# **MAI Index Methodologies**

- Bull-Rider Bear-Fighter®
- Tactical Growth & Income™
- Best-of-Breed Core Momentum<sup>™</sup>
- SectorSurfer® Momentum

**Updated Oct 21, 2020** 

# I. Construction Summary

#### A. Index Overview

MAI Indexes is a service of SumGrowth Strategies, LLC (SGS, the "Index Provider"). This document describes the methodology and construction of the following Indexes (the "Index" or "Indexes"):

- Bull-Rider Bear-Fighter®
- Tactical Growth & Income<sup>™</sup>
- Best-of-Breed Core Momentum<sup>™</sup>
- SectorSurfer<sup>®</sup> Momentum

MAI Indexes are dynamic multi-asset indexes that seek to deliver higher returns and lower risk than a market capitalization-weighted index composed of comparable assets by employing a combination of differential asset class rotation, adaptive momentum filtering, active and passive risk reduction, integrated bear market strategies, and the Merlyn.AI Genetic Algorithms that periodically evolves the model's configuration. Eligible securities are limited to U.S. publicly traded ETFs deemed suitable to maintain investability of the Index.

### **B.** Index Configuration

Each Index consists of a portfolio of underlying thematic momentum strategies, each of which selects a single ETF from within its thematic Category to represent the strategy in the portfolio. The Indexes and their portfolio of underlying thematic Category strategies are listed in Table 1 (below) with their corresponding allocation weights. Momentum strategies seek to identify ETFs having the highest expected subsequent monthly return performance relative to other ETFs in its thematic Category (the "Momentum Leader"). Each Index includes a proprietary Bull/Bear Indicator (Section I-G) that seeks to determine whether U.S. equity markets appear to be in an advancing market (a "Bull" indicator) or appear to have an elevated risk of market decline (a "Bear" indicator). When a Bull market is indicated, the Index identifies a portfolio of ETFs, one determined by each of its thematic Categories. When a Bear market is indicated, each momentum strategy automatically switches its model to a Bear Market Strategy that replaces its set of thematic candidate ETFs with a set of safe-harbor candidate ETFs that generally perform better in bear markets. Bear Market Strategies seek to avoid the punishing losses of a market crash while striving for returns better than sitting on the sidelines in cash.

Bull-Rider Bear-Fighter		Tactical Growth and Income			SectorSurfer Momentum		Best-of-Breed Core Momentum	
Category	Weight	Category	Weight		Category	Weight	Category	Weight
Sectors-I	20%	Sectors	15%		Sectors-I	20%	Sectors	35%
Sectors-II	15%	Countries	5%		Sectors-II	20%	Factors	35%
Countries	15%	Regions	5%		Sectors-III	15%	Global	30%
Regions	10%	Dividends	5%		Sectors-IV	15%		
Factors	10%	Bonds-I	15%		Geopol.Sectors-I	15%	Note: Duplica	ate strategy
StyleMix	10%	Bonds-II	15%		Geopol.Sectors-II	15%	Categories w	vill make an
Bonds-I	10%	Bonds-III	20%				alternative E	TF selection
Bonds-II	10%	Bonds-IV	20%	1			when reasona	bly possible.

## Table 1. Indexes, their Thematic Categories, and Allocation Weights

#### **Bull-Rider Bear-Fighter - Summary**

During Bull markets, the MAI Bull-Rider Bear-Fighter Index selects a portfolio of eight thematic Category ETFs that approximate the 80/20 stocks/bonds ratio of a classic growth portfolio. Categories include Sectors (2), Countries, Regions, Factors, StyleMix, and Bonds (2). Its eight underlying strategies seek to improve returns by owning only the Category Momentum Leaders. During Bear markets, the Index seeks to avoid risk and secure a positive return by selecting at least four Momentum Leaders from among a broad selection of bond, treasury, and gold safe-harbor ETFs. Inverse and leveraged ETFs are prohibited.

#### **Tactical Growth & Income - Summary**

During Bull markets, the MAI Tactical Growth & Income Index selects a portfolio of eight thematic Category ETFs that approximate the 30/70 stocks/bonds ratio of a classic conservative portfolio. Categories include Sectors, Countries, Regions, Dividends, and Bonds (4). Its eight underlying strategies seek to improve returns by owning only the Category Momentum Leaders. During Bear markets, the Index seeks to avoid risk and secure a positive return by selecting at least four Momentum Leaders from among a broad selection of bond, treasury, and gold safe-harbor ETFs. Inverse and leveraged ETFs are prohibited.

