



GSAM DIVERSIFYING ALTERNATIVE RISK PREMIA

IC MANAGER FUNDING RECOMMENDATION MEMORANDUM

May 2015

PROTECTED MATERIALS

BACKGROUND INFORMATION	
Manager Name:	Goldman Sachs Asset Management
Fund Name:	GSAM Diversifying Alternative Risk Premia
Arden Strategy/ Sub-Strategy:	Systematic Macro
Coverage:	
Senior:	Ian McDonald
Primary:	Liang Simon Lai
Secondary:	Emily Letterio
Operational Due Diligence:	Chris Omueti
<i>Date Submitted to IC:</i>	5/8/15
<i>Date Approved by IC:</i>	5/8/15

FUND SNAPSHOT	
Inception Date:	Single strategies launched between 2009-2014 (pages 9-13) – customized solution
Portfolio Manager (s):	Dr. Stephan Kessler
AUM (\$):	
Fund:	NA
Strategy:	\$1,265mn
Firm:	\$1,204bn

TERMS/OTHER	
Fees:	
Management Fee:	0.90%*
Incentive Fee:	Zero*
Liquidity Terms:	Daily
Gate (yes, no, %, type):	No
Side Pocket (yes, no, max %):	No
Side Letter (yes, no):	No
Regulatory Registration:	
SEC:	Yes
FSA:	Yes
Other (specify):	
HedgeMark Approved (yes, no, other):	Strategy will be run in a managed account with HedgeMark.

* For PRIM's negotiated terms, please see the Executive Summary/Recommendation section

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INVESTMENT REVIEW

SUMMARY OF INVESTMENT RANKINGS

Category	Score*
Overall outlook score	2.0
Return profile (right tail, left tail, core)	Core
Investment thesis: pros/cons/conclusion	2.0
Firm stability and background	1.0
Strength and quality of track record	2.5
Strength and quality of references	1.0
Transparency/HedgeMark	1.0

*Key: 1 (best) – 4 (worst)

EXECUTIVE SUMMARY/RECOMMENDATION

The Advanced Investment Strategies (AIS) Group, which sits within GSAM's Quantitative Platform, offers a suite of risk premia single strategy products. The AIS team forms part of the Advanced Beta strategies group and manages \$4.4bn in total, \$1.2bn of which is managed in alternative risk premia strategies and the remaining is in hedge fund replication strategies.

The team offers customized multi-strategy portfolios using independently managed single strategies. The proposed Diversifying Alternative Risk Premia (DARP) Portfolio, which consists of 12 single strategies ("sub-strategies") with equal risk weighting, trades across equities, bond/rate futures, CDX, FX and commodities. The portfolio's investment objective is to achieve attractive risk-adjusted returns with target volatility of 10% and near zero correlation to the S&P 500.

The GSAM Diversifying Alternative Risk Premia Fund has a management fee of 0.90% with no incentive fee for investments between \$150mn and \$200mn. PRIM has succeeded in negotiating terms with the manager to reduce fees in a dedicated managed account structure. GSAM has agreed to run the strategy for PRIM for 0.75% on amounts less than \$50mn, 0.625% on amounts between \$50mn-\$100mn and 0.50% for any amounts in excess of \$100mn.

GSAM will be executing the DARP strategy on PRIM's behalf with some minor modifications in a dedicated managed account.

The strategy is recommended for investment via a managed account.

INVESTMENT MERITS:

- The DARP portfolio is designed to produce diversified return contributions from the sub-strategies while exhibiting a low correlation and beta to equities: the simulated performance has realized low/zero correlation (0.02) and beta (0.02) to S&P 500 over the long term
- Each sub-strategy is designed as an enhanced system to capture risk premia with independent risk models and is intended to deliver a high Sharpe ratio at the sub-strategy level.
 - This is the main differentiator from its peers. The strategy's main intellectual property is more focused on the design and construction of each sub-strategy but less on the portfolio level.
- Impressive backtest performance and Sharpe ratio, even during the "difficult environment" for risk premia strategies over the last 2-3 years
- Experienced research team, many of whom worked together in the securities division at the GS investment bank before moving to GSAM. The team is well-resourced and is further supported by a much broader Quantitative Platform Group within the firm.
- Models are developed using the internal proprietary software the team developed that is linked to the firm's internal data library where all market data and price data are tradable and used for actual execution. This makes the simulated output from model development more reliable.
- Each strategy is managed independently, allowing GSAM to build portfolios which can be tailored to meet specific investor requirements.
- Daily Liquidity and attractive fees:
 - Management fee is 0.75% (on amounts less than \$50mn, and decreases for any incremental)
 - No performance fee

KEY CONCERNS:

- The portfolio construction process and risk management at the portfolio level is fairly basic. The team continues to employ the same process they developed while on the investment bank side of GS by equal risk weighting the underlying building blocks.
 - The team only recently developed and proposed the incorporation of two risk controls (margin cap and forward looking downside cap) at the portfolio level, which seems to be a reaction to our concerns over the simplicity of their portfolio construction process.
- The simulated portfolio performance should be greatly discounted as many of sub-strategies have less than 24 months live track record and are filled with backtested performance data.
- Due to limited data available, the backtest for the Credit Curve strategy was backfilled less-appropriately with simulated returns from Put Writing strategy, even though the two strategies only had a realized correlation of less than 0.25.

- Since their sub-strategy models are “enhanced” to achieve higher risk-adjusted returns, there is greater model risk that is highly dependent on historical data. Such model risk may be caused by data mining/data fitting, which could affect the consistency of the model’s risk/return profile.

CONCLUSION

The GSAM DARP strategy offers a diversified portfolio of well-constructed sub-strategies that aims to deliver high risk-adjusted returns. The strategy is differentiated from its peers by the fact that the investment team designs and manages the sub-strategies independently, while placing more emphasis on strategy construction and risk management at the sub-strategy level than at the portfolio level.

Although there are some concerns over the short length of live track records for certain of the underlying sub-strategies, the portfolio produced decent performance during the second half of 2014, where the pro-forma returns were mainly based on live track records from the sub-strategies. The overall live performance was in line with our expectations during this period of “improved” market environment for risk premia strategies.

The GSAM DARP strategy is approved for investment and recommended as part of a multi-manager alternative beta program run in a dedicated managed account. It may be advisable to fund in stages while monitoring the performance for several months before funding in full.

MANAGER/STRATEGY REVIEW & ANALYSIS

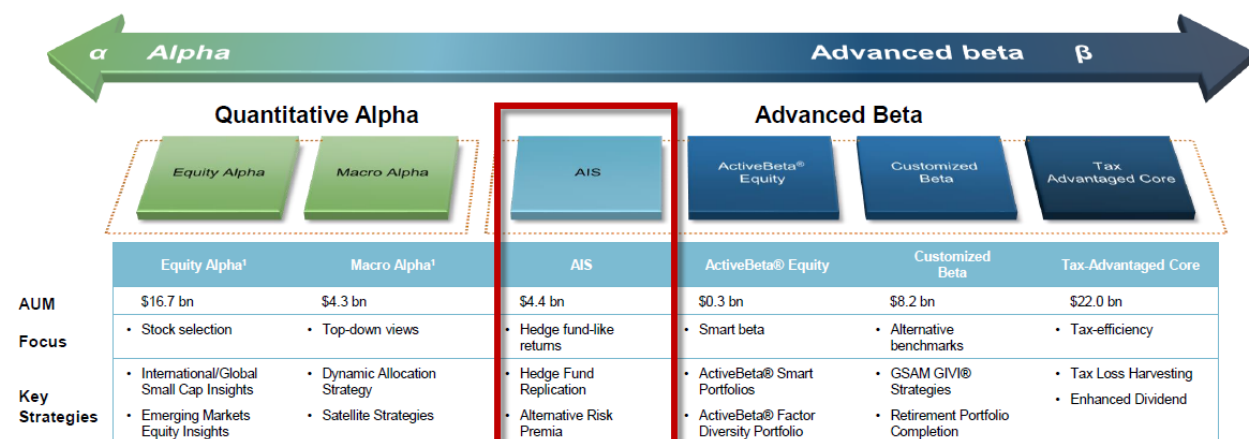
FIRM OVERVIEW/BACKGROUND

Goldman Sachs Asset Management (GSAM) Alternative Investment Strategies (AIS) currently has approximately \$4.4bn in assets, and is one of the sub-strategies within GSAM’s Quantitative Platform Group, which has about \$55.9bn in assets. The Quantitative Platform Group is just one of several divisions within GSAM, which currently has about \$1,204bn in assets under supervision. GSAM is a division of the Investment Management Group, which is one of the four primary business lines of the Goldman Sachs Group, Inc. GSAM is headquartered in New York and has offices across the globe.

The AIS Group is responsible for developing and trading risk premia strategies. The team sits within the firm’s Quantitative Platform, led by Armen Avanesians (CEO of Quantitative Platform, senior partner), which manages \$55.9bn between Quant Alpha strategies (hedge funds) and Advanced Beta strategies (smart beta and risk premia). The AIS team forms part of the Advanced Beta strategies group and manages \$4.4bn in total, \$1.2bn of which is managed in alternative risk premia strategies (mostly in single strategies) and the remaining is in hedge fund replication strategies (GS ART strategy series). There are currently 11 clients invested in

various risk premia strategies, half of whom are pension funds and the other half are made up of banks, high net worth investors and pooled retail funds.

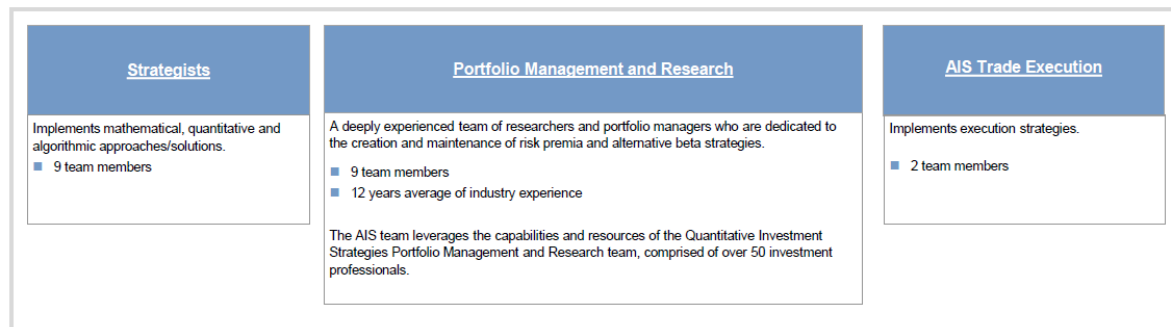
Chart below shows the structure of the group.



