INVESTING IN TOMORROW

A WHITEPAPER ON THEMATIC INVESTING

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by **Mirae Asset**

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Prior to joining Global X, Jay was a business analyst at the New York Stock Exchange (NYSE), in the ETF and Indexing Group, where he helped to launch hundreds of ETFs on the NYSE Arca trading platform.

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INTRODUCTION

Investors consistently face the question of whether history will repeat itself, or if this time will be different. Does one position their portfolio based on what they've learned from the past or make adjustments based on their expectations for a different future?

The recent proliferation of smart beta ETFs and related factor-based research has placed a substantial amount of attention on analyzing the past. The success of these strategies ultimately depends on information from historical stock patterns providing valuable clues to future stock movements. But equally as important should be preparing for a future that may look completely different to anything we are accustomed to.

This is the where thematic investing comes in. It is a forward-looking investment approach that seeks to embrace the changes we anticipate happening in the world. When conducted properly, we believe thematic investing can help position a portfolio for an uncharted era of new technologies disrupting existing paradigms, demographics reshaping the needs of the world's population, and shifting consumer behaviors forcing changes to existing business models.

In this whitepaper, we seek to help investors understand the intricacies of thematic investing and how to best approach the space.

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WHAT IS THEMATIC INVESTING?

Thematic investing refers to the process of identifying powerful macro-level trends and the underlying investments that stand to benefit from the materialization of those trends. Many investors already apply principles of thematic investing, such as identifying investments that could benefit in a rising interest rate regime, in their portfolios. But thematic investing extends far beyond economic policies, and can potentially be most effective when used to identify opportunities in areas such as disruptive technologies, changing demographics, and evolving consumer behaviors.

"Thematic investing is about capitalizing on future trends. Its forward-looking nature stands in clear contrast to the more widely used market capitalization approach [which] assumes that past winners will continue to win out... Why is thematic investing a good idea? In a rapidly changing business environment, the winners will be those that anticipate trends and take advantage of new opportunities."[1]

– Towers Watson, "Thematic Investing"

USES FOR THEMATIC INVESTING: PRIMARILY A LONG-TERM GROWTH PLAY

Investors who apply a thematic investment approach are often returns-focused, either seeking to beat a relative benchmark (e.g., the S&P 500) or an absolute return benchmark over the long term. According to a recent report from UBS, "Investors who are willing to follow the insights of such long-term themes over multiple business cycles can benefit from potential mispricing created by the typically shorter-term focus of financial markets."[2]

Beyond serving merely as a growth play, themes can also be utilized to relate investing to an end-client, as some prefer making allocation decisions based on things they know and can observe. According to respondents in our 2017 Beyond Baby Boomers: The Investable Assets of Tomorrow survey, 83% of affluent US Millennials expressed that they are extremely interested or very interested in thematic investing as a part of their portfolios.[3]

Some investors have also used thematic strategies as a form of hedging risk, such as a pension fund with high exposure to oil prices investing in companies in the renewable energy space, which could succeed at oil's expense.

INTEREST IN THEMATIC INVESTING[3]

Q: "How interested are you in thematic investing?"

% Extremely / Very Interested

Source: Global X, 2017

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"Looking forward, we believe that thematic investing can outperform in the brave, new, post-QE world; that early, contrarian theme adopters can benefit from its low frequency investment style; and that capital flows are increasingly theme driven."[4]

– Merrill Lynch, "The Thundering World"

KEYS TO SUCCESS

Successfully implementing a thematic investment strategy requires correctly identifying structural shifts, finding companies with high exposure to those shifts, and timing the theme so as to enter early enough that earnings and forecasts have not fully priced in the theme's potential. In a report on the rising usage of thematic investing among institutional investors, McKinsey & Company recommended that "Investors should assess the high-level attractiveness of the theme and make sure there are... companies whose businesses are heavily exposed to the theme...", and an investor must then monitor the theme "over time to find the right entry (and exit) points."[5]

In the table below, we list out what we believe are characteristics of better and worse approaches to thematic investing, based on conviction, investability, and time frame.

	BETTER APPROACH	WORSE APPROACH
CONVICTION	High, due to observable structural changes in demographics, technology, behavior, or politics/regulations	Limited, due to conjecture and low likelihood of theme materializing
INVESTABILITY	Broad group of publicly traded companies, with high liquidity, that provide targeted exposure to the theme	Narrow group of companies with low liquidity, and only tangential exposure to the theme
TIME FRAME	Medium to long term, making market timing less of a factor	Shorter term, placing greater importance on timing

AN UNCONSTRAINED APPROACH

A thematic approach differs from traditional portfolio construction in that it breaks out from the grid-like method of asset allocation. According to a whitepaper from RBC, "Thematic investing ignores geographical boundaries, style biases and market capitalization, and it transects traditional sector classifications. This provides investors with a distinctive strategic advantage: The ability to look across all geographies to identify emergent and potentially rewarding investment trends."[6] Given thematic investing's agnostic approach to geographies and sectors, it can have low correlations to other portfolio strategies, which can be particularly useful for investment managers seeking to diversify sources of growth.

ETFS & THEMATIC INVESTING

Many investors are already familiar with the inherent advantages of ETFs, including the typically lower costs of index-based investment strategies compared to actively managed funds, and the tax efficiency and transparency ETFs versus traditional mutual funds. Within the context of thematic investing these advantages still play a large role.

An additional key benefit to using thematic ETFs is the ability to access dozens of companies around the world with a single trade. Traditionally, thematic investing has been limited to more sophisticated institutional investors due to the research required to pinpoint companies with high exposure to a theme and the need to access a variety of international markets for themes that are global in nature. Thematic ETFs track indexes that take care of the security selection part of the process and can provide access to a broad set of companies around the world with exposure to a particular theme.

