedge funds. Market participants often seek alternative investments to improve diversification in portfolios, since these strategies tend to exhibit low correlations to the more traditional financial market asset classes of equities and fixed income. Better diversification may lead to higher risk-adjusted returns and lower drawdowns in a portfolio relative to one that only holds stocks and bonds.

However, a drawback of some alternative investments is that they can be relatively illiquid and only appropriate for long-term investment horizons without short-term liquidity needs. Conversely, investing in alternative strategies through liquid instruments, such as exchange-traded futures contracts, can reduce the illiquidity risk, making them a good fit for a broader range of market participants. These strategies, commonly referred to as liquid alternatives, give market participants better access to alternative investments. Additionally, liquid alternatives in an index format provide a systematic rules-based methodology, transparency in pricing, and typically lower cost structure.

There is a wide range of liquid alternative strategies with differing characteristics or key properties as the underlying rationale for construction. A liquid alternative strategy could vary from directional to market neutral to trend following. Directional strategies are typically long-only with low-to-moderate correlation to broad equities, seeking higher risk-adjusted returns relative to the market over the long term. Market-neutral strategies seek to provide purer exposure to certain risk premia in the marketplace by stripping out the market beta. These are typically long-short and target a zero beta, and thus tend to exhibit a low correlation to broad equities. A trend-following strategy seeks to capture price trends by going long or short different assets based on recent price movements, and its correlation to broad equities varies from positive to negative over time. To have a large opportunity set and proper diversification, a trend-following strategy often incorporates multiple asset classes, such as equities, fixed income, currency, and commodities.

A liquid alternative strategy could vary from directional to market neutral to trend following.

Key Benefits of Liquid Alternatives

1. **Diversification**: Liquid alternatives typically demonstrate low or even negative correlations to traditional asset class strategies. Incorporating liquid alternatives into a broader portfolio can increase diversification.
2. **Drawdown protection**: Because of improved diversification and low correlations to the broad market, liquid alternatives typically exhibit lower drawdowns in times of stress.
3. **Improved risk-adjusted returns**: Liquid alternatives can provide attractive risk-adjusted returns, either in isolation or when added to a broader portfolio.
4. **Liquidity**: Exchange-traded derivatives such as futures contracts are often highly liquid instruments.
5. **Transparency**: These strategies tend to be systematic and transparent in rules and construction, especially when implemented using indices.

Liquid alternatives can provide diversification, drawdown protection, improved risk-adjusted returns, liquidity, and transparency to a portfolio.

Types of Liquid Alternatives

We group the most common types of liquid alternatives into three categories: risk parity, alternative risk premia, and managed futures.

Risk parity is broadly defined as an asset allocation strategy that attempts to balance risk contributions across complementary asset classes. These asset classes often include, but are not limited to, equities, fixed income, and commodities. The rationale for risk parity is that balancing the risk contribution, rather than weights, leads to a more diversified portfolio. Because equities and commodities are generally much more volatile than fixed income, in an equally weighted portfolio almost the entire portfolio volatility would come from equities and commodities. But a balanced risk approach can generally lead to higher risk-adjusted returns over time.

We group the most common types of liquid alternatives into three categories: risk parity, alternative risk premia, and managed futures.

Alternative risk premia (ARP) are systematic investment strategies that attempt to isolate and harvest a source of risk. ARP strategies seek compensation for taking on these identified risks that differ from traditional broad market beta. To get the purest risk exposure as possible, ARP strategies are typically long-short—long the desired characteristic(s) and short the least desired characteristic(s)—which substantially reduces, and often removes, market beta. This construction leads to ARP strategies demonstrating low or even negative correlations to traditional asset classes, and their use in a broader portfolio can enhance diversification and thereby also potentially reduce drawdowns.

Our paper reviews common liquid alternative strategies such as risk parity, alternative risk premia, and managed futures through a passive lens.

Managed futures typically utilize futures contracts to systematically capture persistent price trends across asset classes. This trend-following approach simply follows the price movement of an asset; if an individual asset shows a clear price uptrend (downtrend), then a trend-following strategy will typically hold a long (short) position in that asset. Many of these strategies look across equities, fixed income, currency, and commodities markets to identify patterns. These strategies are often seen as strong diversifiers from traditional asset classes due to low correlations.

Why Index Liquid Alternatives?

Indexing liquid alternatives can offer multiple benefits to the marketplace. First, there has been a lack of proper benchmarks in this space, with some existing benchmarks being a composite average of funds in a respective category. However, this type of benchmark fails to meet certain properties seen as desirable of a benchmark as outlined in the CFA Institute curriculum by Bailey and Tierney (1998),[1] most notably not knowing the makeup of fund allocation in advance and the benchmark not being investable. Driven by investors' need for transparent performance evaluation, innovation in the indexing world has created rules-based systematic strategies to serve that purpose. Additionally, the rules-based method using liquid futures contracts allows passive replication of an index, making it investable.

For each strategy, we specify definition, strategy construction, and key risk/return characteristics.

Our paper reviews common liquid alternative strategies such as risk parity, alternative risk premia, and managed futures through a passive lens. For each strategy, we specify definition, strategy construction, and key risk/return characteristics. While we intend to provide our readers with a broad overview of the liquid alternative space, it is beyond the scope of the paper to explore portfolio implementation.

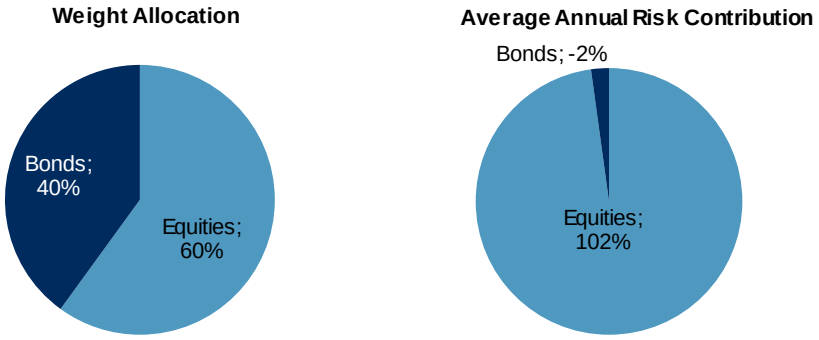
[1] Bailey, J., and D. Tierney. "Controlling Misfit Risk in Multiple-Manager Investment Programs." Research Foundation of the Institute of Chartered Financial Analysts, 1998. The authors' guidelines mention that a benchmark should be unambiguous, investable, measurable, appropriate, reflective of current investment opinions, specified in advance, and accountable.

