

Innovative technologies

End of a craze or start of a secular growth trend?

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Thematic ETFs are here to stay

2022 has been an eventful year, and the events of the past year have shown that the increasing adoption of thematic ETFs in investor portfolios is not mere hype. In an inflation-hit environment with mediocre growth prospects and high geopolitical uncertainties, thematic ETFs could now, more than ever, provide a useful performance boost to core portfolios, especially over the longer term.

The case for thematic investing is clear: much like single stock investing, thematic indices aim to provide exposure to a single growth story, but unlike single stock investing it seeks to mitigate the idiosyncrasies linked to a company's ability to execute on such growth trends. Innovative technologies are no exception to this: positive inflows demonstrate that, despite suffering a performance setback in 2022,¹ investors continue to believe in their long-term growth story. The combination of increased company reporting transparency, improved ability for index providers to digest such data and the assistance of artificial intelligence where necessary, has enabled the creation of transverse portfolios presented in a rules-based, ETF-friendly format.

Unlike the Global Industry Classification Standard (GICS) or Bloomberg Industry Classification System (BICS) sector and industry classification systems, there is no conventional definition of innovative technologies, nor an available granular description of the sub-themes fundamentally driving them. In this brochure, we remind investors of the fundamental trends behind those growth stories, but also drill down into a possible breakdown of innovative technologies, uncovering a diversified pool of sub-trends that also demonstrate the soundness of certain growth trends that could lead investors to believe that they are here to stay.

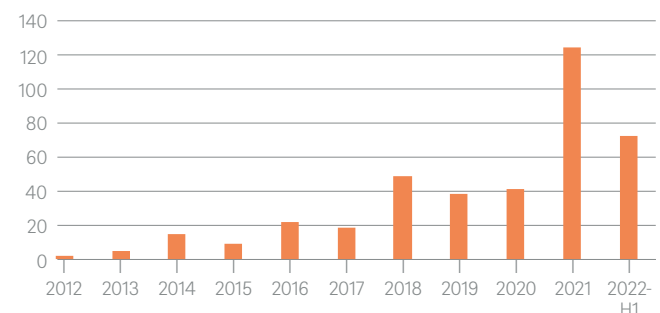
The Cambrian explosion of new Thematic offerings to continue

In recent decades, the nascent ETF industry has gone through multiple important product innovation milestones. Beginning with the first broad market tracking ETF launched in 1993, before expanding into narrower sector-like indices a few years later, and then in the early 2000s finally arriving at the three most important concepts going beyond standard market

exposures: smart beta, ESG, and thematic. For investors, this meant more easily steering their investment preferences and a greater ability to precisely target their goals. This led to different long-term risk/return or impact outcomes tailored to investors' proprietary investment philosophy.

While smart beta and ESG themes have matured significantly over the last 20 years, no conventional definition or methodology exists for thematic products, which in our view is the most promising and innovative category due to the vast number of opportunities and possible themes bordering single stock investing. After a rather slow start in the first decade of the 21st century, thematic ETFs really took off around 2014/15 when they started to draw increased client attention measured by both launches as well as inflow. As seen in Figure 1, three out of four thematic ETFs existing today were launched in the last five years. Looking at flows, even in the first half of 2022, when all major indices entered bear market territory, global thematic equity flows were still positive, with over \$4 billion invested year-to-date and close to \$90 billion cumulative inflows over the last three years.² This inflow resilience could be viewed as solid proof of investor interest and continued demand for concentrated solutions outside of the standard ETF building blocks. A recent survey among wealth managers and independent financial advisers shows that in the Europe-listed thematic ETF space alone, assets under management in thematic products are expected to increase by at least \$9 billion by the end of the year, with 90% of respondents expecting to raise their exposure to thematic ETFs over the next 12 months.³

Figure 1: Global thematic ETF launches by year



Source: DWS International GmbH, based on Bloomberg LP. Period from January 01, 2005 to July 31, 2022. Using Industry / thematic ETF classification filter

¹ Bloomberg LP. As of July 2022

² Bloomberg LP. As of July 2022. Using Industry / Thematic ETF classification filter

³ Ignites Europe. "Thematic ETF assets to continue growing: survey". As of June 15, 2022.