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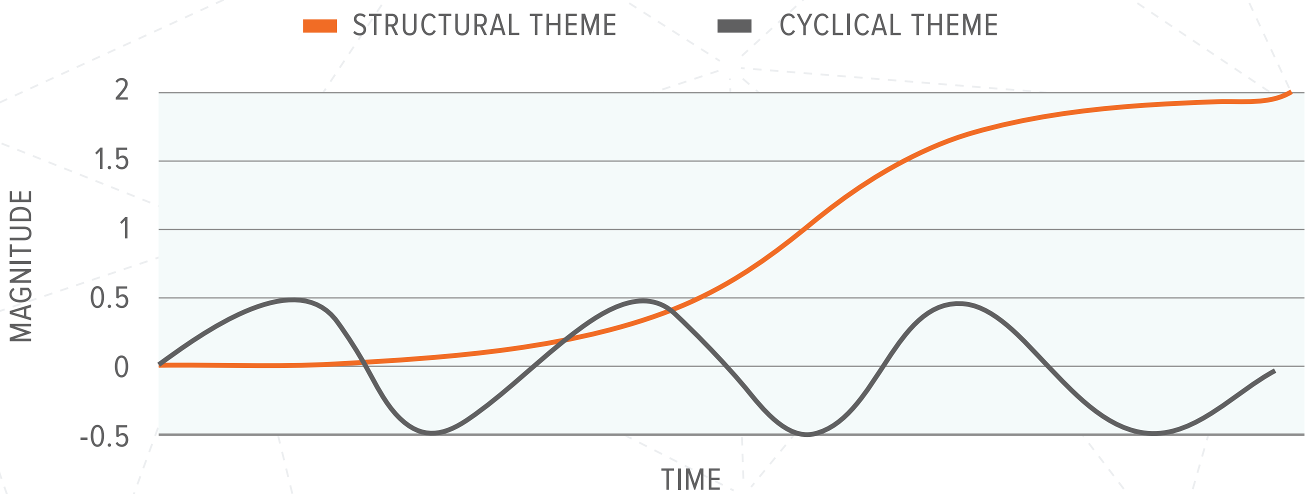
2 THE DIFFERENCE BETWEEN CYCLICAL AND STRUCTURAL THEMES

Thematic investing is often used quite broadly to describe a forward looking investment approach, but we believe it's important to distinguish between two distinct types of themes given their different characteristics.

- **CYCLICAL THEMES:** occur at somewhat regular short - or medium-term intervals, typically based on changes in the business cycle. These cyclical trends can be mean-reverting, so that over a long period of time they tend to converge with some average level. Examples can include asset valuations, volatility, interest rates, and currency values.
- **STRUCTURAL THEMES**: occur as one-off shifts that change an existing paradigm. These structural changes tend to be longer-term in nature and are typically driven by powerful forces such as disruptive technologies or changing demographics and consumer behavior.

CYCLICAL vs. STRUCTURAL THEMES



For illustrative purposes only.

Some areas can be affected by both cyclical and structural trends. Employment levels, for example, can cyclically fluctuate with the economy, as employment typically suffers in recession and benefits from expansion. Structural trends in employment can also occur, such as declining workforce participation rates due to aging populations.

Technology firms can similarly be affected by both cyclical and structural trends. On the cyclical side, tech firms demonstrate sensitivity to economic growth, benefitting from increased personal and business spending. Tech can also participate in structural trends, such as driving advancements in robotics and artificial intelligence that are expected to have a far reaching impact on industrial manufacturing processes, transportation, health care, and other segments of the economy.

We believe long-term investors should prioritize identifying structural themes rather than cyclical ones. Given the longer-term nature of these themes and their disruptive nature, we have found that structural themes can be less dependent on timing entry and exit points and can be significantly more powerful in magnitude.

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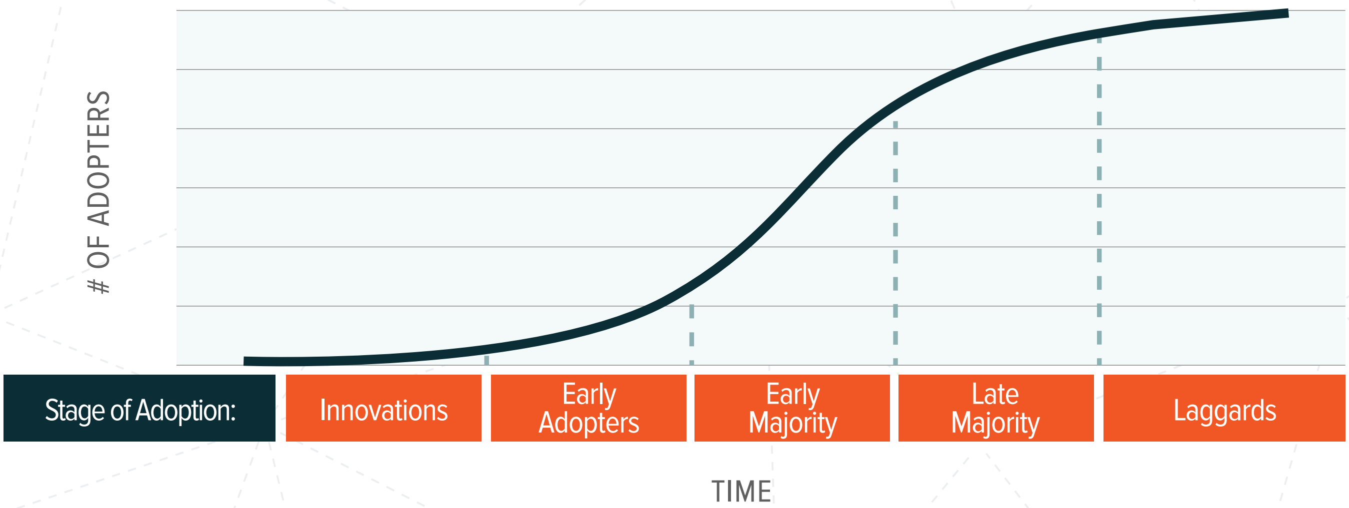
WHAT DOES STRUCTURAL THEMATIC GROWTH LOOK LIKE?

A THEORY ABOUT DISRUPTIVE TECHNOLOGY

The Diffusion of Innovation Theory, developed by E.M. Rogers, holds that disruptive technologies, products, and ideas tend to follow an 'S' shaped adoption curve with five stages.