RISK PARITY

Looking at a traditional 60/40 equity/bond portfolio, we see equities often dominate total portfolio risk.

To understand the risk parity methodology, we first look at traditional asset allocation: the 60/40 equity/bond portfolio. While the weight assigned to each asset class is relatively balanced, this approach leads to equities often dominating total portfolio risk (see Exhibit 1).[2]

Exhibit 1: 60/40 Equity/Bond Portfolio Weight Allocation versus Risk Contribution



The 60/40 equity/bond portfolio is a hypothetical portfolio. Equities is represented by the S&P 500®; bonds is represented by the S&P U.S. Treasury Bond Index from Dec. 31, 1999, to April 30, 2002, and after that, represented by the S&P U.S. Aggregate Bond Index.
Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1999, to Dec. 31, 2019. Past performance is no guarantee of future results. Charts are provided for illustrative purposes and reflect hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

A diversified portfolio consisting of relatively uncorrelated assets may reduce risk without forgoing return.

Risk parity tends to deliver improved risk-adjusted returns because it is sufficiently similar to the traditional portfolio…

Asset class returns are generally proportional to the risk taken over the long term (according to the Capital Market Pricing Model), while volatility is not the same across assets. A diversified portfolio consisting of relatively uncorrelated assets may reduce risk without forgoing return. Risk parity takes these factors into account and aims to balance risk contribution from a mix of assets.

…with a more balanced risk contribution across asset classes.

The theoretical explanation of why a risk parity portfolio should deliver improved risk-adjusted returns is that it is sufficiently similar to the optimal portfolio.[3] This seems reasonable, given that risk parity attempts to balance the risk contribution across asset classes and hence maximize the diversification benefits. However, it should be noted that risk parity makes simplifying assumptions and does not explicitly seek to maximize expected return for a given level of risk.

[2] The contribution to portfolio risk for each asset class was determined at the end of each year based on that year's daily returns. Computationally, the marginal contribution of asset i to the portfolio risk is: $MC_i = w_i * \sigma_p * \beta_i$ Where β_i is defined by: $\beta_i = \frac{Cov(\sigma_i, \sigma_p)}{\sigma_p^2}$.

[3] Asness, C., A. Frazzini, and L. Pedersen. "Leverage Aversion and Risk Parity." *Financial Analysts Journal*. Vol. 68, No. 1, 2012. CFA Institute.

The risk parity technique typically employs a form of risk targeting to provide a more stable risk profile.

A natural consequence of the risk parity technique is that lower-risk asset classes tend to receive a higher weight relative to higher-risk asset classes. As a result, risk parity portfolios use leverage to increase the expected return—which may otherwise be lower than that of a traditional portfolio. In fact, these portfolios typically employ a form of risk targeting to provide a more stable risk profile. The leverage is periodically adjusted to meet a volatility percentage target, such as 8%, 10%, 12%, or 15%. To efficiently lever up the portfolio, liquid instruments such as futures contracts are often used.

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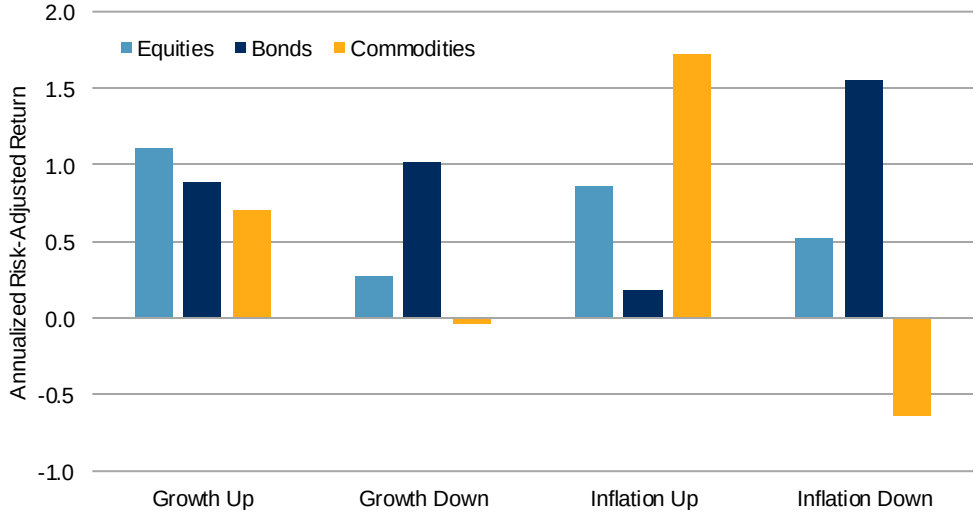
STABLE RETURNS ACROSS DEFINED ECONOMIC REGIMES

The key benefit of risk parity strategies is diversification across asset classes that behave differently across economic environments, specifically in growth and inflation regimes.

This often leads to the selection of three core asset classes: equities, nominal bonds, and commodities (or other inflation-hedging securities). Typically, equities do well in high growth, low inflation environments, bonds do well in deflationary or recessionary environments, and commodities tend to perform best during high inflationary environments (see Exhibit 2). Thus, within each environment, one or more asset classes has historically served to offset any underperformance.

The key benefit of risk parity strategies is diversification across asset classes that behave differently across economic environments.