#### SectorSurfer Momentum - Summary

During Bull markets, the MAI SectorSurfer Momentum Index selects a portfolio of six thematic Category ETFs that approximate the 70/30 domestic/foreign equities ratio of a classic aggressive portfolio. Categories include Sectors (4), and Geopolitical Sectors (2). Its six underlying strategies seek to improve returns by owning only the Category Momentum Leaders. During Bear markets, the Index seeks to avoid risk and secure a positive return by selecting at least four Momentum Leaders from among a broad selection of bond, treasury, and gold safe-harbor ETFs. Inverse and leveraged ETFs are prohibited.

#### **Best-of-Breed Core Momentum - Summary**

During Bull markets, the MAI Best-of-Breed Core Momentum Index selects a portfolio of three thematic Category ETFs (each with > \$10B AUM), that approximate the 70/30 domestic/foreign equities ratio of a classic aggressive portfolio. Categories include Sectors, Regions, and Factors. Its three underlying strategies seek to improve returns by owning only the Category Momentum Leaders. During Bear markets, the Index seeks to avoid risk and secure a positive return by selecting three Momentum Leaders from among a broad selection of bond, treasury, and gold safe-harbor ETFs. Inverse and leveraged ETFs are prohibited.

### c. Universe of Eligible Securities

#### **Bull Universe:**

When the Bull/Bear indicator signals a Bull market, each Index identifies a portfolio of ETFs, one for each of its thematic Categories, from its Bull Universe of candidate ETFs. Categories have generally divergent investment objectives that are further divided into a set of Subcategories. A Category may include a "broad U.S. equity markets" Subcategory that seeks to provide a performance floor when determining the Momentum Leader. Categories and Subcategories are viewed as general guidelines. The scope of each is interpreted broadly and may overlap. The Index Provider initially screens ETFs based on information provided by the ETF's name and investment objectives to identify candidates for membership in a particular Category and Subcategory, then further screens each candidate by conducting a correlation test with other Subcategory members to confirm that the candidate is sufficiently similar to become a member of the Subcategory. As a result, a single ETF may be included in multiple Categories and Subcategories.

- The "Sectors" Category includes ETFs that invest primarily in one of several economic sector Subcategories, such as healthcare, energy, technology, and finance.
- The "Global/Regions" Category includes ETFs that invest primarily in one of several broad geopolitical region Subcategories, such as global, Europe, Asia Pacific, North America, and emerging markets.
- The "Countries" Category includes ETFs that invest primarily in a single country, which can be any country in the world.
- The "Geopolitical Sectors" Category includes ETFs that invest primarily in one of several broad geopolitical region Subcategories, such as global, Europe, Asia Pacific, North America, and emerging markets, or any individual country in the world.
- The "Factors" Category includes ETFs that invest primarily based on one of several investment factor Subcategories, such as value, growth, dividends, earnings, size, and momentum.
- The "Dividends" Category includes ETFs that invest primarily based on one of several dividend Subcategories, such as general, high, quality, achievers, and growth.
- The "Style Mix" Category includes ETFs that invest primarily based on one of several investment style Subcategories, such as large-cap, large-cap growth, large-cap value, mid-cap, mid-cap growth, mid-cap value, small-cap value, equal weight, growth, and value.
- The "Bonds" Category includes ETFs that invest primarily in one of several bond Subcategories, such as treasuries, aggregate bonds, corporate bonds, mortgage bonds, muni bonds, and high-yield bonds.

The Bull Universe excludes, among others: (1) certain small ETFs (based on assets under management); (2) currency ETFs; (3) leveraged ETFs; (4) inverse ETFs; (5) utility ETFs; (6) commodity ETFs; (7) global/foreign fixed income ETFs; (8) inflation-protected treasury ETFs; (9) long-term treasury ETFs; (10) short-term treasury ETFs; (11) short-term bond ETFs; and (12) ETFs with less than one year of operating of history. Each of the foregoing exclusions is based only on the relevant ETF's name and investment objective; and as a result, the Fund's underlying ETFs may, from time to time, hold the foregoing types of securities in their portfolios.