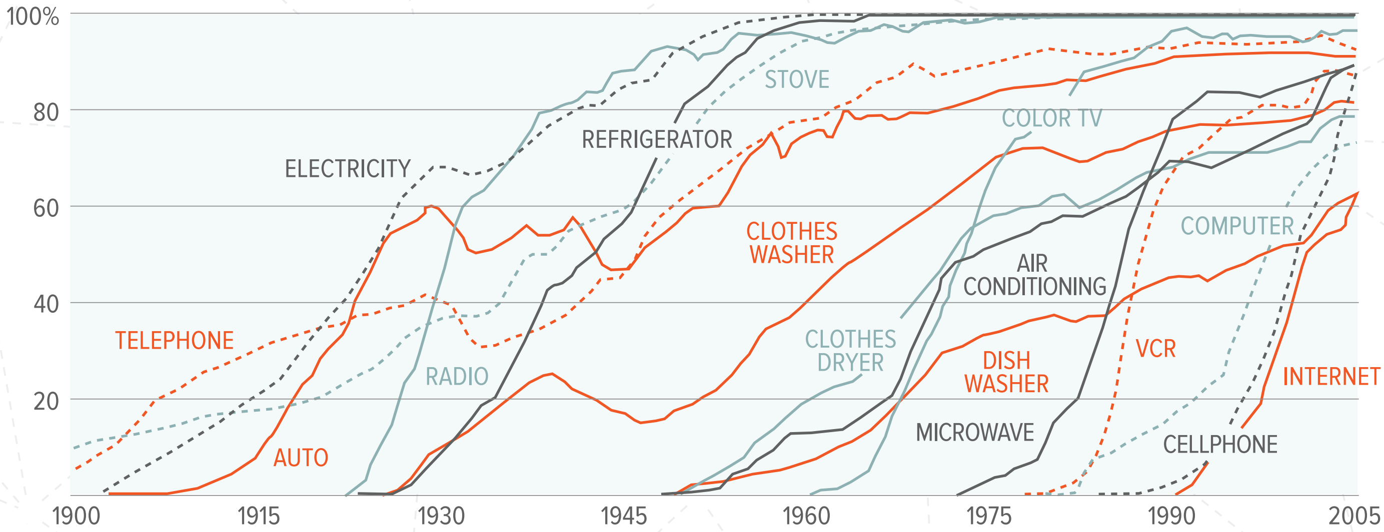
1. Adoption starts slowly, as only a small group of Innovators take a flier on a new technology before it is proven or widely accepted. Consider this group the buyers of the first Apple Watch, the original Tesla Roadster, or in a failed scenario, Google Glass.
2. The next stage is for the slightly larger group of Early Adopters to come in, who accelerate the technology's adoption and evangelize its value via word of mouth. This is often considered the tipping point in a technology's acceptance, as the Early Adopters must convince the bulk of the population that a particularly technology is worthwhile. Currently, 4k TVs fall in this bucket, with approximately 16% adoption.[7]
3. Moving to the Early Majority, we reach the part of the Adoption S-curve where the slope is the steepest, and hence the rate of adoption is at its fastest. In this phase, sales tends to explode. At a 36% adoption rate, wireless headphones are likely in this category.[8]
4. Adoption continues growing at a solid pace as the Late Majority are convinced to participate, and the technology appears seemingly almost everywhere. With 81% adoption, social media is likely somewhere in the Late Majority stage.[9]
5. Finally, the Laggards, or the holdouts, begrudgingly acquiesce and accept/adopt a technology. We might remember this group as the Blackberry keyboard truthers who eventually caved and bought a full screen smart phone. By this point, however, sales growth has cooled off and virtually all of the potential market for a product has been captured.



THIS THEORY IN PRACTICE

In practice, the 'S' curve prediction has held up fairly accurately. Not all products or new technologies follow the same 'S' shape, but by and large, historical adoption patterns for disruptive technologies and products have followed a general 'S' shape, as demonstrated in the chart below.

PERCENT OF U.S. HOUSEHOLDS



Source: Michael Felton, The New York Times and Harvard Business Review.

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The shape of this ‘S’ can be influenced by a variety of factors, including the speed of technological advancements, cost curves, regulations, competition, or even social norms. Some may never experience an ‘S’ at all, as technologies often fail to make it past the Innovators or Early Adopters stages, even if it is a superior product (apologies to Betamax fans).

WHAT DOES THIS MEAN FOR INVESTORS?

The relationship between an adoption curve and stock prices is not always a direct one. Many factors can come into play that introduce differences, such as companies taking losses to build market share, intense competition, or unproven business models. In social media, for instance, firms tend to prioritize building their user base before inundating users with ads. Therefore, the adoption curve tends to noticeably precede revenue growth. Earnings can lag even further behind, as many high growth companies look to plow their cash flows back into their businesses.

Yet while there may not be a direct relationship, investors can certainly take certain cues from the adoption curve. For example, knowing where a product or technology is in its adoption can help signal general risks and characteristics of an investment. For example, if a technology is still clearly in its Innovators stage, an investment may likely resemble more of a venture capital-like risk and return profile, given high potential returns, but also a high possibility of failure. At the other end of the spectrum, a technology that is nearly ubiquitous in the Late Majority or Laggards phase is very well established, but has less upside.

For growth-seeking investors, we believe finding tech that is somewhere between the Early Adopters and Early Majority stages could prove to be a “sweet spot.” In this range, growth potential is still high and accelerating, but the technology has undergone some level of vetting and has proven itself to a meaningful portion of the population.

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MEET THE SECTOR DISRUPTORS

At first glance, equity sectors appear to be relatively consistent over time. While the economy evolves, Consumer Discretionary companies are always there to help us spend our disposable income. Energy firms are always there to fuel our vehicles to get us from point A to point B. In fact, in recent history, there have been only two major changes to the Global Industry Classification Standard (GICS). In 2016, Real Estate was broken out as a distinct sector from Financials. In 2018, the Telecommunications sector was overhauled and renamed "Communications Services." The refreshed sector now consists of stocks from the former Telecoms sector, in addition to Information Technology and Consumer Discretionary. The relative constancy of sectors over time can be valuable to investors looking to manage macro-level risks and correlations.

Yet within each sector, change is unending. As powerful structural themes emerge, one era gives way to the next, and former sector bellwethers are often left behind. The desktop computer giants of the 1990's, like Dell and Compaq, were ultimately replaced by the mobile device makers and social media companies of the 2010's, like Apple and Facebook. This is part of natural economic Darwinism. Comparing major sector indexes to their compositions 20 years ago shows just how much sectors can organically change over time. The 2018 composition of the sector indexes referenced in the following graph on the next page bear little resemblance to their 1998 iterations, with each sharing less than half in overlap to their older selves.

