PortfolioWise™ by CHAIKIN ANALYTICS™

Chaikin Power Gauge™ ETF Ratings

Enhancing the ETF Selection Process

BASIC WHITE PAPER

Marc Gerstein, Director of Research

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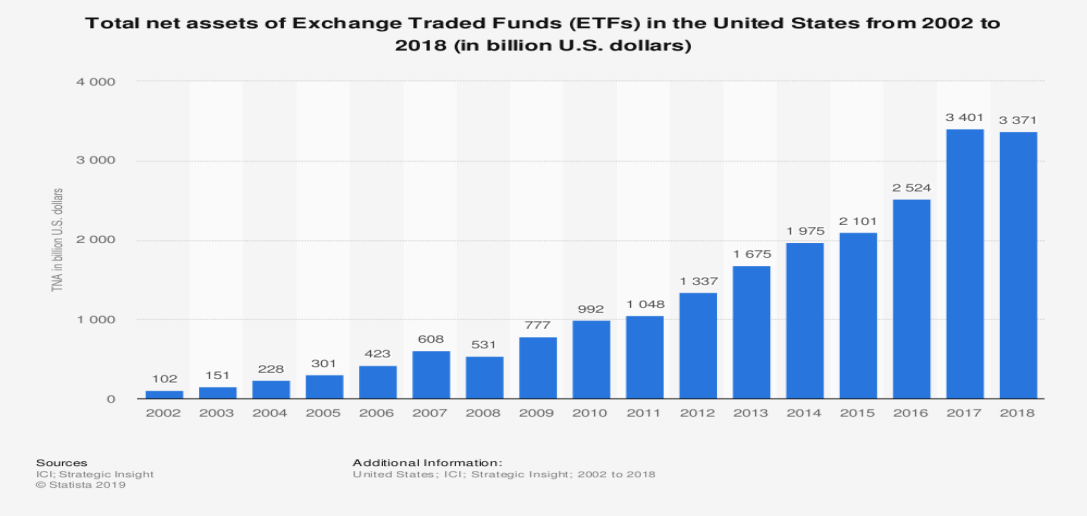
Executive Summary

Exchange-Traded Funds (ETFs) have become a preferred investment vehicle for institutional and individual investors as shown by the approximately $3.4 trillion in assets held by US-listed ETFs at the end of 2018[1]. They represent a diverse set of asset classes and investment strategies and are an efficient way to implement a wide range of portfolio construction goals.



ETFs greatly benefit the investment community by offering investors exposure to asset classes in which they may find it otherwise difficult to invest. In addition, ETFs offer investors different methods to achieve tax efficiency, broad diversification, efficient trading execution, and cost-efficient trading (even in the emerging zero-commission era, zero commission does not necessarily equate to zero cost given requirements brokerage firms tend to impose on commission-free execution).

Choosing among the many ETFs offered for each investment goal can be difficult. Details regarding the construction of indexes that are tracked by the ETF portfolios are skimpy at best, as index providers understandably seek to preserve the value of their proprietary models and processes, and such information that is provided tends to be dulled by legalistic language that makes large groups of ETFs seem virtually indistinguishable from one another. Hence most ETF analysis has primarily focused on relative performance, fees, and assets under management – all important metrics, to be sure. Reliable predictive models, however, are less common.

[1] *How ETFs Became the Market*. Bloomberg, LP. September, 2018.
Total assets managed by US-listed ETFs ($billion), 2003-2018 © Statista.com

At the heart of an ETF is its portfolio, and holdings (constituents) are disclosed, so it would seem reasonable to assume that one could conduct a forward-looking analysis of an ETF by analyzing its constituents. This is, indeed, true but nonetheless challenging to implement. When analyzing a single stock, one can examine financial/statements, calculate ratios above and beyond those provided in company documents and presentations, read conference-call transcripts, and so forth. While this can be time consuming, it is doable, and many investors do it regularly. However, attempting this on an entire basket of stocks is highly impractical and time inefficient. Given the massive quantity of information that would have to be sorted, aggregated, analyzed, and rolled up, "analysis" of ETF portfolios tends to be limited to visual presentations showing percentage allocations among sectors or geographies, or weighted-averages for a few select data-points. Such presentations can make for interesting viewing or conversation, but they do not shed light on the ETF's future performance prospects.

Chaikin Analytics has applied its expertise in multi-factor analysis to create *Chaikin Power Gauge™ ETF Ratings*. These Ratings combine Fundamental and Technical analysis and have been shown in rigorous backtesting to empower investors to successfully differentiate among ETFs on the basis of probable relative future performance.

The biggest differentiator from other ratings is that the Chaikin ETF Power Gauge™ Rating evaluates the individual constituents of an ETF utilizing our stock ratings. These stock ratings are aggregated up for each ETF. We are not using past performance, but rather looking at a rollup of individual stocks ratings that are designed to predict a stock's potential performance 3 to 6 months into the future. The final piece of the rating is a technical factor which can capture market phenomenon such as momentum and oversold conditions.

