Adding thematic equities to diversified portfolios

FOR PROFESSIONAL INVESTORS ONLY
| Section 1 | Growing popularity | 7 |
| Section 2 | Thematic equities as satellite allocations | 8 |
| Section 3 | Thematic equities as global equity allocations | 10 |
| Section 4 | Fully diversified thematic portfolios | 16 |
| Conclusion | Discussion and outlook | 18 |
| Appendix | | 21 |
Growing popularity

They were once considered niche. But thematic equities have in recent years evolved into mainstream investments. Their ability to transform broad, long-term macro-economic, technological and ecological trends into investments has struck a chord with a growing circle of investors.

Even so, questions remain over how to incorporate such stocks within portfolios that use traditional asset allocation frameworks.

In 2019, Pictet Asset Management provided some preliminary guidance on this matter, drawing on well-established portfolio construction concepts and portfolio optimisation tools.

The purpose of this update is two-fold. First, we wish to incorporate revised capital market assumptions into our analysis. Second, the report is an opportunity to explain our evolving thinking on the inclusion of thematic strategy combinations as core portfolio holdings.

In our view, thematic equities can be incorporated into diversified portfolios using any of three broad approaches. Thematic equities can function as:
— Satellite allocations within a core-satellite framework;
— Investments within a global equity asset allocation;
— Alternatives to fully diversified equity portfolios.
Thematic equities as satellite allocations

Investors pursuing a core-satellite approach will find that thematic equities can work particularly effectively as satellite investments.

Under this approach, a portfolio is split into two distinct parts. The ‘core’ is well diversified and typically contains traditional investments such as equities and bonds. It is built using a standard asset allocation framework and its goal is to capture the market return from various asset classes, or their ‘beta’. ‘Satellites’, in contrast, allocate capital to assets that fall outside the boundaries of the traditional asset allocation framework. They account for a smaller portion of the total portfolio, typically up to a maximum of quarter of total assets. Allocations to satellites are either made to express an investors’ structural, long-term view or to take advantage of opportunities that unfold over much shorter timeframes. Either way, the objective is either to access additional sources of alpha (a return that’s in excess – or independent of – the market) or to diversify risk.

How do thematic equities fare as satellites? FIG. 1 provides the results of our simulation and optimisation model that combines portfolios consisting of an allocation to mainstream global equities (MSCI All Countries World Index) with a global government bond index and a representative allocation to a single thematic equity strategy from the Pictet Asset Management range. The results suggest that for portfolios with higher targeted return and risk tolerance, up to 20 per cent of investible assets should be allocated to thematic equities. More details on the methodology are provided in Appendix 1.
This result, we believe, testifies to the focused targeted and benchmark-unconstrained approach that thematic strategies pursue.

By investing in specialised companies operating in sectors of the economy that defy traditional classification, the thematic equity investment universe is very distinct from what is represented by global stock indices such as the MSCI World. The fact that portfolio managers do not invest with reference to a market benchmark provides additional flexibility. The result is a portfolio that bears very little resemblance to mainstream equity indices.

1 Thematic portfolio randomly drawn every month from available thematic strategies. Simulation based on 100 random draws and subsequent calculation of efficient frontier. Chart represents the bottom third allocation to thematic equities across all simulations. For more details on methodology and capital market assumptions, see Appendix sections 1 and 4.
Thematic equities as global equity allocations

Although the core-satellite approach is fairly popular, the majority of professional and non-professional investors allocate capital by region. It’s a strategy that divides the investible universe into large regional blocks such as North America, Western Europe and Asia-Pacific.

Yet there is a strong case for creating a ‘global equity’ allocation to sit alongside larger regional ones.

Because the correlation of returns among regional markets is generally fairly high, the addition of a differentiated global asset class such as thematic equity can help diversify sources of risk and return.

Some thematic equity strategies work more effectively than others as a complement to regional or country-based portfolios. Those that function best invest across multiple investment themes simultaneously and are therefore more broadly diversified. Strategies with these characteristics can account for a larger portion of a global equity allocation.

Source: Pictet Asset Management.²

² For illustrative purposes only.
Indeed, in building customised thematic portfolios for some of our clients, we have discovered that combining two or more thematic strategies into one allocation has much to commend it. The advantages are twofold.

