



PANAGORA DIVERSIFIED FACTOR PREMIA

MANAGER FUNDING RECOMMENDATION MEMORANDUM

PROTECTED MATERIAL



BACKGROUND INFORMATION	
Manager Name:	PanAgora Asset Management, Inc.
Fund Name:	PanAgora Diversified Factor Premia
Arden Strategy/ Sub-Strategy:	Systematic Relative Value
Coverage:	
Senior:	Henry Davis
Primary:	Liang Simon Lai
Secondary:	Jon Furer
Operational Due Diligence:	Chris Omueti
Date Submitted to IC:	
Date Approved by IC:	

FUND SNAPSHOT	
Inception Date:	August, 2013
Portfolio Manager (s):	Edward Qian (CIO), Bryan Belton, Kun Yang
AUM (\$\$ millions):	
Fund:	2.94
Strategy:	500
Firm:	39,533

TERMS/OTHER	
Fees:	
Management Fee:	0.40% for the first \$50mn; 0.35% for the next \$150mn; 0.30% for all amounts above
Incentive Fee:	Zero
Liquidity Terms:	Daily liquidity for managed account
Gate (yes, no, %, type):	No
Side Pocket (yes, no, max %):	No
Side Letter (yes, no):	No
Regulatory Registration:	
SEC:	Yes
FCA:	No
Other (specify):	NA
HedgeMark Approved (yes, no, other):	PanAgora is willing to use HedgeMark as a risk aggregation provider and is currently in discussion with HedgeMark directly.



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INVESTMENT REVIEW

SUMMARY OF INVESTMENT RANKINGS

Category	Score*
Overall outlook score	2
Return profile (right tail, left tail, core)	Core
Investment thesis: pros/cons/conclusion	2
Firm stability and background	2
Strength and quality of track record	2.5
Strength and quality of references	
Transparency/HedgeMark	1

*Key: 1 (best) – 4 (worst)

EXECUTIVE SUMMARY/RECOMMENDATION

PanAgora Asset Management offers a systematic factor premia strategy managed within its multi-asset team led by CIO Edward Qian. The strategy's goal is to generate attractive absolute returns through exposure to a suite of diversified sources of factor-based risk premia. The returns from these sources of factor premia are generated within a broad array of capital markets and include value, momentum, and macroeconomic-oriented factors. The portfolio's factor risk exposures are balanced across sources of risk premia to generate more stable returns that are generally uncorrelated with market risk premia.

The strategy consists of 20 sub-strategies across equity, bond, short-term rate, currency and commodity markets. Each sub-strategy is designed to capture a certain type of risk premium using a rules based approach. There are in total 30 different models that are applied across all sub-strategies. These models are constructed using strategic risk budgeting to minimize the aggregate systematic market risk exposure with a tactical re-weighting overlay based on changing market cycles.

The strategy is recommended for investment via a managed account.

INVESTMENT THESIS

INVESTMENT MERITS:

- PanAgora is one of the most experienced alternative risk premia players. The strategy has been running as an overlay strategy within their multi asset strategy since 2004. They are supported by a large quantitative asset management firm, which has well equipped infrastructure and technology for developing systematic strategies
- Diversified portfolio consisting of 20 risk premia sub-strategies utilizing a total of 30 different models. There is less “heavy engineering” involved in model implementation which reduces model risk
- Certain models are developed to complement others as enhancements to the overall factor premia capture, and also act as individual sources of returns
 - For instance, the DM FX risk aversion model is designed to have negative correlation to the DM FX carry model during increasing volatility environments
- Very thorough portfolio construction process that incorporates both strategic and tactical elements; it also diversifies risk across all models, with appropriate leverage caps in place to limit concentration risk. In order to minimize the aggregate systematic market risk, instead of using a beta hedging overlay, as is commonly applied by their peers, PanAgora applies strategic risk budgeting by using strategies that are negatively correlated to markets to “hedge” the ones that are positively correlated. This approach implicitly reduces both trading costs and basis risk. In addition, the aggregate market risk target can be customized to match clients’ existing portfolio exposures
- The strategy has low correlation and beta to market risk premia
- Good transparency into model implementation and portfolio construction techniques
- Highly liquid profile as it trades the most liquid future contracts and FX forwards – the entire portfolio can be fully liquidated in less than a week without notable price distortions, in normal market conditions
- Attractive management fees

KEY CONCERNS:

- Performance of the live track record is limited and the most recent period in the backtest have been somewhat lacklustre. PanAgora believes the increasing number of participants entering the space may be having a crowding effect, particularly for the most common risk premia strategies such as carry and value. However, value factor is one of the main factors being used in active equity portfolio management for decades and it is our view that there is unlikely any crowding issues in this regard. We believe

that the risk-on/risk-off central bank policy driven market has also proven to be a difficult environment for risk premia capturing strategies

- The “final” portfolio/strategy has only been in place for a few months since they last made further changes to the portfolio in early 2014
- The tactical timing exposure to factor risk premia is purely based on historical risk adjusted returns (Sharpe ratio) as opposed to changes in the market environment. Also, when the Sharpe ratio is negative, it can be a somewhat misleading measure
- Equity value signal uses forward earnings yield because it generated the best information ratio based on historical backtest – could be potential data fitting in the model by cherry picking the best performing signal
- No stop-loss or drawdown control will lead to significant losses
 - Although the model applies a momentum driven tactical shifts that acts implicitly as a drawdown control

CONCLUSION

The team is one of the most experienced groups in the space, having run a risk premia strategy since 2004. The large asset management firm also provides supports and stability to the team. The strategy consists of a diversified portfolio of risk premia models that has a solid portfolio construction process using an efficient proprietary risk budgeting process to minimize portfolio concentration risk and market risk. The backtest performance seems impressive, but the short live track record has been somewhat lacklustre.

The strategy’s uncorrelated return profile to market beta as well as to other risk premia strategies can become a good diversifier.

Recommended for investment.



MANAGER/STRATEGY REVIEW & ANALYSIS

FIRM OVERVIEW/BACKGROUND

PanAgora Asset Management is a Boston-based registered investment advisor founded by Eric Sorensen, Ph.D., in 1989. The firm was spun out of Putnam Investments, where Eric was Head of Quantitative Research. In 2006, Putnam sold their controlling 66% interest in PanAgora to Power Financial Corporation. Nippon Life Insurance owns 14%, and PanAgora employees own the remaining 20%. Today the firm has 106 employees all in the Boston office, 33% of which are on the investment team.

PanAgora manages \$40bn across global/international equity (43%) US equity (34%), and multi-asset/risk parity strategies (23%).

The Diversified Factor Premia strategy has \$500mn in assets managed as an overlay strategy within their multi-asset portfolio, running at 3% volatility target. The strategy being considered for investment has a 10% volatility target and is expected to mirror the \$3mn internally seeded account, which re-launched in August 2013. They have been running the strategy since 2004 and it has since evolved to become a much more diversified portfolio than its original strategy. The final form of the strategy was implemented in August 2013, when the standalone trading account started. It is also important to note that the strategy has continued to evolve and they have added a few more strategies and changed/added several leverage controls in early 2014.

The team managing the strategy sits within the broader multi-asset investment team. The highlighted names below are members of the team who on a daily basis work on the Factor Premia strategy, with Qian, Belton and Yang being the key individuals.

Multi Asset investment team

Name	Title	Area of Focus
Edward Qian, Ph.D., CFA	CIO and Head of Research, Multi Asset	Architect of Risk Parity framework, oversight of Multi Asset group, research and implementation
Bryan Belton, CFA	Director, Multi Asset	Fixed income, currency and commodities research and implementation
Mark Barnes, Ph.D.	Director, Multi Asset	Equity research and implementation
David Liddell	Director, Multi Asset	Equity implementation
William G. Zink	Director, Multi Asset	Equity implementation
Nicholas Alonso, CFA	Portfolio Manager, Multi Asset	Equity research and implementation
Jonathan Beaulieu, CFA	Portfolio Manager, Multi Asset	Fixed income research and implementation
Anthony Borthwick, CFA, CMT	Portfolio Manager, Multi Asset	Fixed income, currency and commodities research and implementation
Kun Yang, Ph.D., CFA	Portfolio Manager, Multi Asset	Currency and equity research and implementation
Randall Yaras	Portfolio Manager, Multi Asset	Equity implementation
Anne Ma, Ph.D.	Research Analyst, Multi Asset	Multi Asset research
Timothy Doyle	Portfolio Analyst, Multi Asset	Portfolio implementation
James Alberto	Analyst, Multi Asset	Software application developer
Justin Neal	Analyst, Multi Asset	Software application developer

Source: PanAgora

INVESTMENT STRATEGY

The Diversified Factor Premia strategy offers a systematic relative value risk premia strategy that provides exposure to a suite of diversified sources of risk premia within a broad range of asset classes based on factors such as value, macro and momentum. The proposed strategy will run with a 10% volatility target, and offers attractive flat management fees of 0.40% for the first \$50mn, 0.35% for the next \$150mn and 0.30% all amounts above.

INVESTMENT PROCESS

Select Factor Premia

The team starts by identifying factor risk premia that are supported by empirical analysis and academic research, and are economically intuitive. The factor risk premia also need to be uncorrelated with market risk premia. The table below shows the sub-strategies the fund consists of:

Commodities	Sovereign Fixed Income	Equity Countries	U.S. Term Structure	German Term Structure	DM Currency	EM Currency
Roll Yield	Momentum	Value	Momentum	Momentum	Momentum	Momentum
Momentum	Level	LEI	Roll Yield	Roll Yield	Carry	Carry
	Slope	TWFX	Macro Slope	Macro Slope	Macro	Macro
	Curvature	Sentiment Momentum	Macro Curvature	Macro Curvature	PPP	
	Macro				Risk Reversal	

Source: PanAgora

Equity

- Value:
 - The sub-strategy compares forward earnings yield across 13 countries' equity indices grouped in four regional baskets (North America: US, Canada; Europe ex-Eurozone: UK, Sweden; Eurozone: France, Germany, Spain, Italy, Netherlands; Asia Pacific: Japan, Hong Kong, Australia, Singapore), and takes long positions in the ones with higher yields and shorts the ones with lower yields within each basket. Their research shows that all value indicators (book-to-price, cash-to-price, etc.) are highly correlated to each other. In order to keep the simplicity of the model, it only selects the signal that generates the best Information ratio based on historical backtest. For equities, the backtest goes back as far as 1990. The models are dollar neutral
- Macro:
 - Trade weighted exchange rate (TFX) model: the model compares TFX across eight countries' equity indices grouped in three regional baskets (North America, Europe ex-Eurozone and Asia Pacific) as cheaper TFX leads to improved export competitiveness and domestic employment, which in turn tends to result in better equity market performance within each basket (and vice versa). This model does not trade the Eurozone basket as the countries use the unified trading currency. The models are dollar neutral
 - Leading Economic Indicator (LEI) model: the model uses the LEI composite across the same three regional baskets as improved LEI tends to predict stronger macroeconomic activity, which tends to lead to better equity market performance within each basket (and vice versa). The LEI data used in the models are actual realized data instead of revised data, whereas the latter would be more accurate but does not come in time for the rebalancing schedule. This strategy also excludes Eurozone countries as there is only one LEI data for the region. The models are dollar neutral
- Sentiment:
 - The model compares analyst earnings revision for all the underlying constituents for each of the 13 countries' equity indices over a 3-month window and aggregates a total momentum signal for each country, taking long positions in countries with high earnings revision momentum countries whilst shorting the low earnings revision momentum countries. Their analysis shows that earnings

revision momentum is highly correlated to price momentum but has a higher information ratio, hence they feel there is no diversification benefit to using both. The model is dollar neutral