Background

Chaikin Power Gauge™ Stock Ratings

Chaikin has advocated a multi-factor approach to stock analysis. In 2011, the company launched Chaikin Power Gauge™ Stock Ratings, combining **Value**, **Growth**, **Technical**, and **Sentiment** factors, which successfully identified potential outperformance over a long backtest period[2], and in real-world lifetime performance through 2019.

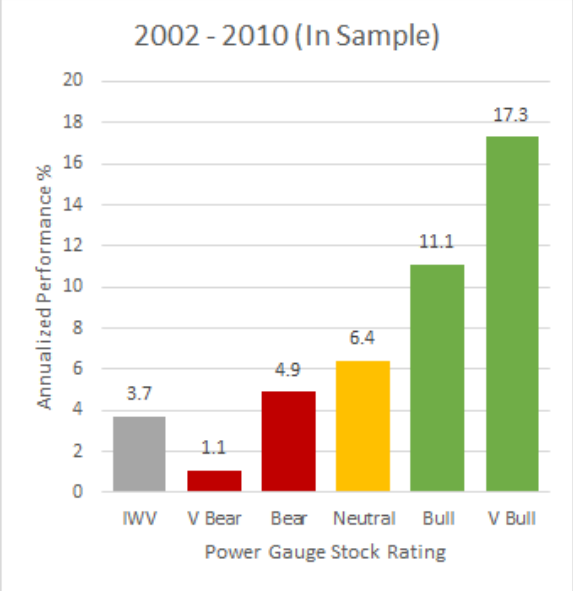
For ETFs holding US equities, this approach can be "rolled up" to the ETF level and added to technical metrics of the ETF's performance to achieve a similar result.

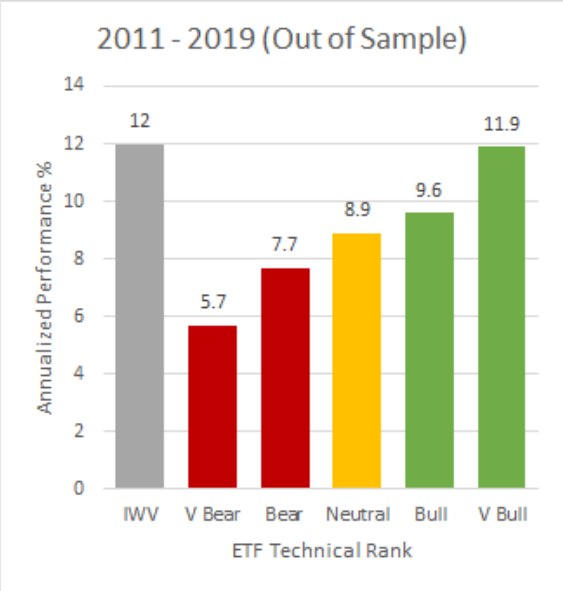
[2] *Evaluation of the Chaikin Power Gauge Stock Rating System*. White Paper. Marc Gerstein, 2013.

Chaikin Power Gauge Stock Rating - Model Factors

Value	Growth	Technicals	Sentiment
LT Debt to Equity	Earnings Growth	Rel Strength vs Market	Estimate Trend
Price to Book	Earnings Surprise	Chaikin Money Flow	Short Interest
Return on Equity	Earnings Trend	Price Strength	Insider Activity
Price to Sales	Projected P/E	Price Strength ROC	Analyst Rating Trend
Free Cash Flow	Earnings Consistency	Volume Trend	Industry Strength

Annualized Performance





ETF Model Construction

The Overall Model

The overall ETF model combines ETF-level technical information with constituent stock rating inputs. For ETFs holding US equities with valid Power Gauge Ratings, the model includes:

1. 60% - ETF Technical Rank
2. 40% - Constituent Power Gauge Rating inputs:
    a. 20% - Constituent Bull/Bear Ratio
    b. 20% - Cap-Weighted Average Power Gauge Rating

For rated ETFs that do not holding US Equities, the Technical Rank comprises 100 percent of the score.

ETF Technical Rank

 The ETF Technical Rank model assesses the technical strength of all ETFs in our ranking universes. It weights and combines the following:

1. Long-term price strength and relative performance indicators
2. Medium-term momentum oscillators
3. Short-term overbought/oversold indicators.

This gives a normalized 0-100 score, reflecting an ETF's percentile rank.

The model is biased toward longer-term strength, so will tend to remain Bullish in the face of short-term pullbacks until confirmed by an intermediate or longer-term retracement.

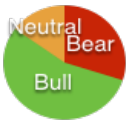
Use of technical analysis is not typical among those who rate ETFs. Chaikin Analytics, however, has a powerful pedigree not just in fundamental analysis but also technical analysis, thanks to the well-regarded work of our founder Marc Chaikin, who has created various technical indexes that are in widespread use (such as the Chaikin Money Flow indicator). So-called pundits have at times presented technical analysis to the investing public in ways that purport to give it some sort of magical aura. Reputable practitioners, however, scorn such misrepresentations.