First, grouping thematic portfolios can make sense from a fundamental perspective. Some thematic portfolios complement one another — in other words, strategies that are underpinned by the same structural trends naturally fit together. By combining such portfolios into one larger investment, investors have the opportunity to harness the same megatrends but through a much broader range of investments.

The second advantage comes in the form of diversification. Combining thematic strategies in this way can diversify sources of return and risk, resulting in a portfolio with a potentially superior risk-return profile.

This can be illustrated by studying the performance of several thematic portfolio combinations. The combinations chosen for this study are described briefly in the box at the bottom of this chapter. A more detailed analysis that includes a wider set of thematic combinations is provided in Appendix 2 alongside a description of our methodology.

When conducting a portfolio optimisation study, it is helpful to combine higher and lower risk investments in order to obtain intermediate risk combinations. The combinations used for the study have been designed to illustrate why such portfolios can have a place within a broader asset allocation, based on standard optimisation techniques. The illustration is by no means exhaustive. The portfolio weights provided should be viewed as a loose indication, not a recommendation.

<table>
<thead>
<tr>
<th>FIG. 3</th>
<th>RISK PROFILE OF SELECTED THEMATIC STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>RISK PROFILE</td>
<td>THEMATIC STRATEGIES</td>
</tr>
<tr>
<td>Below average</td>
<td>Nutrition, Health, SmartCity, Water</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Digital, Security</td>
</tr>
<tr>
<td>Above average</td>
<td>Timber, Clean Energy, Premium Brands, Human, Biotech, Robotics</td>
</tr>
</tbody>
</table>

Source: Pictet Asset Management.
We can illustrate the role that such strategy configurations can play in a well-diversified portfolio by using the same portfolio optimisation tools introduced in Section 2 (Fig. 4; see Appendix 3 for a full explanation). Using data from January 2017 to February 2021, we construct the efficient frontier consisting of allocations to global equities, global government bonds (using the MSCI World and the Bloomberg Barclays Global Aggregate, respectively, as reference indices) and thematic portfolio combinations. For presentational purposes, we only show the portfolio composition for an intermediate return / risk target (target annualised return of 4.9 per cent).

Interestingly, the portfolio optimisation exercise indicates that sizeable allocations to thematic equities make sense even when excess returns from such stocks over the MSCI World Index are assumed to be zero or, in instances in which volatility readings were higher, just 25 basis points annualised.

Source: Pictet Asset Management.

* Observations in which the 25 basis point excess return was assumed are identified with an asterisk (*)
Rather than placing too much emphasis on the specific allocation figures, which can be quite sensitive to small differences in assumptions, the general conclusion to draw is that, under reasonable assumptions, it is possible to create thematic combinations that warrant a significant allocation; in some cases the indicative allocation is larger than that suggested for global equities. This supports the notion that a diversified allocation to thematic equities can account for substantial portion of a global equity portfolio.

One explanation for the portfolio benefits that arise from combining themes is the greater sector diversification the approach provides. As Fig. 5 illustrates, the thematic combinations provide exposure to between eight and 10 of the 11 major industry sectors within the MSCI World reference index. The Herfindahl index, which captures a more systematic picture of sector concentration, indicates industry concentration levels are in line with portfolios that are equally-weighted across between four and seven sectors, whereas global equities exhibit levels compatible with an eight sector equally-weighted portfolio.

So, while these thematic combinations do not typically reach the same level of sector diversification as a global equity portfolio, their diversification across industry sectors is nonetheless quite broad.

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3 The Herfindahl index is calculated as the sum of the squared sector portfolio shares. It would be 0.5 for an equal-weighted 2-sector portfolio, 0.25 for an equal-weighted 4-sector portfolio and 0.125 for an equal-weighted 8-sector portfolio. For further reference, for the MSCI ACWI, the Herfindahl value is 0.12. Moreover, for the underlying single-theme portfolios, the index ranges from 0.45 to 0.2, suggesting that the thematic combinations contribute reducing sector concentration considerably, thereby increasing diversification.
Another way to gauge how concentrated or diverse such portfolios are is to conduct a style analysis. The results of such a study are shown in FIG. 6. While the analysis indicates that all portfolio combinations exhibit a growth and size bias, they differ meaningfully in their exposure to all other factors.

