TD Global Investment Solutions

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The TD Epoch Core Model:
Our Proprietary Stock Model

Overview

- **The TD Epoch Core Model (ECM) is our proprietary stock selection model for a global all-country, all-cap universe, which includes roughly 10,000 stocks. It is, however, not just another stock selection model, it is the rules-based expression of TD Epoch's free cash flow investment philosophy.**
- **First developed in the mid-2000s, the ECM was built to enhance the firm's investment processes across strategies, to surface ideas for further research, to prioritize our research queue, and to inform our portfolio construction process. Since its inception, it has continuously evolved and different TD Epoch strategies use the ECM with varying degrees of emphasis and formality, depending on their respective investment objectives and processes.**
- **The ECM has three distinctive features which make it more representative of reality than other models. First, we tailor the peer groups to reflect the competitive dynamics of different industries. Second, we tackle three sources of accounting distortions. Third, we have developed separate, industry specific versions for banks, insurers and REITs because their business models and regulatory environments are materially different.**

The ECM is a rules-based expression of our investment philosophy. A key tenet of our investment philosophy is that the growth and applications of free cash flow represent the best predictor of long-term shareholder return. We believe cash flows are more reliable than reported earnings because they are harder to manipulate under accounting rules. Furthermore, for innovative businesses which derive much of their economic value from intangible assets, reported earnings have become increasingly less relevant as a measure of value generation compared to cash flows. In addition, businesses which appear to generate reported earnings but not cash flows are more likely to run into financial distress.

As such, we eschew commonly-used measures such as Price-to-Earnings, Price-to-Book, and Return-on-Equity. Although we implement extensive accounting adjustments to the financial information used in the ECM, we do not believe these adjustments sufficiently address the flaws inherent in accounting measures such as reported earnings and book values. Instead, the ECM emphasizes free cash flow-based metrics. Where appropriate, we have created proprietary measures to represent concepts for which there are no conventional measures. E.g., we define Free Cash Flow for a bank as its Net Income Before Extraordinary Items (a proxy for cash flow), less the year-on-year growth in its Tier 1 Common Equity (a proxy for the capital charge necessary to fund its operations).

The second key tenet of our investment philosophy is that capital allocation matters, because decisions on how to allocate cash flows—whether to reinvest in order to grow a company, or to return capital to shareholders—can create or destroy long-term shareholder value. The ECM incorporates direct and indirect measures of management's capital allocation decisions.

Core Model Components

The ECM evaluates each stock in our investment universe according to five broad investment characteristics which we believe drive company fundamentals and security prices. Each investment characteristic – Quality, Valuation, Growth, Capital Allocation, and Investor Behavior – embodies a key aspect of our fundamental research process and is treated as a separate component of the ECM.

For the standard version of the ECM, we use over 20 metrics to represent these five components (see **Table 1**). As discussed below, we have developed separate versions of the ECM for banks, insurers, and Real Estate Investment Trusts (REITs).

Quality

The Quality component is the most important and has the largest weight in the ECM. We take a multi-dimensional view of quality and aim to capture key aspects of Earnings Quality, Operational and Capital Efficiency, and Balance Sheet Quality. We assign roughly equal weights to each of these three sub-components.

To represent (the lack of) Earnings Quality, we use a measure of accrual earnings as well as the variability of Free Cash Flow Margins over time. To measure Operational and Capital Efficiency, we use Free Cash Flow Return-on-Assets, Free Cash Flow Conversion, and Economic Value Added, i.e., the gap between a company's Return-on-Invested Capital (ROIC) and its Weighted Average Cost of Capital (WACC). To capture Balance Sheet Quality, we emphasize a company's ability to support its debt levels and its interest coverage ratio over simple measures of leverage.

Ultimately, measures of quality such as profitability and debt coverage provide indirect evidence for the quality of management's capital allocation decisions. We believe disciplined capital allocation policies eventually lead to profitable and efficient businesses which can comfortably support chosen debt levels.