Technical analysis is an objective measure of market sentiment based not on what analysts and commentators say but on what investors who deploy real money actually do. Indicators are designed to measure the magnitude of supply and demand, changes in both, and the degree of imbalance. As with any other datapoint (sales, earnings, cash flow, etc.), supply-demand as expressed through technical factors shows investors where companies/stocks have been and what forces are in play at present. Fundamental and technical analysts share the challenge of finding ways to discern the likelihood that trends will persist, accelerate, decelerate or reverse. Fundamental and technical models both reflect assumptions about future trends, and successful models of both sorts are those that are most effective at working with factors that successfully shed light on changes, for better or worse, in trends and the extent to which stocks are reasonably or unreasonably priced relative to the probable future.

Technical factors are already part of Power Gauge™ stock ranks. This raises the question of why use a separate Technical model to rate ETFs that own U.S. stocks. It would seem, at first glance, that the weighted (based on portfolio weights) average Power Gauge™ rank ought to serve as the ETF rank. In an ideal world, where models can predict perfectly, that would, indeed, be how we would compute the ETF rank. But as investors know, even investors who make successful use of the most

predictive algorithms available, the world is an imperfect place and prediction can never be precise. There are always factors not accounted for by a quantitative model[3] (even accurate accounting data is often imperfect in the way it depicts corporate performance, and many important factors are simply unquantifiable). Statisticians and academic "quants" account for this in their models through a term known as "residual error."

Whatever terminology one uses, all investors understand that no model can supply 100 percent of everything an investor would want to know about a security's prospects. One obvious approach to addressing lingering uncertainty is, of course, diversification. Beyond that, at Chaikin Analytics, we aim to enhance our views on individual security performance by supplementing Power Gauge™ with technical considerations. On our ChaikinAnalytics.com platform, we refer to a "classic bull setup" as one in which a favorable rating is confirmed (accompanied) by strong Relative Strength, strong Money Flow, industry strength and preferably an oversold tally in an oscillatory designed to measure such conditions. The ETF Technical rank serves this important supplemental role for funds that own stocks with Power Gauge™ ratings.



Cap-Weighted Average Power Gauge Rating

The second factor in the composite ETF model looks at the average Power Gauge™ Rating of stocks held by this ETF, weighted by ETF constituent weighting[4]. This, the most direct Power-Gauge-based assessment of the ETF portfolio, accounts for scenarios where Bullishness is concentrated in a relatively small number of heavily weighted stocks, which disproportionately drive ETF performance. This factor is ignored for ETFs which do not hold US equities.

Constituent Bull/Bear Ratio

The final factor in the composite model looks at the Power Gauge™ Ratings of the ETF's US equity holdings, specifically the ratio of Bullish and Very Bullish stocks to Bearish and Very Bearish stocks held by the ETF[5]. (Chaikin refers to this as an ETF's "Power Bar Ratio"). This provides a measure of the strength of the rating-based opinion regarding the portfolio. ETF A and ETF B may have very similar Weighted Average Power Gauge Ratings, but ETF A achieves its score due to a large amount invested in stocks ranked toward the higher end of the Neutral scale, while ETF B, holding fewer Neutrally-ranked stocks, achieves its score as a result of a heavier concentration in stocks with Bullish and Very Bullish ratings. The Constituent Bull/Bear ratio gives

[3] Even an outstanding correlation between predicted and actual results of 0.80 would still translate, statistically, to an r-square of 0.64, meaning, in ordinary language, that the model would be said to describe 64% of the variations in actual results – meaning 36% of what had been asked would remain unexplained.

[4] This factor uses "raw" Power Gauge Rank, which is a 0-100 value, prior to bucketing, with no technical overlay.

[5] The Ratings in this factor have a "technical overlay" applied: Bullish Ratings for stocks trading below their 200-day DEMA (a long-term trend indicator) convert to Neutral+; Bearish Ratings for stocks above their DEMA convert to Neutral-.

the final rank of ETF B an opportunity to rise as a result of the strength of the bullish conviction reflected in its portfolio. This factor is ignored for ETFs which do not hold US equities.

Rating "Bucketing"

The composite score is converted from a 0-100 value to a Rating using a fractile bucketing scheme, similar to that used for the Power Gauge™ Stock Rating:

	Fractile	Rating
ETF VERY BULLISH	1-3	Very Bullish
ETF BULLISH	4-6	Bullish
ETF NEUTRAL	7-10	Neutral
ETF BEARISH	11-12	Bearish
ETF VERY BEARISH	13-14	Very Bearish

ETF Technical Overlay

A technical overlay may be applied to the ETF Rating itself, if actual price performance and model factors diverge. The principle is the same as in the stock Power Gauge™ Rating model, but in practice the overlay is applied far less for ETFs since: a) a Technical model already forms a significant part of the Rating, and b) tolerance for short-term moves is much greater for ETFs.