#### **Bear Universe:**

When the Bull/Bear Indicator signals a Bear market, the Index identifies a portfolio of at least three Bear Market Category ETFs within the Bear Universe. The Bear Market Category is further divided into a set of Subcategories, including: (1) medium- and long-term treasury, (2) aggregate bond, (3) long-term bond, (4) corporate bond, (5) high-yield bond, (6) gold, and (7) broad-based U.S. equity market (seeking better returns during a bear market rebound). The Index Provider initially screens ETFs based on information provided by the ETF's name and investment objectives to identify candidates for membership in a particular Subcategory, then further screens each candidate by conducting a correlation test with other Subcategory members to confirm that the candidate is sufficiently similar to become a member of the Subcategory.

The Bear Universe excludes, among others: (1) leveraged ETFs; (2) inverse ETFs; (3) currency ETFs; (4) short-term treasury and money market ETFs; (5) inflation-protected treasury ETFs; (6) global/foreign fixed income ETFs; (7) commodity ETFs (except gold); (8) equity ETFs (except broad-based U.S. equity market index ETFs); (9) certain small ETFs (based on assets under management); and (10) ETFs with less than one year of operating of history. Each of the foregoing exclusions is based only on the relevant ETF's name and investment objective; and as a result, the Fund's underlying ETFs may, from time to time, hold the foregoing types of securities in their portfolios.

## D. Bull Market Index Configuration

During Bull markets, each Index employs a set of thematic Category momentum strategies, each of which selects a single ETF to represent the Category in the portfolio. Multiple instances of some Categories may be employed to increase diversification or improve trading logistics. The Index additionally develops 12 unique evaluation Models for each of its thematic Category momentum strategies. Each Model is comprised of a different mix of candidate ETFs from its associated Subcategories. At month-end, each Model selects its Momentum Leader from among its set of candidate ETFs, and each thematic Category selects its overall Momentum Leader from the selections made by its 12 underlying Models. The Index employs a proprietary AI Genetic Algorithm to continuously evolve the set of candidate ETFs associated with its thematic Category Models. The AI Genetic Algorithm seeks to eliminate hindsight selection bias and adapt the Models to changing market conditions. (See Section I-I for more information.) In summary, the Index is composed of a portfolio of Momentum Leaders, each representing one its thematic Categories.









### E. Bear Market Index Construction

During Bear markets, the Index employs a set of defensive Models (per Table 2), each having a different mix of Bear Universe ETFs. Each Model may identify more than one defensive Momentum Leader. Because there are fewer defensive ETFs from which to select, it is possible that the defensive Models may identify duplicate ETFs. Nevertheless,

Table 2. Defensive Models and ETF Selections					
Index Neme	Defensive	Unique ETFs			
	Models	Selected			
Bull-Rider Bear-Fighter	2	4 to 8			
Tactical Growth & Income	2	4 to 8			
SectorSurfer Momentum	2	4 to 6			
Best-of-Breed Core Momentum	2	3			

the Indexes will ensure that at least the specified minimum number of Unique ETFs have been selected.

#### F. Bull Duplicate Selection Reduction

The Index seeks to minimize the selection of duplicate ETFs by its different thematic Categories. A Duplicate Reduction algorithm (Section II-L) identifies instances of duplicate selections and attempts to identify and substitute suitable alternatives from the same Subcategory. If it is unable to identify a suitable substitute, duplicate ETF selections are permitted.

Table 3. Bull Categories and ETF Selections					
Index Name	Thematic	Unique ETFs			
index Name	Categories	Selected			
Bull-Rider Bear-Fighter	8	6 to 8			
Tactical Growth & Income	8	6 to 8			
SectorSurfer Momentum	6	4 to 6			
Best-of-Breed Core Momentum	3	3			

Nevertheless, the Indexes will apply the Duplicate Reduction algorithm to ensure that at least the minimum number of Unique ETFs have been selected.

#### G. Bull/Bear Indicator

The Index uses a proprietary market risk indicator (the Bull/Bear Indicator) that seeks to determine whether U.S. equity markets appear to be in an advancing market (a "Bull" indicator) or appear to have an elevated risk of market decline (a "Bear" indicator). The Bull/Bear Indicator is an algorithm that assesses the risk of U.S. equity markets using four key metrics: price-trend, market momentum, value sentiment, and market volatility. Price-trend indicates the degree to which U.S. market securities prices are trending higher or lower.