Exhibit 2: Annualized Risk-Adjusted Performance across Four Economic Environments since 1970



Source: S&P Dow Jones Indices LLC, Kenneth R. French, FRED. Data from Dec. 31, 1969, to June 30, 2020. Performance based on monthly total return in USD. Equities is represented by the market portfolio in Fama/French 3 Research Factors. Bonds is represented by the 10-year U.S. Treasury bond, as represented by the 10-Year Treasury Constant Maturity Rate Bond. Commodities is represented by the S&P GSCI. The growth indicator uses the Chicago Fed National Activity Index (growth up if greater than 0; growth down if less than 0). The inflation indicator uses the US CPI Urban Consumers YoY NSA series (inflation up if higher than prior month; inflation down if lower than prior month). Chart is provided for illustrative purposes. Past performance is no guarantee of future results.

Risk parity strategies often select three core asset classes: equities, nominal bonds, and commodities.

Investing in Risk Parity

Many large institutional investors have adopted risk parity as part of a core-satellite approach, using risk parity with an appropriate leverage as the core. Some apply the risk parity approach based on underlying risk factors, as opposed to the asset classes. It is also common to see risk parity used within an alternatives bucket due to the use of leverage and derivative instruments. Risk parity strategies can be thought of as a directional alternative strategy, as opposed to a zero-beta, market-neutral, non-directional strategy.

Asset class, risk measurement, risk contribution, rebalance frequency, and leverage application must be considered when building a risk parity portfolio…

Some key considerations when building a risk parity portfolio include the following.

1. **Asset class:** Which asset classes to include and how many; defining the asset classes broadly or narrowly.
2. **Risk measurement:** Which risk metric to use; what time horizon to use for measuring risk.
3. **Risk contribution measurement:** Whether by marginal risk contribution or a more simplified approach in using individual asset class volatility.
4. **Rebalance frequency:** Daily, monthly, yearly, etc.
5. **Leverage:** How much leverage should be applied; how it should be structured.

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…as well as the key risks that can come with these strategies.

Some key risks associated with risk parity portfolios include the following.

1. Underperformance against an equity-centric portfolio when equities outperform other asset classes.
2. A sharp move up in interest rates could be highly detrimental to a leveraged portfolio of bonds.
3. Some asset classes included may have zero or negative risk premiums in the future.
4. Reliance on historical variance-covariance matrix; dislocation from the past can occur.
5. Leverage risk in periods of rising rates or when yield curve is persistently inverted.

Indexing Risk Parity

Despite the popularity of risk parity funds, such strategies have historically lacked an appropriate benchmark …

Despite the popularity of risk parity funds, such strategies have historically lacked an appropriate benchmark, and most investors have used a traditional 60/40 equity/bond portfolio to benchmark the returns of risk parity funds. The issue that can arise with this approach is that most of these benchmarks do not reflect either the construction or the risk/return expectations of such strategies. Exhibit 3 illustrates the various types of benchmarks for risk parity strategies; checks indicate whether each of the essential properties of a valid benchmark is satisfied.

Exhibit 3: Various Benchmarks for Risk Parity Funds

BENCHMARK TYPE	CLEAR	INVESTABLE	MEASURABLE	FIT	SIMPLE	NO SURVIVOR-SHIP BIAS	REFLECT INVESTMENT VIEWS
Absolute Benchmark	✓		✓		✓	✓	
Market Index*	✓	✓	✓		✓	✓	
Peer Group Benchmark			✓	✓	✓		✓
Position-Based Benchmark	✓	✓	✓	✓	✓	✓	
Factor-Based Benchmark	✓	✓	✓	✓		✓	✓

* For example, the 60/40 equity/bond portfolio.
Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

…and using traditional 60/40 portfolios does not reflect the construction or risk/return expectations of such strategies.

There is a growing realization that the efficacy of many active risk parity products could be captured passively in a low-cost and transparent manner. S&P DJI launched a series of risk parity indices in 2018 in order to provide position-based benchmarks and for replication purposes for investors seeking a passive alternative. The indices seek to reflect the construction and risk/return characteristics of funds offered in this space. The series consists of four indices differentiated by volatility targets: 8%, 10%, 12%, and 15%.

In 2018, four S&P Risk Parity Indices were launched, differentiated by target volatilities: 8%, 10%, 12%, and 15%.

The S&P Risk Parity Indices allocate across equity, fixed income, and commodities and are 100% futures-based, which means they are liquid and scalable. The weighting scheme seeks to equalize the volatility contribution of each asset class and uses a long risk measurement period (15 years). This serves to capture risk across at least one complete economic cycle and has the additional benefit of ensuring that allocations are fairly stable. The positions of each constituent are calculated and rebalanced on a monthly basis.

Key Statistics

The S&P Risk Parity Indices have historically had superior long-term risk-adjusted returns than the traditional 60/40 equity/bond portfolio.

The S&P Risk Parity Indices have historically had superior long-term risk-adjusted returns than the traditional 60/40 equity/bond portfolio. Since inception, the S&P Risk Parity Index – 8% Target Volatility (TV) and S&P Risk Parity Index – 10% TV had higher returns but lower maximum drawdowns compared with the traditional 60/40 equity/bond portfolio.

Exhibit 4: Historical Performance of the S&P Risk Parity Indices versus a 60/40 Equity/Bond Portfolio