A Bullish or Very Bullish ETF Rating will be converted to Neutral+ if:

- Price drops rapidly to below a threshold level
- Price reaches a second, lower threshold (regardless of steepness of decline).

The converse is applied for Bearish or Very Bearish ETF Ratings.

Continuity

 As a final step, a Continuity function is applied to contribute to greater smoothness of Rating changes in real-world conditions. Continuity conditions require that a Rating cannot change directly from Green to Red (or vice versa); it must go through Neutral for at least one Rating period.

A Rating period is one week.

Test Methodology

Measuring Performance for the Ongoing Universe(s) of ETFs – Challenges

Ideally, we would compute ranks for all ETFs in our testing universe and track the performance of ETFs, ranked Very Bullish, Bullish, etc. (and recompute the ranks at specified intervals). This is how we measure performance of our stock ranks. With ETFs, however, compiling a complete "testable" universe is easier said than done.

It is well known that the number of ETFs introduced starting near the middle of the 2000s exploded upward, meaning the ETF universe of 2002 bears no resemblance to the universe of 2007, which bears no resemblance to the universe as it stood in 2012, etc. Even over the last 10 years, the U.S. Equity sub-universe itself soared from 287 ETFs to 802. And the nature of the changes was not at all systematic; there was no balance in the number of ETFs introduced among the various sectors, size categories or style categories. Many new ETFs were radically different from any others previously in existence, while others were copy-cat offerings that were highly correlated (indeed, almost identical) to existing funds. As we expand consideration beyond U.S. Equity ETFs to include others that don't hold portfolios of U.S. stocks and whose ranks are calculated solely on the basis of Technical scores, we'll encounter even more diversity.

Tracking the Efficacy of our ETF Ranks

Rather than engage in an ultimately futile attempt to present academia-oriented data showing theoretical results of a large statistically random sample, we aim to depict results that could have been obtained through a realistic investor work process; such as that of an investor who seeks to implement a particular strategy by moving into and out of assumed better or lesser ETFs from a manageable-sized menu of choices.

A set of work-flow-based rank performance results will be based on the following approach:

- Start with a limited collection of ETFs that together comprise a realistic menu of potential choices for an investor seeking to implement a particular strategy (choose a large-cap value ETF, choose a cap-agnostic growth ETF, chose a Technology ETF, etc.)
- Five hypothetical portfolios are constructed for each goal, one comprising ETFs in the group with Very Bullish rating, another consisting of ETFs ranked Bullish, etc. through Neutral, Bearish, or Very Bearish.

- Each portfolio will be assigned an index value of 100 as of 9/30/18, shortly after ETF PGR went live. This is the starting value for the index, and changes in this number signify increases and decreases in the value of the index.
- It is assumed all ETFs in a mini portfolio will be held in equal dollar amounts.
- The total return of each portfolio is measured over the course of the upcoming calendar quarter. (If no ETFs are available for a mini-portfolio (e.g., in the quarter ending 6/30/19, there are no Bullish ranked Energy ETFs), it is assumed that the return on that portfolio for that quarter is zero.) The mini-portfolios are then reconstituted at the beginning of the next quarter.
- Performance tracking ends 12/31/19. So rather than measuring long-term performance, we're measuring results over a very limited five-quarter period. (As time passes, we will, of course, be able to lengthen our meaurement periods.)
- Trading costs are not considered.
- All numbers presented are based on data from S&P Global Market Intelligence via Xpressfeed as processed on ClariFi

Examining Efficacy of Our ETF Ranks Under Various Assumed Workflows

US Equity ETFs

First, we'll look at an updated view of the ranking system's ability to make bullish or bearish calls on the 11 S&P SPDR sector ETFs:

S&P SECTORS AND SPY

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	86.27	84.53
3/31/19	96.15	98.22
6/30/19	100.44	95.50
9/30/19	104.80	89.55
12/31/19	104.80	89.55

The above chart suggests it would still be constructive to use the ETF ranks to guide an S&P sector rotation strategy.

The next chart indicates the potential for a more finely tuned strategy that rotates among 22 sub-sectors.

S&P SUB-SECTORS

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	80.67	76.35
3/31/19	95.46	86.77
6/30/19	97.73	84.87
9/30/19	100.16	75.94
12/31/19	101.23	94.72

Both of the above tables cover clean collections in which each ETF is genuinely different from all others in the group. Below, we combine 188 sector ETFs into a single collection which is less clean, in that there is likely to be an erratic degree to which multiple and possibly similar ETFs are present in a sector. We see, however, that here, too, the ratings effectively guided investors during the brief post-launch period.

ALL SECTORS

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	82.37	85.22
3/31/19	95.15	94.64
6/30/19	97.22	93.31
9/30/19	99.91	11.00
12/31/19	104.63	96.12

It would be desirable, but not credible, if we were to claim that the ETF Ranks effectively discriminated among all ETFs within any given sector. The table below shows the 12/31/19 index-portfolio valuations for all the sectors under different rank approaches.