Table 1: ECM Components and Metrics – Standard Version

Quality

Earnings
- Accrual Earnings Contribution
- Free Cash Flow Margin Variability

Operational & Capital Efficiency
- Free Cash Flow Return on Assets
- Free Cash Flow Conversion Rate
- Economic Value Added

Balance Sheet
- Net Debt-to-EBITDA
- Cash Flow Coverage Ratio

Valuation

Free Cash Flow
- Free Cash Flow Yield
- Free Cash Flow-to-Enterprise Value

Shareholder Return
- Dividend Yield
- Buyback Yield

Capital Allocation

Evidence of Disciplined Approach
- Non-Current Assets Growth
- Net External Financing
- Dividend Coverage Ratio

Investor Behavior

Measuring Changes in Investor Sentiment
- Measuring Changes in Investor Sentiment
- EPS Momentum
- Analyst Upgrades-Downgrade Ratio
- Analyst Up-Down Ratio
- Earnings Surprise

Growth

Historical Trends
- Free Cash Flow Growth
- Profitability Growth

Source: TD Epoch

Valuation
Our valuation measures are Free Cash Flow and Shareholder Return-based.

We use two complementary measures of Free Cash Flow Yield. The first measures Free Cash Flow over the past five fiscal years to provide a historical view and to smooth out short-term fluctuations in Free Cash Flow for firms in cyclical industries. The second uses broker estimates of Free Cash Flow for the next fiscal year to provide a forward-looking view. We also use Free Cash Flow-to-Enterprise Value to provide a "capital structure-neutral" view of valuation.

In addition, we include both Dividend Yield as well as Buyback Yield to capture all sources of shareholder return.

Growth
Theoretically, a company which grows faster should command higher valuation than an otherwise similar company which grows more slowly. As such, we include a Growth component in our Core Model to counter-balance our Valuation component.

We use historical trends in Free Cash Flow and profitability to measure the direction and stability of a firm's historical growth trajectory. We prefer companies which have been able to grow Free Cash Flows over time in a stable and profitable way. Similarly, we favor firms with steadily expanding returns on capital. We believe our approach to measuring growth is more likely to identify firms with sustainable growth prospects relative to a naïve focus on simple sales and earnings growth.

Capital Allocation
Understanding capital allocation is a necessary complement to free cash flow analysis. Capital reinvestment and capital return decisions can create or destroy value depending on the investment opportunity set available to each company.

In addition to indirect evidence of good or poor historical capital allocation decisions "e.g., profitability" we focus on direct evidence of capital allocation decisions. In addition, we penalize companies that invest aggressively, particularly those that are not earning their cost of capital. We prefer companies which are able to (or simply choose to) fund business expansion using internal funds (cash flows or retained earnings) over those which use external funds (equity or debt). We also measure a firm's ability to support its capital return policy based on its cash flows.

Investor Behavior
We believe that stock returns are driven by both company fundamentals and investor behavior. In order to avoid "value traps" we look for signs that investors have begun to recognize the fundamental value of a firm. Similarly, we penalize companies with deteriorating investor sentiment.

To capture the dynamics of investor behavior, we use changes to broker estimates of future earnings, changes in the direction of broker views, and earnings surprises.

Core Model Structure
The Core Model is designed to provide a view on the relative attractiveness of the nine-thousand-plus companies in our global all-country, all-cap investable universe. Each stock in our investable universe is compared to its peer group according to the twenty-plus measures which we use in the Core Model. These measures are normalized within peer groups.

ECM Score Calculation
For a given firm, its normalized score along a measure is its z-score relative to firms within the same peer group. For example, to compute a company's Free Cash Flow Yield Score, we take the company's Free Cash Flow Yield, subtract the average Free Cash Flow Yield for all companies within its peer group, and divide the resulting number with the standard deviation of the Free Cash Flow Yield for companies within the same peer group.

We assess the overall attractiveness of a company relative to its peers by computing a Composite score for the firm. The Composite score is the weighted average of the company's score across all relevant metrics.

In this sense, our Core Model provides an explicit view of how attractive a company is relative to its relevant peer group but does not provide a view on how attractive one peer group is relative to another.

A Global All-Country, All-Cap Model
The ECM is designed to be a unified quantitative tool which can be used by any strategy at TD Epoch, regardless of market capitalization or regional focus. The model universe includes firms in developed and emerging market countries, as well as companies across the market capitalization spectrum. As of July 2020, there are over nine thousand stocks in this universe.

We chose to construct a global all-country, all-cap model for conceptual and practical reasons. A unified approach ensures consistency across strategies. Region- or market cap-specific models can produce

stronger back-test results but come with a higher risk of being "over-fit" i.e., they can appear to explain past patterns well while failing to predict future patterns. In fact, we have explored the potential benefit of building separate models for large vs. small cap companies but did not find better performance. However, we do believe that differences between companies in the financial and real estate sectors and all other sectors are sufficiently large as to merit separate models for banks, insurers, and REITs.