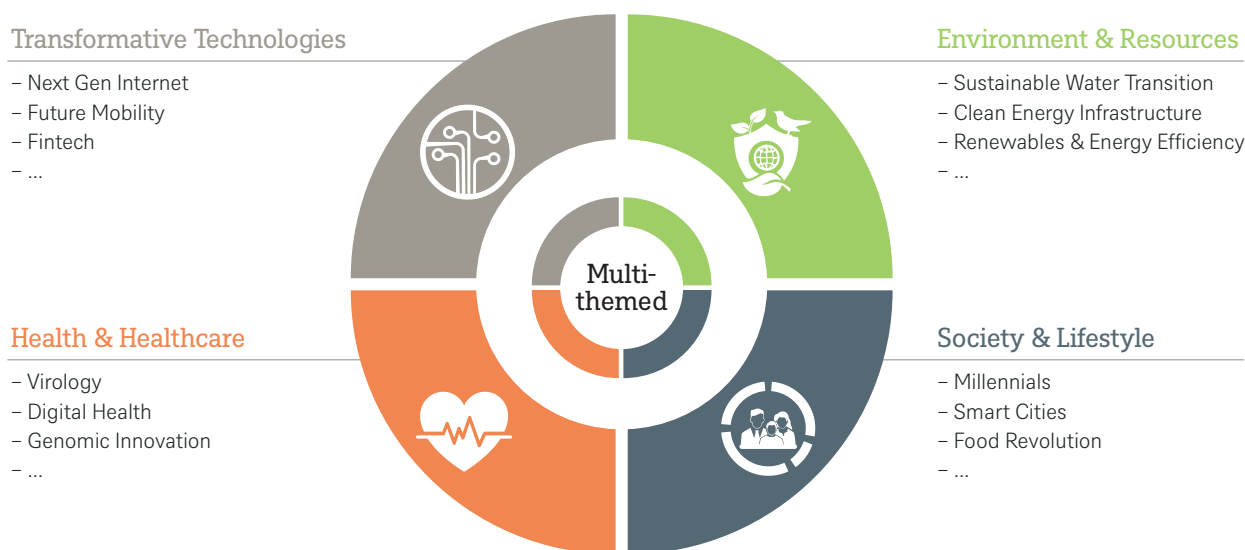
Deep dive into innovative technologies

Thematic investment, and especially investing in innovative technologies is about identifying promising opportunities that have the potential to create profound transformations in the value chain and status quo of entire systems, creating billions of dollars in new revenues and market capitalization – all with the goal of capitalising on the long-term growth potential inherent in the underlying structural changes.

To this end, MSCI has proposed a comprehensive framework that could serve as a powerful guide to thematic investing.⁴ Of the four megatrends identified by the index provider, the field of **Transformative Technologies** is probably the first to come to mind when thinking of the impact of disruptive technological innovation such as fintech, robotics, artificial intelligence, or the 'Internet of Things'. Sustainable development of our

societies is covered by the **Environment & Resources** megatrend, which captures resource use and the impact of man-made damage to the planet. **Society & Lifestyle** deals with the impact of demographics and how we would organize our lives in the future. These two megatrends align well to the United Nations Sustainable Development Goals (SDGs) framework that addresses key global challenges in these areas and aims to direct corporate and private capital towards their achievement. One of the most prominent examples of this is investment in the transition towards more responsible consumption and production, as promoted by SDG 12. This goal is well-suited to replication in an ETF focused on innovative players in the circular economy. The fourth megatrend, **Health & Healthcare**, has recently seen growing attention with the outbreak of Covid 19, making the so-called 'Genomic Age' present in everyday life.

Figure 2: MSCI Thematic Investing classification framework



Source: DWS International GmbH, based on MSCI. "Thematic Investing". Available at <https://www.msci.com/our-solutions/indexes/thematic-investing>.

⁴ MSCI. "Thematic Investing". Available at <https://www.msci.com/our-solutions/indexes/thematic-investing>

Genomics – advancing modern healthcare

An investor seeking exposure to the healthcare megatrend may want to take a closer look at the rapid evolution of genomic technologies – a result of various drivers ranging from revolutionary diagnostics based on gene sequencing that determine the genetic composition of an organism, to therapeutics using innovative approaches for editing genetic code and finding the causes of some hereditary diseases. Bioinformatics offers almost limitless opportunities to leverage both the flood of new data as well as advances in artificial intelligence. The increasing prevalence of wearable technology such as smartwatches is also supporting those trends. Patients constantly wearing these devices generate health-related datasets in abundance, enabling better patient monitoring and refined therapies, which in turn could improve success rates and the efficiency of research and development processes.