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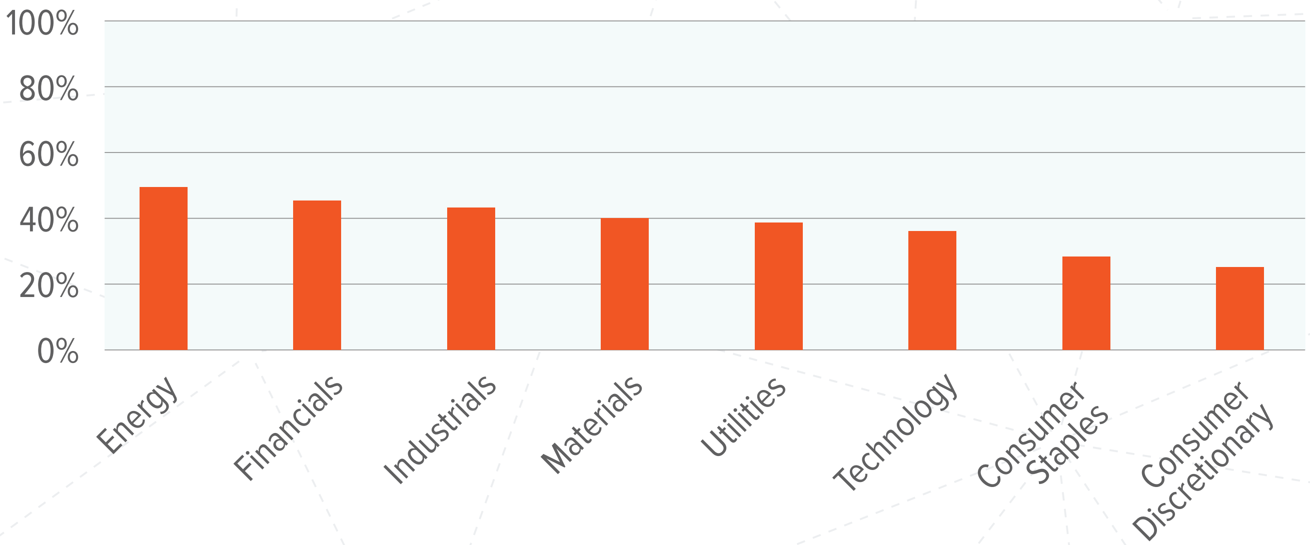
SECTOR OVERLAP (1998 vs. 2018)

Sources: Morningstar and Bloomberg.



Note* Data compares the overlap of Select Sector Indexes from 12/31/1998 to 12/31/2018. Data unavailable for Health Care.

While turnover at the sector level occurs naturally over time, we believe we are in the early stages of a major period of sector-level disruption, given rapid advancements in technology and changing consumer preferences. Falling computing costs, the rise of artificial intelligence, and greater connectivity are dramatically changing how companies operate, and the products that they sell. Similarly powerful themes are stemming from changing consumer habits, as a new generation of spenders reach peak earning years, yet spend their money differently than generations before them. As a result of these emerging themes, the sector bellwethers of today look increasingly at risk of being replaced by companies positioning for the next paradigm.

TRADITIONAL SECTOR	OLD PARADIGM	NEW PARADIGM
Consumer Discretionary	Consumer firms primarily target the spending preferences of baby boomers and Gen Xers, selling through brick-and-mortar channels and appealing to suburban lifestyles and material wants.	**Millennials** are set to see their incomes rise and inherit trillions from the baby boomer generation. Their unique spending preferences, such as buying online via **E-commerce** platforms, living in cities and favoring experiences, are expected to radically alter what types of products are sold and how they are bought.
Energy	The energy sector largely revolves around the extraction and sale of fossil fuels.	Falling costs and rising production of **Lithium-ion batteries** is leading the shift to renewable energy and electric vehicles, which in return are expected to power the **autonomous vehicles** of tomorrow.
Financials	Financial firms primarily rely on employee skills to effectively allocate financial capital and provide services to customers.	**FinTech** allows financial firms to leverage cutting edge technology to reduce costs, improve decision making and risk controls, remove middlemen, and enhance customer experiences.
Health Care	Health care systems are designed to treat symptoms or ailments once they occur.	**Increasing lifespans (Longevity)** and rising health care costs are driving people to proactively improve their **health & wellness**, through physical activity, healthy eating, and greater mindfulness of their well-being. **Genomics** is helping personalize medicine, preventing and treating illness with innovative treatments.
Industrials	Manufacturers provide workers with tools and training to complete tasks in an efficient and consistent manner.	Advancements in **robotics & AI** are making machines smarter and more capable than ever before, allowing robots to take on increasingly sophisticated tasks for faster and more accurate production
Information Technology	The technology ecosystem largely revolves around computers, servers, and mobile devices communicating with each other.	Declining chip costs and improving connectivity allows for virtually any object to connect to internet-enabled networks, allowing it to collect or receive **big data**, in a massive expansion of the **Internet of Things**, supported by the scalable infrastructure of **cloud computing**. All of these secured and protected by **cybersecurity** platforms.
Communication Services	People communicate or consume information primarily through traditional mediums like phone, TV, or radio.	People around the world are communicating via **social media** platforms, to share mobile video and photos, chat with friends, listen to podcasts, read blogs and more recently play and watch **video games & esports** together.

While many investors may be looking to potentially benefit from these paradigm shifts, we believe traditional sector funds are ill-equipped to help investors do so. The traditional sectors tend to favor the winners of the past, tilting exposure to the firms that have already successfully capitalized on a specific economic paradigm. As the powerful macro-level themes mentioned above begin to accelerate, a new set of companies are likely to eventually rise to the top of each sector. Rather than waiting for traditional sector funds to cycle out of the old guard of companies in favor of new leaders, we believe investors can potentially pre-empt these changes by targeting Sector Disruptors: thematic ETFs that invest in companies that are well-positioned to be a step ahead of the status quo in developing revolutionary technologies or catering to a rising consumer base.

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THE RISK-BASED ARGUMENT FOR THEMATIC INVESTING

Many consider thematic investing to be a growth-oriented strategy, seeking to benefit from the emergence of powerful structural trends. Yet investors may also view thematic investing through the lens of potential risk reduction– not necessarily through traditional financial risk metrics like volatility and drawdowns, but as a method for hedging against long term external risks.

To illustrate this point, consider a pension plan for employees of an oil company. The pension plan depends on annual contributions from its sponsor, the oil company, to fund its obligations. If oil prices fall meaningfully, the sponsor could face financial stress, and contributions risk being cut. Therefore the pension plan inherently has risks associated with oil prices. As a result, a fund may actively look for ways to hedge the risk of an oil decline.