Fixed income

- Value:
 - Level model: level is the average yield across the term structure. The model compares the relative level of yields across five countries' sovereign bonds (Australia, Canada, Germany, UK and US) and tends to capture the mean reversion affect. Since the level is negatively correlated to bond prices, the model moves long the bond when the level goes up and vice versa. The model only trades the 10Y bonds and is dollar neutral
 - Slope model: the model compares the shape of the yield curve across five sovereign bonds and takes long positions in the steep slopes and shorts the flat slopes. This is based on forward rate bias that captures more term premia. The model is dollar neutral
 - Curvature model: the model measures the difference between the forward slope (e.g. 10Y vs. 2Y) and near term slope (e.g. 2Y vs. 3M). It goes long the bonds with positive curvature and shorts the ones with negative curvature. The model is dollar neutral
 - Term structure roll down model: the models measures roll downs within localized slope and captures the amount of term premium collected through the passage of time (e.g. long 10Y vs. short 3M). It trades in two separate (US and German) baskets and the model maintains neutral duration
- Macro:
 - Term structure slope model: it is designed to capture the impact of central bank policies on the shape of the yield curve. Within each separate (US and German) basket, the models decompose raw macroeconomic data using Principle Component Analysis and select the top two principle components (one normally represents market activity, and the other represents market inflation) to determine strengthening/weakening signs in the economy. If the indicator is strong, which means a potential steepening of the term structure, then it moves long the short-dated while shorts the long-dated (and vice versa). The models are duration neutral
 - Term structure curvature model: it is designed to capture the re-pricing of central bank expectations and movement in the belly versus wings of the curve. By using the same indicator as the term structure slope model, if it signals the market is strengthening, then it shorts the short- and long-dated while moves long the belly (and vice versa). The models are duration neutral

- Macroeconomic conditions across countries model: similar to the above two models, it uses the same indicator to determine strengthening or weakening signs in the economy, but instead of trading within a country basket, it trades across the five countries. Instruments traded are 10Y bond futures and the model is dollar neutral
- Momentum:
 - Price momentum model: It trades the momentum of the five sovereign bond prices by using the last 12 months' return as the indicator and moves long the positive momentum bonds whilst shorting the negative momentum ones. The model is dollar neutral
 - Slope momentum model: within each market (US & Germany), it trades the momentum of the yield curve slope. E.g. if the 2Y outperforms the 10Y over the last 12 months, which indicates a steep shape of the curve, it then moves long the 2Y and short the 10Y. The models are duration neutral

FX

- Value:
 - Carry models: the models look at interest rate yields within two separate (DM & EM) baskets and long the higher yielding currencies while short the lower yielding currencies. In the DM basket, it trades nine major currencies against USD (AUD, CAD, CHF, EUR, GBP, JPY, NOK, NZD, SEK); in the EM basket, it trades ten currencies against USD (BRL, CLP, CZK, HUF, KRW, MXN, PLN, RUB, TRY, ZAR). Currencies with too low volatility, such as TWD, are removed from the basket. The models are dollar neutral
 - Purchasing power parity (PPP) model: it measures long-term fair value of a currency pair to determine the relative purchasing power of the two currencies. Research suggests despite persistent short-term deviation, currencies eventually converge to the PPP fair value by the force of international arbitrages. The model uses a nonlinear calculation of the 10Y average real exchange rate with a 5Y decay to determine the long-term fair value of a currency vs. USD and moves long currencies with lower exchange rates while shorting the ones with higher exchange rates. This model only applies to the nine DM currencies and it is dollar neutral
- Macro:
 - Change of policy rates models: for the EM basket, the models focus on the changes in central banks' movement as central bank policy has strong implications for the local currency – a hike of policy rates leads to a strong local currency (and vice versa). For the DM basket, the model uses the long-term government bond yield, which serves as barometer of a country's long-term

expected growth trajectory – rising yields reflect expectations of an improved economy in the long-term (and vice versa). The models are dollar neutral

- Risk aversion model: risk reversal measures the difference of implied volatilities from a 25-delta out-the-money (OTM) call option and a 25-delta OTM put option. The implied volatility is highly positively correlated to the rate of change on the price of the option. If the implied volatility of the call is higher than the put, which indicates a bullish market, then it takes a long in the currency vs. USD (and vice versa). The model is dollar neutral
- Momentum:
 - The model measures the 12-month momentum of spot rates within each DM and EM basket. The models are dollar neutral

Commodity

- Value:
 - The model moves long backwardated and short contangoed commodity markets. It trades 22 commodities across agriculture, energy, base metals, precious metals and lean hogs. The slope is defined by the first futures contract and the spot price. There is no sector limit. Weights of the positions are defined by the steepness of the slope. The model is dollar neutral
- Momentum:
 - The model measures the 12-month momentum adjusted by the market volatility. The model is dollar neutral

The second step of the process is to introduce factor conditioning for each of the sub-strategies. These bottom-up factor conditionings are designed to improve the distribution of returns associated with each factor, i.e. using proprietary techniques to enhance returns and reduce tail risk. These enhancements are implemented either at the model level (such as the nonlinear calculation of the FX PPP signals) or by adding additional models that complement the others.

For instance, for the FX carry strategy, the conditioning around the factor is based on the volatility of the currency market. The FX risk aversion model is designed to be negatively correlated to the carry signals during rising volatility environments in order to, implicitly, reduce the carry position or even to reverse the position to reduce tail risk.

Calculate Factor Scores and Weights



Within each model, the model assigns a relative score, which is a linear derivation of relative strength to the group average signal, to each of the markets in their basket. Then it converts these scores to proportional weights within the basket, assuming a gross leverage of 100%.

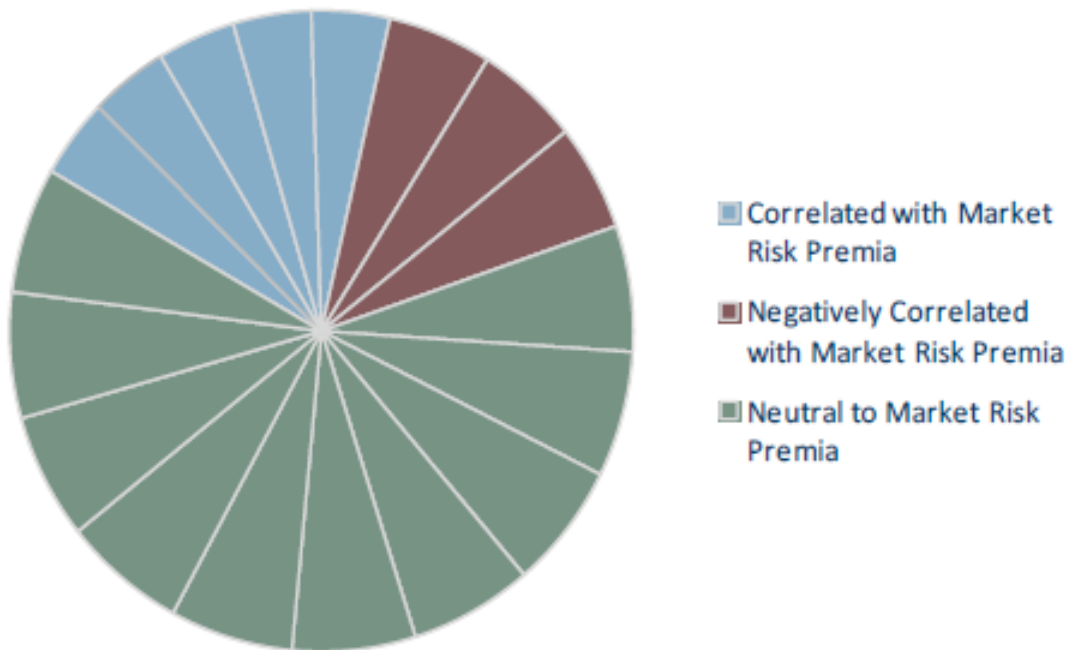
Portfolio Construction

The portfolio construction is a four-step process. The team believes portfolio construction is a key differentiator between PanAgora and its peers, and we tend to agree.

Step One (a) – Strategic risk allocation:

Although the categorization of risk premia as Value, Macro and Momentum factors across recognizable asset classes is useful in its simplicity, the team does not bucket factor premia into these dimensions as part of their portfolio construction process. Rather, they risk budget across more precise and impactful dimensions to ensure the return from factor premia is orthogonal to both one another as well as to market premia in aggregate. They use a strategic risk budgeting process in order to achieve diversification while mitigating correlation with market risk premia. First, they use a composite of equity, fixed income and commodity indices to represent market risk premia (basket of beta exposures). The construction of this composite is to achieve an equal risk contribution from each of the markets using a risk parity approach. As a result, the composite is constructed as 33% MSCI World, 130% World Global Bond, 25% GSCI Commodity. This composite can also be customized based on clients' existing portfolios. Each of the 30 factor risk premia is regressed against the composite to test their correlation to market risk. This will divide the 30 factor risk premia into 3 different groups: 1) positively correlated to market risk (t-statistics > 2.0); 2) negatively correlated to market risk (t-statistics < -2.0); 3) neutral to market risk (-2.0 < t-statistics < 2.0). The system will equally risk weight group 1) and group 2), while the remaining risk allocation is given to group 3).

Below is a chart illustration of a sample portfolio composition.

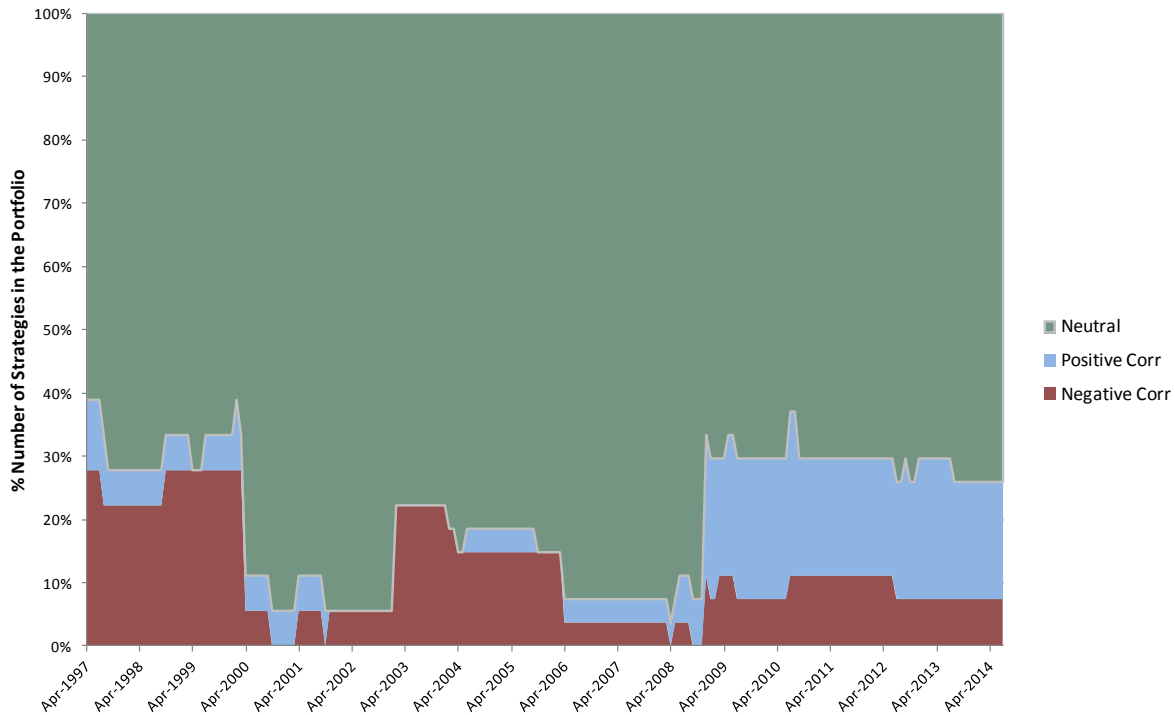


Source: PanAgora

The risk budget for group 3) is dependent on the number of factor risk premia, and has historically represented around two thirds of the total risk, i.e. around 20 out of 30 factors were uncorrelated to market risk. At this stage, each individual model weight is capped at 10% risk contribution. Under circumstances when no negatively-market-correlated models are identified, a 10% risk contribution cap will be applied to the positively-market-correlated group, and vice versa.