CHARACTERISTIC	S&P RISK PARITY INDEX				60/40 EQUITY/ BOND PORTFOLIO
	8% TV	10% TV	12% TV	15% TV	
Launch Date	April 6, 2020	July 9, 2018	July 9, 2018	July 9, 2018	-
ANNUALIZED RETURNS (%) – PERIOD					
Since Inception	6.85	8.51	10.13	12.51	6.44
1-Year	9.10	11.05	12.82	15.15	14.83
3-Year	6.34	7.79	9.19	11.16	9.56
5-Year	7.26	9.02	10.75	13.28	10.23
10-Year	6.29	7.82	9.32	11.54	8.96
Annualized Volatility (%)	8.30	10.38	12.45	15.57	9.51
Sharpe Ratio	0.84	0.84	0.84	0.84	0.71
Maximum Drawdown (%)	-26.23	-31.92	-37.28	-44.75	-35.54
CUMULATIVE RETURNS (%) – SELECT PERIODS					
Global Financial Crisis (October 2007-February 2009)	-20.59	-25.39	-30.04	-36.72	-35.52
Oil Price Decline (June 2008-January 2009)	-21.05	-25.88	-30.53	-37.17	-23.37
Europe/Greece Debt Crisis (March-June 2010)	2.35	2.93	3.51	4.38	-6.99
Downgrade of U.S. Debt (August-November 2011)	-1.29	-1.66	-2.05	-2.67	0.68
Oil Price Decline (June 2014-Febuary 2016)	-4.94	-6.22	-7.52	-9.49	-0.52
China's Black Monday (May-September 2015)	-6.05	-7.53	-9.00	-11.17	-4.88
Inflation Fears (January-March 2018)	-1.82	-2.29	-2.75	-3.44	-3.82
Q4 2018 (October-December 2018)	-4.60	-5.74	-6.89	-8.61	-8.09
March 2020	-8.58	-10.77	-12.98	-16.33	-8.36

The 60/40 equity/bond portfolio is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from December 2003 to December 2020. Index performance based on monthly total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The S&P Risk Parity Indices with 8% and 10% target volatility had higher returns and lower maximum drawdowns that the traditional portfolio.

The S&P Risk Parity Index – 10% TV had long-term correlations of 0.70, 0.56, and 0.64 with equities, bonds, and commodities, respectively. Its long-term correlation with the 60/40 equity/bond portfolio was 0.70 (see Exhibit 5).

The S&P Risk Parity Index – 10% TV had long-term correlations of 0.70, 0.56, and 0.64 with equities, bonds, and commodities, respectively.

Exhibit 5: Correlation of Risk Parity with the 60/40 Equity/Bond Portfolio and Other Asset Classes

CORRELATION	RISK PARITY	60/40 EQUITY/BOND	EQUITIES	BONDS	COMMODITIES
RISK PARITY	**1**	-	-	-	-
60/40 EQUITY/BOND	0.72	1	-	-	-
EQUITIES	0.70	0.97	1	-	-
BONDS	0.56	0.44	0.34	1	-
COMMODITIES	0.64	0.49	0.55	0.21	1

The 60/40 equity/bond portfolio is a hypothetical portfolio. Risk parity is represented by the S&P Risk Parity Index – 10% TV. Equities is represented by the S&P Developed BMI. Bonds is represented by the S&P Global Developed Aggregate Ex-Collateralized Bond Index. Commodities is represented by the S&P GSCI.
Source: S&P Dow Jones Indices LLC. Data from December 2003 to December 2020. Index performance based on monthly total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Alternative risk premia (ARP) strategies are designed to isolate and harvest underlying sources of risk within a given asset class.

ALTERNATIVE RISK PREMIA

Alternative risk premia (ARP) strategies are designed to isolate and harvest underlying sources of risk within a given asset class. In return for assuming such risk, investors should theoretically receive compensation over a long-term investment horizon.

ARP strategies extend factor investing from long-only investments in traditional asset classes to include long-short investing and have been recognized in academic work dating back several decades. For example, Graham and Dodd introduced the concept of value investing in equities in 1934.[4] More recently, ARP strategies have been popularized by landmark research, such as by Fama-French (1992),[5] and been documented across several asset classes beyond equities.

In return for assuming such risk, investors should theoretically receive compensation over a long-term investment horizon.

Since ARP strategies are generally long-short, investors tend to categorize them as market neutral, but individual strategies can range from defensive to more procyclical. Investors are increasingly using ARP to access differentiated sources of return and to fine-tune portfolio exposures.

Exhibit 6 lists five well-researched and commonly utilized ARP styles that can be applied to different asset classes.

[4] Graham, B. and D. Dodd. *Security Analysis*. 1934.

[5] Fama, E. and K. French. "The Cross-Section of Expected Returns." *The Journal of Finance*, Vol. 47, No. 2, pp. 427-465, 1992.

Since ARP strategies are generally long-short, investors tend to categorize them as market neutral, but they can range from defensive to procyclical.

Exhibit 6: Example ARP Styles

STYLE CATEGORY	COMPENSATE FOR	IMPLEMENTATION
Carry	Higher risk associated with higher-yielding assets	Long high-yielding and short low-yielding assets
Curve	Greater uncertainty associated with longer maturities	Long assets with longer maturities and short assets with shorter maturities
Liquidity	Risk of liquidating an illiquid asset	Long illiquid assets and short liquid assets
Momentum	Risk of a sharp reversal	Long past winners and short past losers
Value	Uncertainty over timing of convergence	Long undervalued assets and short overvalued assets

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

Exhibit 7 indicates when an ARP strategy is implementable for each of five major asset classes and style combinations.

One popular implementation of an ARP strategy is called FX (foreign exchange) value. The established strategy here uses purchasing power parity (PPP) rates to determine the relative value of different currencies. This strategy goes long currencies that are most undervalued relative to their PPP rate and short currencies that are most overvalued relative to their PPP rate.

One popular implementation of an ARP strategy is FX value, which goes long undervalued currencies and short overvalued currencies.

Another established ARP strategy is called rates carry. A common approach assumes that sovereign bonds with steeper curves offer higher premia than less-steep curves and ranks them by their respective yield spreads (the 10-year yield minus the 3-month rate). This strategy goes long sovereign bond futures offering the highest-yield spreads and short sovereign bond futures offering the lowest-yield spreads. Academic literature on ARP has expanded greatly over the past couple of decades and strategies certainly go beyond those listed in Exhibit 7.

Exhibit 7: Example ARP Strategy Matrix

STYLE	COMMODITIES	EQUITIES	FOREIGN EXCHANGE	RATES	VOLATILITY (EQUITY)
Carry	✓	✓	✓	✓	✓
Curve	✓			✓	✓
Liquidity	✓	✓			
Momentum	✓	✓	✓	✓	
Value	✓	✓	✓	✓	✓

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

Rates carry is a common approach that goes long sovereign bond futures offering the highest-yield spreads and short those offering the lowest-yield spreads.