One approach could be to take short positions in oil futures, which could mitigate the impact of a near-term oil price decline. But given the long time horizons of most pension funds, the plan may also want to hedge against a longer term, secular oil price decline. One possible solution is to invest thematically in emerging technologies or materials that pose an existential threat to oil, like the rise of renewable energy sources or lithium and battery technology. This is in fact a tactic employed by Norway's sovereign wealth fund. Because it depends heavily on oil revenues, the fund's managers announced that they would "roughly double its environmentally related investments… [including] companies active in renewable energy, energy efficiency, pollution control."[10] By investing in these themes, the fund managers hope to position the fund for an era where renewables could replace oil as the world's premier energy source.

These same principles can apply to individual investors when one considers the question: "what are the risks to my future financial well-being?" While there are dozens of possible answers ranging from an economic downturn, to personal health issues, or natural disasters, few of these risks can be effectively mitigated over the long term. Yet there are certain risks that could be. For example, people who work in a job that is at high risk of automation face a potential threat to their future income because of advancements in robotics and artificial intelligence. Rather than allowing this risk to remain unaddressed, they could attempt to mitigate this risk by investing in companies that stand to benefit from the rise of these technologies.

From another perspective, a couple close to retirement could be concerned about longevity risk, or the risk of outliving their savings. This risk may be particularly acute given rapidly rising health care costs and uncertainty around potential changes in health care policy. In an effort to hedge this risk, the couple may consider investing in companies that should be well-positioned to benefit from the trend of people living longer around the world. This way, if health care costs rise and average lifespans continue to increase, the couple may realize some benefit through stock price appreciation of these longevity-related companies.

While thematic investing is not a perfect hedge, it may serve as a useful counterweight to some of the longer term risks certain investors face. Given the rapid rate of technological advances, uncertainty around government policy, and concern about the future availability of natural resources, we believe investors could be well-suited to consider thematic investing as a means for positioning a portfolio to potentially benefit from the rise of these disruptive themes.

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HOW TO VALUE DISRUPTIVE THEMES

Nobody wants to overpay for an investment, but in many cases 'cheap' stocks are cheap for a reason and 'expensive' stocks are expensive for a reason. Securities with low valuations may have minimal growth prospects or structural concerns, while those trading at elevated multiples may be pioneering revolutionary technologies, products, or services. Take for example the top 5% of companies in the S&P 500 by expected sales growth over the next 12 months. While these high growth firms are expected to accelerate their top line revenues more than four times faster than the median level for the S&P 500, they also come with elevated valuations. Price-to-earnings, price-to-sales, and price-to-book metrics are all more than double those of the median S&P 500 firm.

	FWD 12 Month Sales Growth	P/E	P/B	P/S	Div Yield
Top 5%	17.57%	41.69x	7.17x	6.63x	0.00%
Bottom 5%	-1.24%	12.72x	1.77x	1.48x	2.35%
S&P 500	4.27%	19.47x	3.20x	2.59x	1.88%

Source: Bloomberg , data as of 9/30/2019

Of the top 5% fastest revenue growers, 60% hail from the more innovative Information Technology and Communication Services sectors, including familiar FAANG names like Facebook, Amazon, Netflix, and Google (Alphabet).[11] By contrast, in the group of the bottom 5% – those with the slowest expected 12 month revenue growth – only 8% come from IT or Communications Services, with many categorized as Industrials, Energy, and Utilities. And while their valuations are noticeably lower than the S&P 500 median, so too is their growth rate, coming in at a negative value, implying shrinking businesses.

When looking at the firms at the forefront of disruptive themes, they, like the top 5% bucket, often possess both high growth expectations and high valuations. This can spur questions from investors about whether the valuations are appropriate for their expected growth, or if they are too high to justify an investment. Below we offer a few approaches and considerations to evaluate the multiples of disruptive themes.

DON'T HARP ON EARNINGS-BASED MULTIPLES

Some themes can show unusually high, or even negative price-to-earnings (P/E) ratios, particularly themes early in their adoption cycles. High growth companies simply are not trying to generate earnings – at least not during periods of rapid expansion. While this may sound counter-intuitive, imagine a firm that develops cutting edge artificial intelligence algorithms and expects to generate $10 million in free cash flow. The firm could prioritize booking that $10 million as earnings and return the money to shareholders as a dividend or stock buyback, or retain the earnings for future use. Alternatively, it could prioritize growth and spend the $10 million by hiring teams of engineers or sales people. In the fast-moving world of disruptive companies, most would choose to invest the $10 million back into R&D or sales to further develop their product or grow their market share as they race to beat their competition. They are prioritizing growth over profitability, usually with the blessing of their investors who demand rapid growth.

Recent IPOs (and failed IPOs) of popular startups have brought renewed attention to profitability in the high growth space. A common explanation for these failures is that the firm's lack of profitability challenges the sustainability of their business model. In light of these developments, we believe it is important for investors to accurately distinguish between disruptive firms that are choosing not to be profitable because they are investing in a defensible business versus firms that are unable to be profitable due to a flawed business model. One example of this is in the genomics space, where high R&D costs mean many leading firms in the space often lose money until they develop and receive approval of a successful drug. Just because they are not profitable currently, does not mean their business model is unable to capture positive earnings in the future.