The simplicity and transparency offered by a global model allow our portfolio managers and analysts to easily understand and interact with the model. We have developed tools which allow us to quickly and easily validate the inputs and outputs of the model. We can quickly change the model inputs and peer group for a stock and see the resulting change in ECM Score for the stock in real-time.

Distinctive Features

The ECM has three distinctive features which make it more representative of reality. First, we tailor the peer groups to reflect the competitive dynamics of different industries. Second, we tackle three sources of accounting distortions. Third, we developed separate models for financial companies and REITs.

Peer Group Definition

We believe that structural differences between firms should be taken into account when measuring the relative attractiveness of one company relative to another. Differences in business models, regulatory environments, accounting standards, and investor base all contribute to lack of comparability across companies. As such, we generally define the relevant peer group for a company as other companies within the same GICS level II sector and region, where Developed Market (DM) countries are segregated from Emerging Market (EM) countries.

Although this general definition of a peer group is appropriate for most companies, it does not adequately capture the competitive dynamics for certain industries, specifically those which are global in nature. These global industries include energy, materials, capital goods, and certain sub-industries within the information technology sector. For these global industries, a peer group for a DM (EM) company consists of all DM (EM) companies within the same industry. For example, total, a French integrated oil company is compared to Royal Dutch Shell and Exxon, not just to other European super-majors. See **Table 2**.

Firms in certain global industries such as commercial and professional services tend to be comparable across regions with one exception. Japanese companies within these industries appear more correlated with each other than with non-Japanese companies within the same industry. We believe differences in investor base as well as regional competitive dynamics contribute to this outcome. We consider these industries "quasi-global" and modify the peer group for companies within these

Table 2: Peer Group Definition

	Industry Groups (GICS Level II)	Peer Group Definition	Examples
Global Industries	• Energy • Materials • Capital Goods • Etc.	DM companies: All DM companies in the same industry group EM companies: All EM companies in the same industry group	• Total is compared to other DM energy companies • Petrobras is compared to other EM energy companies
Quasi-Global Industries	• Commercial & Professional Services • Consumer Durables & Apparel • Media • Food, Beverage & Tobacco • Etc.	Same as above except Japanese companies are compared only against each other	• Waste Management is compared to other DM ex Japan C&PS firms... • Toppan is compared to other Japanese C&PS firms... • China Everbright is compared to other EM C&PS firms
Regional Industries	• Transportation • Food & Staples Retailing • Healthcare Equipment & Services • Banks • Etc.	Companies in the same industry group and region	• Bank of America is compared to other U.S. banks • Nordea Bank is compared to other Europe ex UK banks • Banco do Brasil is compared to other EM Lat Am banks

Source: TD Epoch. Information regarding specific companies or securities is presented for illustrative and educational purposes only.

Table 3: Example of R&D Expenditure Capitalization

I. Capitalizing R&D

Fiscal Year	R&D Expense	(%) Unamortized	Unamortized R&D Amount
2016	11,988	100%	11,988.0
2015	12,046	80%	9,636.8
2014	11,381	60%	6,828.6
2013	10,411	40%	4,164.4
2012	9,811	20%	1.962.2
2011	9,043	0%	–
Total Capitalized R&D (2016)			**34,580**

II. Capitalizing R&D

Fiscal Year	R&D Expense	(%) Unamortized	Unamortized R&D Amount
2016	11,988	–	–
2015	12,046	20%	2,409.2
2014	11,381	20%	2,276.2
2013	10,411	20%	2,082.2
2012	9,811	20%	1,962.2
2011	9,043	20%	1,808.6
Total Amortization Expense (2016)			**10,538**

Accounting Adjustment I

2016	Assets
Reported Assets	193,694
(+) Capitalized R&D	34,580
Adjusted Assets	**228,274**

Accounting Adjustment II

2016	EBIT
Reported EBIT	193,694
(+) 2016 R&D Expense	34,580
(-) R&D Amortization Expense	10,538
Adjusted Assets	**228,274**

Source: TD Epoch. The information contained herein is being provided for informational and educational purposes only. Information regarding specific companies or securities is presented for illustrative and educational purposes only.