	ETFs Ranked		ETFs Ranked	
	Very Bullish	Very Bearish	Bullish or Very Bullish	Bearish of Very Bearish
Consumer Discretionary	87.64	98.91	97.86	103.65
Consumer Staples	98.47	108.25	105.87	108.12
Energy	79.87	61.96	77.50	76.53
Financials	118.95	103.42	118.12	102.73
Healthcare	84.62	105.19	88.77	103.18
Industrials	85.41	114.27	93.87	117.54
Materials	80.88	102.37	95.42	99.82
Real Estate	127.68	98.83	121.22	99.76
Technology	115.92	111.09	114.04	108.77
Utilities	106.83	102.45	107.09	101.22

Many investors do not focus on sectors but prefer to select ETFs on the basis of style. Adapting this to what we experienced, both in-sample and out-of-sample with the sector bellwethers, we created a similar collection containing representative bellwether ETFs, one for each major investing style. The 19 ETFs included in this collection are:

BASED ON SIZE
- Vanguard Mega Cap ETF (MGC)
- iShares Russell 1000 ETF (IWB)
- iShares Russell Mid-Cap ETF (IWR)
- iShares Russell 2000 ETF (IWM)
- iShares Micro Cap ETF (IWC)

BASED ON STYLE
- Vanguard Value ETF (VTV)
- Vanguard Growth ETF (VUG)
- iShares Edge Minimum Volatility US ETF (USMV)
- iShares Edge MSCI US Momentum ETF (MTUM)
- iShares Edge MSCI US Quality ETF (QUAL)

BASED ON SIZE-STYLE
- iShares Russell 1000 Growth ETF (IWF)
- iShares Russell 1000 Value ETF (IWD)
- iShares Russell Mid-Cap Growth ETF (IWP)
- iShares Russell Mid-Cap Value ETF (IWS)
- iShares Russell 2000 Growth ETF (IWO)
- iShares Russell 2000 Value ETF (IWN)

EQUITY INCOME
- Basic Equity Income: iShares Select Dividend ETF (DVY)
- Dividend Growth: Vanguard Dividend Appreciation ETF (VIG)
- High Yield Equity: SPDR Portfolio S&P 500 High Dividend ETF (SPYD)

Analogous to what we experienced with the sector bellwether collection we can get worthwhile insights from the ranks of the ETFs included in the style bellwether collection:

REPRESENTATIVE STYLES

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	84.01	81.30
3/31/19	94.65	92.81
6/30/19	98.91	93.74
9/30/19	100.97	93.74
12/31/19	100.97	93.74

The next Table shows 12/31/19 Index levels (9/30/18 = 100) for the five-quarter portfolios comprised of more focused style-based ETFs. (Note: 12/31/19 values of 100.00 mean there were no ETFs in the category during that five-quarter interval that had the ranks indicated in the column headers.)

	ETFs Ranked		ETFs Ranked	
	Very Bullish	Very Bearish	Bullish or Very Bullish	Bearish of Very Bearish
All-Cap Blend	105.40	99.42	105.85	99.42
All-Cap Growth	83.49	108.80	87.57	117.89
All-Cap Value	120.34	102.08	117.47	101.79
Large-Cap Blend	108.64	105.65	110.57	106.49
Large-Cap Growth	102.37	100.00	107.66	100.00
Large-Cap Value	101.27	93.90	106.37	105.35
Mid-Cap Blend	112.39	101.99	109.41	98.76
Mid-Cap Growth	85.06	100.00	86.31	101.15
Mid-Cap Value	100.00	112.48	103.17	104.70
Small-Cap Blend	90.80	96.89	96.17	93.94
Small-Cap Growth	79.23	127.93	88.58	126.16
Small-Cap Value	100.00	99.97	106.04	95.24
Large-Cap ETFs	109.87	105.13	111.07	105.97
Mid-Cap ETFs	90.90	100.12	98.16	102.86
Small-Cap ETFs	89.88	101.84	93.74	100.57
All Blend ETFs	106.89	101.38	107.86	101.50
All Growth ETFs	97.58	107.26	102.67	103.28
All Value ETFs	117.57	102.43	115.22	101.33
All-Cap ETFs	104.60	100.65	105.68	100.38

Many investors crave income, which is very hard to find without exorbitant risks in today's continuing very-low-rate environment. Since the initial launch, the ETF ranks have shown solid potential to help income seekers make choices from the ETFs available to them.

This table shows the efficacy of using ETF ranks to select among ETFs generally classified as Dividend Income:

DIVIDEND YIELD ETFS

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	90.68	87.30
3/31/19	101.07	97.79
6/30/19	104.22	98.92
9/30/19	108.42	100.05
12/31/19	122.78	105.58

Recall too that the ETF ranks have shown their ability to differentiate within sector-specialty ETFs that are often pursued by yield-seeking investors: Real Estate and Utilities. The third table combines Real Estate, Utility and General Equity Income ETFs.