Source: GSAM

AIS's main research and investment team is based in London. Part of the team members moved from the bank's securities division to the asset management arm in April 2012. The purpose of this move was driven by client demands for fiduciary offerings in risk premia strategies applying active management to their portfolios. A team of eight people, including Stephan Kessler (head of research), moved to GSAM. Since then, three senior members of the original team have left over the last 2 years, including an internal transfer back to the securities division. Jason Ekaireb, Head of Systematic Trading in the securities division and Head of AIS group in the asset management division, transferred out in March 2014 to focus solely on his existing securities division responsibilities. Karim Bennani and Massoud Mussavian, both Executive Managing Directors of the AIS group, left the firm in June 2014 and May 2013, respectively. Although there was not a precise replacement for each departure, GSAM has grown the team organically and built a well-resourced investment team.

There are 20 people dedicated to AIS, nine of whom are researchers and portfolio managers, nine are strategists, and two are execution traders. Researchers and portfolio managers are responsible for strategy development and management; strategists are responsible for overseeing the research, data cleaning, program implementation, infrastructure build-out and risk monitoring (see table below). The AIS team also shares client portfolio management, IT and risk management resources with other divisions across the GSAM Quantitative Platform Group.



Source: GSAM

One of the advantages for the team in moving from the securities division to the asset management firm is that there is now more flexibility in developing and implementing models than there was on the bank side. Sitting within GSAM, they have the ability to continually enhance the models to become more adaptable, whereas the bank strategies are defined as hard rules that are implemented and sold to investors in an index format. As a result, once the index rule is set, it cannot be changed. Additionally, at the bank, strategies are developed by different desks defined by the markets they cover (e.g. commodity desk, fixed income desk, etc.) whereas within GSAM the entire team has a multi-asset focus and everyone shares ideas across markets.

INVESTMENT STRATEGY

The DARP portfolio consists of 12 systematic single strategies including Relative Value, Macro, and Equity Market Neutral risk premia, trading across equities, bond/rate futures, CDX, FX and commodities. Each strategy is equally weighted by its realized volatility. The portfolio has a 10% volatility target, and offers daily liquidity and low fees via managed account.

The 12 strategies included in the portfolio are defined as follows:

- Relative Value
 - Credit Curve: Seeks to capture the risk premium in credit spreads across the curve in CDS markets
 - Bond Cross Market Carry: Seeks to capture the carry and roll-down opportunities across government bond markets
 - Credit HY vs. IG: Aims to capture the risk premium in high yield credit vs. investment grade credit
- Macro
 - Bond Monetary Policy and Carry: Seeks to capture the bond term premium with a monetary policy overlay
 - Bond Calendar: Aims to capture systematic flow patterns in fixed income markets

- Commodities Cross Market Carry: Seeks to exploit different decay speeds in various parts of the commodity curve
- Commodities Momentum: Seeks to benefit from cross-sectional trends in commodities
- Trend Commodities: Seeks to benefit from trends in commodities
- FX Carry: Seeks to capture risk premium by going long higher-yielding currencies and shorting lower-yielding currencies
- FX Value: Aims to capture mean-reversion of currencies to their fundamental values
- Trend Rates: Seeks to benefit from trends in rates
- Equity Market Neutral
 - Equity Low Beta: Aims to benefit from the better risk-return trade-off in the low risk (beta) stock universe vs. high risk (beta) stock universe on a beta neutral basis

INVESTMENT PROCESS

Below is the list of 12 single strategies included in the DARP portfolio and their live inception dates.

	Name	Start Date of Benchmarked Assets
1	FX Carry	30-Oct-10
2	FX Value	20-May-14
3	Low Beta	Yet to be launched
4	Commodity Carry	20-May-14
5	Commodity Momentum	20-May-14
6	Bond UPC	1-Oct-13
7	BCS	1-Oct-13
8	Cross Market Carry	1-Oct-13
9	AB Trend Rates	30-Jun-09
10	AB Trend Commodity	30-Jun-09
11	Credit Curve	20-Aug-13
12	Credit HY-IG	Yet to be launched

Source: GSAM

Before they can be implemented, all new strategies need to be approved first by the head of research, then by the strategist team, and finally by the head of the Quantitative Platform Group.

Strategy Descriptions

Currency Risk Premia

- FX Carry Plus Strategy (live since Oct-10):

Long high-yielding currencies; short low-yielding currencies. The strategy trades 27 currencies against USD. Pegged currencies, such as the Venezuelan Bolivar, (characterized by extremely low volatility) are removed. The carry opportunity is measured by the interest rate differentials between the currency pairs. A risk-adjusted carry score is calculated by taking into account annualized volatility for each currency. This is designed to reduce the exposure to EM currencies, which have historically been riskier. The carry score is proportional to the level of conviction in the carry opportunity. The strategy goes long currencies with positive carry scores and short currencies with negative carry scores. If the carry score is greater than a certain threshold, the strategy will linearly reduce the position size due to the heightened risk of central bank manipulation. The volatility of each currency is closely monitored and any currency that is measured at less than 1% annualized vol will be removed from the investable universe. The model was revised as of Dec 2014. Instead of simply using the 27 USD-cross pairs to generate carry scores, the model now uses 378 intra-crosses for signal generation before disaggregating these to the same 27 USD-crosses for trading. For example, a short exposure in MXN via MXN/PLN cross is considered to be short USD/MXN and long USD/PLN. Each of the 27 USD-cross weights is capped at 50% to avoid risk concentration. The main difference between the old and the new model is that the old model had resulted in a strong long USD bias, whereas the new model has a neutral bias to USD. Correlation of the new model with the Dollar Index (DXY) is close to zero. A momentum-based stop loss is applied. The strategy is rebalanced monthly.

Most of the strategies summarized below apply the same stop loss mechanism and the full process is detailed at the end of the investment process section.

- FX Value Strategy (live since May-14):

The strategy trades the same 27 currencies against USD. It seeks to leverage on Goldman Sachs Dynamic Equilibrium Exchange Rate (GSDEER) value scores to determine the fair value. GSDEER estimates a group of 33 real exchange rates as a function of terms of trade, productivity and international investment position differentials. It combines coefficients with underlying fundamentals to arrive at an estimated real exchange rate, and then removes inflation differentials to get to fair value nominal exchange rate. This strategy is very similar to FX Carry strategy but with the carry signal replaced by the value signal. A risk-adjusted GSDEER value score is calculated by taking into account annualized volatility of each currency. The strategy goes long currencies with positive value scores and short currencies with negative value scores. A momentum based stop loss is applied. The strategy is rebalanced monthly.

Credit Risk Premia

- Credit Curve Strategy (live since Aug, 2013):

Designed to capture the persistent mispricing of the credit yield curve through different speeds of decay for the front-end vs. the back-end of the credit curve. Buying protection on the 10Y point and selling protection on the 5Y point in an equal weight for Markit CDX IG and Markit iTraxx IG credit curves. The traded spread is selected as 5Y vs. 10Y as these are among the most liquid points on the corresponding credit curves. The traded spread is duration hedged daily. The strategy has an equal weight between the US and European markets. The strategy focuses solely on investment grade and not high yield as HY tends to involve more idiosyncratic risk and is more expensive to trade. There is a carry overlay on the strategy – if the carry return of the 5Y vs. 10Y is negative, the exposure of the strategy is switched to cash as the strategy is temporarily impaired. There is a stop loss mechanism to dial down/scale back up positions based on price momentum.
- Credit HY vs. IG Strategy (yet to be launched):

Designed to capture the persistent mispricing between high yield and investment grade – buying protection on IG and selling protection on HY on a beta neutral basis. The investment universe covers Markit CDX North America Investment Grade and High Yield (5Y) and Markit iTraxx Europe Investment Grade and Crossover High Yield (5Y). HY will have a fixed weight while the weight of IG fluctuates based on the calculated beta. Beta is calculated based on 120-day window with a half-life. US and European markets are equally weighted. For each market, there is a beta floor in place such that the IG weight does not drop below 2.5x. This is designed to keep the strategy hedged despite market dislocations whereby IG volatility spikes. A carry overlay is also applied on the strategy – if the carry return of HY vs. IG is negative, the exposure of the strategy is switched to cash. This carry signal is independent for each market. Momentum based stop loss is applied.

Commodity Risk Premia

- Commodities Carry Strategy (live since May, 2014):

Seeks to construct a long/short commodity strategy that uses the shape of the commodity curve as a trading signal. A commodity curve that is backwardated is typically a sign of a commodity in short supply and one that is expected to outperform those that are in contango. The stronger the relative shape, the larger the potential profit/loss. Therefore, the strategy goes long backwardated contracts and shorts commodities that are in contango. It trades 20 commodity futures from the S&P GSCI Commodity Index, excluding less liquid contracts such as livestock and cocoa. A carry score is calculated for each commodity and normalized for the volatility (exponentially weighted) of the commodity. The most backwardated contracts will have the highest score. Volatility

normalization is necessary due to the wide spectrum of risk associated with the different commodities. The lowest scores receive negative weights and the highest scores receive positive weights. Half of the positions are long and half of the positions are short. For seasonal stocks such as agriculture, new/old crops strongly influence the shape of the term structure, so they use momentum signals to scale down positions if the signal is against carry signals. The strategy is rebalanced on a monthly basis.