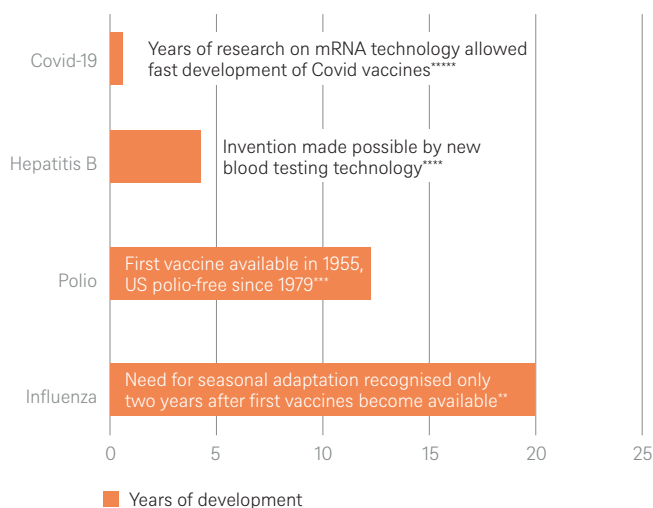
During the Covid crisis, policymakers integrated insights from mobile devices and other similar technologies into their analytical processes to better understand how the virus spreads and to detect new outbreaks at an early stage. Possibly more important for combatting the virus, however, proved the major advances that have been made in gene sequencing over the last 30 years.⁵ Next-generation gene sequencing, meaning the simultaneous reading of millions of DNA fragments with the help of machine learning techniques, has been paramount in uncovering the genome of the virus in unprecedented time.⁶ As recently as 2003, this would not have been possible, not least because of the high cost of sequencing. At that time, the decoding of the first human genome had just been completed after 13 years of research and at a total cost of around \$3 billion.⁷

Knowledge of the code of the virus has paved the way for vaccine development. Several pharmaceutical companies switched their existing efforts towards novel treatments to find medical answers to the Covid virus, putting forth the mRNA vaccine, among others. The underlying research leverages strongly on the interdisciplinary approach of synthetic biology, where DNA is produced in the laboratory and inserted into an organism’s genome. With machine learning entering the discipline, even more precise and efficient results are delivered. The impressive speed with which the mRNA vaccines passed through the approval pipeline is a strong argument in favour of the convergence of genomics and modern computational technologies.

And this seems to be just the beginning. Further advances in genetics are expected to have a significant impact on drug development pipelines by reducing failure rates and enabling faster research and development processes. It is estimated that the global market for cell and gene therapies could grow fifteenfold between 2021 and 2027, reaching annual growth of \$50 billion by 2027. In the US alone, up to 20 new gene therapies per year could soon come to market and enable new lifesaving treatments.⁸

The shift from curing to managing disease could be as profound for human well-being as its commercial implications. Only recently, a novel approach to lowering blood cholesterol based on gene editing has been tested in New Zealand, which could be revolutionary in preventing heart attacks.⁹ The scope of application outside of healthcare also needs to be taken into consideration. Innovative genomic solutions in agriculture have the potential to ensure food security to combat global hunger, which addresses overpopulation and climate change – two of the most pressing socioeconomic issues we face today.

Figure 3: Historical speed of vaccine development



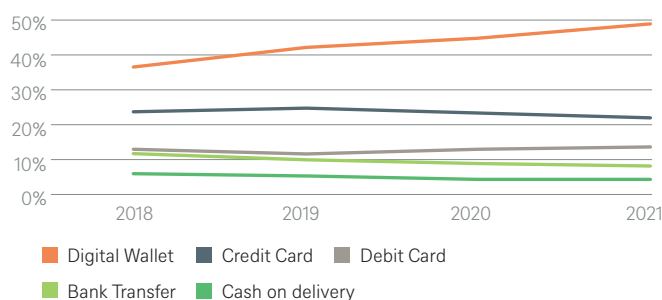
Source: DWS International GmbH, based on "Business Insider. "How long it took to develop 12 other vaccines in history". July 18, 2020. Available at <https://www.businessinsider.com/how-long-it-took-to-develop-other-vaccines-in-history-2020-7>. "Centers for Disease Control and Prevention. "Influenza Historic Timeline". Available at <https://www.cdc.gov/flu/pandemic-resources/pandemic-timeline-1930-and-beyond.htm>. "Centers for Disease Control and Prevention. "Polio Vaccination". Available at <https://www.cdc.gov/vaccines/vpd/polio/index.html>. "Hepatitis B Foundation. "Baruch Blumberg, MD, DPhil". Available at <https://www.hepb.org/about-us/baruch-blumberg-md-dphil/>. "University of California. "The COVID vaccine came out super quickly. Here's why it's safe". May 19, 2021. Available at <https://www.universityofcalifornia.edu/news/covid-vaccine-came-out-super-quickly-heres-why-its-safe>