The chart below illustrates the historical (including backtest period) distribution of factor grouping. It is observed that since 2006, the number of negatively-market-correlated models has decreased while the number of positively-market-correlated models increased. This may have coincided with the increasing correlation across markets in recent years.

Factor Grouping Distribution History



Source: PanAgora

Step One (b): Tactical shifts

The model seeks to identify cycles and tilts exposures towards factors that are expected to perform better in the current environment. Tactical shifts are tightly constrained and are designed to enhance rather than determine the return.

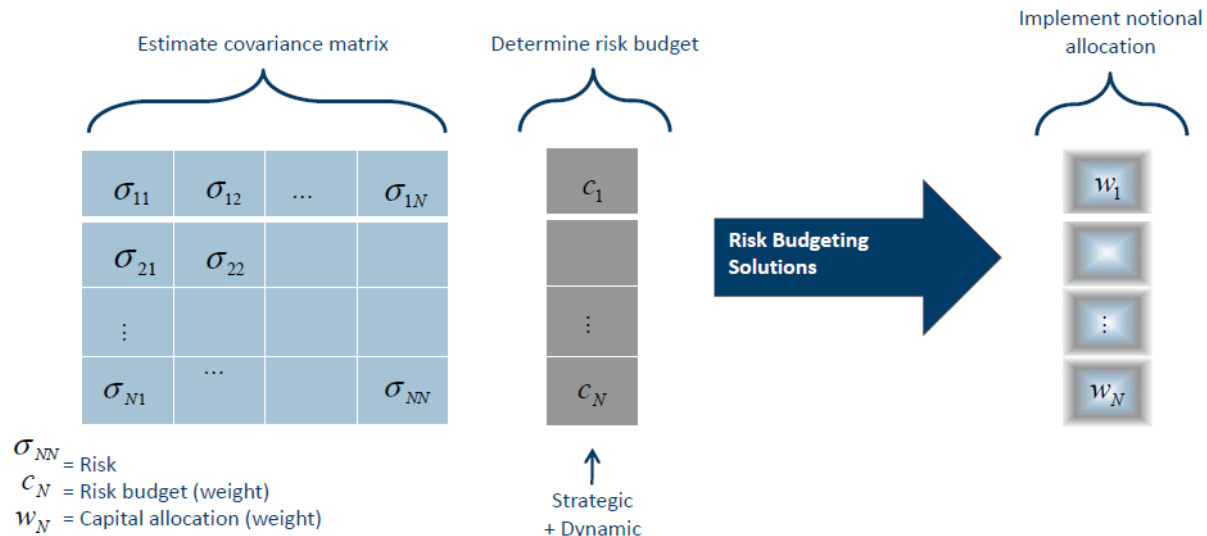
Effectively, the system looks at the 1yr Sharpe ratio of each factor and increases/decreases the factor exposure by 25% of its own weight based on which percentile it is in, with a maximum increase/decrease of 50%.

	Top 20 percentile	20-40 percentile	40-60 percentile	60-80 percentile	Bottom 20 percentile
Incremental Weight	+50%	+25%	0%	-25%	-50%

This is very similar to a momentum effect, which overweights factors that have done well recently and underweights factors that have not done so well.

Step Two: Determine notional exposure to each model

The risk parity approach is applied at this stage; it calculates the covariance matrix across all 30 models over long-term (5Y) horizon and incorporates the risk budgets defined by the first step of the process. The figure below illustrates the process.



Source: PanAgora

Step Three: Determine portfolio asset weights

This process aggregates the net positions across all models as the new rebalancing weight. All models are reconfigured once a month. The portfolio is rebalanced on a monthly basis.

Step Four (final): Risk controls

There are leverage constraints applied at different levels within the portfolio.

- At the asset class level, the leverage is capped at two standard deviations of the historical leverage level
- At the asset level within its own basket, leverage depends on the number of assets in the basket and has a 50% incremental limit above the average weight. For instance, in the sovereign bond basket where it has five countries' 10Y government bonds, the average weight for each asset is 20%, hence each asset weight is capped at 30%
- At the portfolio level, for a 10% volatility strategy, the maximum leverage is 10x

There is no stop loss or drawdown control either at the model level or at the portfolio level. PanAgora believe such "re-active" risk controls will only hurt performance overall as they will likely result in the strategy missing the sharp rallies that typically follow market drawdowns.



Instead, they believe their grouping of models and risk parity approach to risk allocation diversifies the portfolio risk and is the most efficient form of “pro-active” risk management.

The strategy only trades exchange traded futures and currency forwards, and the entire portfolio can be fully liquidated in less than a week without notable price distortions, in normal market conditions.



INVESTMENT THESIS SUPPORT/PERFORMANCE ANALYSIS/OTHER ANALYTICS

While PanAgora's original alternative risk premia strategy started in 2004, it has evolved significantly over time. The current incarnation results in a much more diversified portfolio that has significant differences in terms of risk allocation across the models, and subsequently the return/risk profile. Therefore, it is less relevant to compare the strategy's historical realized P&L when considering the current mandate. The current program has been implemented in a separate trading account at 10% target volatility since August 2013. The strategy has been further enhanced in early 2014 by introducing more factors, applying more layers of leverage constraints and relaxing the portfolio leverage constraints. The table below shows the live track record of the account plus the current strategy's backtest going back to 1995. The numbers below include a 0.40% management fee per annum deducted from gross returns.

Net of fees (0.40%) Return (ex. cash interest)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
1995	2.2%	0.3%	-2.9%	-0.7%	2.7%	3.4%	-2.5%	-0.1%	2.5%	-0.6%	1.3%	-1.5%	4.0%
1996	1.9%	-0.3%	2.9%	3.3%	2.6%	3.5%	-3.0%	0.4%	4.9%	3.0%	3.8%	3.2%	29.4%
1997	3.3%	3.5%	1.6%	3.7%	-2.4%	5.4%	3.5%	0.9%	0.0%	2.6%	-0.1%	3.2%	28.2%
1998	4.2%	2.6%	4.8%	-0.6%	5.9%	-0.7%	1.5%	1.6%	1.8%	-3.3%	3.3%	-0.1%	22.4%
1999	0.4%	2.8%	0.9%	6.6%	-1.7%	0.2%	-1.1%	1.2%	-1.3%	1.0%	2.8%	1.1%	13.5%
2000	3.0%	3.4%	-1.5%	1.3%	2.8%	4.7%	-1.1%	3.6%	-2.1%	2.5%	0.5%	-2.4%	15.4%
2001	-1.6%	0.9%	3.5%	5.6%	2.0%	1.8%	2.3%	3.2%	5.1%	1.6%	4.3%	9.8%	45.6%
2002	-2.2%	1.4%	-0.9%	1.5%	3.4%	0.5%	7.6%	2.4%	3.5%	1.9%	2.2%	-0.6%	22.4%
2003	1.9%	5.0%	0.5%	-0.5%	0.9%	3.0%	-4.2%	2.9%	5.7%	2.2%	0.3%	1.5%	20.5%
2004	6.5%	5.4%	-0.5%	-3.8%	-0.8%	1.1%	1.6%	0.0%	1.0%	0.6%	2.1%	1.0%	14.7%
2005	6.0%	0.1%	2.9%	1.7%	3.8%	4.3%	0.5%	-1.2%	3.5%	1.6%	2.7%	0.3%	29.1%
2006	1.4%	0.9%	1.2%	2.4%	1.5%	1.3%	0.7%	1.2%	1.2%	2.6%	2.5%	1.0%	19.3%
2007	-0.2%	1.2%	1.7%	2.5%	-0.9%	2.6%	0.4%	-0.1%	5.2%	2.7%	3.1%	4.7%	25.3%
2008	-2.2%	8.3%	-0.3%	-0.9%	4.8%	8.1%	-1.5%	1.1%	-0.9%	1.8%	0.1%	-1.1%	17.9%
2009	3.2%	4.9%	2.4%	4.3%	8.7%	0.7%	2.4%	-1.8%	1.8%	1.3%	2.8%	-1.6%	32.7%
2010	0.8%	2.0%	2.4%	1.8%	-1.1%	0.5%	0.6%	1.7%	1.0%	3.1%	-0.2%	-4.1%	8.8%
2011	1.3%	0.8%	0.8%	3.2%	1.2%	-0.4%	0.0%	3.5%	0.9%	-1.2%	-1.1%	1.3%	10.7%
2012	-0.6%	-0.8%	-0.5%	0.1%	0.4%	-1.5%	2.3%	3.1%	-0.8%	-0.1%	1.1%	1.5%	4.1%
2013	1.9%	1.1%	1.8%	0.8%	-2.0%	1.2%	-0.5%	0.7%	-1.2%	-0.3%	0.3%	-1.7%	2.1%
2014	1.6%	-0.3%	1.2%	0.3%	0.2%	1.8%	-0.6%	0.3%	-2.0%				2.4%