FIG. 6

SELECT STYLE FACTOR EXPOSURES:
THEMATIC PORTFOLIO COMBINATIONS VS. MSCI ACWI

<table>
<thead>
<tr>
<th>Style Factor</th>
<th>Generational Shift</th>
<th>Climate Change</th>
<th>21st Century Infrastructure</th>
<th>High Tech Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividend Yield</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
</tr>
<tr>
<td>Size</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
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<tr>
<td>Value</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
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<tr>
<td>Medium-term Momentum</td>
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<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
</tr>
<tr>
<td>Market Sensitivity</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
</tr>
<tr>
<td>Growth</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
</tr>
<tr>
<td>Volatility</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
<td>Highly Positive Exposure to Factor</td>
</tr>
</tbody>
</table>

Source: Pictet Asset Management.

4 Data based on observations of average exposure from 30.04.2018 to 30.04.2021 and Axioma risk model.
Better together: thematic portfolio combinations

**Generational Shifts**
Health, Digital, Premium Brands, Human (each 25%)
The baby boom and the echo-boom/millennial generation are two large cohorts whose behaviour has a disproportionate affect on the economy. This combination captures both, emphasising old age-related care, leisure in retirement, but also the consumption of digital services.

**Climate Change**
Clean Energy (20%), Timber (20%), Nutrition (30%), Water (30%).
Invests in solutions to climate change through renewable energy, energy efficiency, natural carbon capture and storage, less resource-intensive food systems and climate resilience through efficient water provision.

**21st Century Infrastructure**
Digital, SmartCity, Clean Energy, Water (each 25%).
Focuses on digital technology, clean environmental tech and new industrial applications and materials to cater to the urban societies of the future.

**High Tech Innovation**
Digital, Security, Robotics, Biotech (each 25%).
When dealing with the challenges of the modern world, high technology innovation provides a constant flow of solutions and is bound to remain provide an area of strong secular growth.
Fully diversified thematic portfolios

Thematic equity strategies can also serve as alternative to – or replacements for - global equity portfolios that invest across industry sectors.

As the thematic equity landscape has expanded, the number and range of thematic equity investments has grown. This means that, by investing thematically, investors can now hope to achieve the same degree of diversification as they would investing in a strategy referenced to mainstream stock indices.

To illustrate this point, we conducted an analysis using the two broadest thematic strategies at Pictet Asset Management – Global Megatrend Selection (GMS), which equally allocates across the firm’s twelve single-themed strategies, and Global Thematic Opportunities (GTO), which is a high-conviction, concentrated thematic portfolio.

![Optimal Allocation to a Fully Diversified Thematic Portfolio (Global Megatrend Selection)](image)

The optimisation procedure relies on monthly data from 01.12.2008 to 28.02.2021 to calculate the covariance matrix, uses return estimates for global equities and government bonds provided in Appendix 4 and assumes no return advantage for thematic equities (Global Megatrend Selection) relative to global equities.
The approach could of course be illustrated with a variety of well-diversified thematic portfolios.

Using the same optimisation technique deployed in the analysis described in Section 2 and Appendix 3, the optimal portfolio allocation to global equities, government bonds and GMS is depicted in FIG. 7 for different return targets. FIG. 8 provides the same analysis for GTO.

Across target returns, the allocation to global equities and GMS is approximately evenly split, suggesting that, when it comes to diversifying a portfolio, allocating across themes is on par with a traditional regional approach. For GTO, which is a more focused portfolio, the proportion of total equities consisting of thematics varies from one fifth to a third from moderate to aggressive risk profiles. This too is consistent with the notion that diversified thematic equities can be viewed as core portfolio holdings.

**FIG. 7**

**FIG. 8**

Optimal allocation to a fully diversified thematic portfolio (global thematic opportunities)

Source: Pictet Asset Management.

6 The optimisation procedure relies on monthly data from 01.10.2016 to 28.02.2021 to calculate the covariance matrix, uses return estimates for global equities and government bonds provided in Appendix 4 and assumes no return advantage for thematic equities (GTO) relative to global equities.
The analysis provided in this study makes a strong case for the inclusion of thematic equities in a diversified portfolio.

A potential shortcoming of this analysis is that the data were taken during a period in which equity markets were enjoying an almost uninterrupted rally thanks mainly to exceptionally low interest rates.