REAL ESTATE

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	100.00	93.39
3/31/19	116.52	93.39
6/30/19	119.91	95.49
9/30/19	128.84	98.83
12/31/19	127.68	98.83

UTILITIES

As of	ETFs Ranked	
	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	85.58	100.00
3/31/19	94.96	100.00
6/30/19	98.06	100.00
9/30/19	106.65	102.45
12/31/19	106.83	102.45

DIV. YLD ETFS + REAL ESTATE & UTILITIES

As of	ETFs Ranked	
	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	86.57	90.11
3/31/19	99.40	97.14
6/30/19	102.91	96.42
9/30/19	106.79	96.24
12/31/19	116.18	101.33

In addition to the long-familiar styles referred to thus far, in recent years the ETF market has seen an explosion of stylistic creativity.

- ETFs that invest in companies believed to be socially conscious in terms of the nature of their business, corporate governance, employment practices, sensitivity to environmental concerns and so forth – some expressly bearing the initials ESG (Environmental, Social, Governance) in the indexes they aim to track.
- Another emerging category of ETFs consists of those that track indexes whose constituents are compiled using some sort of quantitative model. These include indexes that forego conventional market capitalization protocols, and choose instead "smart beta" (where weights are based on one or more factors that do not vary with share price movements) or some other approach (e.g., value weighting, volatility weighting) and/or funds tracking

indexes that weight positions conventionally but use section models to determine what stocks should be added to the index or replaced (bought or sold).

- Yet another group of ETFs defy categorization under any label other than "Special Themes." Indexes/ETFs aimed at such themes may build portfolios that emphasize companies with track records for innovation, companies that supposedly benefit from societal trends such as the aging of the population, Millennial lifestyles, business disruption (e.g., as in retail), increased health consciousness, etc.

The extremely heterogeneous nature of these groups and the ongoing additions of new funds continue to pose challenges when trying to make apples-to-apples comparisons among similarly classified ETFs. Nevertheless, as time passes, we're already starting to see indications that as investors assess these ETFs, they ay do well to more carefully scrutinize those rated Bearish or Very Bearish.

SOCIAL-ESG

	ETFs Ranked	
As of	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	85.66	92.64
3/31/19	98.19	99.08
6/30/19	102.38	101.95
9/30/19	103.62	102.76
12/31/19	112.40	107.30

QUANT

	ETFs Ranked	
As of	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	84.79	83.99
3/31/19	96.13	95.53
6/30/19	99.47	96.47
9/30/19	100.44	95.79
12/31/19	106.75	106.01

SPECIAL THEMES

As of	ETFs Ranked	
	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	85.87	85.02
3/31/19	97.73	98.42
6/30/19	101.57	100.77
9/30/19	101.30	98.23
12/31/19	109.89	107.06

US Fixed Income ETFs

Fixed Income ETFs raise issues far beyond the legalistic differences between stocks and debt instruments (the presence/absence of contractual obligations, the most prominent of which address payments of interest and principal), and textbook recitations of risk-reward differences (fixed income being widely seen as being lower in both respects). The analytic and selection decision processes are completely different for fixed income ETFs.

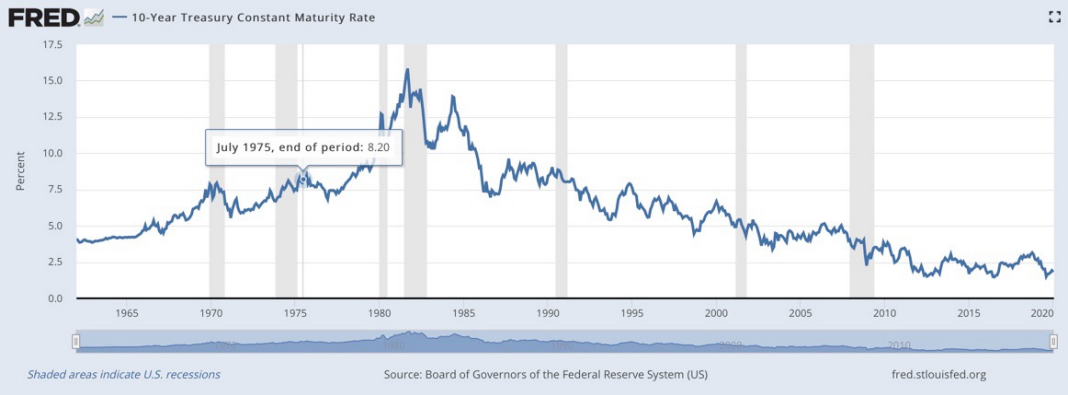
With equities, there are countless decision points even among stocks ostensibly considered to be stylistically related. (How, for example, is Value to be defined? Which ratio(s)? What levels of the chosen rations are to be deemed too high or too low? How to risk and growth expectations impact such determinations and how are risk and growth expectations to be articulated?)