Market momentum indicates the volume-adjusted, price-trend of U.S. equity market securities to assess investor conviction. Value sentiment indicates the recent proportion of U.S. equity market securities making 52-week highs against those making 52-week lows. Higher market volatility is correlated with a higher probability of declining markets and may indicate the possible onset of an extreme market decline. In addition, when in a Bear market, the Bull/Bear Indicator assesses whether a particularly sharp rebound follows a recent market decline, in which case the Bull indicator is triggered.

The Index remains constructed using a "Bull" or "Bear" methodology, as the case may be, until a subsequent event triggers a change. Shifts between a "Bull" and a "Bear" methodology generally occur at month-end. Additionally, as noted below, market changes may trigger an Index methodology shift mid-month. The following set of rules is used to determine when the Index methodology will shift between a "Bull" and a "Bear" methodology.

Bull to Bear: When any one of the first three metrics (i.e., price-trend, market momentum, value sentiment) is negative and that metric is declining further at month-end, the "Bear" indicator is triggered and the Index is constructed via the Bear methodology. Additionally, the "Bear" indicator may be triggered at any time during the month when excess market volatility is indicated, but in that case, the Bear Index's construction will be limited to using only medium- and long-term treasury ETFs of the Bear Universe.

Bear to Bull: When one or more of the first three metrics is positive in value and the remaining metric(s) are increasing at month-end, the "Bull" indicator is triggered and the Index is constructed via the Bull methodology. In addition, the "Bull" indicator may be triggered at any time during the month if a particularly sharp rebound follows a recent market decline.

The Bull/Bear Indicator employs well-known PID (proportional, integral, and differential) process control algorithms to further condition the three basic metrics before combining them using the methods of "fuzzy logic" to produce the final Bull/Bear Indicator value. See Section II-I and Section II-J for a more detailed description of the calculations. The Bull/Bear Indicator is published daily by SGS as StormGuard-Armor.

#### H. Polymorphic Momentum – Forward-Walk Progressive Tuning

"Poly," meaning many, and "morph," meaning change, describe the nature of the momentum filter design for the Indexes. Momentum filters may be either DEMA (double exponential moving average) or TEMA (triple exponential moving average) in form and are progressively re-tuned at monthly intervals. The momentum strategies employ progressively tuned momentum filters because (1) the character of the noise present in market data has changed substantially over time, and (2) the differential noise between a strategy's candidate ETFs will depend on the character of the combination of bonds, treasuries, broad markets, sectors, and commodity ETFs present as they can be markedly different from one another. Thus, the filter time constants may range from 11 days to 105 days depending on the absolute and differential noise characteristics of the candidate ETF daily data. All momentum strategies do an initial backtest to tune the momentum filters through 12/31/2003, after which formal monthly performance evaluation begins. The momentum strategies then walk forward in time through out-of-sample data and progressively retune their momentum filters at subsequent month-end intervals. This methodology eliminates hindsight bias distortions that might otherwise plague the momentum filter tuning process.

## I. Genetic Algorithm – Eliminating Hindsight Selection Bias

Hindsight selection bias can be problematic in simple backtested investment models because funds that made a model perform well in the past may not continue to do so in the future. These Indexes employ Merlyn.Al Genetic Algorithms designed to both expand the universe of candidate ETFs and evolve a population of candidate momentum Models on a monthly basis seeking to continuously adapt to the market's evolving character while eliminating hindsight bias in the ETF selection process.

The Genetic Algorithm evolves a population of 12 Models in much the same way as populations of plants and animals evolve naturally. Consider the analogy where each ETF Subcategory represents a different animal body part. When animals evolve by mutation, their child's legs might be different in some way, but they will not have turned into arms or heads. The same applies to the Category Models – meaning that if the mutation Subcategory happened to be energy, then the child Model would have a different energy Subcategory ETF than its parent. As a result, the child Model might then perform slightly better or worse than its parent. In evolution through crossover, a child gets some of its genes from one parent and some from another parent. Here, the child Model starts with the Subcategory ETFs of its parent but then replaces one of its Subcategory ETFs with the ETF of the same Subcategory used by one of the other 12 Models.

If the child Model evolves through mutation or crossover to have a better Fitness (a measure of risk-adjusted return performance, see Section II-F) than the parent Model, then the child Model replaces the parent Model going forward. Otherwise, the child Model is discarded and the parent Model continues forward.