⁵ National Human Genome Research Institute. "The Cost of Sequencing a Human Genome". Available at <https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost>
⁶ University of California. "The COVID vaccine came out super quickly. Here's why it's safe". May 19, 2021. Available at <https://www.universityofcalifornia.edu/news/covid-vaccine-came-out-super-quickly-heres-why-its-safe>
⁷ National Human Genome Research Institute. "The Cost of Sequencing a Human Genome". Available at <https://www.genome.gov/about-genomics/fact-sheets/Sequencing-Human-Genome-cost>
⁸ EY (2020). "How collaboration will strengthen the future of cell and gene therapies"
⁹ MIT Technology Review. "Edits to a cholesterol gene could stop the biggest killer on earth". July 12, 2022. Available at <https://www.technologyreview.com/2022/07/12/1055773/crispr-gene-editing-cholesterol/>. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

Fintech – the age of online payment

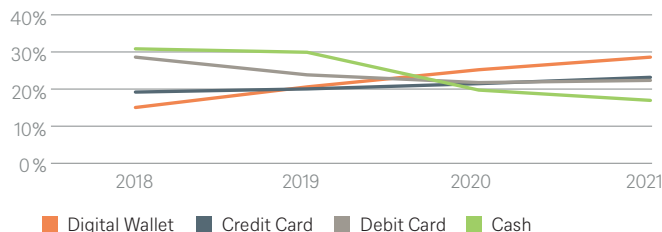
As society has adjusted to the changes brought about by COVID-19, this has led to the acceleration of several trends, many of which have been underway for some time. Innovative technologies have left a lasting footprint on one of the most fundamental functions in financial services, money transfers and transactions, where digital payments and contactless solutions have widely replaced cash usage.

Figure 4: Development of top ecommerce payment methods (share of global ecommerce purchase volume)



Source: DWS International GmbH, based on (1) Worldpay (2018). "Global Payments Report". (2) Worldpay (2019). "Global Payments Report". (3) Worldpay (2020). "Global Payments Report". (4) Worldpay (2021). "Global Payments Report".

Figure 5: Development of top point-of-sale payment methods (share of global point-of-sale purchase volume)



Source: DWS International GmbH, based on (1) Worldpay (2018). "Global Payments Report". (2) Worldpay (2019). "Global Payments Report". (3) Worldpay (2020). "Global Payments Report". (4) Worldpay (2021). "Global Payments Report".

The convergence of mobile connected devices and a greater technological opportunity set based on artificial intelligence and computational advances has led to the creation of digital wallets. These are online payment applications that could be conveniently accessed at any time on smartphones and similar devices. A major benefit of digital wallets is scalability since their client base increases almost naturally through network effects in which existing users of the application recruit friends and family as new members. Client acquisition

becomes more cost efficient, and previously unnoticed micro-tipping payments and other micro-transactions develop into attractive business opportunities.

Digital wallets could also serve as a powerful gateway to up- or cross-sell¹⁰ existing users into other financial services or (e)commerce offerings. This capability drives the value per global user up to \$3,800 and if one in two smartphone users worldwide were to adopt a digital wallet by 2026, this would translate into a total opportunity of \$10 trillion.¹¹

As heterogeneous as the many fintech business models may be, their value proposition rests on similar core deliverables: high convenience, low cost and broad accessibility. These characteristics put fintechs in a position to play a decisive role in serving the 1.7 billion adults that do not have access to financial services and to help lift economically underprivileged households out of poverty.¹²

Next generation internet – revolutionising daily life

No single technological innovation has influenced the life of so many people as the advent of the internet. In its early days, users primarily consumed information in a read-only mode, whereas today we interact with and via the web. The internet continues to evolve with the growing number of use cases, and in the next generation could be shaped by artificial intelligence applied for example via neural networks and advances in how information is processed and which hardware it is processed on. Combined with big data, these novel technologies provide the necessary ingredients for the evolution of smart systems that self-train their intelligence with fresh information to permanently improve.