Constructing Risk Premia

Not all ARP implementations are created equal, and there is a risk of data mining. Therefore, it is important that strategies are supported by academic or practitioner research that can explain them in economic, behavioral, or structural terms. Furthermore, the premium must be observable over a long period of time and preferably in more than one geography with a rationale for its continuation in the future.

ARP strategies are typically constructed as long-short within a single asset class to remove market beta and to isolate pure risk exposure. The underlying holdings of ARP are typically liquid instruments, such as listed futures and options, and FX forwards, which allow for relatively low transaction costs and daily liquidity at the portfolio level.

Market participants can use ARP in a variety of ways to meet a range of investment objectives…

Investing in Risk Premia

Market participants can use ARP in a variety of ways to meet a range of investment objectives, including the following examples.

1. **Diversification/Completion**: ARP strategies can be used to help diversify a broader portfolio of traditional market betas, while also providing a means to efficiently adjust the overall portfolio risk.
2. **Overlays**: Generally constructed using unfunded instruments such as futures and options, ARP strategies provide an efficient means to apply a portfolio overlay to dynamically hedge or acquire certain risk exposures.
3. **Replacement**: With ARP's potential cost savings combined with greater liquidity and transparency, many investors have considered replacing a portion of their hedge fund allocation with a diversified ARP portfolio.
4. **Cash Equitization**: Managers employing a dedicated alternatives program are often subject to cash drag, as they manage redemptions and shift between investments. The unfunded nature of ARP means that they can be used to put excess cash to work.

…including to diversify or complete a portfolio and as an overlay, replacement, or cash equitization.

ARP Portfolios

While individual ARP strategies can offer positive risk-adjusted return over the long term, they are not immune to drawdowns and the underlying risk is expected to materialize from time to time. However, since correlations among ARP styles have historically been low, they offer significant diversification potential when combined.

While individual ARP strategies can offer positive risk-adjusted return over the long term, they are not immune to drawdowns and the underlying risk is expected to materialize from time to time.

It is common for investors to construct ARP portfolios with the goal of creating more robust risk-adjusted returns. ARP portfolios can be implemented in a number of ways: by asset class and across multiple styles (for example, carry, momentum, and value within rates); by style across asset classes (for example, carry across commodities, FX, and rates); or a combination of the two.

The selection of strategies within an ARP portfolio will depend upon the underlying objective. As such, individual strategies can be used as building blocks for allocators to create tailored ARP portfolios and harness the diversity of strategies to help achieve a particular goal.

ARP strategies lend themselves nicely to being indexed because they are rules based and use underlying liquid instruments.

Indexing Risk Premia

ARP strategies lend themselves nicely to being indexed because they are rules based and use underlying liquid instruments. S&P DJI launched a series of risk premia indices across various styles and asset classes that were built to satisfy demand for both index-linked products and performance benchmarking.

The S&P ARP Indices are transparent and fully replicable, and the methodologies are supported by well-documented academic and practitioner research. The indices attempt to isolate the intended risk exposure in a pure and simple manner; there is no risk timing.

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Currently, no established benchmarks exist for ARP strategies and approaches can vary considerably across providers. Where possible, our goal is to establish standardized methodologies for individual ARP strategies and to also build multi-strategy baskets that will serve as industry benchmarks.

The indices attempt to isolate the intended risk exposure in a pure and simple manner; there is no risk timing.

Exhibit 8: Methodology Overview for Four of S&P DJI's Live ARP Indices

CATEGORY	S&P RISK PREMIA INDEX			
	FX VALUE G10	RATES CARRY	RATES MOMENTUM (CROSS-SECTIONAL)	RATES VALUE (SPREAD REVERSION)
Constituent Universe	G10 Currencies	7 Global 10-Year Sovereign Bond Futures	7 Global 10-Year Sovereign Bond Futures	7 Global 10-Year Sovereign Bond Futures
Ranking Metric	Long three currencies and short three currencies based on deviation from PPP level	Long three higher-yielding sovereigns and short three lower-yielding sovereigns	Long three sovereigns and short three sovereigns based on 12-month price momentum	Long three high and short three low sovereigns based on deviation from moving average yield
Constituent Weighting	Equally Weighted	Equally Weighted	Equally Weighted	Equally Weighted
Sum of Long Leg Weights	100%	100%	100%	100%
Sum of Short Leg Weights	-100%	-100%	-100%	-100%
Rebalance Frequency	Quarterly	Monthly	Monthly	Monthly

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

Key Statistics

Each of the four S&P ARP Indices studied earned positive excess return over the long term and had meaningful Sharpe ratios.

Exhibit 9a shows the performance statistics since inception for four S&P ARP Indices versus the S&P 500. Each of the four strategies earned positive excess returns over the long term and had meaningful Sharpe ratios. Note that the volatilities were generally disparate across the ARP strategies, and thus allocators tend to manage single APR to a target volatility and risk weight within multi-strategy baskets.

Exhibit 9a: Performance Statistics for the S&P ARP Indices and S&P 500

CHARACTERISTIC	S&P RISK PREMIA INDEX				S&P 500
	FX VALUE G10	RATES CARRY	RATES MOMENTUM (CROSS-SECTIONAL)	RATES VALUE (SPREAD REVERSION)	
Launch Date	Feb.10, 2020	Feb.10, 2020	March 30, 2020	Feb.10, 2020	-
ANNUALIZED RETURN (%) – PERIOD					
Since Inception	3.99	1.94	1.20	1.44	8.16
1-Year	7.02	-3.66	-1.81	-3.08	17.61
3-Year	4.45	0.83	0.20	-0.80	12.15
5-Year	4.31	1.84	0.24	0.80	13.52
10-Year	3.30	1.98	1.09	0.90	12.86
Annualized Volatility (%)	6.62	2.60	2.91	2.56	15.17
Sharpe Ratio	0.63	0.75	0.43	0.57	0.60
Maximum Drawdown (%)	-13.43	-6.03	-5.60	-7.91	-53.06

Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 31, 2020. Index performance based on monthly excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Allocators tend to manage single ARP to a target volatility and risk weight within multi-strategy baskets.