Index Categories employing the Genetic Algorithm create and evolve their underlying population of 12 unique Models. Each month, the Genetic Algorithm utilizes the following process steps to evolve each of the 12 Models attempting to improve their overall Fitness. Together, the 12 Models will vote to determine which one of their momentum leading ETFs will represent the Category in the Index. The steps include:

- For each of the 12 underlying evaluation Models:
  - Select one of its candidate ETFs for possible genetic mutation
  - o Create a list of potential substitute ETFs from its Subcategory
  - o Rank the list according to their current momentum value
  - o Substitute the highest-ranking one for the ETF selected for mutation
  - Evaluate the mutant child Model for its Fitness (return and risk)
  - o If the mutant child Model has better Fitness, the child replaces the parent
- For each of the 12 underlying evaluation Models:
  - Select one of its candidate ETFs for possible genetic crossover
  - o Select a different underlying strategy as the donor for the genetic crossover
  - o Substitute the corresponding ETF from the donor into the recipient child
  - Evaluate the crossover child Model for its Fitness (return and risk)
  - o If the crossover child Model has better Fitness, replace the parent with the child
- Create a voting strategy for determining the Momentum Leader among the 12 Models
  - $\circ$   $\,$  Create a list comprised of the Momentum Leaders from each of the 12 Models  $\,$
  - $\circ$   $\,$  Use the list of Momentum Leaders as candidate ETFs for the voting strategy
  - Evaluate the voting strategy to determine the ultimate Momentum Leader
  - o The ultimate Momentum Leader represents the Category within the Index

# **II.** Calculations

#### A. EMA, DEMA, TEMA

EMA is the exponential moving average, DEMA the double exponential moving average, and TEMA is the triple exponential moving average of a data series computed as follows:

$$EMA(n) = \frac{Val(n)}{d} + EMA(n-1) * (1-\frac{1}{d})$$
$$DEMA(n) = \frac{EMA(n)}{d} + DEMA(n-1) * (1-\frac{1}{d})$$

$$TEMA(n) = \frac{DEMA(n)}{d} + TEMA(n-1) * (1-\frac{1}{d})$$

Where:

- d = the EMA filter time constant in days.
- V(n) = the value of raw data on the n<sup>th</sup> day.
- EMA(n) = the EMA value on the n<sup>th</sup> day
- DEMA(n) = the DEMA value on the n<sup>th</sup> day
- TEMA(n) = the TEMA value on the n<sup>th</sup> day

#### **B. Trend Leader – Population Member Strategy and Bear Market Strategy**

The trend leader is the fund with the highest DEMA or TEMA of its daily return data series. The choice between the DEMA or TEMA filter is determined by the performance/Fitness of the strategy. Generally, the Momentum Leader is the Trend Leader. However, following an oversold condition mean reversion principles may apply for a few weeks resulting in the projected Momentum Leader being the opposite of the Trend Leader.

**TrendLeader** = 
$$IndexOfMax(Trend(i))$$
 ... for  $i = 1$  to 12

Where:

- *i* = the index, 1 to 12, of a strategy's candidate funds
- Trend(i) = the trend value (DEMA or TEMA) of the i<sup>th</sup> candidate fund
- *IndexOfMax(f(i))* = the index of fund(*i*) having the highest trend

### c. CAGR – Compound Annual Growth Rate

The CAGR is the annualized return for an investment.

$$CAGR = \left(\frac{EndPrice}{StartPrice}\right)^{\frac{1}{\gamma rs}} - 1$$

Where:

• yrs = the number of years the investment was held

#### D. Quarterly Downside Deviation

The underlying measure of risk used herein will be the Quarterly Downside Deviation (QDD), which is calculated as the root mean square of negative quarterly returns, sampled daily over the portfolio's data span. More specifically:

Quarterly Downside Deviation = 
$$\sqrt{\frac{\sum_{i=1+3mo}^{Total Days} \left[Min\left(\frac{p(i)}{p(i-3mo)}-1, 0\right)\right]^{2}}{Total Days-3mo}}$$

Where:

- *Total Days* = the number of market days in the evaluation period.
- 3mo = one quarter of a year, typically 63 market days.
- p(i) = the equity curve value on day i.