Except in extreme ("edge") cases, fixed income presents far fewer decision points and in this regard, and as a result can seem simpler than equity analysis: Will the borrower be able to pay its interest and principal obligations (for many ETFs, those that invest in obligations of the United States, this issue is not on the table at all)? Will interest rates rise or fall in the future (this question, the one that impacts potential capital gains or losses for those who don't hold securities to maturity and possibly opportunity losses for those who do, tends to dominate much fixed-income analysis)? The downside, so to speak, of having fewer questions to answer is the urgency of getting answers that are as close as possible to being 100% accurate. This small amount of room for even modest errors is what causes seemingly simple fixed income investing to be quite challenging.

Our ratings for Fixed Income ETFs are based entirely on Technical Analysis, and within the realm of technical work, our model is primarily trend-oriented in nature. [6]

[6] Trending models assume securities will, in the future, move as they have in the past and differ in terms of how they measure trends — typically, the computations involve far more than naïve calculations of percent change over a particular period — and, in many cases, in the way they allow for in-trend reversals to accommodate the tendency of price movements to be jagged rather than straight line. Oscillating models, on the other hand assume ebb snd flow

Because of this, we can readily assume that our ETF ratings will work best (successfully distinguish among Fixed Income ETFs that are more or less likely to outperform others) when interest rates and/or creditworthiness trends remain more or less persistent. As of this writing, however, trend persistence is absent. Consider the below depiction of long-term trends in the 10-Year US Treasury.



We see a very lengthy uptrend from the beginning of the measurement period, which began 1/1/1962, through the September 1981 peak. The rate experienced something of a roller coaster ride until a second, lower peak in May 1984. Then, rates trended broadly and persistently lower for about 35 years. Considering where we are today, rates cannot repeat anything like the significant downtrend of the last 35 years. Something must change. Rates must embark on a new uptrend, or they may zig and zag along a sideways pattern. The chart below, which covers the 9/30/18-12/31/19 out-of-sample period for our ETF Ratings, viewed in context of the previous chart, suggests a degree of fixed-income market uncertainty going forward.

Rates trended downward for much of the out-of-sample interval. So, its natural that our trend-oriented model, which favors the longer trends and doesn't flip quickly when counter moves occur,

based on movements away from a central level followed by backtracking, sometimes referred to as "reversion to the mean."

tends to put bullish ratings on Fixed Income ETFs aimed at benefitting from declining rates. But note the reversal toward the end of the period. It's natural to assume it would have punished the performance of those fixed-income ETFs that were most oriented toward rate declines.

Given observed movements in interest rates, coupled with the absence of any events that prompted widespread reassessment of credit risk (leaving interest rate movements as the dominant decision point), the performance of our US Fixed Income ETF ranks is as to be expected once we also factor in the tendency of financial markets to discount expectations, rather than the past or present.

We measured this using a collection of domestic bellwether fixed-income ETFs:[7]

US FIXED INCOME BELLWETHERS

	ETFs Ranked	
As of	Very Bullish	Very Bearish
9/30/18	100	100
12/31/18	95.59	104.59
3/31/19	97.86	112.52
6/30/19	102.54	113.28
9/30/19	105.92	113.28
12/31/19	108.00	113.75

Early on in the period, the trend-oriented nature of the ETF Ranks, which necessarily extrapolated recent rate declines, could not be supported in the marketplace, which had to adjust to the inevitability of a change in trend due to the close proximity of the 10-year rate to zero. Later in the period, as the market recalibrated expectations to accommodate the direction rates took toward the end, the Very Bullishly ranked Fixed Income ETFs substantially outperformed the Very Bearish rated funds and by the end of 2019, and closed a good deal of what had earlier in the period been a much wider disadvantage in terms of index value.

[7] ETFs in the Fixed Income bellwether collection are:
iShares Short-Term Treasury ETF (SHIV)
iShares 1-3 Yr Treasury Bd ETF (SHY)
iShares 3-7 Yr Treasury ETF (IEI)
iShares 7-10 Yr Treasury ETF(IEF)
iShares 20 Plus Yr Treasury ETF (TLT)
Vanguard Short-Term Bond ETF (BSV)
iShares Intermediate-Term Corporates ETF (IGIB)
iShares Iboxx Investment Grade Corporates ETF (LQD)
iShares Core US Aggregate Bond ETF (AGG)
iShares Iboxx High Yield Corporates ETF (HYG)
iShares National Municipal Bond ETF (MUB)
Vaneck Vectors High Yield Municipals ETF (HYD)
Vanguard Total Bond Market (BND)

Separately, we have seen some ability of the ranks for effectively differentiate among ETFs within the same broad maturity categories.