- **AB Trend Commodities Strategy (live since Jun, 2009):**
Seeks to capture trends in the commodity markets – to buy commodities that are trending positively and sell commodities that are trending downward. Weightings vary based on the strength of the trends. When trends are less prevalent, the strategy is designed to manage risk. It trades 16 commodity futures – 6 energy, 7 metal, 3 soft. The trend is determined by moving average crossovers within five equally weighted time windows, i.e. when the short-term average is above the long-term average, this receives a positive score or weight (and vice versa). The five time windows are 1-10 days, 3-30 days, 6-60 days, 9-90 days, 12-120 days, with exponentially weighted (half-life) on both legs. Weightings are reduced in weaker trending environments. In addition, weightings are normalized based on the volatility (half-life) of each commodity and weightings are reduced for less liquid contracts, where liquidity is measured by bid/ask spread and open interest. The strategy is rebalanced on a daily basis.
- **Commodities Momentum Strategy (live since May, 2014):**
Seeks to capture momentum in the commodity markets on a market neutral basis by buying commodities that are trending more positively and selling commodities that are trending less positively. It trades all 24 commodity futures within the S&P GSCI universe. Each commodity is ranked by its respective 12-month risk-adjusted performance. Weightings are based on their respective z-scores using cumulative normal distribution. The long and short baskets are determined by the mean of the z-score, hence the strategy could, for instance, be long 10 markets and short 14 markets. The strategy has a 10% volatility target under normal conditions. Unlike trend following, this strategy targets a consistent volatility level since holdings are required on both the long and short side. The strategy is rebalanced weekly.

Given the volatile commodities market over the past two years, especially with significant price movements in energy markets in 2014, it is relevant to mention how these commodities risk premia strategies contributed to the DARF portfolio during this period. Overall, as shown in the table below, the commodities strategies have positively contributed during the period between Jan 2013 and Mar 2015. In 2014, Commodity Trend and Commodity Momentum have both benefited by the large moves in the energy markets, while Commodity Carry suffered from those moves. It also illustrates the complementary nature of the strategies.

Return Attribution by Commodities strategies				
	AB Trend Commods	Commod Carry	Commod Momentum	Total Commod strategies
2013	-1.2%	-0.2%	0.6%	-0.7%
2014	4.0%	-4.5%	5.7%	5.2%
2015 Q1	0.4%	0.0%	-0.8%	-0.5%

Source: GSAM, Arden Research

Fixed Income Risk Premia

- Bond Monetary Policy & Carry Strategy (live since Oct, 2013):**
 Seeks to generate returns based upon US Federal Reserve policy action and the carry in the yield curve. US Federal Reserve target rates and announcements are taken into account when determining conventional or unconventional US Federal Reserve monetary policy actions. 1) in an increasing rate environment, the strategy employs flattener positions by shorting the shorter-dated futures and going long the longer-dated contracts; 2) in a decreasing rate environment, the strategy employs steepener positions by going long shorter-dated futures and shorting the longer-dated contracts; 3) if monetary policy is deemed unconventional, it is transformed into a target rate hike or cut leading to flattening or steepening positions. During periods with no change in monetary policy, the strategy aims to take advantage of carry and roll down by trading a duration-adjusted portfolio of government notes and bond futures contracts (for example: 2Y-5Y, 10Y-30Y in duration neutral pairs).
- AB Trend Rates Strategy (live since Jun, 2009):**
 Seeks to capture trends in short-term interest rates by buying rate contracts that are trending positively and selling rates that are trending downward. The weightings will vary based on the strength of the trends. It trades interest rate futures across multiple maturities of EUR, USD, GBP, AUD and CHF. Trends are identified by the same five moving average crossovers as the ones used for AB Trend Commodities strategy. Weights are normalized based on the volatility of each interest rate. Weightings are reduced for less liquid contracts. When a particular interest rate falls below 0.75%, the strategy will start cutting the position and remove it completely when the rate drops to/below 0.25%. The strategy is rebalanced on a daily basis.
- Bond Calendar Strategy (live since Oct, 2013):**
 Seeks to profit from the pattern of flows in fixed income markets. Investors that are benchmarked to fixed income indices have historically bought duration at the end of the month when the indices rebalance and generally tend to replace maturing bonds with newer issues. In addition, government auctions typically create supply pressure on prices. The strategy aims to build long positions

around month-end and short positions ahead of government bond auctions. The strategy invests in futures contracts of 10-year US treasuries, Bunds, Gilts and 10-year JGB. As of Dec 2014, Italy, France, Australia and Canada were added in order to diversify the universe. Each country is weighted according to the size of the respective market (liquidity weighted). The strategy aims to take a long position around the month-end and a short position ahead of government bond auctions. Since Dec 2014, the strategy also added long positions after the auction as GSAM's analysis shows that a price rebound tends to follow shortly after an auction. The exposure is set such that the overall strategy level moves by approximately 0.20% if all traded instruments move by 0.01%. The strategy is rebalanced as frequently as daily.

- **Bond Cross Market Carry Strategy (live since Oct, 2013):**
Seeks to capture risk premium across government bonds in different countries. It takes advantage of carry and roll-down opportunities across government bond markets through long positions in futures markets with the highest carry and roll down and short positions in markets with the lowest carry. The positions are established on a risk-adjusted basis. The strategy invests in futures contracts of 10Y US treasuries, Bunds, Gilts and 10Y JGB. It calculates the ratio of carry and roll-down to historical volatility for each pair spread (USD-EUR, USD-GBP, USD-JPY, EUR-GBP, EUR-JPY, GBP-JPY). It takes a position if the current or previous day absolute carry and roll ratio is bigger than a defined threshold. If this criteria is not met, no positions are taken. The risk allocation is scaled for each spread, taking into account the historical volatility. Returns are repatriated into USD. The strategy is rebalanced as frequently as daily.

Equity Risk Premia

- **Equity Low Beta Strategy (yet to be launched):**
Seek to capture the low beta risk premium in equities. Portfolios of low beta stocks have often historically matched or beaten broader equity market returns, and have often done so with significantly lower volatility. At the same time, high beta stocks have significantly underperformed, exhibiting lower returns while appearing to take much more risk. The strategy takes long positions in low beta stocks and short positions in market index futures. It trades in two regions, US and EU, with the investment universe defined as S&P 500 for US and all stocks denominated in EUR/GBP/CHF from the STOXX Europe Large 200 Index (approx. 190 names). The beta score for each stock is measured vs. S&P 500 (for US) and vs. MSCI Europe (for EU). The strategy holds long positions in the bottom 20% of low beta stocks in each universe with equal weighting, and short positions in the S&P 500 (for US) and a basket of EStoxx50, FTSE and SMI Index futures (for EU). Both the long and short legs are adjusted to have beta of 1.0. The portfolio has a target volatility of 10% measured over three-month time window. The strategy is rebalanced on a monthly basis.

A stop-loss mechanism is enacted which will dynamically reduce losing positions. The stop-loss signal is calculated using the exponentially-weighted price momentum for each position, which acts to scale down or scale back up the position size. Momentum is defined by three moving-average crossovers: 6-60 days, 9-90 days and 12-120 days, with exponentially weighted (half-life) on both legs – equivalent decay factor of $0.93 = 0.5^{(1/10)}$, e.g. in the 120-day window it weights half of the weight at the latest data point. Each moving-average crossovers are equally weighted and the strength of the signals determines how fast the position sizes are adjusted.

Portfolio Construction

The portfolio construction process is straightforward: strategies are weighted based upon the inverse of their volatility. GSAM does not use a covariance matrix within the process as it believes that in a crisis it is highly likely the covariance matrix among sub-strategies may change dramatically so that the portfolio risk would be understated. The aggregate portfolio is diversified across asset classes as well as by strategy construction and return drivers. GSAM believes these fundamental factors are more reliable than quantitative measures such as correlation or covariance.

The strategy has a target volatility of 10%. The portfolio construction model first scales each sub-strategy using simple time series (i.e. without trend overlays) to 10% volatility, then applies an equal weighting allocation among the sub-strategies. The resulting portfolio is then scaled proportionally to achieve its aggregate 10% volatility target. During the scaling process, covariance among the sub-strategies is considered in order to measure the ex-ante portfolio volatility, which differs from their philosophy of avoiding using covariance matrix. However, we believe this is the only feasible way to control the portfolio volatility around the target. Over the long term, we would anticipate the portfolio will slightly undershoot the 10% volatility target because of the following two reasons:

1. the resulting portfolio trades the actual sub-strategy series (with the trend-driven risk reducing overlay)
2. when certain sub-strategies are in switch-off mode, their risk budgets will not be re-distributed to the other sub-strategies in the portfolio. This is similar to a hedge fund that allocates risk only as opportunities arise, in that they do not want to inadvertently lever up other strategies simply because risk has been reduced elsewhere.

Nevertheless, we think this approach is appropriate and more conservative than the alternatives.

Portfolio level risk management

- Minimum amount for unencumbered cash in the portfolio is 25%. This is an implicit limit on portfolio usage of leverage.
 - The average margin to equity ratio is 0.38 for the DARP portfolio. A margin cap of 0.75 is applied to the final portfolio construction.

- If the risk model reflects a theoretical worst-case scenario of greater than -30% (forward looking based on current positions) all positions are reduced proportionally to maintain that threshold.
 - In a simulated pro-forma time series, this threshold was breached four separate months in 2013 and 2014. However, the resulting impact to the portfolio was insignificant as the cap reduced performance by just 0.22% in 2013 and improved performance by 0.06% in 2014 (see table below).

	Drawdown Scaling Factor	Pro-forma	Pro-forma with cap	trade-off	
	(A)	(B)	(A x B)	(A x B - B)	
31/01/2013	0.90	2.17%	1.94%	-0.22%	→ 2013 loss: -0.22%
28/02/2013	1.00	3.06%	3.06%		
31/03/2013	1.00	2.02%	2.02%		
30/04/2013	1.00	4.58%	4.58%		
31/05/2013	1.00	-1.77%	-1.77%		
30/06/2013	1.00	-1.38%	-1.38%		
31/07/2013	1.00	-0.36%	-0.36%		
31/08/2013	1.00	1.56%	1.56%		
30/09/2013	1.00	-4.27%	-4.27%		
31/10/2013	1.00	0.08%	0.08%		
30/11/2013	1.00	-1.03%	-1.03%		
31/12/2013	1.00	-1.78%	-1.78%		
31/01/2014	1.00	0.72%	0.72%		
28/02/2014	1.00	0.11%	0.11%		
31/03/2014	1.00	-1.22%	-1.22%		
30/04/2014	0.83	0.62%	0.51%	-0.10%	} 2014 gain: 0.06%
31/05/2014	0.94	2.06%	1.94%	-0.12%	
30/06/2014	0.85	-1.95%	-1.66%	0.29%	
31/07/2014	1.00	-0.58%	-0.58%		
31/08/2014	1.00	2.33%	2.33%		
30/09/2014	1.00	7.17%	7.17%		
31/10/2014	1.00	1.37%	1.37%		
30/11/2014	1.00	3.45%	3.45%		
31/12/2014	1.00	0.93%	0.93%		

Source: GSAM, Arden Research

These two risk features were developed in mid-2014 and have become standard building blocks in their infrastructure.