During this period, thematic equities have on average outperformed global equities. However, the results are not heavily reliant on forward-looking return assumptions. For a number of optimisation runs, no return advantage was assumed for thematic over global equities. In other instances, when the portfolio’s estimated risk was higher, the excess return required to justify a significant allocation to thematic stocks was a modest 25 basis points per year.

This means that, for these results to be no longer valid, it would require a profound change in both the correlation of returns between thematic stocks and mainstream asset classes and in thematic stocks’ risk.

While we cannot exclude this possibility, such a scenario looks improbable – thematic stocks should retain their distinctive risk-return profile. This is likely for a number of structural reasons.

To begin with, there’s the make-up of thematic investment universe itself. It consists to a much less degree of large mega-cap companies than traditional indexes. This has significant investment implications.

There is a large body of evidence showing that the stocks of specialised firms do better than those of large, diversified companies over the long run. Essentially, large firms suffer from what is known as the “conglomerate discount”. Put another way, broadly diversified companies are worth less than the sum of their parts.

Discussion and outlook

Thematic equities have on average outperformed global equities.
By contrast, specialised firms — sometimes known as “pure play” companies — typically have a much clearer view of their strategic priorities and concentrate spending in areas that promise the strongest growth. Their capital allocation is more efficient which, in turn, builds a premium into their share prices over time, the BCG research found. Our thematic strategies are designed to take advantage of this tendency. For each thematic strategy we manage, there are explicit rules for the construction of the portfolio. Each stock must have a high “thematic purity” for it to qualify as a potential thematic investment. Thematic purity is a proprietary, numerical indicator of how specialised and thematically-aligned a company’s activities are.

Companies that qualify as thematic investments share another attractive attribute that has a bearing on investment returns. Because they are specialised in their activities, they have little in common with the huge, diversified multi-nationals that dominate mainstream equity indices such as the MSCI World or the S&P 500 Index.

This carries over to the portfolio. The investment approach is index-unconstrained, delivering a portfolio that bears little, if any, resemblance to those whose reference index is a mainstream equity benchmark. Thematic strategies’ high active share is an indication of this.

And while the risk and performance of thematic equities may vary over the different phases of the market cycle, their structural design features should lead to portfolios with market characteristics that are relatively predictable over full market cycles.
Appendix
The results presented in FIG. 1 are derived through mean-variance optimisation across global equities (MSCI ACWI), global government bonds (BofAML) and a representative thematic equity strategy from the Pictet Asset Management range. Such a representative return series is generated through simulation. For each simulation run, a time series of thematic returns is generated by assigning to each month a return randomly selected among the thematic strategies available at that point in time. The covariance matrix is calculated across the three asset classes and used to compute the optimal weights across the three asset classes. These optimal weights are designed to generate the lowest estimated portfolio volatility for every portfolio return target over a realistic range. The return expectations are derived from the Pictet Asset Management Secular Outlook 2020 report (see Appendix 4) and represent 5-year return estimates. For the results presented here, we assumed equal returns for the thematic equity portfolio and the global equity market. Since the representative thematic series was randomly generated, we need to run the same process multiple times in order to establish what typical outcomes look like. We therefore run 100 simulation of the thematic returns with a portfolio optimization each time and derive 100 efficient frontiers detailing the optimal allocation among the three asset classes. The thematic equity allocations quoted and shown in FIG. 4 represent the 33rd percentile of the allocation to thematic equities for each return target. This means that in two thirds of the simulations, the suggested allocation is higher than the figure shown in the chart.
The strategies included in the study were Water, Security, Health, Biotech, Premium Brands, Clean Energy, Digital, Timber, Nutrition, Robotics, SmartCity, Human, Global Environmental Opportunities and Global Thematic Opportunities. This process assumes no skill in strategy selection since thematic portfolios were chosen randomly. The thematic strategy returns used are in US dollar terms, are net of fees and are I-share classes. They were sourced from fund data published on Bloomberg. We use historical data covering the period between December 2008 and February 2021.

For a more detailed description of mean-variance portfolio optimisation, see Martin Haugh, Mean-Variance Optimisation and the CAPM.\footnote{Link: http://www.columbia.edu/~mh2078/FoundationsFE/MeanVariance-CAPM.pdf}
Appendix 2: thematic portfolio combinations

This appendix section provides a broader set of thematic portfolio combinations, relying on the same approach as in Section 3.