One way to gather inputs for intelligent systems is through wireless networks from individual sources that communicate via the internet. Physical objects such as cars could be equipped with modern sensors to collect data about their surroundings, while cameras capture traffic signs, and GPS satellites add information about geographical position. Combined with self-learning computers, real-time scanning of the environment is a powerful puzzle piece to the current developments in the transportation sector, where artificial intelligence is on the verge of revolutionising point-to-point mobility. If autonomous transportation arrives in daily life, taxis would no longer need human drivers and could have higher occupancy rates than

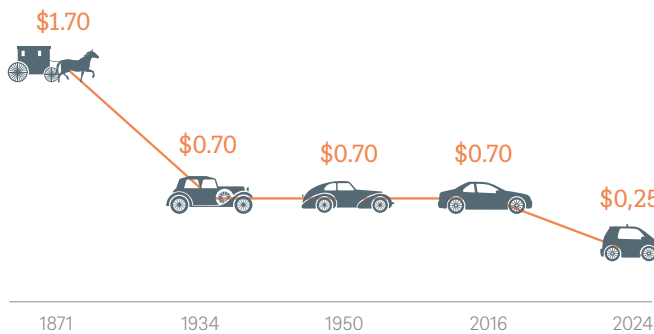
¹⁰ Up-selling means the transfer of customers to an upgraded version of the currently consumed services (e.g. from standard to platinum level). Cross-selling means the sale of related services such as Insurance.

¹¹ Ark Invest. "Digital Wallets". Available at <https://ark-invest.com/videos/all/bis2022-digital-wallets-upending-traditional-banking/>. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

¹² Worldbank. "On fintech and financial inclusion". October 26, 2021. Available at <https://blogs.worldbank.org/psd/fintech-and-financial-inclusion>

¹³ Ark Invest. "Autonomous Ridehailing Could Be More Profitable Than We Had Modeled". February 19, 2020. Available at <https://ark-invest.com/analyst-research/autonomous-ridehailing-fees/>

Figure 6: Cost of transportation following a switch from personally owned vehicles to autonomous taxis in 2024 (per mile in USD)



Note: ARK has estimated previously that an autonomous taxi could price at \$0.35 per mile. We have refined our estimates and believe that autonomous taxis could be even cheaper, at only \$0.25 per mile. Forecasts are inherently limited and cannot be relied upon. Source: DWS International GmbH. Data as of 2019 and based on MSCI (2021). "A world shaped by autonomous technology. Economic disruption in the transport sector – a case study"

traditional cabs, so that per mile transportation prices could drop to less than half the cost of owning a car.¹³ If passengers reduce individual travel in favour of the innovative alternative, their behavioural change may have a positive impact on climate. Fewer fatalities could also be a consequence, as programmed cars obey traffic rules, while humans could be prone to risky driving.

Taking the entire autonomous ride-hailing apparatus, autonomous platform providers are likely to account for most of the profits. These are the companies that own the technology that enables self-driving cars and are estimated to reach an aggregate enterprise value of \$12 trillion by 2026.¹⁴ Without doubt, the potential application of self-learning computers goes way beyond the transportation sector, and the businesses that exploit this potential are estimated to be worth a global market capitalisation of \$30 trillion by 2037.¹⁵

Possible portfolio implementation

Considering the long-term investment potential offered by megatrends, it is nevertheless appropriate to take a deeper look at both risks as well as return opportunities associated with innovation-focused investments. In their publication from March 2021,¹⁶ MSCI noticed that innovation-focused companies tend to have risks related to investment quality, residual volatility, and momentum factors. MSCI has also warned that reversals in those factors could expose investors to draw-downs, and this has indeed happened in the first half of 2022.

For the subsequent analysis, we have considered three different types of investors and portfolios associated with each of them. We are using the MSCI World Index in USD to represent the standard equity module of the portfolio and the Bloomberg Global Aggregate Index in USD as the standard fixed income module. Furthermore, we are using the following three MSCI indices in USD as thematic enhancement modules: Innovation - MSCI ACWI IMI Innovation Select ESG Screened 200 Index; Genomics - MSCI ACWI IMI Genomic Innovation Select ESG Screened 100 Index; Fintech - MSCI ACWI IMI Fintech Innovation Select ESG Screened 100 Index.