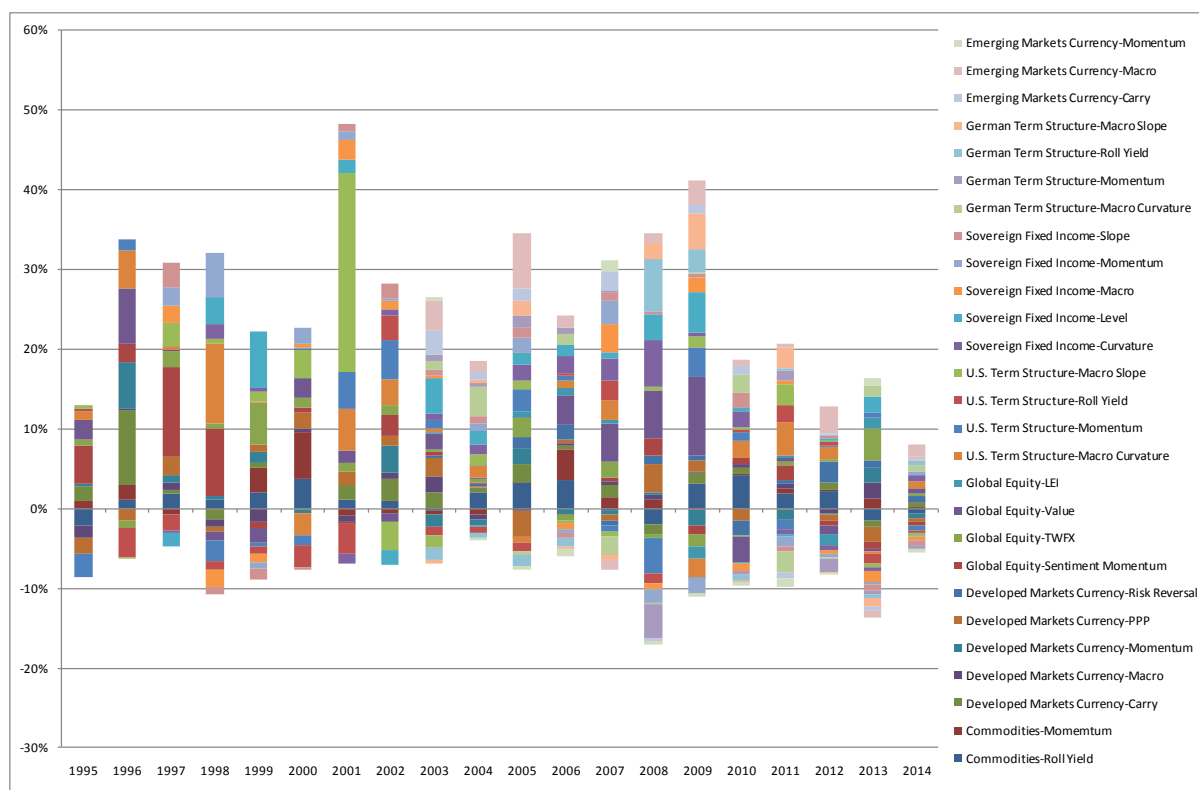
Source: PanAgora, Arden Research

One item worth noting is that the above returns do not include any interest earned on cash holdings (during both live account performance and historical backtest). As the strategy only trades exchange-traded future contracts and FX forwards, a high percentage of the portfolio (80%) is available to be held in cash, which would potentially generate additional returns on T Bills or the equivalent.

The combined live track record and simulated performance shows a weakening of performance over the last 2-3 years. The PanAgora team surmises that the increasing number of participants entering into similar trading strategies, particularly the most common risk premium strategies such as carry and value strategies, has been the main reason for the recent performance

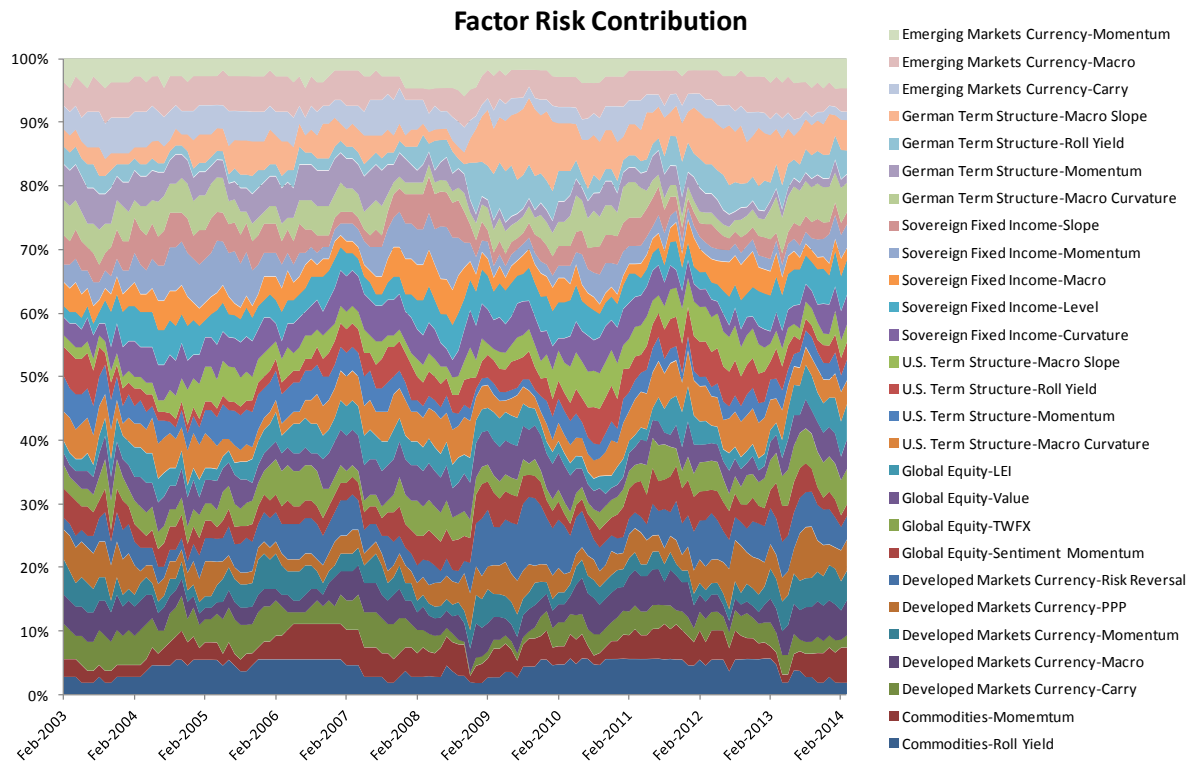
decline. However, value factor is one of the main factors being used in active equity portfolio management for decades and it is our view that there is unlikely any crowding issues in this regard. We believe that the risk-on/risk-off central bank policy driven market has also proven to be a difficult environment for risk premia capturing strategies. There is also a time-varying nature of factor efficacy for risk premia investing. For example, the cycle from 2002-2007 experienced an unusual concentration of models performing significantly better than their historical averages. The PanAgora team has observed that during the most recent cycle many of these models have reverted to more normal performance, while only 20% of the models have performed poorly.

The return attribution chart below highlights the variation of contribution from each model, and it demonstrates the diversified sources of return in the portfolio.



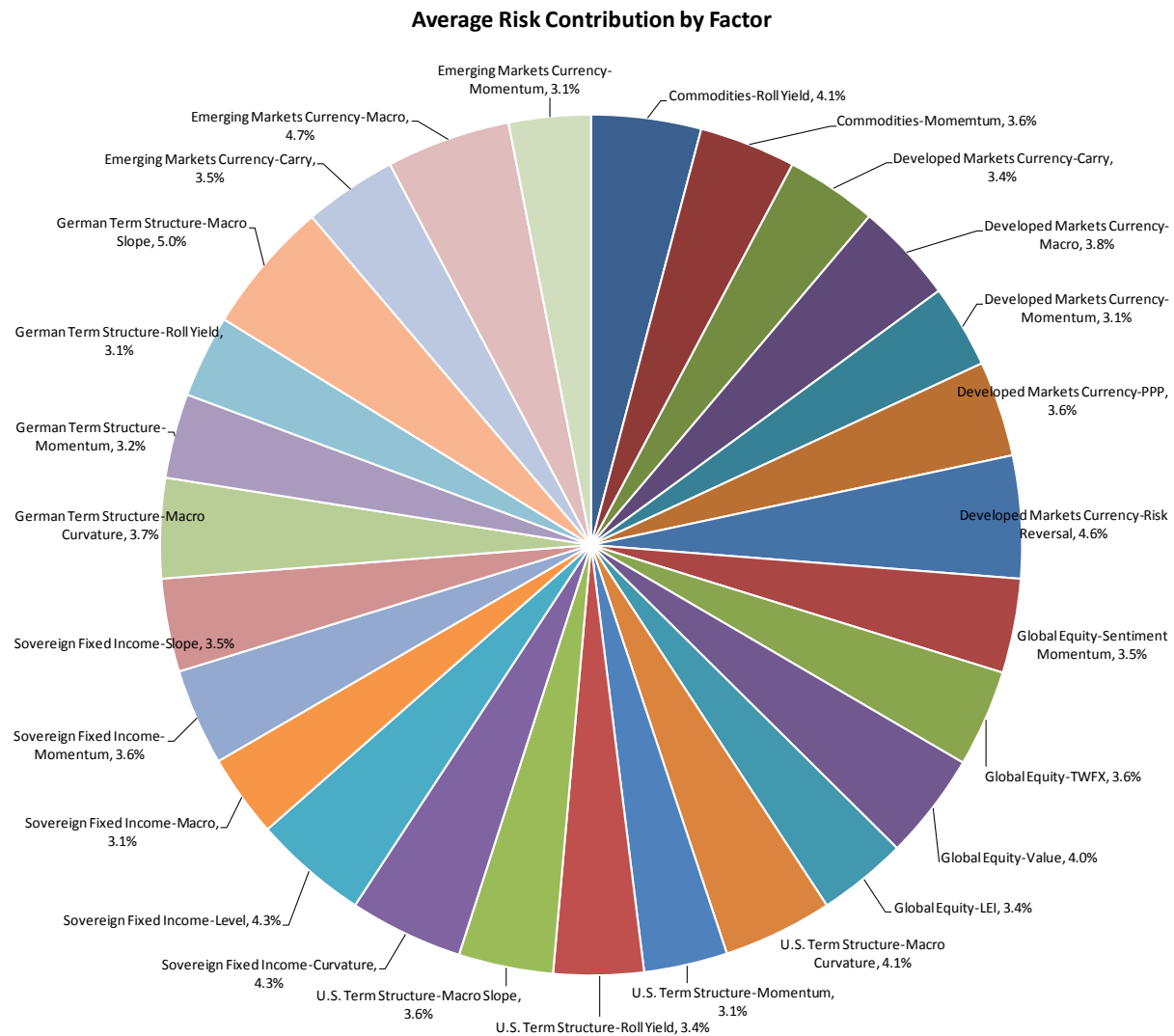
Source: PanAgora, Arden Research

Historical risk contribution by factors is illustrated below. With certain leverage constraints at the asset level, factor level and portfolio level, the portfolio is well diversified with no single factor able to dominate the portfolio risk.



Source: PanAgora, Arden Research

On average, risk is fairly evenly distributed across all factors.



Source: PanAgora, Arden Research



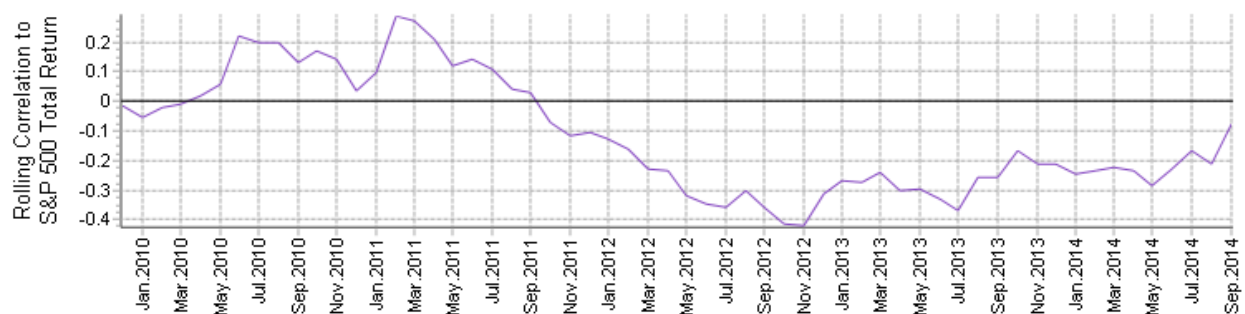
Including the backtest performance, the strategy has produced impressive absolute returns as well as risk adjusted returns. In general, it is uncorrelated to market risk premia. However, since going “live” in August 2013, as noted above, performance has been somewhat lacklustre. Nevertheless, returns have been generally uncorrelated (and more negatively correlated to the S&P) – though this is only based on 14 monthly data points.