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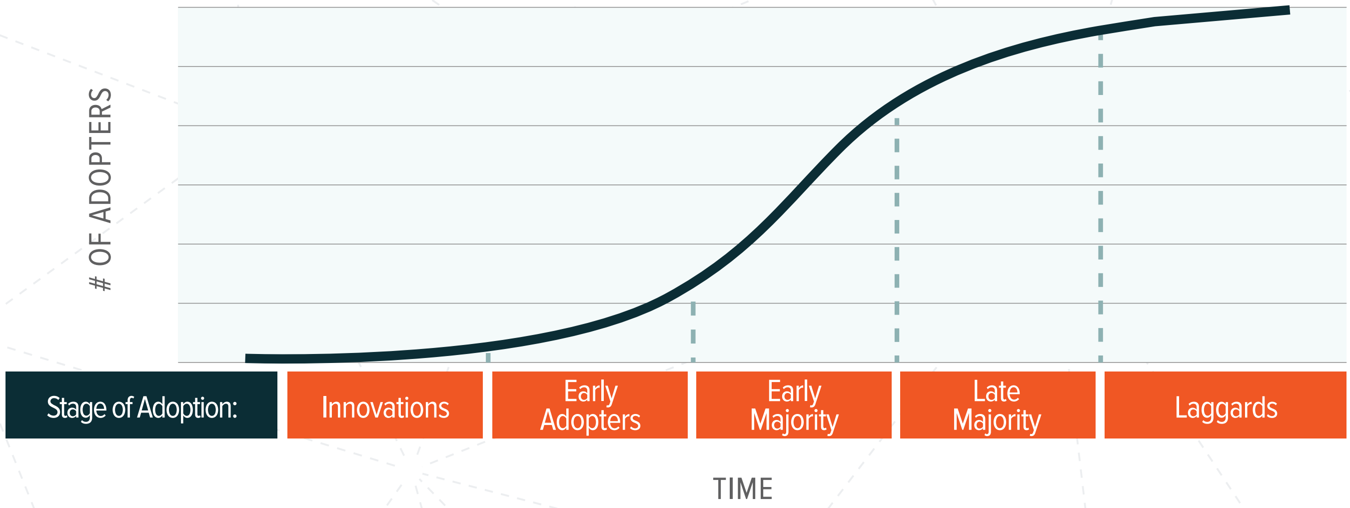
LOOKING TO SALES-BASED METRICS

Rather than analyzing earnings-based valuations, a preferred technique is to consider sales-based metrics, such as the price-to-sales (P/S) ratio. While high growth firms may care little for profitability during their early stages, their investors and management teams do focus on adoption: how many people or businesses are implementing the firm's new product or technology. Sales data can provide useful information on the speed and stage of this adoption. For example, by looking at total sales and sales growth, one can estimate where a product may be on the adoption curve. If total sales are low, but growth is very high, it is likely in the earlier stages of adoption than if total sales are large, but growth is flattening.



But how does one know what a 'fair' price-to-sales ratio is for a high growth firm? One method to analyze these figures is to divide price-to-sales by 12 month forward expected sales growth. This is commonly implemented with the price-to-earnings ratio, which becomes the 'PEG' ratio when divided by growth. When dividing price-to-sales by growth (PSG), one can get a better sense of not just how much they are paying for each unit of sales, but how much they are paying for future sales growth. All else equal, a firm with the same price-to-sales ratio, but higher growth expectations, would have a lower PSG than a firm with lower growth expectations, making it more attractive from a growth-adjusted valuation standpoint. A modified version of this approach is to use enterprise value (EV), rather than price (P) in the ratio, which takes into account a company's debt, punishing those with high leverage.

	P/S	EV/S	Growth	PSG	EVSG
AI & Big Data (AIQ)	3.13	3.24	13.65	0.23	0.24
Autonomous & Electric Vehicles (DRIV)	0.81	0.96	8.58	0.09	0.11
Cannabis (POTX)	17.60	41.06	66.96	0.26	0.61
Cloud Computing (CLOU)	7.44	7.83	19.04	0.39	0.41
E-Commerce (EBIZ)	1.77	1.79	14.98	0.12	0.12
FinTech (FINX)	5.85	7.92	18.73	0.31	0.42
Genomics (GNOM)	11.27	10.59	60.55	0.19	0.17
Health & Wellness (BFIT)	1.32	1.52	8.01	0.16	0.19
Internet of Things (SNSR)	2.35	2.58	7.82	0.30	0.33
Lithium & Battery Tech (LIT)	1.05	1.34	22.11	0.05	0.06
Longevity (LNGR)	3.23	3.71	15.34	0.21	0.24
Millennials (MILN)	2.49	2.94	11.28	0.22	0.26
Robotics & AI (BOTZ)	1.95	2.09	9.85	0.20	0.21
Social Media (SOCL)	4.17	3.92	16.92	0.25	0.23
US Infrastructure Development (PAVE)	1.00	1.32	3.45	0.29	0.38
S&P 500 Index	2.09	2.46	6.46	0.32	0.38
MSCI All Country World Index	1.52	1.89	9.55	0.16	0.20

Source: Bloomberg , data as of 9/30/2019

As depicted in the table above, there can be a wide range for PSG or EVSG values across themes. While a low PSG number may imply that a theme is relatively inexpensive compared to its growth prospects, other factors can play an important role in determining near term returns, such as changes in sentiment, risk, and geographic and sector tilts, among others.

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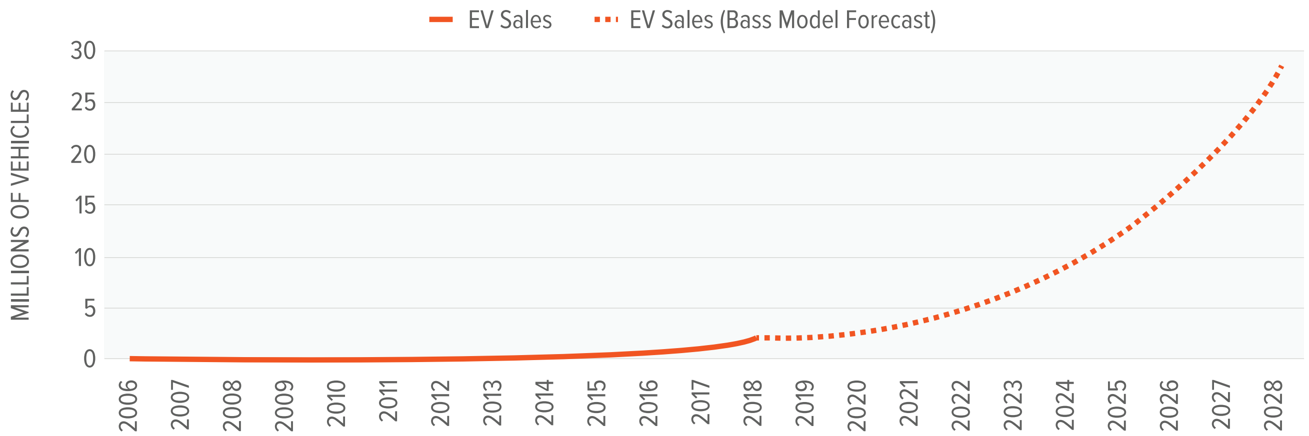
PROJECTING GROWTH

While price is known, and sales is a relatively straight forward accounting statistic, predicting future growth can be a challenge. Data providers, like Bloomberg, aggregate wall street analyst expectations to publish a single expected growth estimate, which is what is shown in the table above. These data points can be useful as it effectively crowd-sources growth expectations from a variety of analysts, each incorporating their own projection methods. However, many foreign and small cap stocks may not have adequate, or any, analyst coverage and therefore growth forecasts. Further, analysts can often anchor their growth expectations based on other analyst reports or previous sales figures.