One of the core objectives of ARP is to provide diversifying returns relative to traditional beta strategies, especially during major market shocks. As Exhibit 9b shows, the S&P ARP Indices generally performed fairly well during select drawdown periods since 2005.

One of the core objectives of ARP is to provide diversifying returns relative to traditional beta strategies, especially during major market shocks.

Exhibit 9b: Performance of S&P ARP Indices and S&P 500 during Select Drawdown Periods

PERIOD	S&P RISK PREMIA INDEX				S&P 500
	FX VALUE G10	RATES CARRY	RATES MOMENTUM (CROSS-SECTIONAL)	RATES VALUE (SPREAD REVERSION)	
Global Financial Crisis (October 2007-February 2009)	19.05	-0.03	3.67	8.41	-53.28
Oil Price Decline (June 2008-January 2009)	12.52	-5.78	-0.46	1.36	-35.82
Europe/Greece Debt Crisis (March-June 2010)	2.22	1.47	-0.84	1.00	-11.56
Downgrade of U.S. Debt (August-November 2011)	4.30	0.93	3.35	1.42	2.83
Oil Price Decline (June 2014-Febuary 2016)	17.98	4.07	-0.11	9.88	1.25
China's Black Monday (May-September 2015)	7.02	0.50	-0.64	-0.16	-8.55
Inflation Fears (January-March 2018)	3.87	0.98	0.57	0.86	-6.63
Q4 2018 (October-December 2018)	2.85	-0.51	-1.56	-1.09	-14.29
March 2020	3.46	-3.11	-0.66	-1.50	-12.53

Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 31, 2020. Index performance based on monthly excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The S&P ARP Indices generally outperformed across select drawdown periods.

Exhibit 10 shows the correlations among the S&P ARP Indices and the S&P 500 using monthly returns—all ARP indices exhibited low or negative correlations to the S&P 500. Furthermore, the indices exhibited low correlations to each other over the long term.

Exhibit 10: Correlation Matrix of the S&P ARP Indices and S&P 500

CORRELATION	FX VALUE G10	RATES CARRY	RATES MOMENTUM (CROSS-SECTIONAL)	RATES VALUE (SPREAD REVERSION)	S&P 500
FX VALUE G10	1	-	-	-	-
RATES CARRY	-0.16	1	-	-	-
RATES MOMENTUM (CROSS-SECTIONAL)	-0.05	0.33	1	-	-
RATES VALUE (SPREAD REVERSION)	-0.01	0.21	0.18	1	-
S&P 500	-0.26	0.07	0.05	-0.01	1

Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 31, 2020. Index performance based on monthly excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

All S&P ARP Indices exhibited low or negative correlations to the S&P 500, as well as low correlations to each other over the long term.

MANAGED FUTURES STRATEGIES

Managed futures strategies use futures contracts to systematically exploit persistent market price trends across asset classes.

Managed futures strategies use futures contracts to systematically exploit persistent market price trends across asset classes. Managed futures strategies tend to be trend following, which means that when an individual asset shows a clear price uptrend (or downtrend), the strategy will hold a long (or short) position in the asset. The strategies use a wide variety of quantitative models based around highly liquid, exchange-traded financial derivatives across equities, fixed income, foreign exchange, and commodities markets.

While most managed futures strategies focus on quantitative, transparent, rules-based, and trend-following models, individual strategies commonly vary.

While most managed futures strategies focus on quantitative, transparent, rules-based, and trend-following models, individual strategies commonly vary based on the following.

1. The universe of securities, across and within asset classes.
2. The definition of the trend signal such as:
   a. The length of the measurement window; and
   b. The time series versus cross-sectional momentum.
3. The weighting mechanism across and within asset classes.

Investing in Managed Futures

Traditionally, investors use managed futures as a complement or an alternative to active or less-liquid alternative strategies. Investors may include managed futures in their portfolios for a variety of reasons.

- Cost-effective hedge fund replacement
- Diversifier to traditional assets due to low correlations
- Global diversification
- Absolute multi-asset solution as core or overlay
- Access to long-short commodities exposure with the benefit of lower risk from adding financial futures
- Liquidity solution in times of crisis
- Capital preservation during periods of broad equity market malaise

Traditionally, investors use managed futures as a complement or an alternative to active or less-liquid alternative strategies.

Managed futures strategies have a unique profile relative to traditional investment strategies, including the following.

- Long-term positive historical returns, achieved with unlevered risk levels that are, on average, one-half that of equities;
- Low and sometimes negative correlations to equities and other asset classes; and
- Strong historical performance during equity bear markets.

Managed futures strategies are well suited to indexing, because they are based on transparent, rules-based quantitative models.

Indexing Managed Futures

Managed futures strategies are well suited to indexing, because they are based on transparent, rules-based quantitative models. Research has shown that simple trend-following strategies explain the bulk of returns of managed futures funds and that fund fees and transaction costs can be a significant drag on performance.[6] S&P DJI has three managed futures indices.

S&P DJI has three managed futures indices.

- The S&P Strategic Futures Index (SFI) seeks to reflect the price momentum of 24 futures contracts on physical commodities, interest rates, and currencies. The index uses an enhanced rolling schedule for long commodities and applies a risk parity weighting scheme by sector.
- The S&P Dynamic Futures Index (DFI) is also designed to reflect the price momentum of 24 futures contracts on physical commodities, interest rates, and currencies, but it applies an equal weighting scheme between commodities and financials, and individual commodities weights are based on the S&P GSCI Light Energy.
- The S&P Systematic Global Macro Index (SGMI) seeks to reflect the price momentum of 37 constituent futures contracts, covering equities, commodities, interest rates, and currencies. Each sector contributes equally to index risk, and each constituent contributes equally to the risk of the sector in order to hit a target volatility. Leverage is used to help achieve the volatility target.