Feb'94 - Sep'14	PanAgora	S&P	BarCap Glb Agg	GSCI
Ann Rtn	17.3%	6.9%	5.5%	3.3%
Ann Vol	8.0%	15.1%	5.5%	21.5%
Corr	1.00	-0.03	0.04	0.15
Beta	1.00	-0.02	0.05	0.06

Aug'13 - Sep'14	PanAgora	S&P	BarCap Glb Agg	GSCI
Ann Rtn	-0.2%	14.4%	2.3%	-6.8%
Ann Vol	3.9%	9.2%	4.3%	10.5%
Corr	1.00	-0.20	0.37	0.42
Beta	1.00	-0.08	0.34	0.15

Source: PanAgora, Arden Research

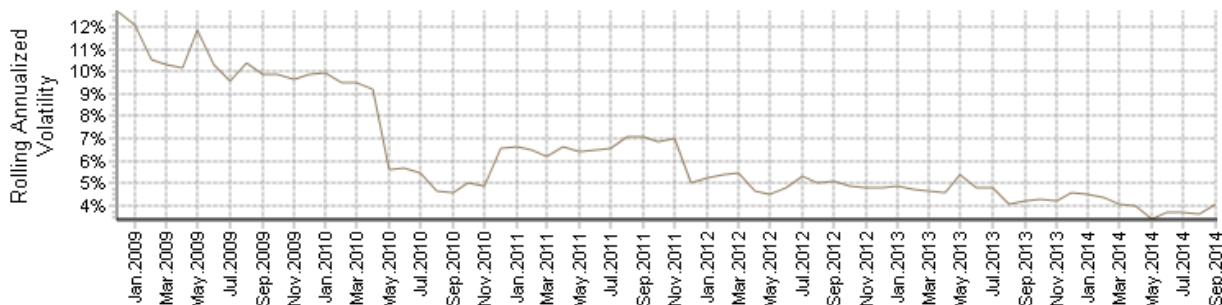
Including the backtest going back to 1995, the fund has a correlation to the S&P 500 -0.03. The rolling 24-month correlation chart below suggests the fund has been consistent in eliminating direct equity exposures.



Source: PanAgora, Arden Research



Rolling 12-month volatility shows that the volatility of the strategy has declined significantly during 2010 and has stayed fairly low at around 4-5%.



Source: PanAgora, Arden Research

PanAgora believes that this typically happens during periods when market volatility is unusually high or low. This is also in-line with our observation that Global Macro funds in general have struggled to find opportunities in the low volatility market environment. Over the last several years, market volatility has been grinding lower, causing the ex-post risk of many strategies to be lower than the ex-ante target. To account for the changing level of volatility, they use adaptive risk models that are regularly re-estimated to account for the changing covariance structure between assets and factors. One danger of using an overly adaptive risk model is that it can increase the risk of being whipsawed given volatility's tendency to mean-revert. As a result, PanAgora tend to prefer gradually changing estimates of risk so that they do not dramatically increase/decrease leverage in response to declining/increasing market volatility, but yet the portfolio remains adaptive to structural changes in the covariance structure of assets and factors.

The chart below shows the product's correlation to other risk premia products since inception in August 2013. It shows that PanAgora has been uncorrelated (or even negatively correlated) to other peers, suggesting it will act as a good diversifier in a portfolio of risk premia strategies.

	PanAgora Diversified Factor Premia	AlphaParity All-Weather Fund	AQR Style Premia Fund	CCP Core Macro Fund	CFM ISD	Fulcrum Alternative Beta Plus Fund	Goldman Sachs Diversifying Alternative...	Janus Global Diversified Alternatives Fu...	JPM Systematic Alpha Fund	Kepos Exotic Beta Fund
PanAgora Diversified Factor Premia	1.00	-0.43	-0.26	0.22	-0.19	0.11	-0.25	0.23	-0.14	0.23
AlphaParity All-Weather Fund	-0.43	1.00	0.53	0.15	0.52	0.21	0.25	-0.09	0.51	0.03
AQR Style Premia Fund	-0.26	0.53	1.00	0.25	0.73	0.32	-0.10	0.11	0.66	-0.19
CCP Core Macro Fund	0.22	0.15	0.25	1.00	0.76	0.70	0.21	0.70	0.36	0.32
CFM ISD	-0.19	0.52	0.73	0.76	1.00	0.64	0.08	0.42	0.64	0.08
Fulcrum Alternative Beta Plus Fund	0.11	0.21	0.32	0.70	0.64	1.00	-0.23	0.81	0.65	0.40
Goldman Sachs Diversifying Alternative Risk	-0.25	0.25	-0.10	0.21	0.08	-0.23	1.00	-0.10	-0.07	0.14
Janus Global Diversified Alternatives Fund	0.23	-0.09	0.11	0.70	0.42	0.81	-0.10	1.00	0.45	0.21
JPM Systematic Alpha Fund	-0.14	0.51	0.66	0.36	0.64	0.65	-0.07	0.45	1.00	0.28
Kepos Exotic Beta Fund	0.23	0.03	-0.19	0.32	0.08	0.40	0.14	0.21	0.28	1.00

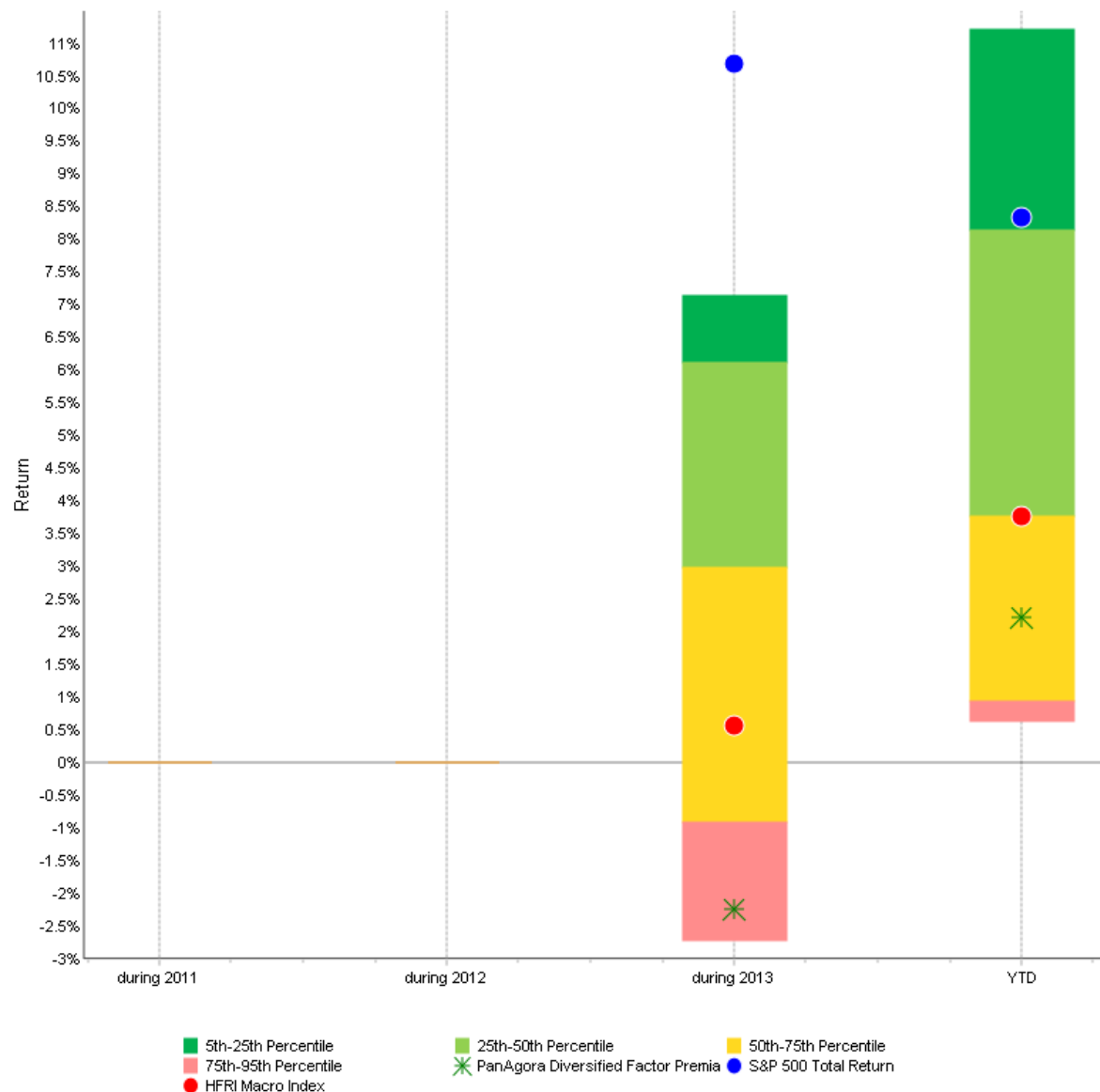
Source: PanAgora, Arden Research

Over a longer period - since January 2008 (including backtests) - PanAgora is generally uncorrelated to other peers.