**New Consumer: 25% Human, 50% Nutrition, 25% Premium Brands**

The new consumer basket offers a mix of goods and services experiencing growing demand from the contemporary consumer. Nutrition, Human and Premium brands occupy different points along the Maslow hierarchy of needs. While Nutrition serves to provide us with the basic tangible need of sustenance, Premium Brands serves to give a sense of belonging and aspiration through material goods, and Human encompasses the top of the Maslow pyramid through services catering to the intangible needs of individuals that look to experiences, education, care and enjoyment. The “new consumer” is one that lives very much a 21st century life — complex and dynamic, and looks for the goods and services that support us in this context.

**Consumer Goods: 50% Nutrition, 25% Premium Brands, 25% Timber**

This basket focuses on the full value chain of the goods and services demanded by our “new consumer” described above. Consumers are ever more vocal in their demands for quality and sustainability — not just in the final product, but across the supply chain whether in raw material inputs, manufacturing process or packaging. Governments are backing these vocal consumer demands for quality/sustainability, e.g. through the EU Green Deal or the Biden Administration’s environmental policies. This basket represents the crossroads at which consumer tastes, government policies and technological advances are converging to encourage sustainable quality whether in food, industrial materials or consumer goods more generally.
Health & Wellbeing: 25% Health, 25% Biotech, 25% Nutrition, 25% Human

We need products and services to help improve our quality of life for longer as life expectancy has increased, we start families later and live more alone. This basket addresses businesses providing improvements to the physical parts of our lives: through better nutrition and disease prevention, but also better diagnosis and treatment. It also addresses improvements to the mental and emotional parts of our lives: through the comfort and support of community, family and pets; a sense of achievement through education and work prospects, as well as a sense of enjoyment through travel, leisure and cultural experiences.

Generational Shifts: 25% Health, 25% Digital, 25% Premium Brands, 25% Human

The baby boom and the echo-boom / millennial generation are two large cohorts that affect large parts of the economy and society as they move through different phases of their life-cycle. This combination captures both of these generational shifts. It focuses on old age-related care (Health, Human), leisure in retirement (Premium Brands), but also the consumption of digital services (Digital, Human) and millennial-driven discretionary consumption (Premium Brands).

* Observations in which the 25 basis point excess return was assumed are identified with an asterisk (*)
Climate Change: 25% Clean Energy, 25% Timber, 25% Nutrition, 25% Water

Mitigating climate change is undoubtedly one of the key challenges of our lifetime. It requires a three-pronged strategy: 1) investing heavily in renewable energy and energy efficiency-enhancing technologies (Clean Energy), 2) developing carbon capture and storage, which can be achieved highly effectively with sustainable forestry and higher wood content in the economy (Timber) and 3) substituting our food consumption patterns away from energetically inefficient and environmentally problematic animal protein, in particular beef (Nutrition).

FIG. A2

Source: Pictet Asset Management.

8 The Herfindahl index is calculated as the sum of the squared sector portfolio shares. It would be 0.5 for an equal-weighted 2-sector portfolio, 0.25 for an equal-weighted 4-sector portfolio and 0.125 for an equal-weighted 8-sector portfolio. For further reference, for the MSCI ACWI, the Herfindahl value is 0.12. Moreover, for the underlying single-theme portfolios, the index ranges from 0.45 to 0.2, suggesting that the thematic combinations contribute reducing sector concentration considerably, thereby increasing diversification.
**Agroforestry: 50% Timber, 50% Nutrition**

Agroforestry is typically a term to describe a type of land management that combines trees with crops or livestock. More broadly we can refer here to the benefits of both a sustainable forestry and timber value chain and a food value chain focused on access to high-quality nutrition and sustainable food production. Both Timber and Nutrition provide important solutions to two of our largest environmental challenges today: climate change and agricultural land use. Agriculture is the world’s largest land user, and produces circa 40 per cent of global greenhouse gas emissions. This highlights the vast, largely untapped potential for precision farming, sustainable aquaculture and plant-based diets to positively contribute to climate change mitigation, soil and water quality, biodiversity, and ultimately better human health. Forests, in contrast, are nature’s own carbon sink through its net absorption of CO₂. Forests are also important habitats for a diverse number of species, vital to water and soil quality. The environmental benefits of investing in the sustainable timber and food chains are considerable.