#### E. Relative Risk

Relative Risk is a ratio between the Quarterly Downside Deviation (QDD) of a strategy versus the Quarterly Downside Deviation of a very aggressive traditional portfolio consisting of 70% VFINX and 30% VTRIX measured from 1/2/2004 to present.

 $RelativeRisk = QDD_{TestPortfolio}/QDD_{AggressivePortfolio}$ 

#### F. Fitness

Fitness is a Genetic Algorithm term used to judge the relative performance/value of a population member. The Fitness value used in the MAI Categories is the 5yr CAGR divided by its Relative Risk.

## G. Score

The Score value for a strategy is a risk-adjusted return that includes the CAGR for all years, the CAGR for the most recent three years, and the RelativeRisk value for the Strategy.

$$Score = (CAGR_{AllYrs} + CAGR_{3Yrs}/2)/(40\% + RelativeRisk)$$

#### H. Progressive Tuning

At each six month interval, the Tuning Time Constant for the momentum filter is re-evaluated by evaluating the *Score* of a strategy's performance over a range of 20 time constants ranging from 11 days to 105 days with an interval determined by a geometric ratio step size of 1.125. The tuning time constant producing the best *Score* will be used for the momentum filter algorithm for the subsequent six-month period of time.

$$TimeConstant(i) = 10 * 1.125^{i}$$
 ... for  $i = 1$  to 20

BestIndex = IndexOfMax(Score(TimeConstant(i))) ... for i = 1 to 20

**TuningTimeConstant** = TimeConstant(BestIndex)

Where:

- *i* = the index, 1 to 20, of a strategy's candidate funds
- *TimeConstant(i)* = the momentum filter time constant in market days
- *Score*(*TimeConstant*(*i*)) = the *Score* of the strategy using *TimeConstant*(*i*)
- IndexOfMax(Score(TimeConstant(i)) = the index of the one with the best Score
- *TuningTimeConstant* = the final momentum filter time constant in market days

## I. Bull/Bear Indicator: Price Trend, Market Momentum, Value Sentiment

The Price Trend is calculated as the 50d DEMA of the S&P500 composite index daily return, scaled monthly (21 market days), and offset by +0.5%. The Market Momentum is calculated as the 50d DEMA of the Volume-Adjusted S&P500 composite index daily return, scaled monthly, and offset by +0.5%. The Volume-Adjusted S&P500 composite daily return scales the daily return in proportion to the square of the UpVolume/TotalVolume +.5

**PriceTrend** =  $21 * DEMA_{50d}(DailyReturnS\&P500) + 0.5\%$ 

 $VolAdjustedDailyReturnS\&P500 = DailyReturnS\&P500 * [UpVolume/TotalVolume + .5]^{2}$  $MarketMomentum = 21 * DEMA_{50d} * (VolAdjustedDailyReturnS\&P500) + 0.5\%$ 

AvgHighsPlusLows = EMA<sub>255d</sub>(NewHighs + NewLows) ValueSentiment = EMA<sub>15d</sub>(2 \* NewLows/AvgHighsPlusLows)/66

Where:

- *UpVolume and TotalVolume* are trading volume statistics of the US Markets
- *NewHighs and NewLows* are rolling 52-week statistics of the US Markets

### J. Bull/Bear Indicator: Fuzzy Logic Decisions

The decision of whether to exit the market, re-enter the market, or hold the current status consists of the following set of rules, each governed by a combination of logic and analog measures of market statistics.

Conditions indicating the market is not safe: Invoke the Bear Market Strategy

- Price Trend < 0 and declining.
- Value Sentiment < 0 and declining.
- Market Momentum < 0 and declining.

Conditions to hold off on re-entering the market: Remain in the Bear Market Strategy

- Long bear market (>6mo) and three primary measures not unanimously positive
- Price Trend remains < 0.
- Market Momentum < -.5% for 3 months.

• Value Sentiment < 0 for at least 3 of last 5 months.

Conditions for normal re-entry to the market with the momentum strategy: Exit Bear Market Strategy

- Price Trend > 0 and increasing.
- Value Sentiment > 0 and increasing.
- Market Momentum > 0 and increasing.