Please note that the pro-forma analysis in the Performance section below does not include the implementation of these two risk features.

INVESTMENT THESIS SUPPORT/PERFORMANCE ANALYSIS/OTHER ANALYTICS

Performance Backtest (net of transaction costs and 1.0% management fee)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000													
2001		1.85%	3.10%	0.52%	2.64%	0.22%	-0.35%	1.73%	2.31%	1.42%	-1.32%	4.06%	17.26%
2002	-2.55%	2.48%	2.78%	8.88%	0.49%	-2.94%	-0.63%	3.21%	3.65%	-1.93%	-2.30%	7.88%	19.77%
2003	0.55%	6.83%	-0.95%	3.38%	7.08%	0.87%	-1.82%	0.92%	3.91%	2.58%	1.38%	5.55%	34.31%
2004	-0.66%	5.97%	2.59%	-2.91%	0.52%	2.56%	3.93%	2.02%	5.57%	3.04%	5.33%	2.39%	34.47%
2005	2.79%	2.42%	2.39%	-0.25%	3.40%	2.67%	1.84%	4.35%	1.61%	-0.68%	5.75%	3.03%	33.37%
2006	9.80%	0.48%	4.26%	7.34%	0.31%	1.35%	0.68%	3.73%	1.48%	3.64%	1.28%	3.84%	45.01%
2007	5.35%	-1.58%	0.88%	6.48%	2.71%	-1.48%	-3.47%	0.04%	2.24%	3.26%	4.54%	0.77%	21.05%
2008	3.15%	10.20%	1.65%	-0.33%	4.26%	2.10%	-1.62%	-1.57%	2.57%	3.72%	1.00%	2.79%	31.10%
2009	-0.11%	0.22%	0.70%	1.14%	2.62%	-1.81%	3.74%	3.29%	5.37%	1.82%	6.57%	-2.61%	22.57%
2010	2.06%	-0.11%	1.94%	1.70%	-6.31%	1.00%	0.95%	3.22%	5.85%	5.56%	0.07%	1.64%	18.44%
2011	0.86%	2.35%	0.06%	5.79%	1.02%	-1.56%	3.54%	-0.57%	0.48%	0.57%	2.41%	-0.68%	15.01%
2012	2.67%	3.38%	-0.18%	2.78%	6.11%	0.84%	5.67%	3.01%	0.85%	-0.77%	1.78%	-2.74%	25.63%
2013	2.17%	3.06%	2.02%	4.58%	-1.77%	-1.38%	-0.36%	1.56%	-4.27%	0.08%	-1.03%	-1.78%	2.56%
2014	0.72%	0.11%	-1.22%	0.62%	2.06%	-1.95%	-0.58%	2.33%	7.17%	1.37%	3.45%	0.93%	15.71%
2015	3.34%	-5.09%	-0.37%										-2.29%

Source: GSAM, Arden Research

Return Statistics	
Return Last 1 month	-0.37%
Return Last 3 months	-2.29%
Return Last 6 months	3.42%
Return Last 1 year	13.53%
Annualized Return	23.07%
Annualized Return Last 3 years	11.20%
Annualized Return Last 5 years	13.81%
Annualized Outperformance vs S&P 500 Tot	18.06%
Annualized Outperformance vs Arden Hedge	15.05%
Risk Statistics	
Annualized Volatility	9.54%
Skewness	0.25
Excess Kurtosis	0.59
Correlation to S&P 500 Total Return	0.02
Bull Correlation to S&P 500 Total Return	0.01
Bear Correlation to S&P 500 Total Return	-0.09
Beta to S&P 500 Total Return	0.02
Bull Beta to S&P 500 Total Return	0.01
Bear Beta to S&P 500 Total Return	-0.08
Annual Sharpe Ratio (Rf= 0.25%)	2.39

Source: GSAM, Arden Research

The DARP portfolio has an impressive pro-forma/backtest performance and Sharpe ratio, even during the “difficult environment” for risk premia strategies over the last 2-3 years. The pro-forma performance should be greatly discounted, however, as most of sub-strategies have less than 24 months live track record. However, it is noted that since the second half of 2014 (mostly based on live track record from underlying sub-strategies), when the market environment became more favorable for risk premia strategies due to increasing market volatility and continued spreads widening, the DARP portfolio has illustrated strong performance that is in line with our expectations.

The DARP portfolio combines a diversified mix of return/risk drivers from the underlying sub-strategies resulting in simulated performance, which exhibits low/zero correlation (0.02) and beta (0.02) to the US equity market (S&P 500) over last 14 years.

Return Attribution by sub-strategies

	AB Trend Commods	AB Trend Rates	BCS	Bond UPC	Commod Carry	Commod Momentum	Credit Curve	Credit HY- IG	Cross Market Carry	FX Carry	FX Value	Low Beta	Fed Funds
2001	1.1%	4.1%	1.1%	4.5%	1.8%	0.3%	-1.9%	-3.4%	2.6%	2.7%	0.1%	0.8%	3.5%
2002	-2.0%	3.6%	0.4%	4.2%	-0.6%	1.3%	-1.8%	-0.2%	3.3%	6.3%	3.4%	0.5%	1.7%
2003	1.5%	0.2%	1.5%	3.4%	0.6%	0.3%	4.3%	3.0%	2.6%	6.4%	2.9%	3.8%	1.2%
2004	1.2%	-0.1%	0.9%	1.8%	3.8%	0.8%	5.7%	1.1%	1.2%	5.0%	4.3%	4.7%	1.4%
2005	1.8%	-0.4%	3.4%	4.1%	4.2%	0.9%	4.0%	3.2%	-0.4%	2.3%	-0.4%	4.6%	3.3%
2006	2.5%	0.6%	3.2%	0.9%	3.0%	4.7%	2.0%	3.5%	4.3%	0.7%	3.1%	6.0%	5.2%
2007	1.8%	1.5%	1.5%	0.4%	-0.5%	1.8%	-0.3%	5.8%	2.0%	1.9%	-1.6%	1.3%	5.3%
2008	4.4%	5.8%	3.6%	3.9%	1.5%	0.9%	-0.3%	0.3%	1.8%	0.3%	4.8%	0.2%	2.0%
2009	-1.0%	1.3%	3.3%	2.3%	2.5%	2.5%	3.6%	3.4%	-0.7%	1.5%	1.6%	1.6%	0.2%
2010	0.5%	3.5%	1.5%	3.3%	1.4%	-1.8%	1.2%	5.4%	2.4%	0.3%	-0.2%	1.0%	0.2%
2011	-1.1%	3.8%	0.6%	0.5%	-0.1%	0.3%	1.9%	0.4%	3.4%	0.7%	0.2%	4.5%	0.1%
2012	-1.6%	1.7%	3.3%	1.5%	2.9%	-2.1%	10.3%	5.3%	0.5%	0.7%	0.4%	1.8%	0.1%
2013	-1.2%	-3.5%	0.7%	-1.7%	-0.2%	0.6%	5.4%	2.8%	-2.6%	-1.6%	0.7%	4.4%	0.1%
2014	4.0%	-1.3%	-2.9%	2.2%	-4.5%	5.7%	0.3%	1.2%	1.1%	0.4%	2.9%	7.2%	0.1%
2015 Q1	0.4%	0.3%	0.0%	-1.1%	0.0%	-0.8%	-1.0%	0.0%	0.4%	0.4%	-0.2%	-0.1%	0.0%

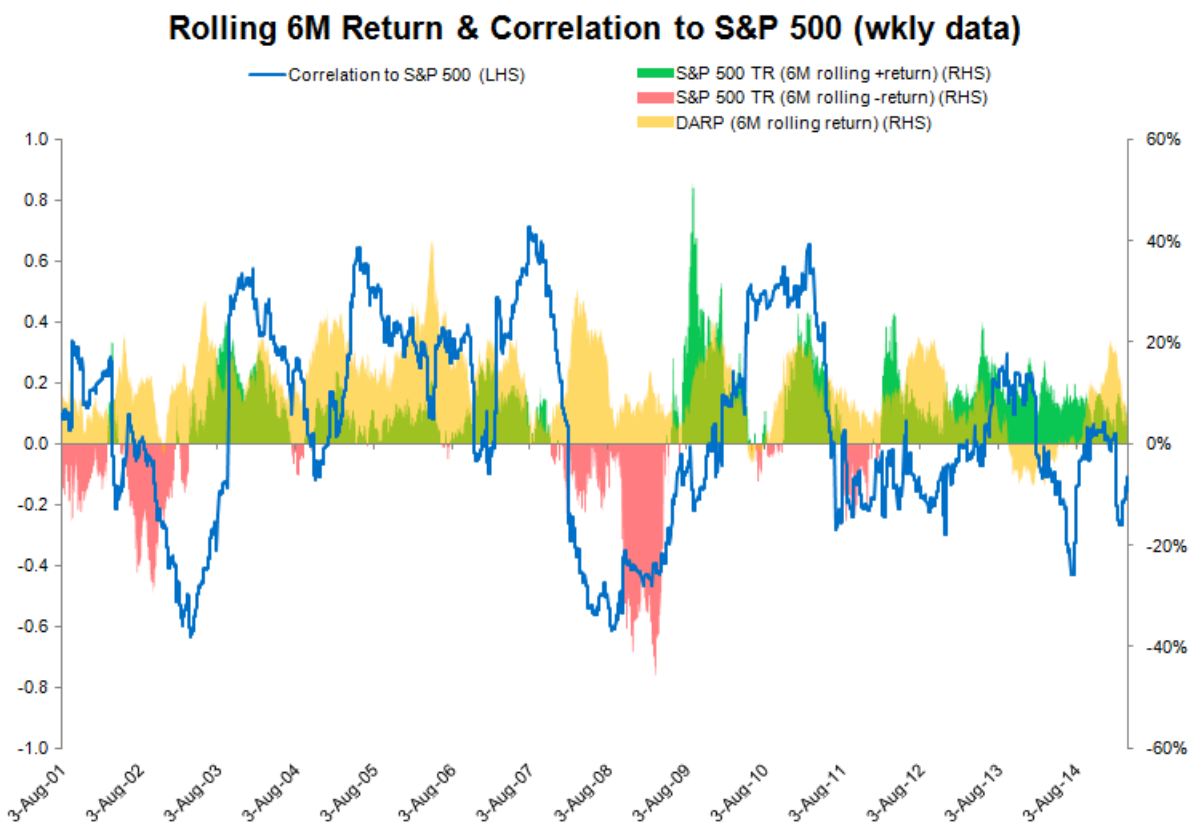
Source: GSAM, Arden Research

Below is a heat map of rolling 24-month sub-strategy performance attribution vs. S&P 500 total return over the same periods. Rolling returns for the S&P 500 are sorted in ascending order as shown on the far left.