All portfolios are rebalanced quarterly at the end of February, May, August and November.

- Case 1: Classical multi asset investor with a 60/40 portfolio (60% equity and 40% fixed income allocation). Since such an investor is usually tightly monitoring both return as well as risk exposure of the portfolio, we are re-allocating only 10% of the equity portfolio into broad innovation exposure, meaning that the final enhanced portfolio is composed of 54% MSCI World, 6% Innovation and 40% Global Aggregate.
- Case 2: Long term passive equity investor with 100% invested into MSCI World. We are keeping the core MSCI World exposure at 85% and adding a 15% satellite allocation via Innovation, as the investor could usually tolerate slightly higher risks but still wants to have a majority of assets invested into broad market exposure.
- Case 3: Actively minded equity investor doing single stock investing in selected themes and already having an exposure to artificial intelligence and internet stocks. In order to create a passive exposure to other megatrends, this investor considers a thematic core / satellite portfolio composed of Innovation as core with 50% weight, and two promising megatrend satellites, in which he is less experienced, and hence rather prefers a diversified ETF solution by allocating 25% into Genomics and Fintech, respectively.

In all three cases the addition of innovation-focused exposures improved absolute returns. In Case 1 and 2 it also improved the risk adjusted returns vs. the initial allocation without innovation. Furthermore, in those two cases, the portfolios were not significantly riskier, with slightly higher volatility but at the same time lower drawdowns. All this speaks in favour of modest blending of innovation strategies with the standard benchmarks to achieve performance enhancement or diversification effects. Case 3 on the other

¹⁴ Ark Invest. "Autonomous Ride-hailing". Available at <https://www.ark-bigideas.com/2022/en/session/be7e0ae0-7e43-11ec-9965-c7ad3cc62caf>. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

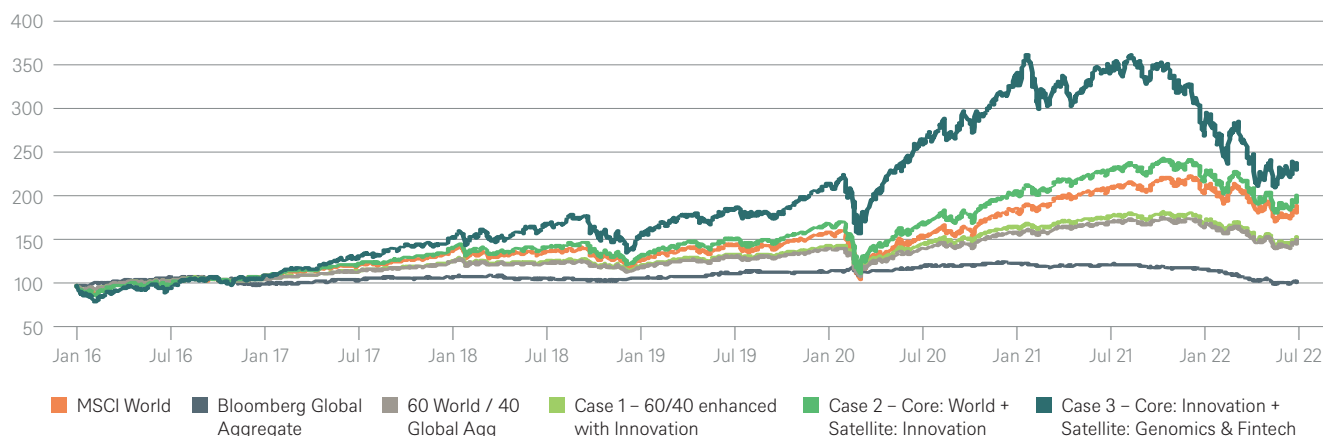
¹⁵ Ark Invest. "The Cost of AI Training is Improving at 50x the Speed of Moore's Law: Why It's Still Early Days for AI". May 6, 2020. Available at <https://ark-invest.com/analyst-research/ai-training/>

¹⁶ MSCI. "The Pace of Fast Change: Growth vs. Thematic Investing". March 16, 2021. Available at <https://www.msci.com/www/blog-posts/the-pace-of-fast-change-growth/02386088177>. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

hand demonstrates both the potential for significant out-performance of innovation-focused strategies but also the significantly higher level of risk which investors need to consider before doing the investment. While the higher level of risk does not always guarantee better long-term

performance, at least not in all asset classes, the diversification benefits of using a broader basket of companies should help investors to better preserve their capital compared to single stock bets.