Note: Unless other wise noted, figures are in millions of USD.

industries to segregate Japanese companies from the global DM peer group. For an illustration of how this is done in practice, refer to Table 2.

Adjustments to Reduce Accounting Distortions

The companies in our global all-country investable universe report their financial information using a variety of accounting standards, including U.S. GAAP, IFRS, and Japanese GAAP. This heterogeneity in accounting standards can introduce distortions in reported financial information, and in turn, metrics which rely on this information. Accounting conventions can themselves make direct comparison of one company to another more difficult. We have identified three main sources of distortion and implemented adjustments to reduce or eliminate them in our Core Model: (a) Research & Development expenditures, (b) Operating Leases, and (c) under-funded pension liabilities.

R&D Expenditures

First, companies which spend significant amounts on research and development (R&D) can appear to be less profitable than those which do not because GAAP accounting requires that R&D expenditures be expensed immediately. In contrast, companies which engage in high levels of capital expenditures can capitalize these costs and amortize them over time. Since R&D expenditures are not reflected in a company's asset base unlike capital expenditures, R&D-intensive companies also tend to appear less capital-intensive than firms which emphasize capital expenditures.

We believe that capitalizing R&D costs for all companies and amortizing these costs over time allows us to make more meaningful comparisons across companies. For simplicity, we assume R&D expenditures are made at the end of each fiscal year and use straight-line amortization. The amortization schedule chosen for each firm depends on the industry in which it operates, ranging from three years for industries with shorter investment cycles (e.g., Software & Services), to ten years for industries with longer investment cycles (e.g., Aerospace & Defense).

Table 3 illustrates how the R&D expenditures for Microsoft (as of 2017) are capitalized and amortized. For Microsoft, we use a five-year amortization schedule. The capitalized R&D expenditures result in an "R&D Asset". The unamortized portion of the R&D Asset

is added to Microsoft's asset base (as shown in the calculations on the left). The Earnings Before Interest and Taxes (EBIT) figure for Microsoft is also adjusted. The R&D Expenditure for fiscal year 2016 is added back to EBIT, while the amortization expense associated with the R&D asset for that year is subtracted from EBIT (as shown in the calculations on the right).

Operating Leases

Second, within certain industries such as retail, companies often choose to use Operating Leases rather than Capital Leases. Firms which choose to use Operating Leases can appear less capital-intensive and less levered than those which choose to use Capital Leases. To address this distortion, we capitalize all Operating Leases for companies in our investable universe and amortize these costs over time.

Table 4 illustrates how we capitalize the operating leases for Whole Foods (as of 2017). Like many companies, Whole Foods reports annual operating leases for the next five years along with a lump sum representing all payments beyond year five. Using the average lease commitment for the first five years, we estimate the average lease beyond year five and the number of years remaining on the lease after year five. All payments are then discounted back to present value and reflected in each company's asset base. The company's debt level is also adjusted upwards by an equivalent amount.

Under-Funded Pensions

Finally, we believe that an under-funded pension plan poses an underappreciated risk to a company's future earnings and financial health. As such, we add any underfunded pension liabilities reported by a company to its debt level.

Net Effect on Financial Metrics

We cascade each of these accounting adjustments through the financial statements of all 9,000+ companies in our Core Model universe. **Table 5** on the following page shows the effect of these three accounting adjustments on key financial metrics for GAP, Inc.

Treatment of Financials and REITs

Companies within the financial sector tend to have business models which are sufficiently distinct from non-financial companies to merit special consideration.

Table 4: Example of Operating Lease Capitalization

Operating Lease Commitments	Operating Lease Expense (USD MM)	Discount Factor	Present Value
2017 (Year 1)			
2018 (Year 2)			
2019 (Year 3)			
2020 (Year 4)			
2021 (Year 5)			
Average Lease Commitment (Years 1 – 5)			
Years of Lease Commitments Remaining[2]			
Average Rent[3] (After Year 5)			
Total Rent[4] (After Year 5)			
	Capitalized Leases (2016)[5]		**6,030**

Accounting Adjustments		
2016	**Debt**	**Assets**
Reported	1,051	6,341
(+) Capitalized Leases	6,030	6,030
Adjusted Assets	**7,081**	**12,371**

Source: Source: TD Epoch. Information regarding specific companies or securities is presented for illustrative and educational purposes only.