Given these obstacles, some investors may take it upon themselves to craft their own growth forecasts. One method to project growth is to calculate a technology's total addressable market (TAM) and to analyze how much of that market has already been penetrated. For example, a very basic calculation would show that the 2 million electric cars sold in 2018 represents 2.9% of the total 68.7 million cars sold that year.[12] Using techniques like linear extrapolation or a Bass Diffusion Model can help analyze how quickly the remaining addressable market could be penetrated. More sophisticated models would incorporate other considerations as well, such as changing demographics, the impact of ride-sharing, and the potential for alternative forms of transformation. If analyzing individual companies, one must also consider their change in market share, as early market leaders often lose market share as competitors catch up. When looking at a basket of stocks that is representative of an entire industry however, this step is less necessary as changes in market share are zero-sum among the peer group in the basket.

ELECTRIC VEHICLE MARKET GROWTH

Source: IEA Global EV Outlook 2019, Global X Research.



Disruptive companies tend to look expensive on traditional valuation metrics compared to slower growth areas of the stock market. But investors in high growth firms are not paying a premium because they value today's earnings; they are future-focused, caring about the economic potential several years from now. As such, we believe considering trends in sales, adoption, and future growth are more relevant to valuing disruptive companies in the early stages than more traditional metrics like earnings.

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WHAT HAPPENS WHEN THEMES CONVERGE?

It's important not to lose sight of the fact that effective themes rarely emerge in isolation. For example, it's no coincidence that consumers are becoming more focused on health and wellness, while at the same time people are living longer around the world. Nor is it happenstance that social media firms are reporting record revenues, just as Millennials are beginning to see their earnings and consumption power accelerate. As investors vet various themes for possible inclusion in a portfolio, they may be well served by targeting similarly interconnected ideas. Researchers from McKinsey & Company, for example, wrote: "In our experience, the most attractive opportunities are found when multiple themes converge and reinforce one another…"[13]

Why do we believe in targeting interconnected themes? The most disruptive technologies and powerful trends often require multiple themes to emerge simultaneously. For example, the development of autonomous vehicles not only depends on advancements in robotics and artificial intelligence to operate vehicles, but also on the maturation of the internet of things so an array of sensors can analyze driving conditions and interact with other cars, not to mention improvements in lithium and battery technology for cars to be able to efficiently refuel themselves. The interdependence of these technologies has no doubt contributed to their synchronous advancement. For example, many believed a limiting factor in the emergence of driverless cars was the high cost of batteries required to travel long distances. In response, however, battery producers have begun to dramatically increase production to scale down per-unit costs.

In the following chart, we highlight the specific themes targeted by Global X's Thematic Growth ETFs and demonstrate how various new technologies and trends are connecting these themes together.

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LONGEVITY
Lifespans are increasing around the world and the senior population is growing rapidly

MEDICAL DEVICE IMPLANTS

LITHIUM
Mobile devices and electric vehicles are creating massive demand for lithium and batteries

RENEWABLE ENERGY STORAGE

INFRASTRUCTURE
As the population grows, and infrastructure ages, there is renewed demand to modernize US infrastructure assets

ANTI-AGEING

AUTONOMOUS VEHICLES

GENOMICS
Falling genetic testing costs, the rise of precision medicine, ever-increasing amounts of genetic data, and other trends fueling genomics' disruption of health care

GENOMIC DATA

ROBOTICS & ARTIFICIAL INTELLIGENCE
A variety of businesses are turning to robots and AI to improve efficiency or reduce costs

SMART CITIES /SMARTGRIDS

BIG DATA
The world's data is increasing exponentially, allowing for AI capabilities to become a reality

GENETIC TESTING

SMART FACTORIES

CLOUD INFRASTRUCTURE AS A SERVICE

HEALTH & WELLNESS
Consumers are spending more money on eating healthy and exercising

FITNESS TRACKERS

INTERNET OF THINGS
A wide range of ordinary items are now connected to the internet to collect data and be controlled remotely

CONNECTED DEVICES

CLOUD COMPUTING
Cloud computing provides the scalable resources to gather, store, and analyze all kinds of data use for a variety of advance applications

CBD & MEDICAL MARIJUANA

AUGMENTED & VIRTUAL REALITY

ENCRYPTED DECVICES

SECURE DATA

CANNABIS
Regulatory overhaul, changes in public opinion, and a large, proven addressable market, including its medical capabilities, are significantly increasing the demand of cannabis

VIDEO GAMES & ESPORTS
People spend more time than ever playing and watching others play video games, making it the new social outlet

CYBERSECURITY
Investing in cybersecurity has become inexorable for enterprises as the availability of more data warrants higher spending

DIGITAL ENTERTAINMENT

ONLINE GAMING & STREAMING

ECOMMERCE

MILLENNIALS
Largest U.S. generation has unique preferences and increasing spending power

MILLENNIAL FOCUSED ADVERTISING

SOCIAL MEDIA
Revolutionary platforms are changing how people communicate, share, and consume media around the world

CROWD-FUNDING

FINTECH
New technology solutions are disrupting antiquated financial firms or improving their efficiency

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CONCLUSION

'Conclusion' may be the wrong word for the end of a whitepaper on thematic investing. As the pace of change in the world appears to only be accelerating, there will be an ever-changing landscape of thematic opportunities as new themes emerge and older themes mature. Therefore 'the book' on thematic investing will never be truly finished. Yet our hope is that the analyses, examples, and frameworks provided in this whitepaper help equip investors to better capitalize on tomorrow's trends.

To keep up to date with our latest research and insights on the thematic space, please visit our research blog at www.globalxetfs.com/research.