	PanAgora Diversified Factor Premia	AlphaParity All-Weather Fund	AQR Style Premia Fund	CCP Core Macro Fund	CFM ISD	Fulcrum Alternative Beta Plus Fund	Goldman Sachs Diversifying Alternative...	Janus Global Diversified Alternatives Fu...	JPM Systematic Alpha Fund	Kepos Exotic Beta Fund
PanAgora Diversified Factor Premia	1.00	-0.01	0.01	0.30	0.23	0.23	0.29	0.16	0.03	0.29
AlphaParity All-Weather Fund	-0.01	1.00	0.22	0.20	0.27	0.20	0.24	0.23	0.19	0.16
AQR Style Premia Fund	0.01	0.22	1.00	0.11	0.35	0.20	0.11	-0.06	0.38	-0.00
CCP Core Macro Fund	0.30	0.20	0.11	1.00	0.54	0.69	0.57	0.59	0.21	0.32
CFM ISD	0.23	0.27	0.35	0.54	1.00	0.50	0.34	0.32	0.37	0.26
Fulcrum Alternative Beta Plus Fund	0.23	0.20	0.20	0.69	0.50	1.00	0.35	0.58	0.31	0.47
Goldman Sachs Diversifying Alternative Risk	0.29	0.24	0.11	0.57	0.34	0.35	1.00	0.29	0.14	0.35
Janus Global Diversified Alternatives Fund	0.16	0.23	-0.06	0.59	0.32	0.58	0.29	1.00	0.06	0.50
JPM Systematic Alpha Fund	0.03	0.19	0.38	0.21	0.37	0.31	0.14	0.06	1.00	0.12
Kepos Exotic Beta Fund	0.29	0.16	-0.00	0.32	0.26	0.47	0.35	0.50	0.12	1.00

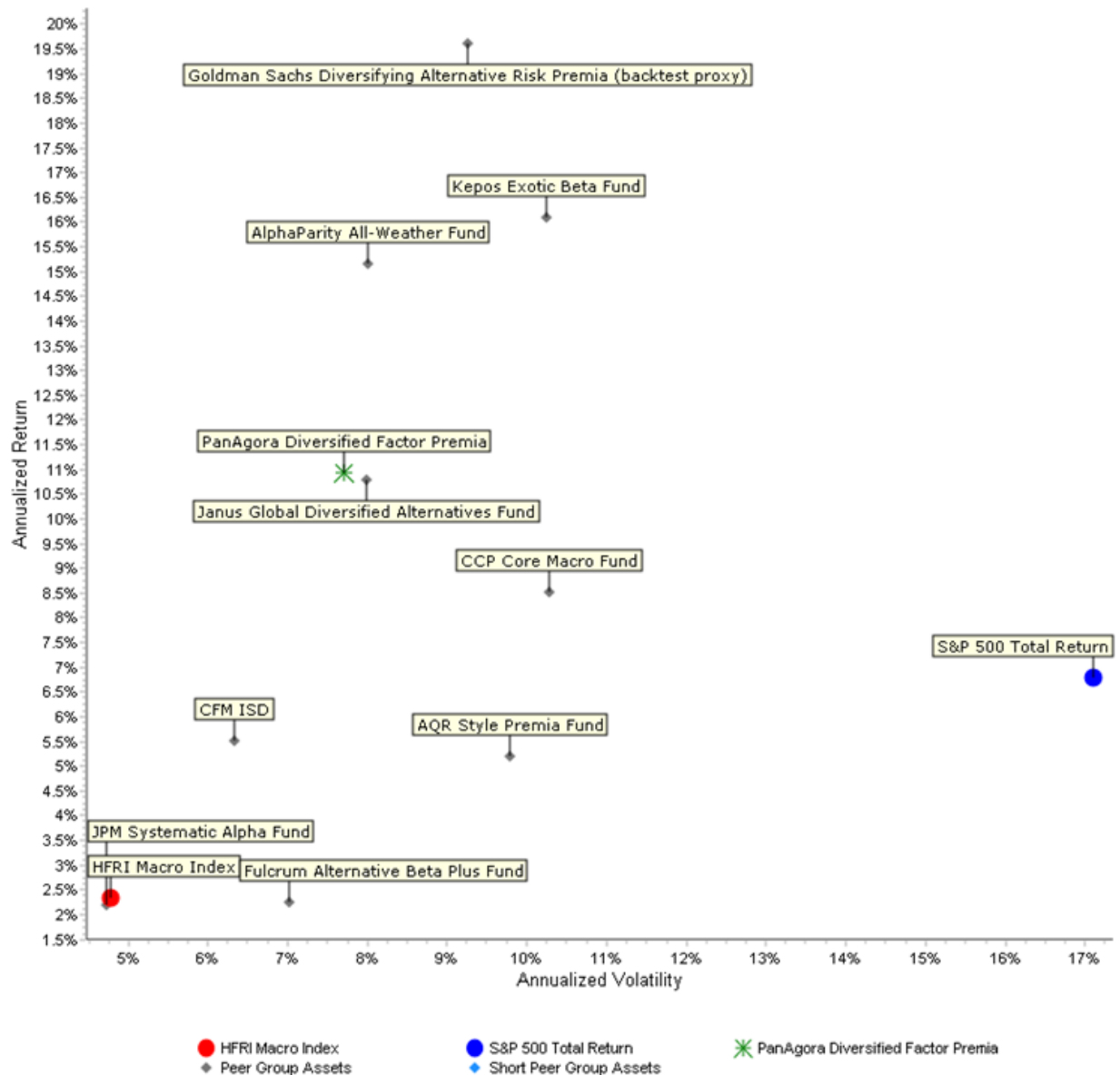
Source: PanAgora, Arden Research

Since the new strategy's inception in August 2013, PanAgora has underperformed the peer group in the final months in 2013. Although relative performance has slightly improved YTD, it still remains below the median.



Source: PanAgora, Arden Research

While most of the peers have relatively short live track records, we have included backtests going back to January 2008 and PanAgora seems to deliver more attractive risk adjusted returns.



Source: PanAgora, Arden Research



PARTNER PROFILE/REFERENCES

Edward Qian, CIO & Head of Research, PanAgora Asset Management, 2005-present

EMPLOYMENT HISTORY

2100 Capital, Portfolio Manager

Putnam Investments, Global Asset Allocation, Senior Asset Allocation Analyst

Back Bay Advisors, Fixed Income Quantitative Analyst

EDUCATION

National Science Foundation Research Fellow at **MIT**

Florida State University, PhD

The Chinese Science Academy, MS

Peking University, BS

CFA

Bryan Belton, Director, PanAgora Asset Management

EMPLOYMENT HISTORY

Federal Home Loan Bank of Boston, Investment Portfolio Officer

Investors Bank & Trust Company, Senior Manager

EDUCATION

Northeastern University, MSF

Boston College, AB

CFA

Kun Yang, Portfolio Manager, PanAgora Asset Management

EDUCATION

Vanderbilt University, PhD in Economics

Wuhan University, MS in Finance

Hubei University, BA in Economics

CFA

RECOMMENDED FOR INVESTMENT:

☒ YES ☐ NO _____ Other Recommendation (explain)

Pending items:

☐ Reference checks ☒ HedgeMark



RISK MANAGEMENT/QUANT REVIEW

SUMMARY OF RISK RANKINGS

Category	Score*
Risk overall	2
Risk environment	1
Portfolio risk	2
Liquidity/complexity	1
Portfolio concentration	2

*Key: 1 (best) – 4 (worst)

EXECUTIVE SUMMARY AND CONCLUSION

PanAgora's Diversified Factor Premia strategy is a systematic alternative risk premia strategy investing predominantly in liquid exchange-traded equity index futures, bond and rate futures, FX forwards and commodity futures. As a systematic strategy, investment risk management is embedded within the strategy's models. PanAgora places risk management at the heart of its process. The strategy as a whole is highly levered mainly due to margin based investment instruments. However, the risk infrastructure and the portfolio construction process in place significantly mitigate this risk, allowing the investment team to monitor the risk across the portfolio and manage it accordingly.

RISK ENVIRONMENT

PanAgora's overall approach to risk management is to protect the interests of the firm and investors. They seek to ensure that its investment activities do not expose the firm or investors to losses beyond their respective risk tolerance levels. They consider various types of risk, both across the firm and within individual investment portfolios. An investment mandate compliance monitoring process is also in place for their clients' portfolios. As part of its fiduciary responsibility, PanAgora has an independent compliance function to provide support and advice to the portfolio management teams and other departments of the firm. The compliance group ensures that client portfolios are managed in accordance with the investment guidelines, reducing risk for both the company and investors.

The compliance function seeks to reduce risk for both the firm and its clients through the following systematic controls:

- For new clients, the compliance group holds a pre-launch meeting with the relevant departments, including investment personnel, to review the business relationship,



unique restrictions and client rules and pre-trade and post-trade monitoring requirements. The meeting is held to ensure consistent guideline interpretation amongst the applicable parties. Investment guidelines are maintained on an internal website as a reference for investment personnel

- Before a trade is executed, pre-trade orders are run through the pre-trade compliance system to test for compliance with client guidelines and objectives. A pass/fail message is sent back to the portfolio management team and pass orders can then be sent to the executing broker
- On a nightly basis, the compliance group receives feeds from the different systems in order to run a fully automated, post-trade compliance cycle, where it reviews all asset classes and all holdings to ensure compliance with investment limitations.

Pre-Trade Monitoring

When trade orders are entered into their automated compliance system, Charles River Development (“CRD”), each trade order is systematically tested for compliance with the automated rules established for the account for which the order is being placed. As CRD detects potential compliance exceptions, the investment professional and the compliance group are notified via a CRD automated message and workflow monitor.

The investment professional reviews the potential exception and determines if an override is warranted. If warranted, the investment professional or compliance group may override the potential exception depending upon the potential exceptions severity. Severities are assigned to automated rules during the rule coding process and are classified as either “Hard” or “Soft.” Investment professionals may override Soft exceptions. Hard exceptions may only be overridden by a compliance group member.

Each pre-trade exception and the details of the override, including who executed the override and the reason for the override are captured by CRD.

Post-Trade Monitoring

Potential exceptions identified by CRD automated compliance or manual testing are researched on the date they are identified and reviewed by a compliance group member. Potential exceptions that are deemed “valid” by the compliance group member are communicated via email to PanAgora’s Chief Compliance Officer, Compliance Manager, appropriate investment professionals, and Client Service Manager (as applicable) for resolution. This email outlines the exception details and recommended action steps for resolution.

Each warning and alert is recorded within an automated alert tracking log queue. A compliance group member monitors the status of the warnings and alerts for resolution on a daily basis. On a weekly basis, the Compliance Manager reviews any open alerts for resolution and escalates where appropriate.



PanAgora has not breached the limits or guidelines of the Diversified Factor Premia portfolios since re-launch in August 2013.

In addition to the investment strategy risk management performed by the multi-asset investment team, PanAgora has additional risk management sub-committees in place which are comprised of firm senior executives, the chief compliance officer and senior investment and operational professionals.

Firm-wide risk is overseen by PanAgora's Risk Management Committee. This committee is responsible for setting firm risk policy, investment risk policy and trading practices, as well as monitoring and evaluating risk across the firm. The Risk Management Committee is supported by three sub-committees:

- Portfolio Management Risk Committee
- Trading & Investment Practices Committee ("TIPC")
- Operational Risk Committee

The Portfolio Management Risk Committee meets monthly and is responsible for the establishment and review of portfolio risk metrics across the firm. This Committee is comprised of PanAgora's Chief Investment Officers, senior investment professionals and Chief Operating Officer. With regard to the individual investment strategies, each investment team reviews portfolios managed using their respective strategies on a regular basis. This review verifies that each portfolio's performance, exposures, and predicted distribution of investment returns are in-line with the expectations of the investment team and their clients. Included in these reviews are assessments of portfolio characteristics, volatility, tracking error and dispersion of returns across portfolios with similar guidelines and objectives. In addition to the individual investment teams, members of the Portfolio Management Risk Committee review the performance of individual portfolios that are representative of each investment strategy as well as those deemed to be outliers in terms of relative performance or positioning. As a quantitatively-oriented asset manager, elements of risk management are directly built into the investment processes employed by PanAgora within all client portfolios. Rigorous risk control is achieved through the use of proprietary risk-budgeting and/or optimization techniques that incorporate explicit parameters designed to mitigate drawdowns and improve the likelihood that each portfolio's performance objectives will be met.

The Trading & Investment Policy Committee meets monthly to focus on issues related to trading, best execution and portfolio management. This sub-committee is primarily responsible for oversight of the firm's trading activities, trade policies and procedures. The TIPC is chaired by PanAgora's Chief Executive Officer and includes senior investment professionals and the Compliance Officer. In addition to senior members from within PanAgora's investment division,



representatives from compliance, operations and information technology are included, as needed. PanAgora's market and counterparty risk are the responsibility of the TIPC.