[1] A discount rate of 5% is assumed.

[2] Years of Lease Commitments Remaining = Operating Lease Commitments After 5 Years ÷ Average Lease Commitment, Years 1 through 5

[3] Average Rent = Operating Lease Commitments After 5 Years ÷ Years of Lease Commitments Remaining

[4] Total Rent is calculated as the present value of an annuity, assuming a payout of the Average Rent, over the Years of Lease Commitments Remaining. Assumes a discount rate of 5%.

[5] Capitalized Leases is calculated as the sum of the present value of the operating lease commitments.

Table 5: Example of Adjustments to the Financial Information for GAP, Inc.

	Adjustment from:					Value	
Variable	**R&D**	**Cap Lease**	**Pension***	**Formula**	**Adjusted Formula**	**Unadjusted**	**Adjusted**
Assets	X	X		= Current Assets + Non-Current Assets	= Current Assets + (Non-Current Assets + Research Asset + PV of Operating Lease Expenses**)	7,610	13,071
Invested Capital	X	X		= (Assets - Cash) - (Curr Liabilities - Short-Term Debt)	= (Adjusted Assets - Cash) - (Curr Liabilities - Short-Term Debt)	3,398	8,859
Debt		X	X	= Short-Term Debt + Long-Term Debt	= Short-Term Debt + Long-Term Debt + PV of Operating Lease Expenses + Unfunded Pension Liabilities	1,313	6,774
EV		X	X	= Market Cap + Debt + Preferreds + Minority Interest - Cash	= Market Cap + Adjusted Debt + Preferreds + Minority Interest - Cash	10,556	16,017
EBIT	X	X		= EBIT	= EBIT + (R&D Expense - R&D Amortization) + (Rent Expense - Depreciation on Lease)	1,470	2,005
D&A	X	X		= Depreciation and Amortization	= Depreciation and Amortization + Amortization of R&D Asset + Depreciation on Lease	593	1,373
EBITDA	X	X		= EBIT + Depreciation and Amortization	= Adjusted EBIT + Adjusted Depreciation and Amortization	2,063	3,378
					= EBITDA + R&D Expense + Rent Expense		
NOPAT	X	X		= EBIT * (1 - Tax Rate)	= Adjusted EBIT * (1 - Tax Rate)	884	1,206
CFO	X	X		= CFO = Net Income*** + D&A - Chg Wk Cap	= CFO + (R&D Expense + Rent Expense)*(1 - Tax Rate) - Int Exp on Lease*(1 - Tax Rate) + (Amortization of R&D Asset + Depreciation on Lease)*(Tax Rate)	1,719	2,657
CAPEX	X	X		= CAPEX	= CAPEX + YoY Chg in PV of Operating Lease Expenses + R&D Expense	524	339
FCFE	X	X		= CFO - CAPEX	= Adjusted CFO - Adjusted CAPEX	1,195	2,318
Interest Expense		X		= Interest Expense	= Interest Expense + PV of Operating Lease Expenses*Pretax Cost of Debt	75	348
FCFF	X	X		= FCFE + Int Exp (1 - Tax Rate)	= Adjusted FCFE + Adjusted Interest Expense * (1 - Tax Rate)	1,240	2,527

Source: TD Epoch. Information regarding specific companies or securities is presented for illustrative and educational purposes only.

Financial companies also typically operate within regulatory regimes which can differ by industry (e.g., banks vs. insurers) and by region (e.g., U.S. vs. Europe vs. Japan). Within the Core Model, we make a number of adjustments to account for these differences. We have developed separate bank-, insurance-, and REIT-specific models, which use metrics tailored for these industries, while maintaining the overall structure of the Core Model. For example, we continue to use Free Cash Flow as the measure of economic performance for banks and insurers but modify how we define and measure Free Cash Flow to make them economically and conceptually meaningful for these types of businesses. We also incorporate several measures of quality which are not found in the standard Core Model, including Asset Quality, Liquidity/Funding Ability, and Capital Adequacy.