Source: GSAM, Arden Research

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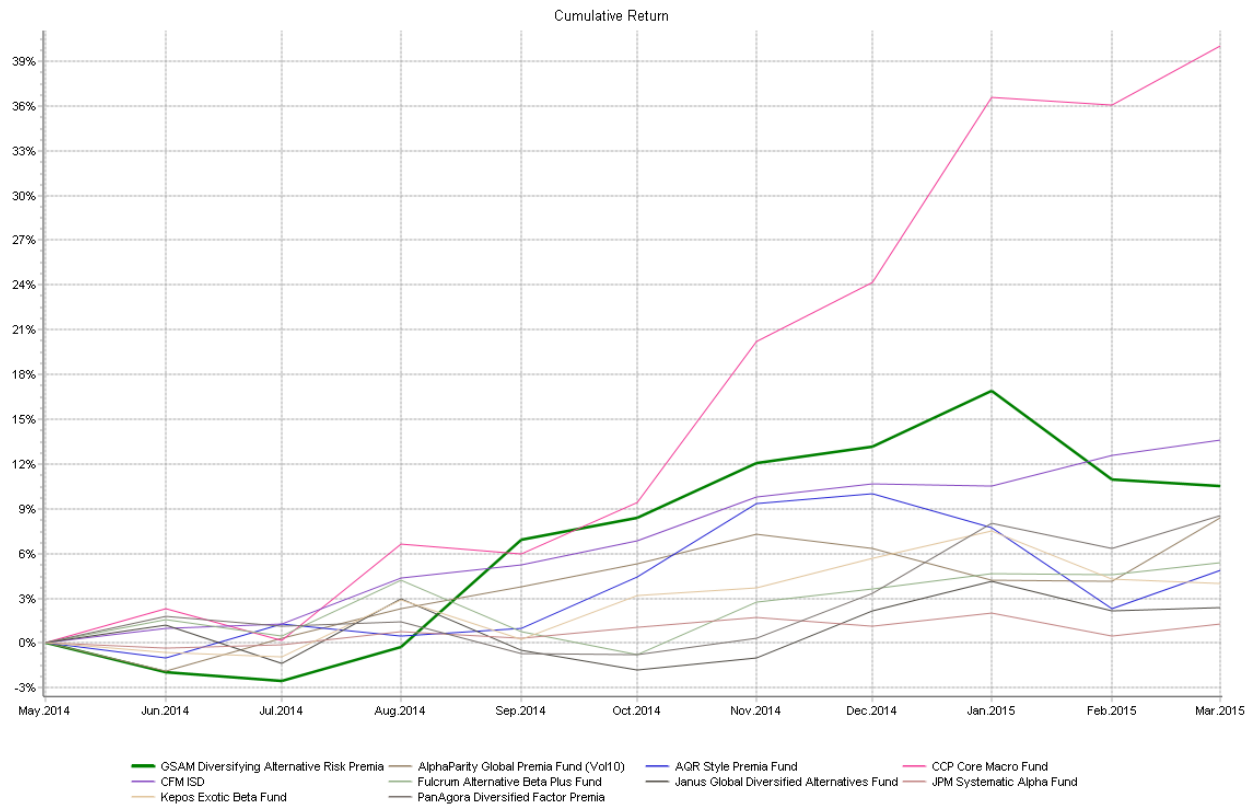
The chart below shows the rolling 6-month correlation to S&P 500 TR and rolling performance of the portfolio vs. S&P 500 TR. Although over the long term, the equity correlation is low on average, over a rolling 6-month window we can see the time-varying behavior of the correlation (blue line in chart below) as it ranges between +0.80 to -0.60. It is interesting to see that during strong equity markets (green area in chart below) the portfolio tends to have a higher positive correlation, while during periods of equity market stress (red area in chart below), the portfolio tends to be strongly negatively correlated. Most importantly, the rolling performance of the DARP strategy (yellow area in chart below) also demonstrates that the portfolio can be profitable across various market environments.



Source: GSAM, Arden Research

Peer Group Analysis

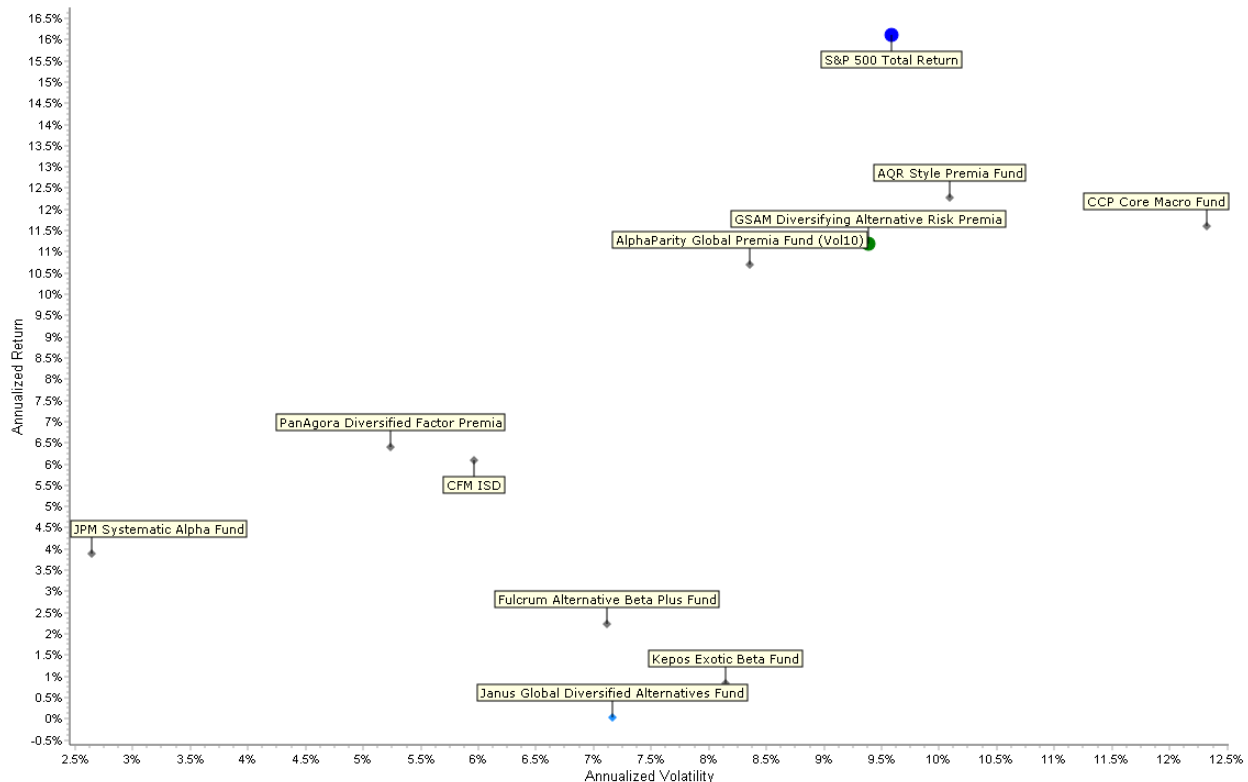
Since June 2014, when most of strategies started live trading, the DARP portfolio has outperformed most peers.



Source: Managers, Arden Research

While GSAM and most of their peers have relatively short live track records, we have included backtests for the last 3 years. Over this time period, GSAM DARP shows an attractive return profile on both absolute and risk-adjusted basis. Nevertheless, we should always be cautious when forming opinions based on simulated performance.

Peer Group Scatter Chart (last 3Y)



Source: Managers, Arden Research

PARTNER PROFILE/REFERENCES

Dr. Stephan Kessler, Head of Research at AIS, GSAM, 2010-present

EMPLOYMENT HISTORY

Morgan Stanley Investment Management, portfolio manager for a quantitative multi-strategy fund

Prior to Morgan Stanley, Kessler acted as founding partner of a financial consulting company in Switzerland. Today, Kessler is still a lecturer for financial modeling at University of St. Gallen.

EDUCATION

University of St. Gallen, PhD in Economics

University of Mannheim, Master in Economics and Business Administration

Gary Chropuvka, Head of Customized Beta Strategies within QIS, GSAM, 1999-present

EMPLOYMENT HISTORY

GSAM, co-heads global client portfolio management for GSAM's Quantitative and Fundamental Equities businesses

GSAM, portfolio manager for Quantitative Equity business

GSAM, analyst in the Private Equity Group

Morgan Stanley, analyst in the Correspondent Clearing Group

EDUCATION

Columbia University, Masters in Financial Engineering

Rutgers University, BA in Mathematics

CFA charter holder

Jacob Buitelaar, Head of AIS Strat Team, GSAM, 2006-present

EDUCATION

Delft University of Technology, MSc in Applied Mathematics

Erasmus University Rotterdam, MSc in Econometrics

Alexander De Feo, Portfolio Manager within QIS, GSAM, 2013-present

EMPLOYMENT HISTORY

Credit Suisse Asset Management, portfolio manager for 12 alternative beta funds

Bank of America, research analyst in the Fund of Hedge Fund Group

EDUCATION

University of California, MS in Mechanical Engineering

Massachusetts Institute of Technology, BS in Mechanical Engineering

RECOMMENDED FOR INVESTMENT:

☒ YES ☐ NO _____ Other Recommendation (explain)

Other items:

☒ Reference checks ☒ HedgeMark

RISK MANAGEMENT/QUANT REVIEW

SUMMARY OF RISK RANKINGS

Category	Score*
Risk overall	2.0
Risk environment	1.0
Portfolio risk	2.0
Liquidity/complexity	2.0
Portfolio concentration	1.0

*Key: 1 (best) – 4 (worst)

EXECUTIVE SUMMARY AND CONCLUSION

GSAM Diversifying Alternative Risk Premia strategy employs a systematic multi-asset approach to investing predominantly in equities, bond and rate futures, CDX, FX forwards and commodity futures. As a systematic strategy, investment risk management is embedded within the strategy and portfolio construction process. Risk management is more emphasized on the sub-strategy level since each sub-strategy is managed independently and can be offered on a stand-alone basis. The portfolio as a whole is highly levered mainly due to trading margin-based investment instruments; however, a portfolio leverage control measure based on margin-to-equity is employed. Leverage is continuously adjusted on a systematic basis to achieve the target volatility at the portfolio level, which is determined based on the covariance among the underlying strategies and their realized volatility.