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RELATED ETFs

TICKER	FUND NAME	BRIEF DESCRIPTION
GXTG	Thematic Growth ETF	Provides exposure to a variety of structurally disruptive macro-trends and the underlying investments that potentially stand to benefit from the materialization of those trends.
SOCL	Social Media ETF	Provides investors access to Social Media companies around the world.
FINX	FinTech ETF	Seeks to invest in companies on the leading edge of the emerging financial technology sector.
SNSR	Internet of Things ETF	Companies that stand to potentially benefit from the broader adoption of the Internet of Things.
BOTZ	Robotics & A.I. ETF	Companies that potentially stand to benefit from increased adoption and utilization of robotics and artificial intelligence.
LIT	Lithium & Battery Tech ETF	Invests in the full lithium cycle, from mining and refining the metal, through battery production.
DRIV	Autonomous & Electric Vehicles ETF	Invests in firms involved in the development of autonomous vehicle technology, electric vehicles (EVs), and EV components and materials.
AIQ	Future Analytics Tech ETF	Companies that potentially stand to benefit from the further development and utilization of artificial intelligence and big data.
CLOU	Cloud Computing ETF	Invests in companies positioned to benefit from the increased adoption of cloud computing technology.
GNOM	Genomics & Biotechnology ETF	Invests in companies that potentially stand to benefit from further advances in the field of genomic science.
HERO	Video Games & Esports ETF	Seeks to invest in companies positioned to capture potential growth opportunities across the video game & esports industry.
BUG	Cybersecurity ETF	Invests in companies that stand to potentially benefit from the increased adoption of cyberse-curity technology.
MILN	Millennials Thematic ETF	Companies that have a high likelihood of benefiting from the rising spending power and unique preferences of the U.S. Millennial generation.
LNGR	Longevity Thematic ETF	Companies positioned to serve the world's growing senior population through exposure to sectors that contribute to increasing lifespans and extending quality of life in advanced age.
BFIT	Health & Wellness Thematic ETF	Seeks to harness the effects of changing consumer lifestyles by investing in companies geared toward promoting physical activity and well-being.
EBIZ	E-commerce ETF	Invests in companies positioned to benefit from the increased adoption of E-commerce as a distribution model.
POTX	Cannabis ETF	Seeks to invest in companies that potentially stand to benefit from the legalization, adop-tion, and growth of cannabis around the world.
PAVE	U.S. Infrastructure Development ETF	Invests in companies that stand to benefit from a potential increase in infrastructure activity in the United States.

[1] Towers Watson, "Thematic Investing," March 2012. [2] UBS, "House View: 2016 and Beyond," 2016. [3] Global X, "Beyond Baby Boomers: The Investable Assets of Tomorrow," 2017. S urvey commissioned by Global X and conducted by ORC International in Q1 2017. Millennials are defined as 21-37 years old, and Gen X'ers are defined as 38-49 years old. "Affluent" is defined as >$250,000 in investable assets for Millennials and >$500,000 in investable assets for Gen X'ers. "General Population" is defined as 21-86 years old with >$100,000 in investable assets. 200 people in each group (e.g., affluent Millennials, affluent Gen X'ers, and General Population) were surveyed. [4] Merrill Lynch, "The Thundering World," 2016. [5] McKinsey on Investing, "From Indexes to Insights: The rise of Thematic Investing," Winter 2014/15 [6] RBC, "Global Megatrends: Capitalizing on Tomorrow's Trends Today," 2014. [7] Source: Consumer Technology Association, "A Smartphone Surprise: US Ownership Hits Record Levels, Says CTA Research," May 25, 2017. [8] Source: Consumer Technology Association, 'Consumers Adopting Innovation: Wearables, Wireless Audio, Connected Devices Experience Largest Ownership Growth in 2016, says CTA,' Apr 28, 2016. [9] Source: Statista, "Percentage of U.S. Population with a Social Media Profile," 2017. [10] New York Times, "Norway's Sovereign Wealth Fund Ramps Up Investment Plans," June 24, 2014. [11] The missing FAANG from the Top 5% is Apple, which ranked 143rd in the S&P 500 by expected sales growth (top 30%). [12] International Organization of Motor Vehicle Manufacturers, 2019. [13] McKinsey on Investing, "From Indexes to Insights: The rise of Thematic Investing," Winter 2014/15

This information is not intended to be individual or personalized investment or tax advice and should not be used for trading purposes.

Investing involves risk, including the possible loss of principal. There is no guarantee the strategies discussed will be successful. International investments may involve risk of capital loss from unfavorable fluctuation in currency values, from differences in generally accepted accounting principles or from economic or political instability in other nations. Emerging markets involve heightened risks related to the same factors as well as increased volatility and lower trading volume. Narrowly focused investments may be subject to higher volatility. There are additional risks associated with investing in lithium and the lithium mining industry. The investable universe for thematic ETFs may be limited. The funds are non-diversified.

Investments in infrastructure-related companies have greater exposure to the potential adverse economic, regulatory, political and other changes affecting such entities. The Funds invest in the Healthcare, Pharmaceutical, Biotechnology, Medical Device sectors. These sectors can be affected by government regulations, expiring patents, rapid product obsolescence, and intense industry competition.

POTX's investments are concentrated in the cannabis industry, and the Fund may be susceptible to loss due to adverse occurrences affecting this industry. The cannabis industry is a very young, fast evolving industry with increased exposure to the risks associated with changes in applicable laws (including increased regulation, other rule changes, and related federal and state enforcement activities), as well as market developments, which may cause businesses to contract or close suddenly and negatively impact the value of securities held by the Fund. Cannabis Companies are subject to various laws and regulations that may differ at the state/local, federal and international level. These laws and regulations may significantly affect a Cannabis Company's ability to secure financing and traditional banking services, impact the market for cannabis business sales and services, and set limitations on cannabis use, production, transportation, export and storage. The possession, use and importation of marijuana remains illegal under U.S. federal law. Federal law criminalizing the use of marijuana remains enforceable notwithstanding state laws that legalize its use for medicinal and recreational purposes. This conflict creates volatility and risk for all Cannabis Companies, and any stepped-up enforcement of marijuana laws by the federal government could adversely affect the value of the Fund's investments. Given the uncertain nature of the regulation of the cannabis industry in the United States, the Fund's investment in certain entities could, under unique circumstances, raise issues under one or more of those laws, and any investigation or prosecution related to those investments could result in expense and losses to the Fund.

Investing in securities engaged in the social media industry include disruption in service caused by hardware or software failure; interruptions or delays in service by third-parties; security breaches involving certain private, sensitive, proprietary and confidential information managed and transmitted by social media companies; and privacy concerns and laws, evolving Internet regulation and other foreign or domestic regulations that may limit or otherwise affect the operations of such companies.

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