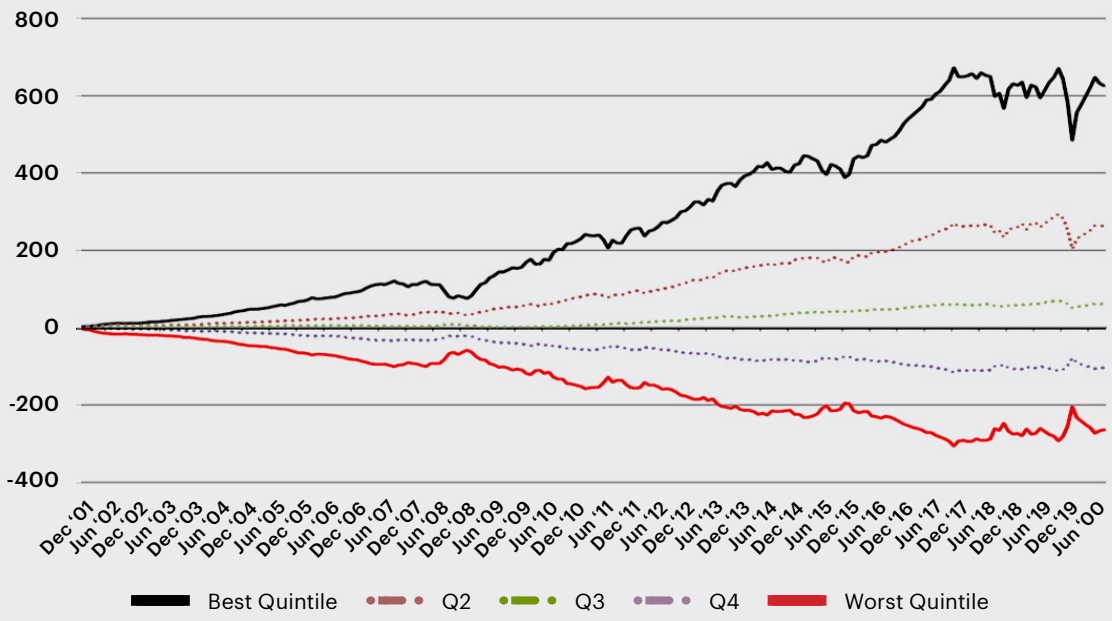
For non-bank, non-insurance financial companies, we make smaller adjustments to better reflect their business models and accounting conventions. For example, we use Earnings Before Extraordinary Items to measure Free Cash Flow for these companies. We also adjust or exclude measures of leverage and debt changes as appropriate for all financial companies.

Historical Performance

The ECM has been tested, refined, and validated in live portfolio performance over many years. The ECM effectively explains differences in future, cross-sectional stock returns over time. Although the model is calibrated to forecast security returns over a one-year horizon, it has also been effective in forecasting returns over shorter and longer horizons, e.g., from three months to three years ahead.

Figure 1 shows the performance of quintile portfolios—formed by ranking all companies in our global all-country, all-cap universe according to their ECM Scores and assigning them into five portfolios—since the end of 2001. The portfolios are rebalanced on a monthly basis. It shows the ability of the model to discriminate between top, middle, and bottom performers within our investable universe. The model has delivered steady performance in most periods but tends to struggle during periods when lower-quality firms out-perform, e.g., April 2003 and March 2009.

Figure 1 – Cumulative Returns of Core Model Quintile Portfolios - Global All-Country, All-Cap Universe



Source: TD Epoch

Note: Quintile portfolios are rebalanced monthly.

There are limitations inherent in model results, particularly that such results do not represent actual trading and they may not reflect the impact that material economic and market factors might have had on decision-making if the advisor had been managing clients' money. Quintile portfolios are formed by ranking all companies in our global all-country, all-cap universe according to their ECM scores and assigning them into five portfolios since the end of 2001. Model returns are presented net of a management fee and include the reinvestment of dividends.

Usage in Our Investment Process

The ECM was first developed in the mid-2000s to enhance our investment process and continues to play that role today. We use the ECM to surface ideas for further research, to prioritize our research queue, and to inform our portfolio construction process.

The ECM is used across TD Epoch strategies. Different Epoch strategies use the ECM with varying degrees of emphasis and formality, depending on their respective investment objectives and processes.

The ECM is an important input into our investment processes but not the only one. Regardless of its ECM score, each security must undergo in-depth fundamental research by our sector specialists, followed by a thesis review before it can be included in a portfolio. We neither require that a security have a specific Core Model score to go into a portfolio, nor do we require that a security be sold when it reaches a specific score.

Learn more about TD Global Investment Solutions

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