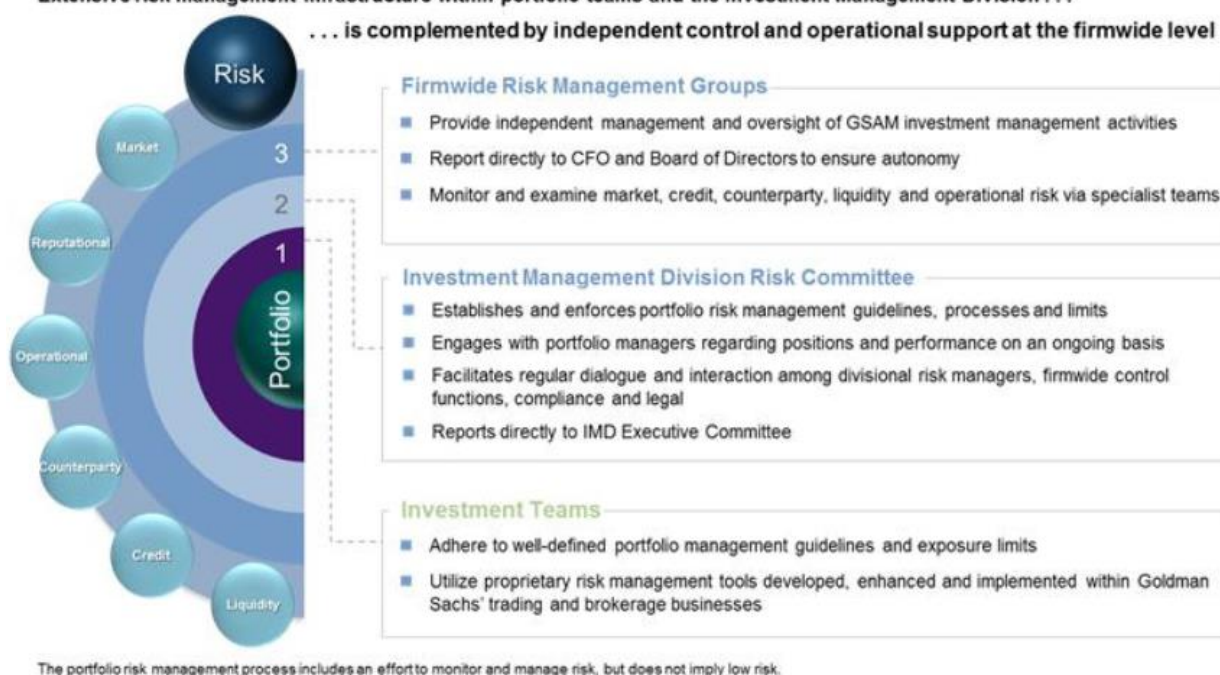
Overall, while the portfolio employs significant leverage, the embedded risk management at the sub-strategy level mitigates the potential large drawdowns.

RISK ENVIRONMENT

The Investment Management Division (IMD) Global Risk Management team is responsible for coordinating the risk management process across all the various business lines within IMD. The team consumes independent risk reporting produced by the various independent risk teams in the Goldman Sachs Federation (that includes Market Risk Management & Analysis Department's IMD Market Risk Analysis Group, Operational Risk Management & Analysis Department, Credit Risk Management & Advisory Department, Controllers, Compliance, Legal and Operations), and engage with portfolio managers, CIOs and embedded risk managers when necessary. The risk manager does not have authority to override the portfolio manager and exit trades.

Extensive risk management infrastructure within portfolio teams and the Investment Management Division . . .

. . . is complemented by independent control and operational support at the firmwide level



Source: GSAM

The firm-wide Risk Management Group as well as the IMD Risk Committee are led by senior partners of the firm. Additionally, the firm-wide Risk Management Group, which provides independent management and oversight of GSAM investment management activities, reports directly to the Chief Financial Officer and Board of Directors to ensure autonomy.

The IMD Risk Committee is globally responsible for monitoring and controlling the financial risks associated with the activities of IMD. The Committee reviews market, counterparty credit and liquidity risk and sets thresholds or targets as appropriate. The Committee is chaired by the IMD CRO and reports to the CRO of Goldman Sachs. The Committee meets bi-weekly.

Each portfolio management team within GSAM has its own methodologies to manage risk for the Goldman Sachs Funds. In addition to the risk management processes by asset class shown below, the independent Market Risk Analysis (MRA) group is responsible for measuring and monitoring risk across all portfolios managed directly by GSAM. MRA provides an independent risk view to the IMD Risk Committee and presents a risk assessment to the pooled vehicle's board of directors at each board meeting.

Within the quantitative area of GSAM, they have developed proprietary daily risk models that assist them in the investment process to assess the overall risk, and risk concentrations, within each portfolio. They also manage the strategy such that the ex-ante tracking error is equal to their targeted tracking error. The ex-post tracking error is monitored on a daily basis by the Market Risk Analysis (MRA) team.

MRA uses an exception-reporting engine to identify unusual concentrations or behaviour on a daily basis. Usually, after a conversation with the portfolio manager, no action is taken. Occasionally, a change in the market or the portfolio occurs that requires that a concentration (this could be due to an overweight or underweight) be reduced or that the overall risk of a portfolio be increased or decreased. This decision is driven by the client, the portfolio managers and MRA team based on the client's preferences and the market environment. The portfolio manager may then work with MRA to remedy the situation and ultimately MRA will re-run the portfolio to verify the concentration or variance has been reduced (or increased). Given the exception-driven nature of their risk management process, time spent on risk management of risk premia strategies is dictated where attention is most needed day-to-day, rather than by static time allocations.

GSAM employs state-of-the-art risk management models, including their proprietary risk models, to assist in the monitoring and management of market risk, as well as helping to ensure that risk-related client guidelines are being met, and to pinpoint and quantify sources of risk within a specific portfolio.

Their risk models enable them to estimate absolute tracking error, as well as how the tracking error is allocated across the exposures in the portfolio. In this way, the models can pinpoint how much an overweight or underweight position in any given asset within the benchmark is contributing to the overall tracking error of the portfolio.

This approach allows them to reflect their view most efficiently to maximize expected targeted excess return at a pre-determined level of risk. Proposed portfolio allocation changes can be entered into the models and the impact on portfolio risk and contribution to risk assessed before the investment is implemented.

No model that is used to predict risk is perfect, and the use of any model must incorporate a clear understanding of its limitations. In order to limit the effects of rapid changes in the underlying covariance matrix, their risk models incorporate daily data points in its analysis and gives greater weight to more recent data.

There are two risk controls applied on the portfolio level:

- Minimum amount for unencumbered cash in the portfolio is 25%. This is an implicit limit on portfolio usage of leverage.
 - The average margin to equity ratio is 0.38 for the DARP portfolio. A margin cap of 0.75 is applied to the final portfolio construction.
- If the portfolio hits a -30% worst-case scenario (forward looking based on current positions), all positions are reduced proportionally to maintain that threshold.
 - The breach occurs over 4 months in 2013 and 2014 during the pro-forma analysis. The impact to the portfolio is insignificant as the cap reduces performance by 0.04% in 2013 and 0.05% in 2014.

The team claims that the impact on pro-forma performance by employing the above listed margin and drawdown caps is insignificant. These two risk features were developed in mid-2014 and have become standard building blocks in their infrastructure.

PORTFOLIO RISK

The IMD Global Risk Management team provides independent management oversight of the strategies. Given the team-oriented and iterative nature of their investment and research process, there is no specific investment committee or voting processes for the underlying strategies.

The portfolio management team has constructed the portfolio in a framework that seeks to manage risk. Each individual risk premia strategy includes embedded risk management techniques and overlays where possible. For example, the FX Carry strategy has a trend overlay which seeks to mitigate drawdowns. In addition to this, top level weights will be reduced if certain drawdown or margin requirements are breached at the overall portfolio level. The risk team also uses severe loss scenario analysis as an additional tool to evaluate risk.

The model portfolio construction has an embedded margin cap as well as a drawdown cap. For each rebalance date they freeze the underlying positions and simulate the model portfolio return back in time to calculate the maximum drawdown. If a breach in the drawdown or margin cap is reached, all positions are reduced proportionally. In the backtested results of the model portfolio, the breach occurs in 4 months during the 2013 to 2014 periods. The impact to the model portfolio is minimal as the cap reduces performance by 4bps in 2013 and 5bps in 2014.

The leverage calculations are indicative of the model portfolio's definition of leverage. These calculations are based on a model portfolio of \$1 and represent the sum of gross adjusted notional value. Calculations treat physical holdings and the notional value of derivatives the same.

- Fixed Income: Government bond exposures are converted to 10 year equivalents. \$1 long and -\$1 short for the same government entity is netted to 0.
- Interest Rates: Eurodollar and other 90-day maturity contracts are converted to 10-year equivalents.
- Credit: \$1 long and -\$1 short for the same credit with different maturities are netted to 0.
- Currencies: \$1 long and -\$1 short for a currency USD cross is represented as \$1.

With regards to capacity constraints, the team believe the model portfolio has substantial capacity for additional assets, especially given their systems capabilities and investment process. Should they feel that they are approaching capacity in any of their strategies, they will either temper their marketing efforts in that product or increase staffing to accommodate its

growth. Limitations on the number of accounts or assets will be based upon their continued ability to provide quality performance, service, and administration.

On the sub-strategy level, a stop-loss mechanism is enacted which will dynamically reduce losing positions. The stop-loss signal is calculated using an exponentially-weighted price momentum on each position, which acts to scale down or scale back up the position size. Momentum is defined by three moving-average crossovers: 6-60 days, 9-90 days and 12-120 days, with exponentially weighted (half-life) on both legs – equivalent decay factor of $0.93 = 0.5^{(1/10)}$, e.g. in the 120-day window it weights half of the weight at the latest data point. Each moving-average crossovers are equally weighted and the strength of the signal decides how fast to reduce/scale back positions.