Figure 7: Simulated performance comparison of investment cases versus broad equity and fixed income benchmark



Source: DWS International GmbH, based on Bloomberg LP. Period from January 04, 2016 to July 29, 2022. All data in USD. Past performance, whether actual or simulated, is not a reliable indicator of future returns.

Table 1: Key metrics of benchmarks and simulated portfolios

Name	MSCI World	Bloomberg Global Aggregate	60 World / 40 Global Agg	Case 1 – 60/40 enhanced with Innovation	Case 2 – Core: World + Satellite: Innovation	Case 3 – Core: Innovation + Satellite: Genomics & Fintech
Annualized Return	10,22%	0,86%	6,51%	6,90%	11,19%	14,07%
Annualized Volatility	16,2%	4,8%	9,9%	10,1%	16,9%	22,8%
Max. Drawdown	-34,0%	-19,7%	-22,5%	-22,2%	-33,3%	-41,6%
Return / Volatility	0,63%	0,18%	0,66%	0,68%	0,66%	0,62%

Source: DWS International GmbH, based on Bloomberg LP. Period from January 04, 2016 to July 29, 2022. All data in USD. Past performance, whether actual or simulated, is not a reliable indicator of future returns.

Table 2: Rolling 12 month returns

	07/16-07/17	07/17-07/18	07/18-08/19	07/19-08/20	07/20-07/21	07/21-07/22
MSCI World	16.12%	11.88%	3.62%	7.23%	35.07%	-9.16%
Bloomberg Global Aggregate	-1.28%	-0.48%	5.73%	7.85%	0.78%	-14.58%
60 World / 40 Global Agg	8.93%	6.83%	4.51%	7.68%	20.49%	-11.34%
Case 1 - 60/40 enhanced with Innovation	9.62%	7.64%	5.01%	9.63%	20.46%	-12.48%
Case 2 - Core: World + Satellite: Innovation	17.94%	13.99%	4.81%	12.16%	34.97%	-12.09%
Case 3 - Core: Innovation + Satellite: Genomics & Fintech	26.96%	22.98%	10.99%	43.18%	28.63%	-30.11%

Source: DWS International GmbH, based on Bloomberg LP. Period from July 29, 2016 to July 29, 2022. All data in USD. Past performance, whether actual or simulated, is not a reliable indicator of future returns.

Conclusion

As evidenced by both the impressive increase in product offerings and unabated investor flows, thematic investing is one of the most promising categories in the current market environment, especially for a long-term oriented investor. Although no conventional definition for thematics exists, the broad equity universe can already be successfully broken down into a reasonably pure and representative spectrum of sub-trends, and this could be done in a passive friendly manner. Investing in genomics companies, for example, promises participation in the fundamental change in the identification and therapy of previously incurable diseases. Highly efficient fintech companies are making financial services more convenient and, above all, more accessible – a big step towards global financial inclusion.

All trends have one thing in common: investors who recognise and invest in them early could participate in massive and still largely untapped growth potential. Depending on risk appetite, a thematic investment could serve as a performance-boosting addition to a traditional multi-asset core portfolio, or potentially provide a double-digit return for more risk-seeking investors. Either way, tomorrow's winners could represent a valuable building block for every portfolio, as they enforce business models that find innovative answers to the significant secular megatrends that could permanently change our world.

Related Readings

Ark Invest. "Big Ideas Summit". Available at <https://www.ark-bigideas.com/2022/en/home>

Ark Invest. "Digital Wallets". Available at <https://ark-invest.com/videos/all/bis2022-digital-wallets-upending-traditional-banking/>

Ark Invest. "Genomics Innovation. A Catalyst for Growth" | July 9, 2020. Available at https://research.ark-invest.com/hubfs/1_Download_Files_ARK-Invest/White_Papers/ARKInvest_070620_whitepaper_Genomics-Innovation.pdf?hsCtaTracking=d4bdce99-3810-4a99-9e17-b6f14aeb3ba3%7C06e4a224-a261-4223-9b58-36cc0f3e21dc

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