[6] Hurst, B., H. Ooi, and L. Pedersen. "Demystifying Managed Futures." *Journal of Investment Management. 2013.*

There are several advantages of passive managed futures strategies.

Passive strategies may offer an enhanced level of liquidity and lower fees as compared to active managed futures strategies and other alternative strategies.

Exhibit 11: S&P Dow Jones Indices Managed Futures Index Family Summary Comparison

CHARACTERISTIC	S&P SFI	S&P DFI	S&P SGMI
Launch Date	Aug. 14, 2014	Dec. 21, 2009	Aug. 11, 2011
Description	Designed to reflect the price momentum that physical commodities, interest rates, and currencies tend to exhibit over the long term due to their cyclicality	Designed to reflect the price momentum that physical commodities, interest rates, and currencies tend to exhibit over the long term due to their cyclicality	Designed to represent the global macro and managed futures/commodities trading advisor universe by using a flexible model to capture price trends
Constituents	24 constituents: • Financials (8) • Commodities (16)	24 constituents: • Financials (8) • Commodities (16)	37 constituents: • Commodities (10) • Energy (6) • Fixed income (6) • Foreign exchange (6) • Short-term interest rates (3) • Stock indices (6)
Position/Direction	• Compares current price to an exponential moving average model using seven months of historical prices to capture positive or negative trends • Trend is determined for each commodity individually	• Compares current price to an exponential moving average model using seven months of historical prices to capture positive or negative trends • Trend is determined for each commodity individually	• Based on a flexible model to capture price trends, whether they are short, medium, or long term • Each constituent has its own direction
Weighting Scheme	Risk parity	50% commodities/ 50% financials	Equally weighted by risk budget. Leverage is used to help achieve the volatility target but cannot exceed 300%.

Source: S&P Dow Jones Indices LLC. Table is provided for illustrative purposes.

There are several advantages of passive managed futures strategies. Passive strategies may offer an enhanced level of liquidity and lower fees as compared to active managed futures strategies and other alternative strategies such as real assets or private equity. The transparent, rules-based approach of passive managed futures strategies also provides the tools to track and benchmark relative performance. Style drift has become a major concern of investors in the managed futures space; many fear managers have made changes to their investment processes over recent years to improve short-term performance relative to the bullish equities market. With a rules-based approach and set periodic rebalancing, managed futures solutions based on an index may eliminate the risk of style drift.

With a rules-based approach and set periodic rebalancing, managed futures solutions based on an index may eliminate the risk of style drift.

From a benchmark perspective, the S&P Managed Futures Indices seek to represent the performance of a pure strategy, not the fund-of-fund approach adopted by other benchmarks that combine the actual performance of individual managed futures strategies.

While the absolute performance of the S&P Managed Futures Indices was modest over most of the past decade…

Key Statistics

While the absolute performance of the S&P Managed Futures Indices was modest over most of the past decade (see Exhibit 12), its performance during equity market drawdowns has been admirable. During the S&P 500 drawdown of nearly 50% in the global financial crisis, all three S&P Managed Futures Indices rallied, posting positive returns. The same occurred in March 2020, when the performance of these indices reflected their ability to provide liquidity and capital preservation during broad market downturns. The unlevered risk of these indices has historically been less than a 60/40 equity/bond portfolio and the S&P 500.

…its performance during equity market drawdowns has been admirable.

During the global financial crisis and March 2020, all three managed futures indices rallied, posting positive returns.

The unlevered risk of these indices has historically been less than a 60/40 equity/bond portfolio and the S&P 500.

Exhibit 12: Historical Performance of the S&P Managed Futures Indices versus a 60/40 Portfolio

CATEGORY	S&P SFI	S&P DFI	S&P SGMI	60/40 EQUITY/BOND PORTFOLIO	S&P 500
ANNUALIZED RETURN (%) – PERIOD					
Since Inception	1.38	0.08	5.40	6.77	8.16
1-Year	4.81	8.41	12.32	14.83	17.61
3-Year	1.33	1.05	1.95	9.56	12.15
5-Year	1.13	0.90	4.05	10.23	13.52
10-Year	0.68	-0.97	3.31	8.96	12.86
Annualized Volatility (%)	5.17	7.29	11.43	9.93	15.17
Sharpe Ratio	0.29	0.05	0.52	0.71	0.60
Maximum Drawdown (%)	-12.39	-25.85	-22.88	-35.54	-53.06
CUMULATIVE RETURNS (%) – SELECT PERIODS					
Global Financial Crisis (October 2007-February 2009)	12.39	12.81	21.85	-35.52	-52.89
Oil Price Decline (June 2008-January 2009)	4.36	-0.17	4.93	-23.37	-35.52
Europe/Greece Debt Crisis (March-June 2010)	-1.43	0.06	1.83	-6.99	-11.52
Downgrade of U.S. Debt (August-November 2011)	-2.36	-4.51	-7.78	0.68	2.80
Oil Price Decline (June 2014-Febuary 2016)	6.60	8.65	22.53	-0.52	1.55
China's Black Monday (May-September 2015)	-0.84	-5.31	-7.13	-4.88	-8.35
Inflation Fears (January-March 2018)	-0.42	-0.20	-6.62	-3.82	-6.43
Q4 2018 (October-December 2018)	-0.71	0.37	-8.10	-8.09	-14.11
March 2020	4.74	7.25	11.21	-8.36	-12.44

The 60/40 equity/bond portfolio is a hypothetical portfolio.
Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 31, 2020. Index performance based on excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Risk is defined as the standard deviation calculated based on monthly total returns. The S&P SGMI may use up to three times the leverage, while the S&P DFI and S&P SFI are unlevered. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Low-to-negative correlations can make these strategies attractive to investors looking to diversify their portfolios and preserve capital during periods of broad equity market stress.

Low-to-negative correlations can make these strategies attractive diversification tools that could preserve capital during periods of broad equity market stress. The S&P SGMI has had a relatively modest correlation to the S&P 500, while the S&P DFI and S&P SFI have been negatively correlated to equities (see Exhibit 13).