LIQUIDITY/COMPLEXITY

The portfolio is designed to have daily liquidity, and the investment team believes in most circumstances this would be possible. However, since the portfolio is global, different holiday schedules may prevent the portfolio from being fully liquidated on the same day. Certain days, usually around holidays, can also have lighter than usual volumes. On days such as these, the trading team will use their judgment to execute trades with minimal impact to the market.

Since the trading strategy is focused on the most liquid FX and futures markets, plus some large cap developed market stocks and S&P options, their presence in the market is generally very small. They ensure that no position size would cause significant market impact.

A list of instruments the fund is currently able to trade is below.

Instruments Traded

CA 1	CLA 1	GCA 1	HGA 1	HOA 1	IAA 1	ILA 1	INA 1	IZA 1	LCOA 1
LGOA 1	NGA 1	RBA 1	SA 1	SBA 1	SIA 1	EDA 1	EDB 1	EDC 1	EDD 1
EDE 1	EDF 1	EDG 1	EDH 1	FEIA 1	FEIB 1	FEIC 1	FEID 1	FEIE 1	FEIF 1
FEIG 1	FEIH 1	FESA 1	FESB 1	FESC 1	FSSA 1	FSSB 1	FSSC 1	FSSD 1	FSS E 1
FSSF 1	FSSG 1	FSSH 1	YBA A 1	YBA B 1	YBA C 1	CGB A 1	FBTP A 1	FOAT A 1	YTCA 1
FV 1	TY 1	TU 1	US 1	CCA 1	CTA 1	KCA 1	KWA 1	LCA 1	WA 1
FC A 1	LHA 1	Credit CDX 5y	Credit CDX 10y	Credit ITEEU 5y	Credit ITEEU 10y	Credit CDXHY 5y	Credit ITEXO 5y	FGBL 1	FLG 1
JGB 1	USD/AUD 1m 1	USD/BRL 1m 1	USD/CAD 1m 1	USD/CHF 1m 1	USD/CLP 1m 1	USD/CNY 1m 1	USD/CZK 1m 1	USD/EUR 1m 1	USD/GBP 1m 1
USD/HUF 1m 1	USD/IDR 1m 1	USD/ILS 1m 1	USD/INR 1m 1	USD/JPY 1m 1	USD/KRW 1m 1	USD/MXN 1m 1	USD/MYR 1m 1	USD/NOK 1m 1	USD/NZD 1m 1
USD/PHP 1m 1	USD/PLN 1m 1	USD/RUB 1m 1	USD/SEK 1m 1	USD/SGD 1m 1	USD/TRY 1m 1	USD/TWD 1m 1	USD/ZAR 1m 1		
AIS Low Beta Long Stock Short Index Europe (Large Cap)					AIS Low Beta Long Stock Short Index US (Large Cap)				

Source: GSAM

The team currently has no calculation on the industry-wide capacity for each strategy and is in the process of creating a methodology for an estimate. They claim that it is difficult to state exact figures on capacity given the dynamic nature of markets, but believe by trading in the most liquid spectrum of every asset class it should serve to maximize the capacity of the strategies.

PORTFOLIO CONCENTRATION

The investment philosophy of the portfolio is based on a multi-strategy, multi-asset approach. There are 12 sub-strategies in total and trade across a highly diversified basket of assets. Each strategy has uncorrelated sources of returns (see correlation matrix below). Strategies are equally weighted by their realized volatility to avoid any strategy becoming a significant risk driver in the portfolio.

	FX Carry	FX Value	Low Beta	Commod Carry	Commod Momentum	Bond UPC	BCS	Cross Market Carry	AB Trend Rates	AB Trend Commods	Credit Curve	Credit HY-IG
FX Carry	1.00	-0.07	0.00	-0.04	-0.04	-0.01	0.10	0.06	-0.03	0.10	0.40	0.37
FX Value	-0.07	1.00	-0.07	0.07	0.03	0.10	-0.02	-0.01	0.12	0.21	-0.28	0.11
Low Beta	0.00	-0.07	1.00	-0.14	0.07	-0.13	-0.23	0.15	0.00	0.11	-0.05	0.02
Commod Carry	-0.04	0.07	-0.14	1.00	0.30	-0.17	0.05	-0.07	-0.11	0.06	0.05	0.00
Commod Momentum	-0.04	0.03	0.07	0.30	1.00	-0.01	0.03	-0.06	0.06	0.49	0.01	-0.02
Bond UPC	-0.01	0.10	-0.13	-0.17	-0.01	1.00	0.32	0.07	0.27	0.09	0.12	-0.08
BCS	0.10	-0.02	-0.23	0.05	0.03	0.32	1.00	-0.02	-0.04	0.09	0.23	0.10
Cross Market Carry	0.06	-0.01	0.15	-0.07	-0.06	0.07	-0.02	1.00	0.47	0.07	-0.21	-0.05
AB Trend Rates	-0.03	0.12	0.00	-0.11	0.06	0.27	-0.04	0.47	1.00	0.18	-0.15	-0.20
AB Trend Commods	0.10	0.21	0.11	0.06	0.49	0.09	0.09	0.07	0.18	1.00	0.00	0.01
Credit Curve	0.40	-0.28	-0.05	0.05	0.01	0.12	0.23	-0.21	-0.15	0.00	1.00	0.27
Credit HY-IG	0.37	0.11	0.02	0.00	-0.02	-0.08	0.10	-0.05	-0.20	0.01	0.27	1.00

Source: GSAM, Arden Research

The portfolio invests in a diversified basket of near 100 FX and futures markets, and hundreds of US and European large cap stocks. In addition, the portfolio may also hold as collateral significant amounts of US Treasury or short-term investments, including money market funds, repurchase agreements, cash and time deposits, which provide T+0 liquidity.

RECOMMENDED FOR INVESTMENT:

☒ YES ☐ NO _____ Other Recommendation (explain)

OPERATIONAL DUE DILIGENCE (“ODD”) REVIEW

SUMMARY OF ODD RANKINGS

Category	Score*
Overall score	1.0
Pricing/valuation	1.0
Organizational viability	1.0
Trade/flow/back office/IT	1.0
Ownership structure/management investment	1.0
Service providers	1.0
Current investor base	1.0

*Key: 1 (best) – 4 (worst)

OPERATIONAL SCORE

We assign an operational score of 1.0 (Green).

RECOMMENDATION

GSAM is an institutional organization with segregated functions and strong controls in place. Management continues to invest heavily in top talent, systems, technology and compliance. We noted no major operational flags or concerns that would prevent an investment with GSAM.

OVERVIEW

Goldman Sachs Alternative Management (GSAM) Alternative Investment Strategies (AIS) currently has about \$4.4bn in assets, and is one of the sub-strategies within GSAM's Quantitative Platform Group, which has about \$55.9bn in assets. The Quantitative Platform Group is just one of several divisions within GSAM, which currently has about \$1,204bn in assets under supervision.

GSAM AIS focuses on obtaining hedge fund like returns using hedge fund replication and alternative risk premia methodologies and uses several sub-strategies. GSAM is a division of the Investment Management Group, which is one of the four primary business lines of the Goldman Sachs Group, Inc. GSAM is headquartered in New York and has offices across the globe.

INFRASTRUCTURE OVERVIEW

- **Prime Brokers/Custodians:** N/A
- **Fund Administrator:** State Street (Luxembourg) acts as the Trustee Bank.

- **Auditor:** N/A – structured as a Trust with several individual managed accounts.
- **Legal:** Fried, Frank, Harris, Shriver & Jacobson
- **Systems:** Proprietary systems, SunGard system