Conditions for early re-entry to the market with the momentum strategy: Exit Bear Market Strategy

- Bottom Conviction: At least one measure positive, the slope of others > .5%/mo.
- Re-entry Tease: < All measures increasing and expected to cross < 21 days
- Whipsaw Reduction: Recent drop >5% and highest S&P500 in seven weeks

Conditions for preventing a Bull/Bear Indicator false-trigger exit to Bear Market Strategy

• S&P500 drops>6% in the prior 6 weeks with >85% recovery by current month-end.

### **K. Suitability**

The Suitability of a candidate ETF is a measure of its relative volatility. Candidate ETFs with large relative volatility become unsuitable for participation in a momentum strategy. When differential volatility between the candidate ETF and the MDY (midcap 400) is larger than the volatility of the MDY, the ETF is unsuitable.

**RelativeVolatility** =  $1 - (ETF_{Rtn} - MDY_{Rtn})^2 / (MDY_{Rtn})^2$ 

**Suitability** =  $EMA_{44d}$ (RelativeVolatility)

Where:

- RelativeVolatility is a daily measure of the ETF-MDY difference relative to the MDY
- Suitability is the 44day EMA of RelativeVolatility

#### L. Duplicate Reduction

When a Category selects the same ETF already selected by another Category, a suitable substitute is identified to improve diversification and trading logistics. The set of candidate substitutes is limited to the set of ETFs belonging to the same Sector/Asset Class. The candidate substitutes are ranked as follows, and the list is searched for the first non-duplicative instance with *Ranking* > 0.95. Failure to find a suitable substitute results in accepting a duplicate choice.

**Ranking** = 
$$Correlation_{42d}(1 + Return_{42d})$$

Where:

- Correlation is the 42 market-day correlation between the selection and the candidate
- *Return* is the 42 market-day cumulative return of the candidate

# **III. Index Evaluation and Rebalancing**

### A. Evaluation and Rebalancing Schedule

All MAI Indexes are normally evaluated following the last trading day of the month. However, the Bull/Bear Indicator may at times change mid-month in response to a significant punctuated event. Rebalancing becomes effective at the close of the subsequent trading day for trades produced by the Index. Each Category typically produces 4 to 5 trades per year.

#### **B. Target Buffer Weights**

To help minimize turnover, buffers of +/- 10% of the target weight are applied to the target weight of each of the Categories. If the weight of any individual Category deviates by more than the buffer amount from its target weight, the Category will be rebalanced back to its target weight at the next monthly evaluation.

#### c. Fund Turnover (annual, including backtest modeling and since inception)

- Bull-Rider Bear-Fighter: 773%
- Tactical Growth and Income: 675%
- SectorSurfer Momentum: 775% (Est.)
- Best-of-Breed Core Momentum: 750% (Est.)

# **IV. Index Calculation and Maintenance**

#### A. Daily Calculation

The MAI Indexes are produced by SumGrowth Strategies, LLC (the Index Provider), and transmitted to Solactive AG (the Calculation Agent). The Index Calculation Agent is responsible for calculating index ETFs and weights as determined by the Index Provider on a daily basis using the ETF selections provided by the Index. The Index Provider will be the final authority on the Index and the interpretation of the Index Methodology.

The total return indexes are calculated for each MAI Index in US dollars. Total return indexes assume reinvestment of cash dividends across the full index at the open on the ex-date. The ETF compositions of the MAI Indexes are additionally available on the MAI Indexes website (<u>www.maiindexes.com</u>).

#### **B.** Inception Date

The MAI Indexes have the following inception dates. Index data before the inception dates are based on backtesting (pre-inception performance).

Index Name and Description	Inception Date
MAI: Tactical Growth & Income Index	09/01/2019
MAI: Bull-Rider Bear-Fighter Index	09/01/2019
MAI: SectorSurfer Momentum Index	10/31/2020
MAI: Best-of-Breed Core Momentum Index	10/31/2020

## c. Amendments and Exceptions to this Methodology

The Index Committee, comprised of MAI Indexes and SumGrowth Strategies employees, is responsible for approving changes to the methodology for the MAI Indexes. This document is updated to reflect any changes approved by the Index Committee. In the event that the Index Calculation Agent or the Index Provider determines that a material error has occurred in the calculation of the Index, the Index Calculation Agent, having consulted, or having been consulted by, the Index Provider, will endeavor to correct such error on a date agreed to by the Index Provider. If a material error is corrected, the Index Provider will apply the correction from the relevant date forward.

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# **V. Disclosures and Disclaimers**

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