SHORT-TERM FIXED INCOME

	ETFs Ranked	
As of	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	100.59	98.06
3/31/19	102.08	100.46
6/30/19	103.23	102.83
9/30/19	104.06	103.55
12/31/19	105.25	103.37

INTERMEIDATE-TERM FIXED INCOME

	ETFs Ranked	
As of	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	100.17	100.53
3/31/19	103.65	103.96
6/30/19	106.98	106.07
9/30/19	108.65	107.34
12/31/19	109.61	108.32

LONG-TERM FIXED INCOME

	ETFs Ranked	
As of	Neutral or Better	Bearish-Very Bearish
9/30/18	100.00	100.00
12/31/18	100.34	100.39
3/31/19	103.50	103.47
6/30/19	107.03	105.79
9/30/19	109.56	106.71
12/31/19	109.59	107.07

Given the nature of ETF price movements, the nature of technical analysis, and that ETFs within each category, while broadly similar to one another, are not by any means identical, we can assume that rating differentials reflect collective investment community assessment of the exact differences in portfolio maturity, duration and credit quality among ETFs within the category.

Putting all of this together, we can infer that over prolonged time periods, when interest rates are expected to trend one way or another, the ETF ranks will have the potential to point fixed income investors toward those funds that are best positioned in light of expected conditions and, hence, which enjoy greater probabilities of outperforming peers. This can be considered akin to instant one-datapoint holdings analysis.

Obviously, though, there will be episodes of trend re-assessment and reversal during which time it will be especially challenging for the ETF ranking system to successfully choose among different kinds of ETFs, whether in a bellwether basket such as the one created here, a comparative one created by user, or even a full less- or non-curated collection of all Fixed Income ETFs. Tests relating to the term-based ETFs suggest, however, that once an investor has formulated their own view of potential interest rate developments, and, presumably, made a decision to focus attention on ETFs classified such as to suggest appropriateness under the investor's expected scenario, the ETF Ranks can assist the investor in choosing which among the similarly situated funds to favor. For example, one who assumes rates will rise will, in all likelihood have already decided to limit consideration to ETFs whose portfolios (i.e. the indexes they track) focus on the shorter end of the maturity spectrum. If rates ultimately fall or move sideways, lackluster performance relative to fixed income as a whole is to be expected. But even in this scenario, use of the ETF Ranks to choose among the more favorably rated short-term Fixed Income ETFs has the potential to leave the investor better positioned than would be the case had the Ranks not been consulted.

To this point, data relating to High-Yield and Municipal Fixed Income ETFs remains skimpy and inconclusive.

Non-US ETFs

Ranks for Non-U.S. Equity and Non-U.S. Fixed Income ETFs are also based entirely on our trend-oriented Technical model. Accordingly, many of the considerations discussed above for U.S. Fixed Income apply here as well. The main differences are in the nature of the decision points that drive security analysis.

For Non-U.S. Fixed Income ETFs, the credit risk and interest rate decision points are present. In addition, it is important with this asset class to understand whether the ETF invests in "Yankee Bonds" (which refer to debt issued by a foreign entity that is denominated in U.S. Dollars), in securities denominated in a foreign currency through a portfolio that is hedged at least some degree to mitigate the risk of the foreign currency relative to the U.S. Dollar, or an unhedged local-currency portfolio. Depending on the answer to the latter question, currency risk may or may not have to be added to credit and interest-rate risks.

Interpretation of performance data for Non-U.S. Fixed Income is impacted by the greater degree of variety within the asset class but our limited view, while inconclusive for the asset class as a whole,

suggests some promise in the more focused areas of Emerging Markets Fixed Income and Non-U.S. High Yield.

NON-US FIXED INCOME

	ETFs Ranked	
As of	Very Bullish	All Others
9/30/18	100	100
12/31/18	98.80	98.99
3/31/19	100.71	103.54
6/30/19	104.56	106.66
9/30/19	106.06	108.39
12/31/19	108.33	108.86

EMERGING FIXED INCOME

	ETFs Ranked	
As of	Very Bullish	All Others
9/30/18	100	100
12/31/18	100.00	99.98
3/31/19	106.58	103.34
6/30/19	111.40	105.22
9/30/19	112.40	105.17
12/31/19	115.32	108.83

NON-US HIGH YIELD

	ETFs Ranked	
As of	Very Bullish	All Others
9/30/18	100	100
12/31/18	100.00	99.67
3/31/19	103.72	103.06
6/30/19	107.02	104.27
9/30/19	110.04	103.75
12/31/19	111.88	106.62

Meanwhile, Non-U.S. Equities present more challenges than both of the Fixed Income groups given the widely diverse geographic representation as well as the large number of equity-related analytic

decision points. Given that, and the limited length of the out-of-sample period, we cannot draw conclusions regarding the post-launch performance of these ranks without further study, which is ongoing.

Conclusions

Performance tracking shows that even over the course of their limited out-of-sample (post launch) period, the Chaikin Power Gauge™ ETF Rating can be an important and effective tool to help investors navigate many typical work-process challenges involving ETF selection. This is especially so for U.S. Equity ETFs, which are calculated on the basis of Power Gauge™ stock ratings in addition to our Technical model. We believe even greater benefits can be attained by using the ratings in conjunction with other important metrics such as fees & expenses, trading liquidity, volatility and dividend yield to determine the suitability of any given ETF for investment purposes.

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Contact: info@portfoliowise.com
www.portfoliowise.com