**Urbanization winners / Urban society:**

**50% SmartCity, 50% Premium Brands**

Economic development over the world has spurred the growth of cities – from third tier to mega metropolises. This increases the need for supporting infrastructure, affordable residential housing, convenience retail and a new logistics paradigm supporting last mile distribution to cater to the demands of urban consumers. It has also upped the ante for aspirational consumption activities tightly linked to urban life. In particular, it strengthens the tendency of diverse populations living in close proximity to get new insights into their neighbours and encourages “keeping up with the Jones”. Ultimately, urban life encourages a premiumization of consumption.
Virtual future: 20% Digital, 20% Human, 20% Premium Brands, 20% SmartCity, 20% Security

The COVID-19 pandemic has spurred an acceleration in consumer adoption of online tools and services, in companies’ online presence and reliance on cloud computing, and in cities commitment to technological infrastructure. More than ever, society is turning towards virtual solutions for everyday needs from education and work, to healthcare, shopping and entertainment. Companies across every sector are better establishing themselves for the 4th industrial revolution – investing in omnichannel delivery strategies to weather the future and its uncertainties. While Digital provides comprehensive exposure to the digital transformation through a wide range of data-driven web-based business models and Security provides the needed cybersecurity component, Human and Premium Brands emphasize digital delivery and experience around consumer goods and services. Finally, SmartCity relies – to an important extent – on technology-based solutions to urbanization challenges.

Source: Pictet Asset Management.

FIG. A3
SELECT STYLE FACTOR EXPOSURES FOR SELECTED THEMATIC PORTFOLIO COMBINATIONS VS MSCI ACWI

DIVIDEND YIELD
SIZE
VALUE
MEDIUM-TERM MOMENTUM
MARKET SENSITIVITY
GROWTH
VOLATILITY

HIGHLY NEGATIVE EXPOSURE TO FACTOR
HIGHLY POSITIVE EXPOSURE TO FACTOR

Source: Pictet Asset Management.9

9 Based on average exposure from May 2018 to April 2021 and Axioma risk model.
21st century infrastructure: 25% Digital, 25% SmartCity, 25% Clean Energy, 25% Water

Building a resilient and sustainable infrastructure for the 21st century requires harnessing the power of digital technology, fully realizing the potential of clean tech, in particular in energy and water distribution, and deploying new industrial applications and materials, while catering to the evolving needs of consumers — most of whom are now urban — for sustainability, productivity and convenience.

High tech innovation: 25% Digital, 25% Security, 25% Robotics, 25% Biotech

When dealing with the challenges of the modern world, high technology innovation provides a constant flow of solutions. Whether it’s through digital technology to address individual or business needs, robotics and automation to improve efficiency and performance, through biotech innovation to keep pushing the boundaries of medical possibilities, or through security solutions to allow all other areas to operate smoothly and safely, technology-driven innovation is bound to remain an area of strong secular growth.
Appendix 3: methodology used in sections 3 and 4

In Sections 3 and 4, mean-variance portfolio optimization procedures are used to determine optimal composition of portfolios across global equities, global government bonds and thematic equity portfolios. Unlike Section 2 and Appendix 1, where random returns were drawn to capture a representative thematic portfolio, the operation here involve optimization but no simulation, since the returns of the thematic portfolio combinations are known. For Section 3, based on data availability, the calculations of the respective covariance matrices rely on monthly return data from 01.01.2017 to 28.02.2021 adjusted to reflect our proprietary forward-looking risk estimates (since risk cannot reliably be calculated over a full market cycle). For Section 4, monthly return data from 28.12.2008 to 28.02.2021 is relied on to compute a historical covariance matrix for GMS. For GTO, the data ranges from 01.10.2016 to 28.02.2021 and the risk estimates are forward-looking as for calculations in Section 3. In both sections, the forward-looking return estimates for global equities and global government bonds are sourced from the Pictet Asset Management 2020 Secular Outlook as described in Appendix 4. The return assumption for thematic equities is either in line with global equities or reflects a slight advantage, as reflected in the Secular Outlook piece.
Appendix 4: secular outlook return estimates

Please see Pictet Asset Management’s return assumptions from our 2020 Secular Outlook.\textsuperscript{10}

\textsuperscript{10} Link: https://www.am.pictet/en/uk/global-articles/2020/pictet-asset-management/secular-outlook