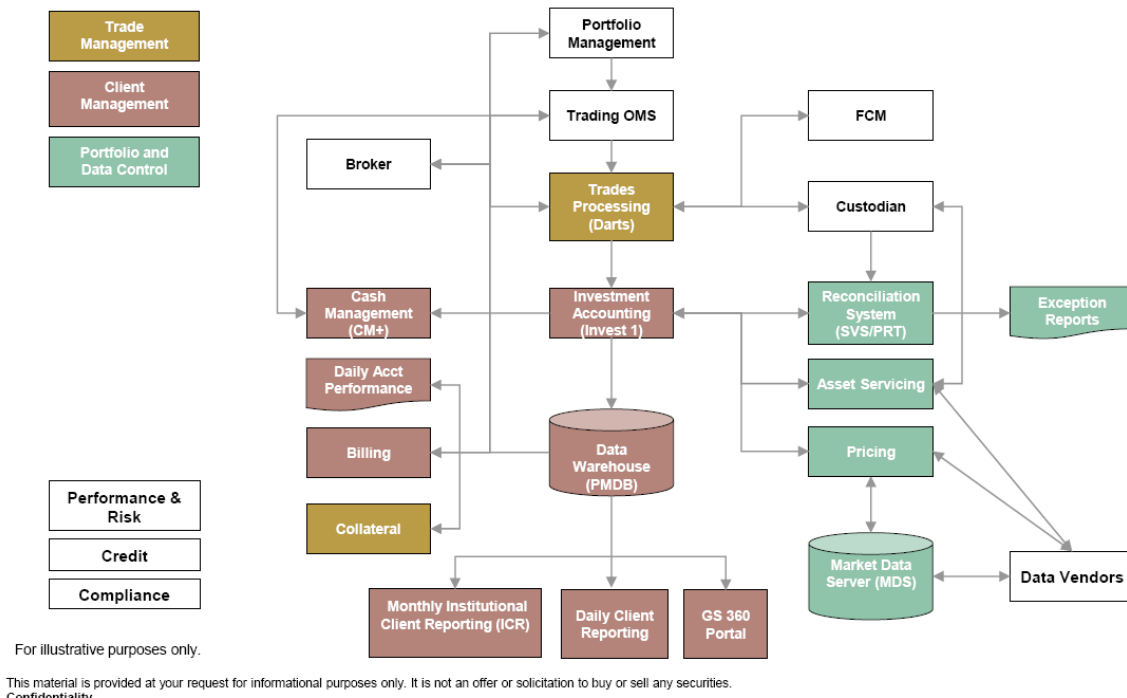
ODD MEETING SUMMARY

- **Ownership Structure:** GSAM AIS is just one of the numerous funds under GSAM. GSAM itself is a wholly-owned subsidiary of the publicly traded company Goldman Sachs Group, Inc.
- **Fund Structure:** GSAM will create a customized product for the proposed GSAM Diversifying alternative Risk Premia for MassPrim. This vehicle will operate as a separate managed account subject to management fees only.
- **Affiliated broker-dealer/entities:** Goldman Sachs Prime Brokerage is an affiliated entity of GSAM. GSAM, the investment advisor, uses several prime brokers and maintains an arms-length relationship with the affiliated prime broker.
- **Staffing:** The AIS portfolio management team is based in London, and the team comprises 20 dedicated professionals; 9 researchers and portfolio managers, 9 strategists and 2 execution traders. Researchers and portfolio managers are responsible for strategy development and management; strategists are responsible for overseeing the research, data cleaning, program implementation, infrastructure built-out and risk monitoring. The AIS team shares the following resources with other divisions across the GSAM Quantitative Platform; client portfolio management (22 staff members), information technology (38 staff members) and risk management (2 staff members). The AIS team has access to GSAM's robust operational and personnel infrastructure. GSAM has fully integrated this team with the firm's compliance, operational and technological program.
- **AUM:** GSAM currently has about \$1,204bn in assets under supervision. The GSAM Quantitative Platform, a division of GSAM, manages \$55.9bn across five core strategies. The breakdown across the GSAM Quantitative Platform is as follows; \$16.7bn in Equity Alpha, \$4.3bn in Macro Alpha, \$4.4bn in AIS, \$0.3bn in Active Beta Equity, \$8.2bn in Customized Beta and \$22bn in Tax Advantaged Core.
- **Investor Base:** Investor composition is not a primary concern because the investment will be made through a separate managed account. That said, GSAM has about 1,073 investor accounts in pooled accounts, and has about 24,658 separately managed accounts.
- **Service Providers:** See the list of providers above. GSAM's AIS is not a "fund" in the traditional sense but a combination of managed accounts managed with several strategies/programs hence does not have an auditor. State Street, in this case, serves as a trustee bank. State Street does not strike a "fund NAV" as there is no fund, but receives daily control reports with key metrics for monitoring and reporting on behalf of several trustee accounts. State Street independently sources prices and obtains quotes directly from brokers where applicable.

- **Counterparty Agreements:** The GSAM legal team plays an intricate role in counterparty negotiations and product development and helps to structure strong agreements where applicable.
- **Cash Management:** GSAM maintains liquid cash reserves and has tri-party repo arrangements as part of its centralized cash management process. GSAM reviews and updates the list of cash authorizers on a quarterly basis. GSAM provided Arden with the list of cash authorizers that includes their respective signatures. The fund administrator controls client inflows and outflows. The administrator also controls expense payments subject to appropriate approval and provision of adequate documentation by GSAM.
- **Leverage Facilities:** The strategy obtains leverage through the use of derivatives such as options, swaps, and futures.
- **Daily Ops & Controls:** GSAM has a centralized operation function led by Terri Messina, who joined the firm in 2011 and has over 30 years of industry experience. There are about 505 operations professionals in nine offices across the globe, which enables 24-hour support.

GSAM operations can be broken down into four core areas: client management, trade management, portfolio and data control and global projects and risk management. The client management division oversees account implementation and oversight, middle office account oversight, investment monitoring guidelines, client reporting and billing. Trade management function is responsible for trade confirmations and instructions, prime broker and executing broker management, collateral management and liquidity reporting and trading line management. The portfolio and data control oversees position exception processing and management, corporate action processing and data pricing. The global projects and risk management is responsible for managing strategic initiatives and providing operational risk management. The key theme here is that the operations function is centralized, well-organized and operates within an institutional framework.

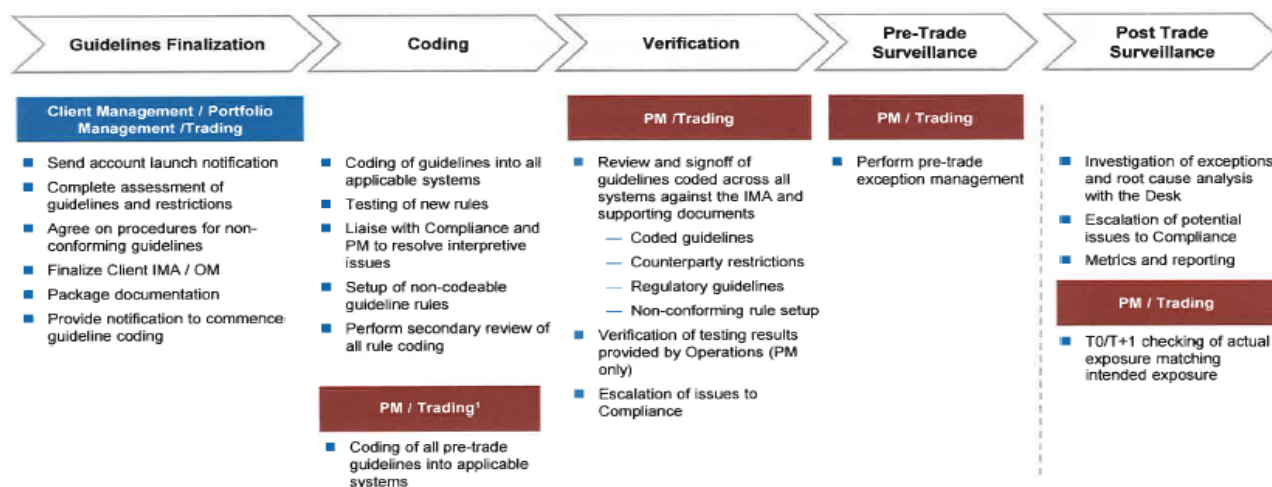
Transaction Life Cycle



Cash, positions and transactions are reconciled daily. On an annual basis, the GSAM operations team performs over 6 million trade confirmations, 7,000 asset-serving events, 3.2 million transactions reconciliations, and 52,000 security valuations among many other events. GSAM has invested heavily in automation and has hired several experienced personnel to oversee its operations.

GSAM has a dedicated investment guidelines operations team. This team, in close conjunction with the front office, helps with interpreting and reviewing proposed investment guidelines to determine code-ability. The operations team specifically reviews the testing and coding of guidelines in all applicable systems once the front office has initially entered the codes. Non-codeable guidelines or guidelines that cannot be automated are escalated for independent review. The independent review team establishes mitigating controls and oversight procedures for guidelines that cannot be coded. This is an important function especially for the proposed 40 Act Fund that requires compliance with specific trading guidelines. The proprietary system is built with pre- and post-trade notifications, and has a module to store supporting documents.

Overview of the Investment Guidelines Workflow



PWC issued an unqualified opinion for on the SSAE 16 report covering the period from 10/1/2012 through 9/30/2013. The SSAE16 review for the period from 10/1/2013 through 9/30/2014 is currently in progress.

• **Pricing & Valuations:** GSAM has a centralized valuation function that oversees the pricing of all securities across all funds. Pricing sources include Reuters, Bloomberg, and JP Morgan Pricing. GSAM uses a proprietary system to aggregate prices for OTC derivatives. The daily valuation process includes the designation of primary and secondary sources, transaction analysis, reviewing significant price movers and monitoring of market news. The valuation committee (VC) includes members from the board of trustees, compliance, controllers, risk and performance and product services. The valuation committee meets on a monthly basis and reviews and ratifies fair valuations done by the valuation oversight group (VOG). The VOG is part of the controllers department with the finance department of Goldman Sachs. The VOG is independent from GSAM. Core responsibilities of the VOG are administrator oversight, pricing verification, fair value recommendation and management reporting.

• **Fund Accounting/Tax/Audit:** The portfolio and data control team at GSAM has a redundant accounting process and maintains a parallel set of books and records to those of the fund administrator.

• **Regulatory Compliance/Legal Issues:** Per review of the interim background report, there were no criminal, legal or regulatory issues against Stephen Kessler (PM). GSAM has a strong compliance program that is intertwined with all aspects of its operations. The compliance team actively monitors and reviews key risk areas like valuation, trade aggregation and allocation, best execution among others. GSAM physically segregates its investment banking professionals from asset management and trading professionals. Furthermore, there are numerous security protocols and firewalls to restrict information flow between different business lines.

All employees are generally required to trade through a Goldman Sachs brokerage account and may not trade through another account unless the compliance department grants a formal exception. The compliance department has to pre-clear all trades and all trades are subject to a minimum of 30 to 90 days holding depending on the type of investment or employee's job function. U.S treasuries, mutual funds and certain other specific securities do not require pre-clearance.

- **IT/BCP:** GSAM has over 500 dedicated technology personnel that is part of the larger technology team of the parent company. Goldman Sachs has several levels of redundancy and given its global footprint, the firm has the capability to transition critical operations in the event of a regional disaster. GSAM has dispersed critical market activities such as trading, settlement, clearing and funding across the different regional and global locations to reduce vulnerability if one location goes down. Goldman Sachs also has hot site and warm/cold site capacity. There is no single point of dependency on any one location. The firm actively monitors threats, and has established firewalls, intrusion detection and virus protection technology. GSAM replicates data in real time to datacenters and maintains backup tapes at one the datacenters for immediate access. GSAM has near and far recovery sites in Chicago, New York, New Jersey, Mumbai, Bangalore, Osaka and Singapore.

GSAM's information security division is responsible for cyber security protection across the firm. The group monitors various threats using several intelligence service providers, industry consortia, government sources and internal resources. GSAM has a tiered network architecture that has multiple security zones, which creates a highly segregated environment. GSAM also has intrusion prevention systems (IPS) and intrusion detection systems (IDS).

- **Side Letters:** GSAM side letters will not affect this proposed investment. The proposed investment is through a managed account that only charges management fees and is liquid.

ASSESSMENTS/FLAGS NOTED

- GSAM is a sub-entity of Goldman Sachs and is subject to headline risk.
- GSAM is an operationally complex organization that operates in several jurisdictions and is subject to oversight from multiple regulators.

RECOMMENDED FOR INVESTMENT:

☒ YES ☐ NO _____ Other Recommendation (explain)

Other Items:

☒ Service provider verification ☒ Background Checks ☒ Manager Documents
☐ Other

Explain:

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