The Operational Risk Committee meets monthly and is responsible for the oversight of PanAgora's operational risk, compliance risk and financial risk associated with the firm's investment activities. Examples of their oversight include reconciliations, trade errors, corporate actions, compliance and audit matters. PanAgora's Operational Risk Committee is comprised of its Chief Operating Officer, and the Heads of Finance, Operations, Information Technology, Compliance and Client Service. The Operational Risk Committee is independent of the portfolio management teams.

Ultimately, all decisions that relate to the firm and its oversight, including risk management, are the responsibility of PanAgora's Operating Committee. The Operating Committee also allocates resources and formulates overall firm strategy and policies. The Operating Committee meets on a weekly basis and is comprised of PanAgora's senior executives.

PORTFOLIO RISK

PanAgora's Diversified Factor Premia strategy investment process is built around a foundation of robust risk management. The multi-asset investment team is primarily responsible for monitoring/managing risk for the Diversified Factor Premia portfolios. The investment team has several portfolio constraints and multiple, independent estimates of risk, which represent the core of the risk management process. Using proprietary and commercially available risk models, the investment team monitors leverage constraints, total portfolio risk estimates, loading of risk factors, Value at Risk, expected shortfall, stress tests and historical scenario analysis. Portfolios exposures are monitored on a daily basis and rebalanced as necessary to ensure positions and risk exposures are within expectations.

The multi-asset investment team employs a highly adaptive model to consistently target volatility at client specified levels of risk. To ensure portfolios are well diversified, the team balances risk across a broad array of factors using a proprietary risk-budgeting procedure. As part of the risk-budgeting procedure, the model diversifies the risk contribution to factor premia such that the beta of the aggregate portfolio to either the MSCI World index or the Citigroup WGBI is constrained in the range of -0.20 to +0.20. This involves balancing the contribution to risk across factor groups that have statistically significant loadings to market risk premia. Diversifying risk across these dimensions helps to eliminate the market directionality of the strategy. The risk budgeted (i.e. contribution to risk) to any individual factor premium is capped at 10%.

As previously discussed in the portfolio construction process, key portfolio constraints for Diversified Factor Premia portfolios include:

- Leverage constraints; the Diversified Factor Premia portfolio targeting 10% annualized volatility will be capped at 10x leverage
- At the asset class level, the leverage is capped at two standard deviations of the historical leverage level
- At the asset level within its own basket, leverage depends on the number of assets in the basket and has a 50% incremental limit above the average weight
- Loading of risk factors; the risk budgeted (i.e. contribution to risk) to any individual factor premium is capped at 10%

As mentioned in the investment section, we observed a weakening of performance over the last 2-3 years. The PanAgora team surmises that the increasing number of participants entering into similar trading strategies has been the main reason for the recent performance decline; also the risk-on/risk-off central bank policy driven market has also proven to be a difficult environment for risk premia capturing strategies. However, it is never certain whether such “difficult” environment may continue for a prolonged period of time.

Stop-Loss Limits & Stress Testing

PanAgora believe that stop-loss limits may lead to uncharacteristic losses and, as a result, they do not employ stop-loss mechanisms. Instead, PanAgora focuses on the diversification of the portfolio to maintain return stability. PanAgora also periodically rebalances the portfolio to accommodate for any position shifts, as previously discussed in the investment section.

The multi-asset investment team performs stress testing and historical scenario analysis as part of the portfolio risk management process. Additionally, the team uses Barclays POINT as risk management tool in this regard. They stress test the Diversified Factor Premia strategy by simulating how the portfolio would have performed during various historical periods of market stress, such as 1987 market crash, 1997 Asian financial crisis, 1998 Russian crisis, 2001 dotcom slowdown, 2007-2009 credit crisis, etc. In addition, the team evaluates how the portfolio will perform under different stress scenarios, for example: USD yield curve level +100 bps, U.S. equity market -20%, VIX Index +100%, oil price +30%. The suggested trades will be executed only if they pass various scenario analysis and stress testing.

Leverage

Leverage is achieved through the use of futures, forwards, and other liquid instruments whose notional exposure requires significantly less of a margin or capital outlay. Leverage is not achieved through the use of borrowed funds. Leverage for the Diversified Factor Premia strategy is measured as the sum of the portfolio’s long and short exposure divided by its notional capital. Additionally, for leverage exposure reporting they express all fixed income exposures in 10-year duration equivalents. Leverage used in Diversified Factor Premia portfolios depends on the level of risk targeted for a given portfolio and follows approximately a linear relationship. As a result, the investment team would expect a Diversified Factor Premia



portfolio targeting 10% annualized volatility to be run at 8-10x leverage. During the backtest, the average, minimum, and maximum leverage has been 805%, 524%, and 1000%, respectively.

Cash Management

Given the use of exchange-traded futures and currency forwards in the Diversified Factor Premia strategy, as well as the fact that exchange-traded futures and currency forwards require a relatively small initial cash/collateral outlay to open a position, a high percentage of the portfolio (80%) is available to be held in cash. They generally invest the majority of the available cash invested in short-term U.S. Government securities, either directly via the purchase of physical securities or indirectly through a U.S. Government cash sweep vehicle administered by the Custodian. Other than the U.S. T-Bills that are used as collateral to satisfy initial margin requirements, all of the remaining cash is considered unencumbered as it is readily available, or in the case of U.S. T-Bills, could be converted to cash intraday.

LIQUIDITY/COMPLEXITY

The strategy only trades exchange traded futures and currency forwards, and the entire portfolio can be fully liquidated in less than a week without notable price distortions, in normal market conditions.

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

Commodities		Sovereign Fixed Income	Equity Countries	U.S. Term Structure	German Term Structure	DM Currency	EM Currency
Soybean Oil	Copper	Australian Government Bond	Australian SPI 200	Eurodollar Futures (1-20)	Euribor Futures (1-12)	AUD	BRL
Cocoa	Aluminum	Canadian Government Bond	Singapore Index	U.S. 10-Year Treasury	German 5-Year BOBL	CAD	CLP
Cotton	Nickel	German Bund	Hong Kong Hang Seng	U.S. 30-Year Treasury	German 10-Year Bund	CHF	CZK
Corn	Zinc	U.K. Gilt	Japan TOPIX		German 30-Year BUXL	EUR	HUF
Coffee		U.S. Treasury				GBP	KRW
Sugar	Gold		German DAX			JPY	MXN
Soybean Meal	Silver		Spain IBEX 35			NOK	PLN
Soybean			France CAC 40			NZD	RUB
Wheat	Lean Hogs		Italy MIB			SEK	TRY
			Netherlands Amsterdam IDX				ZAR
Brent Crude Oil							
WTI Crude Oil			Sweden OMX 30				
Heating Oil			U.K. FTSE 100				
Gas Oil							
Natural Gas			Canadian TSX 60				
Gasoline			U.S. S&P 500				

Source: PanAgora, Arden Research

Expected annual turnover for the Diversified Factor Premia 10% volatility portfolio is approximately 350 – 450%.

A key objective in trading the Diversified Factor Premia strategy is to be able to rebalance the portfolio with minimizing the market impact. To assess whether a position has the proper



liquidity to meet that objective, market-based metrics are evaluated which include open interest, average daily volume, and the average depth of the bid and offer sides of the market. The investment team ultimately seeks to trade the portfolio with the goal of keeping transaction costs low. Given that the Diversified Factor Premia strategy is comprised of highly liquid instruments, the investment team believes it can accept approximately \$5bn in assets under management; however, this is not a hard capacity constraint. With the possible use of additional instruments (e.g. swaps) the investment team may consider closing the strategy at an amount greater than \$5bn.

PORTFOLIO CONCENTRATION

The strategy currently invests in a diversified portfolio of over 60 futures contracts and currency forwards across 30 different factor models.

As mentioned in the investment strategy section, the portfolio is well diversified with no single factor able to dominate the portfolio risk. On average, risk is fairly evenly distributed across all factors.

RECOMMENDED FOR INVESTMENT:

☒ YES ☐ NO _____ Other Recommendation (explain)



OPERATIONAL DUE DILIGENCE (“ODD”) REVIEW

SUMMARY OF ODD RANKINGS

Category	Score*
Overall score	Yellow
Pricing/valuation	1
Organizational viability	2
Tradeflow/back office/IT	1
Ownership structure/management investment	3
Service providers	3
Current investor base	3

*Key: 1 (best) – 4 (worst)

OVERVIEW

PanAgora manages over \$40 billion in total assets, with only \$100mn in the Diversified Alpha Fund and \$3 million in the Diversified Factor Premia Fund. PanAgora has several managed accounts (> 200), and they appear to be comfortable setting up more of these. The firm has had a few owners (Lehman, Putnam, and now Power Financial and Nippon along with the internal partners); currently the majority owner is external to the firm however, PanAgora stated that they have full autonomy to run the portfolio. Overall, the core operational infrastructure is very good. The firm has an SSAE 16 report conducted by Deloitte & Touche. The 3 ODD rating takes into account some weaknesses at the fund level noted below.

ASSESSMENT

PanAgora is in the midst of changing its administrator and adding a secondary PB; they have been unhappy with the service of their current administrator (Citi) and are looking to switch to a boutique firm (Stone Coast) where they feel they will receive better service.

Given the pending changes in the service providers, the lack of AUM in the fund and the fact that PanAgora is comfortable with the managed account platform, if an investment is deemed appropriate it is recommended that it be made through a managed account.



FLAGS/CONCERNS

- Majority ownership not with the internal partners
- Changing administrators to a second tier service provider
- Only one prime broker relationship which presents counterparty risk; weak prime broker terms
- AUM base in the 10% volatility trading account is very small

OPERATIONAL SCORE

3 (Yellow)

ODD MEETING SUMMARY

Prime Brokers/Custodians: JPM

Fund Administrator: Citi Hedge Fund Services

Auditor: Deloitte & Touche

Legal Counsel: K&L Gates (onshore); Walkers (offshore)

Systems: Charles River and proprietary applications

• **Ownership Structure:** PanAgora's ownership interest includes PanAgora employees and two outside corporate entities. Internally, the PanAgora Management Equity Plan, which was implemented in March 2008, offers up to 20% ownership in the firm by PanAgora's senior management and investment staff (18 directors) through restricted stocks and options. Eric Sorensen of PanAgora has the largest internal stake at just under 50% (of the max 20%).

The two outside entities include Power Financial Corporation (66% owner), through its affiliates Great West Life/Putnam Investments, and Nippon Life Insurance Company (14% owner).

Each firm has a seat on the board but typically abstains from voting; they allow PanAgora to make all investment decisions. Power has, on occasion given PanAgora a name that they have to put on the restricted list.

Lehman sold their interests to Power in 2003. Putnam also bought 30% of the stake from Nippon in 2003. Putnam was later bought by Power in 2004. Nothing is outsourced to Power Financial or Nippon.



- **Fund Structure:** The fund is set-up as a simple master feeder fund. There are also several managed accounts that trade pari-passu or similarly to the commingled fund. The Diversified Factor Premia Fund was formerly named the Global Multi-Asset Alpha GT fund.
- **Affiliated broker-dealer/entities:** PanAgora does not use affiliated broker/dealers in executing trades. Putnam Investments and Great-West Lifeco, affiliates of the ultimate parent company, have affiliated broker/dealers that would not act on an agency or principal basis in publicly traded securities transacted by PanAgora as an investment manager.
- **Staffing:** PanAgora has over 100 employees all in the MA office, 33% of which are on the investment team. Since 2008; when the firm went to the stock option plan there have been 2 significant departures, 1 of which was Ron Hua the CIO of dynamic strategy, global/international equities. He was replaced by George Mussalli.