Exhibit 13: Correlation of the S&P Managed Futures Indices and S&P 500

CORRELATION	S&P SFI	S&P DFI	S&P SGMI	60/40 EQUITY/BOND PORTFOLIO	S&P 500
S&P SFI	1	-	-	-	-
S&P DFI	0.86	1	-	-	-
S&P SGMI	0.59	0.55	1	-	-
60/40 EQUITY/BOND PORTFOLIO	-0.24	-0.21	0.11	1	-
S&P 500	-0.25	-0.21	0.09	0.98	1

Source: S&P Dow Jones Indices LLC. Data from Dec. 30, 2005, to Dec. 31, 2020. Correlations based on monthly excess returns. The S&P SGMI may use up to three times the leverage, while the S&P DFI and S&P SFI are unlevered. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The S&P SGMI has had a relatively modest correlation to the S&P 500…

CONCLUSION

…while the S&P DFI and S&P SFI have been negatively correlated to equities.

Liquid alternatives offer diversification, potential for attractive risk-adjusted returns, and lower drawdowns relative to traditional asset classes and their related strategies. While liquid alternatives are widely used by sophisticated investors, there has been a lack of proper benchmarks for them. The S&P Liquid Alternatives Index Series provides the liquid alternatives market with transparent, rules-based passive benchmarks.

PERFORMANCE DISCLOSURE/BACK-TESTED DATA

The S&P Risk Parity Index – 8% Target Volatility was launched August 5, 2019. The S&P Risk Parity Index – 10% Target Volatility and S&P Risk Parity Index – 12% Target Volatility were launched July 9, 2018. The S&P Risk Parity Index – 15% Target Volatility was launched December 31, 2003. The S&P Risk Premia FX Value G10 Index was launched October 16, 2019. The S&P Risk Premia Rates Carry Index and S&P Risk Premia Rates Value (Spread Reversion) Index were launched February 10, 2020. The S&P Risk Premia Rates Momentum (Cross-Sectional) Index was launched March 30, 2020. The S&P Systematic Global Macro Index was launched August 9, 2011. The S&P Strategic Futures Index was launched August 14, 2014. The S&P Dynamic Futures Index was launched on December 21, 2009. All information presented prior to an index's Launch Date is hypothetical (back-tested), not actual performance. The back-test calculations are based on the same methodology that was in effect on the index Launch Date. However, when creating back-tested history for periods of market anomalies or other periods that do not reflect the general current market environment, index methodology rules may be relaxed to capture a large enough universe of securities to simulate the target market the index is designed to measure or strategy the index is designed to capture. For example, market capitalization and liquidity thresholds may be reduced. Complete index methodology details are available at www.spdji.com. Past performance of the Index is not an indication of future results. Back-tested performance reflects application of an index methodology and selection of index constituents with the benefit of hindsight and knowledge of factors that may have positively affected its performance, cannot account for all financial risk that may affect results and may be considered to reflect survivor/look ahead bias. Actual returns may differ significantly from, and be lower than, back-tested returns. Past performance is not an indication or guarantee of future results. Please refer to the methodology for the Index for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations. Back-tested performance is for use with institutions only; not for use with retail investors.

S&P Dow Jones Indices defines various dates to assist our clients in providing transparency. The First Value Date is the first day for which there is a calculated value (either live or back-tested) for a given index. The Base Date is the date at which the index is set to a fixed value for calculation purposes. The Launch Date designates the date when the values of an index are first considered live: index values provided for any date or time period prior to the index's Launch Date are considered back-tested. S&P Dow Jones Indices defines the Launch Date as the date by which the values of an index are known to have been released to the public, for example via the company's public website or its data feed to external parties. For Dow Jones-branded indices introduced prior to May 31, 2013, the Launch Date (which prior to May 31, 2013, was termed "Date of introduction") is set at a date upon which no further changes were permitted to be made to the index methodology, but that may have been prior to the Index's public release date.

Typically, when S&P DJI creates back-tested index data, S&P DJI uses actual historical constituent-level data (e.g., historical price, market capitalization, and corporate action data) in its calculations. As ESG investing is still in early stages of development, certain datapoints used to calculate S&P DJI's ESG indices may not be available for the entire desired period of back-tested history. The same data availability issue could be true for other indices as well. In cases when actual data is not available for all relevant historical periods, S&P DJI may employ a process of using "Backward Data Assumption" (or pulling back) of ESG data for the calculation of back-tested historical performance. "Backward Data Assumption" is a process that applies the earliest actual live data point available for an index constituent company to all prior historical instances in the index performance. For example, Backward Data Assumption inherently assumes that companies currently not involved in a specific business activity (also known as "product involvement") were never involved historically and similarly also assumes that companies currently involved in a specific business activity were involved historically too. The Backward Data Assumption allows the hypothetical back-test to be extended over more historical years than would be feasible using only actual data. For more information on "Backward Data Assumption" please refer to the FAQ. The methodology and factsheets of any index that employs backward assumption in the back-tested history will explicitly state so. The methodology will include an Appendix with a table setting forth the specific data points and relevant time period for which backward projected data was used.

Index returns shown do not represent the results of actual trading of investable assets/securities. S&P Dow Jones Indices maintains the index and calculates the index levels and performance shown or discussed but does not manage actual assets. Index returns do not reflect payment of any sales charges or fees an investor may pay to purchase the securities underlying the Index or investment funds that are intended to track the performance of the Index. The imposition of these fees and charges would cause actual and back-tested performance of the securities/fund to be lower than the Index performance shown. As a simple example, if an index returned 10% on a US $100,000 investment for a 12-month period (or US $10,000) and an actual asset-based fee of 1.5% was imposed at the end of the period on the investment plus accrued interest (or US $1,650), the net return would be 8.35% (or US $8,350) for the year. Over a three-year period, an annual 1.5% fee taken at year end with an assumed 10% return per year would result in a cumulative gross return of 33.10%, a total fee of US $5,375, and a cumulative net return of 27.2% (or US $27,200).

GENERAL DISCLAIMER