- **AUM:** The PanAgora Diversified Arbitrage fund has assets of approximately \$100m million. The Diversified Factor Risk Premia fund only has about \$3 million in assets. Firm-wide PanAgora manages approximately \$39 billion in assets across all strategies.



Strategy Name	AUM (\$M)
Alternatives	
Diversified Arbitrage	100
Dynamic Global Equity Extended Alpha	586
Dynamic International Equity Extended Alpha	136
Fixed Income Diversified Opportunities	154
Global Equity Multi Alpha	871
Stock Selector Equity Series	
U.S. Large Cap Core Stock Selector	8,677
U.S. Small Cap Core Stock Selector	1,016
U.S. All Cap Stock Selector	404
U.S. Large Cap Growth Stock Selector	94
U.S. Large Cap Value Stock Selector	93
Dynamic Equity Series	
Dynamic Global Equity	11,462
Dynamic International Equity	3,363
Dynamic Emerging Markets Equity	1,845
Dynamic U.S. Large Cap Core	1,793
Dynamic U.S. Mid Cap Core	148
Dynamic Small Cap Equity	299
Risk Parity Multi Asset/Smart Beta	
Risk Parity Multi Asset	2,822
Risk Parity Multi Asset Plus	528
Diversified Risk Equity	467
Other Multi Asset Strategies	
Tactical Asset Allocation	705
Passive Equity and Active & Passive Fixed Income	
Passive Equity	3,040
Active & Passive Fixed Income	378
TOTAL PANAGORA AUM	38,981

- **Investor Base:** 54% is from non-US FoF, 14% from corporations, 8% from non-US pensions, 7% from HNWI and 19% from internal/seed capital. Internal capital in the Diversified Arbitrage fund is \$6.2mn; the directors have capital spread throughout several of the PanAgora products. PanAgora has over 125 institutional client relationships globally. The Diversified Factor Premia Strategy has been seeded internally.

- **Service Providers:** The service providers are noted above. PanAgora Diversified Arbitrage only has one prime broker because their AUM is too small to support a second prime broker. They are hoping to be able increase AUM by Q3/Q4 and are working with Bank of America Merrill Lynch to potentially add them as a prime broker. PanAgora is very dissatisfied with Citi as their administrator and is interviewing for a replacement. They stated that Stone Coast Hedge Fund Services is the frontrunner. They are hoping to finalize a contract with the new admin before year end.

An online review was performed on Stone Coast with minimal hits; a review of their website and a Q2 2013 service provider survey performed by E-vestment showed that Stone Coast had \$14bn in assets under administration and 106 hedge fund clients. A follow-up call will be performed with the administrator.



- **Counterparty Agreements:** All agreements are negotiated by Joel Feinberg and outside counsel. The outside legal counsel charges between \$20,000 and \$30,000 for each counterparty contract. Joel reviews all of the costs, the price per trades and is very aggressive in continuously negotiating the costs down. The NAV triggers are 25/35/50 for most of the ISDAs.

- **Cash Management:** Unencumbered cash is typically maintained at the prime brokerage account. PanAgora leaves it at the prime brokerage account so that they can receive better financing rates.

PanAgora provided a signatory summary sheet which shows which employees have the ability to perform the following:

Level 0	Authorized to place orders directly in the market.
Level 1	Authorized to instruct brokers and custodian banks on behalf of PAM for securities transactions (including FX and derivatives), to make elections on voluntary corporate actions and provide advice on fair valuation matters
Level 2	Authorized to submit elections on voluntary corporate actions
Level 3	Authorized to instruct brokers, administrators (swaps) and custodian banks on behalf of PAM for security settlements (including standing instructions) and money movements between sleeves and/or from FCM to custody account
Level 4	Authorized to confirm contribution and withdrawal directions on client accounts (X) or on PAM funds participant accounts (#)
Level 5	Authorized to approve payments of fees and expenses from PAM funds (requires both X and Y authorizations)
Level 6	Authorized to confirm contribution and withdrawal direction on PAM corporate accounts
Level 7	Authorized to confirm the Authorization Levels for Investment Management, Investment Operations and Finance

- **Leverage Facilities:** PanAgora switched to enhanced stock loan and can go as high as 9x with JPM. Though they are typically in the 2x-6x range, they are currently 5.25x levered. There are no margin lock-up agreements, all financing is demand based. The Diversified Factor Premia portfolio is targeting 10% annualized volatility and currently run at 8-10x leverage.

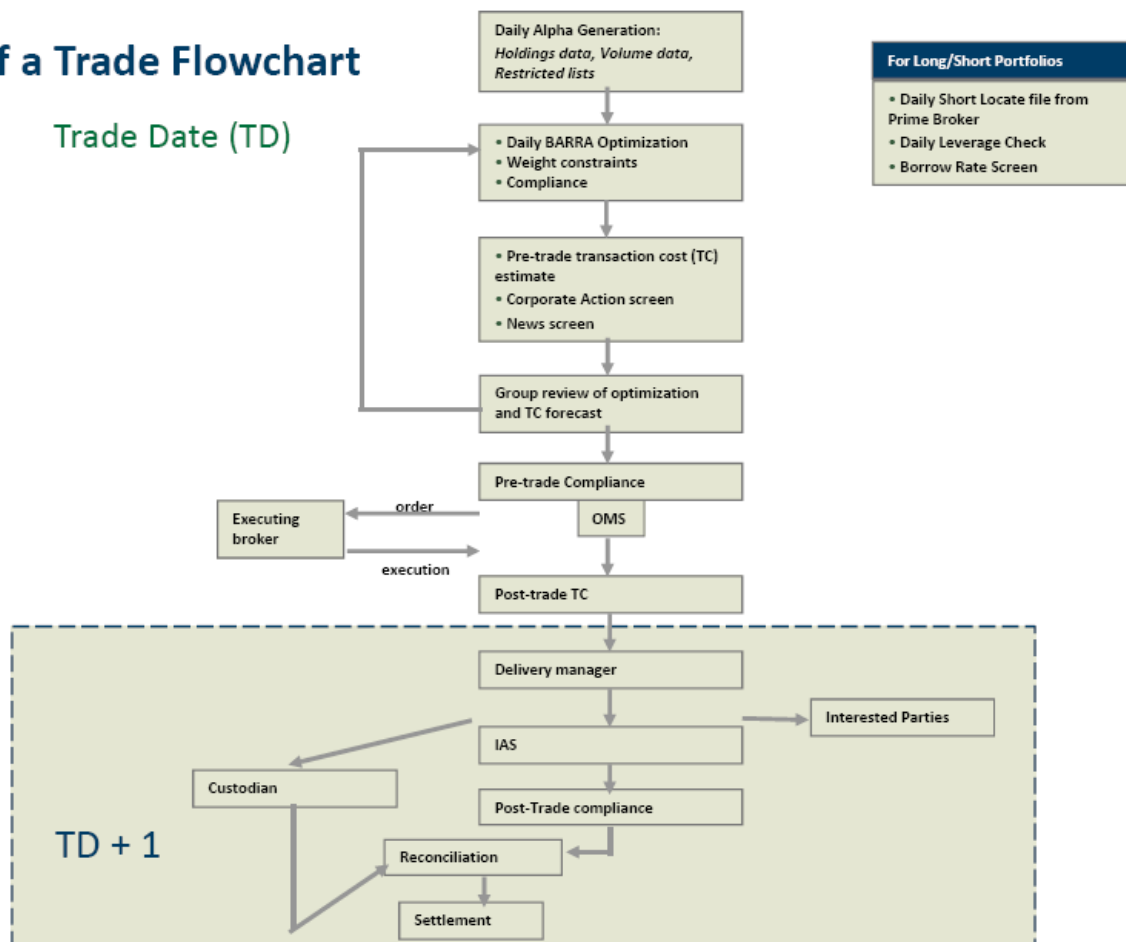
- **Daily Ops & Controls:** The trades are executed electronically via Charles River (the fund trades in equities, futures and ETFs). Prior to execution trades are run through a pre trade compliance check; once executed the trades are SWIFT messaged to Brown Brothers Harriman, who then sends the trade to the custodian. PanAgora also SWIFT messages the trades to the prime broker and the administrator.

Trades are then matched using an internally built system; a break report is then created and cleared by the back office team. The firm executes 2,000-3,000 trades a day; the firm executes ~500 trades for the Diversified Alpha Fund on a daily basis.

Best Execution is monitored by the investment oversight committee. The committee performs a broker review and provides an approved broker and counterparty list. Trades are executed on a pro rata basis. In the rare event that a trade is not executed on a pro rata basis compliance must review and approve of the allocation.

There are no cross trades between the products, all trades are executed through the market.

Life of a Trade Flowchart



• **Pricing & Valuations:** The investment manager prices the book via Bloomberg, Reuther, IDC, and MarkIT. There are no securities that go to third party valuation agents or require broker quotes or model pricing. There are no side pockets or internally valued securities; 99% of the portfolio is in level 1 and 1% in level 2.



The administrator is able to independently verify all of the prices using their valuation sources. Given that the portfolio trades exchange traded securities, there is rarely a discrepancy between the administrator and PanAgora's price.

- **Fund Accounting/Tax/Audit:** There has never been a NAV restatement but there has been delay. Typically, the statements are available 20 calendar days after month end; however, Citi had incorrectly calculated the NAV and ending balance for a few investors which caused a 10 day delay. The Factor Premia fund audit is included under the PanAgora Group Trust financial statements.

The back office team uses a proprietary system and leverages off of BNY Mellon's systems as well.

The audits are available 90 days after year end; there has never been a change in auditors or a qualified opinion. PanAgora has a SSAE 16 report conducted by D&T. There were a few exceptions noted which were either corrected or further explained.

- **Regulatory Compliance/Legal Issues:** PanAgora is registered with the SEC (#801-35497). The compliance manual was reviewed onsite, it was last updated Dec 31, 2013. The CCO is responsible for reviewing 50 emails a day for compliance monitoring. PanAgora utilizes soft dollars, however they are all within 28 (e). Approximately 18% of commissions, or \$3 million was soft dollars. PanAgora has not had a regulatory review since 2008. PanAgora does not permit employees to speak to expert networks. PanAgora is also registered as a CPO and CTA and Swap Firm with the CFTC.

- **IT/BCP:** The firm has a DR and collocation site in Andover, Maryland. The site replicates the database on a real-time basis. In the event of a disaster several of the functions would be automatically switched over, the remaining key/integral switches would need to be performed manually. The server room has a primary and secondary A/C unit, primary and secondary UPS, and a pre-action water system that will close the vents and suck the oxygen out of the room in the event of a fire. If that does not work the water head sprinklers would be turned on.

PanAgora hires a consultant to perform a penetration test on its systems, firewalls, and website on an annual basis. If any breaches or weak spots are identified PanAgora will fix it and re-test the systems to ensure they rectified the issue.

RECOMMENDED FOR INVESTMENT:

☐ YES ☐ NO ☒ X Other Recommendation (explain) : An investment in the commingled account is not recommended. If an investment is made it should be done via managed account.



Pending Due Diligence Items:

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

Explain: