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WHERE ENGINEERS TALK FINANCE



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ESG REPORT ON AUTOMOBILE MANUFACTURING SECTOR



By João Filipe

to more effective and sustainable practices throughout the supply chain.

This is particularly strong in the case of the automobile manufacturing industry, whose environmental footprint and supply chain are tremendous. The problems posed are not looking good, right from resource use to greenhouse gas emissions, and from an ethical perspective extend to labour practice and corporate governance. Embracing the principles of ESG enables automobile manufacturers to take the lead in environment reduction through advanced technologies in the form of electric vehicles and sustainable manufacturing. From the viewpoint of society, this also assists in improving community and stakeholder relations by fostering fair labour practices and partaking in corporate social responsibility projects. On the front of governance, strong ethical frameworks and transparent practices ensure compliance, minimise legal risks, and help build consumer and investor trust.

INDUSTRY CURRENT ESG PRACTICES

Environment

In 2022, there was a 1.4% year-on-year increase in global carbon dioxide (CO₂) emissions from the automotive sector, with a total of 3.53 billion metric tons emitted. The increase in emissions underscores the industry's large environmental impact, showing the pressing need to face its carbon footprint.

The movement toward electric vehicles (EVs) has significantly increased speed as a major tactic to reduce carbon emissions. Large car companies are making significant investments in electric vehicle technology and establishing ambitious goals for this transition. The shift is motivated by regulations, environmental issues, and rising demand for eco-friendly transportation. For example, *BMW* aims to cut CO₂ emissions per vehicle by 33% by 2030 compared to 2019 and be completely carbon neutral by 2050. Since 2020, all of *BMW*'s production facilities have been powered entirely by renewable energy.

Social

Automotive companies face criticism for their labour practices, particularly concerning forced labour. Legislations such as the EU's Corporate Sustainability Due Diligence Directive (CSDDD) and the US Uyghur Forced Labor Prevention Act mandate that companies guarantee that their supply chains are not involved in human rights violations. They aim to improve relationships with the community and support fairness in their operations. This includes initiatives to support local communities and ensure ethical labour

practices throughout supply chains.

Governance

The traditional business model of the automotive industry is being questioned and requires new and strategic changes. Senior leaders need to change from traditional methods and adopt various viewpoints to successfully adapt. It is essential to consider regional and technical perspectives, as well as promote diversity in management and board representation, to effectively navigate the changing industry environment.

General Motors (GM) has demonstrated significant leadership in this field. At GM, a quarter of the board members have technological backgrounds, and the senior leadership team consists of a female CEO and CFO. Furthermore, half of the GM employees are women. The variety of leaders and employees in the company assists in dealing with difficult problems and successfully promoting innovation.

Automakers need to be able to quickly change directions and adapt to changes in industry trends. *Volkswagen* (VW), which suffered major consequences from its 2015 emissions scandal, has revealed plans to invest \$66 billion in electric and autonomous vehicles (AVs) within the next five years. VW intends to release 75 new electric vehicle models and aims to sell 26 million EVs in the next ten years. These significant pledges highlight the industry's movement towards sustainability and the vital importance of large financial investments in achieving long-term environmental objectives.

Due to regulations such as the EU's CSRD (Corporate Sustainability Reporting Directive), companies must now offer comprehensive reports on their ESG performance. This encompasses not only environmental effects but also social and governance criteria.

Leading companies combine their financial and sustainability reports to offer a more holistic perspective on their performance in Integrated Financial and Sustainability Reporting. This method helps align financial outcomes with sustainability goals.

Partnerships and joint ventures are essential for meeting the expertise needs beyond automakers' main skills. Furthermore, collaborating across different industries offers various advantages, such as sharing the expenses of research and development that the car manufacturer would otherwise have to cover completely and establishing uniform operating technologies that are not unique selling points for the final consumer.

As highlighted, in the modern business world, an **ESG approach** is one of the key ways to sustainable development. The criteria of ESG provide for mechanisms which would make the operation of companies responsible for protecting the environment, contributing to social well-being, and ensuring ethical governance. A more comprehensive approach to minimising risks, enhancing corporate reputation, attracting investments, and triggering innovation is aligning business strategies with global sustainability goals.

In fact, ESG is integrated into the investment decision-making process. Currently, the international capital market is gradually incorporating ESG factors into the investment decision-making system. For instance, China has also sought to rely on ESG value accounting methods, using new indicators such as ESG net value and ESG risk opportunity value to evaluate A-share listed companies. The companies need to adopt the concept of defining "materiality". Identifying materiality begins with a materiality assessment, in other words, a formal exercise that involves engaging stakeholders to determine the importance of specific environmental, social and governance issues. This approach ensures that the most relevant and impactful issues are prioritized, leading



By Leonor Pinhol

The sector also prioritizes the development of a sustainable supply chain through responsible sourcing of raw materials, waste reduction, and promotion of ethical practices in the supply chain. Companies are also concentrating on decreasing the use of rare-earth metals and enhancing the sustainability of their supply chains. This involves the thorough reporting of Scope 3 emissions that cover the complete supply chain. (indirect emissions that occur in the reporting company's upstream and downstream supply chain).

In conclusion, the automotive sector is currently at a crucial point in its ESG progress, achieving noticeable advancements in eco-friendliness, governance changes, and social duties. Although there are still obstacles, the industry's dedication to decreasing its carbon emissions, promoting diverse leadership, guaranteeing ethical supply chains, and adjusting to regulatory requirements shows a strong reaction to the worldwide improvement for sustainable and ethical business operations.

Innovation and Next Steps

Innovation confers a competitive edge to bear the intensely competitive market environment in car production industries. In environmental issues and regulation requirements, sustainable technologies should be tapped by car producers and adopted in the industry. The fields of the two most promising advances of the people for alternative fuel vehicles and sustainable manufacturing processes are of the essence to reduce the environmental impact of the industry in actualizing long-term sustainability goals.

Alternative fuel vehicles are the alternatives to the classic gasoline- and diesel-powered vehicles moving the largest polluters from the streets. Sustainable fuels for these vehicles include fuel cells powered by hydrogen, biofuels, synthetic fuels, and electricity. Because AFVs have become it was already changing ever since the major oil crises due to rapid diversification towards electric vehicles, hydrogen fuel cells, biofuels, and synthetic fuels, which are not only zero-emission vehicles but are followed by a continuous advancement in battery efficiency, charging time, and lifecycle management. Hydrogen fuel cells, for instance, cause chemical reactions between hydrogen and oxygen to cause power, providing only water vapour as an emission. The innovations under this technology are making hydrogen

production more sustainable, as well as cells themselves better reformed and cost-reduced.

Biofuels include ethanol and biodiesels, which are generated biologically and offer a renewable solution to fuels, whilst at the same time decreasing emissions. Research has been conducted on even more sustainable second- and third-generation biofuels. Synthetic fuels, or e-fuels, are produced using captured carbon dioxide and hydrogen produced from renewable energy. Running parallel to these AFV developments, environmental sustainability in manufacturing practices should be leading in reducing environmental impacts during the fabrication of the vehicles. Other sustainable practices at play here include the incorporation of wind and solar power sources as a source of renewable energy. This is not only an improvement in reducing the dependency on fossil fuels but considerably reduces carbon emissions in the production plants. Incorporation of advanced materials to make a lightweight, recycled, and sustainable material ultimately reduces the whole impact on the environment. The importance of lightweight will be seen when delving into advanced materials with an eye on recycled and sustainable materials like recycled plastics, carbon fiber, and bio-composites.

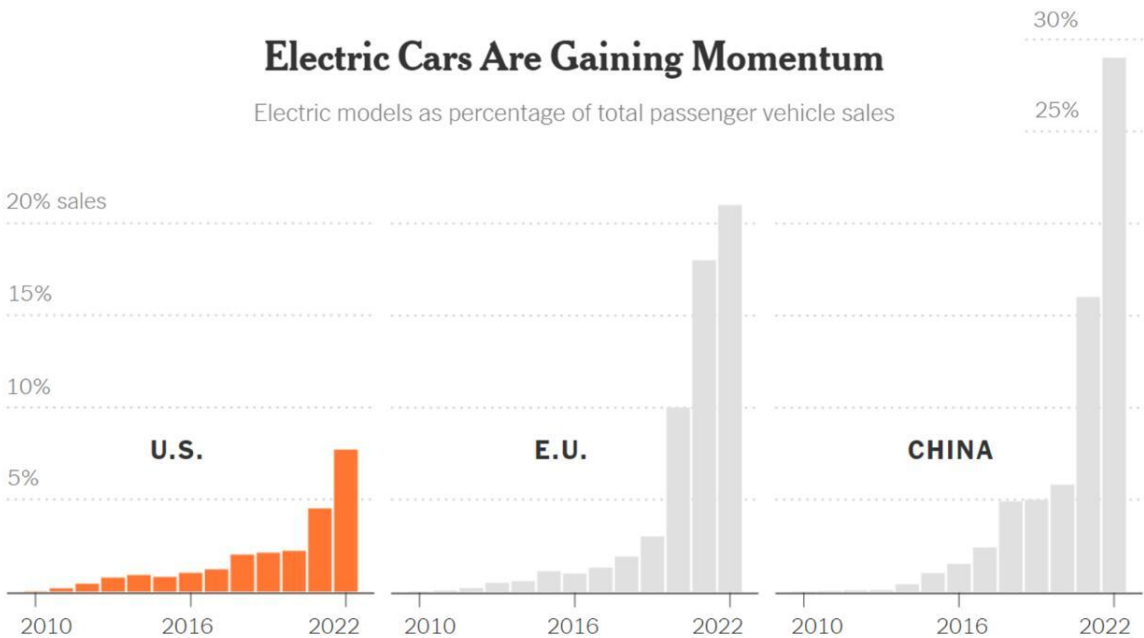
Additionally, waste reduction and recycling must be given much importance, and zero-waste policies need to be pursued in the manufacturing plants to enhance the recycling process of waste generated. Water conservation is coming to the fore, and its conservation has been one of the emerging global concerns that push pressure on manufacturers to invest in technologies that

will reduce water usage and increase recycling rates.

In addition to alternative fuel vehicles and sustainable manufacturing practices, the integration of autonomous driving technology represents a transformative frontier in the automotive industry. Autonomous vehicles (AVs) leverage advanced sensors, artificial intelligence, and machine learning to navigate roads without human intervention, which could significantly enhance road safety and efficiency. This technology is particularly promising in reducing traffic congestion and lowering emissions, as it optimizes driving patterns and speeds, leading to smoother traffic flow and less idling.

Moreover, autonomous vehicles could redefine car ownership models, potentially leading to a rise in shared vehicle services. This shift would not only decrease the number of vehicles on the road but also contribute to a more substantial reduction in automotive emissions. The environmental impact is further mitigated by the possibility of integrating AVs with electric and hybrid powertrains, creating a synergy that maximizes the benefits of both technologies.

As the industry evolves, it faces the challenge of integrating these technologies with existing infrastructure and regulations. However, the potential rewards are vast, promising a future where road safety is significantly enhanced, and the environmental impact of transportation is drastically reduced. The automotive industry's commitment to this dual approach of environmental responsibility and technological innovation is crucial for advancing toward a sustainable future.



STOCK SUMMARY



By Marta Lourenço



By José Horta

NOTE AB operates in the Electronic Manufacturing Services (EMS) sector. This sector encompasses the production of electronic components, the assembly of PCBAs (Printed Circuit Board Assembly), and the manufacture of complete products for clients across various industrial sectors.

Macroeconomic factors can have a big impact on the company's revenue. During a period of a slower economy with high interest rates, a noticeable decline in demand and investment for certain products can be observed. Furthermore, *Note's* revenue has been adversely affected by fluctuations in the Swedish currency, leading to a reduced added value for the company. Nonetheless, the board maintains confidence in forecasting steady growth in the forthcoming years for adjusted revenue growth as soon as interest rates are expected to decrease.

Geopolitical crises affect the global economy and so it can influence the demand and investment of certain products. The war between Ukraine and Russia and Israel and Palestine has created tension around the globe. The United States and the European Union are concerned that a global war is imminent. Thus, Europe is investing a lot in defence, especially in the latest technologies which can improve their safety. This is where

Note's products came in, being on the high end of electronic products.

Note's Market Cap is valued at 4 237,46 million dollars. The company's Enterprise Value is 4 589,46, a lower number than its MC, meaning a negative net-cash. Being on the Stockholm Stock Exchange since June 2004, the company stock was very stable until 2020. The company's stock price experienced a significant boost, growing by 447%, in the last five years.

History

NOTE AB was founded in 1999, in Sweden, originating from EuroSupply Nordic and its Polish subsidiary. Initially, it only focused on producing electronics for Swedish customers but then, it quickly expanded through strategic mergers and acquisitions. Such as in 2000, using a merger with a Swedish company to strengthen their manufacturing capabilities, and in 2001, they had new subsidiaries in Sweden and Poland. Then there was the creation of *NOTE Components* which helped managing purchases from suppliers across Europe and Asia.

A significant milestone was their long-awaited listing on the Stockholm Stock Exchange in 2004, which boosted their expansion into Finland and Estonia. They also acquired companies in Norway, China, and the UK to increase their manufacturing power. In order to allow customers to stay close to the company and offer efficient and flexible production, there was the establishment of Nearsourcing centres in Sweden, Finland, Norway, and the UK.

From 2016 onwards, *NOTE* focused on seeking out long-term customer partnerships and growth. Despite the COVID-19 pandemic in 2020, they achieved record sales and profits, maintaining a strong order book into 2021. By 2022, they reached their highest sales ever in a single quarter, surpassing SEK 1 billion, and expanded their focus on *Medtech* and *Communication*. In 2023, despite supply chain challenges, they remained optimistic about future growth. Although planning cautiously for 2024, they are expecting improvements throughout the year.

Business Model

Note is a Swedish manufacturer of electronic and complete products, strategically segmented into four distinct sectors: *Industry*, *Communication*, *Medtech*, and *Greentech*. Each of these sectors significantly contributes to the company's year-over-year revenue growth. By delving deeper into each sector, we can enhance our understanding of *Note's* operational complexity.

Industry: With the continuous advancements in digitalization, the field of electronics must simultaneously achieve progress and growth. *Note* displays an array of sophisticated products for a diverse range of industries, including mining and railways. These products range from thermal cameras, lift electronics, electric motors, GPS, geodetic systems, and more, catering to the specific needs of each sector. Being the sector with the most influence on the company's revenue, 52% the past year, as its segment is growing in a fast way. This growth is expected to keep its high pace once it is indispensable for Europe, nowadays, to continue their investment in defence, becoming even more independent from countries like China and the USA.

Communication: This segment is responsible for delivering products that interact with each other like satellite and optical systems, IoT devices and network devices. The segment showed good growth last year, 16%, although is expected to slow its growth mainly due to stock accumulation as revenue fell short of expectations. In the long term, by improving the company's supply chain management, the company expects steady growth for this segment.

Medtech: This segment is focused on customers who want to develop their products. Whether you are in an early stage and need help to raise your product from the ground or just need an improvement to the product, *Note* can help from the design stage to full-scale serial production. Just like Communication, this sector was also affected by inventory adaptations. That resulted in the disbelief of substantial growth in this segment for the upcoming years.

Greentech: This is the segment responsible for delivering products that contribute positively to increased sustainability. Products like energy storage systems, power systems and charging stations for electric cars are developed in this segment. This is the worst segment when looking into revenue growth, -11% last year. Taking this into consideration and analyzing the market that the company operates in, the lack of investments in this segment is noticeable. For that reason, the company expects a revenue decrease for this segment in the upcoming years.

Financials

After examining *Note's* financial statements, it reveals a substantial growth in revenue, primarily driven by the improvement of the industry sector, particularly in Europe. The gross margin of the company has not kept up with its revenue growth, maintaining a steady percentage of approximately 12% last

quarters, an indicator that the company has not been focusing their investments on product development. The EBIT multiple has been having a positive outcome in the latest financials reports and the company hopes that once its revenue pumps up even more, this multiple will keep up with its growth.

Upon closer examination of the company's financials, inventory management is clearly a weaker aspect of this company. With revenue growth falling short of expectations, stock accumulation has been inevitable. Consequently, reducing inventory levels will be crucial for the company in the upcoming quarters. It is also evident that there is a negative net cash position. This outcome is attributed to the company's recent investments in tangible assets, as reflected in the Cash Flow from Investing Activities. With a General Liquidity Ratio exceeding 1 in the latest financials (1,64 in the last quarter), it is clear that despite having a negative net cash position, the company is capable of meeting its debt obligations.

Furthermore, analyzing *Note*'s investments made with their capital, it demonstrates a highly positive outcome (around 10% in the latest quarters), indicating that the company effectively manages its capital, making investments that are both conscious as well as profitable.

Industry Overview

When comparing *Note AB* with the industry, a deeper look into companies Hanza and Kitron is warranted. These companies have market capitalizations of 4.182B and 2.794B, also respectively.

Companies	CARG 2019-2023	Avr. EBIT Margin (2019-2023)	Avr. ROIC (2019-2023)	EV/E
Note AB	24.6%	8.5%	21.7%	16.0x
Hanza	18.9%	4.8%	7.5%	13.8x
Kitron	28.3%	7.2%	15.6%	15.5x

Hanza, a company specializing in regional and complete manufacturing, was founded in 2008 by Erik Stenfors. Despite emerging during a global financial crisis, it adapted by adopting a business model focused on reducing costs, increasing flexibility, and minimizing environmental impact. Hanza rapidly expanded its operations through strategic acquisitions, adapting struggling factories and integrating them into its model. It operates in various sectors, but with a significant focus on rapid and regional responses to customer needs, adapting to various markets as economic crises and opportunities arise. The company's growth has been driven by strategic acquisitions and expansion into new markets, in addition to investing in the continuous improvement of its existing operations.

Kitron, on the other hand, bases its business model on partnering with customers to provide customized solutions from the product development phase through to manufacturing and post-sales services. It serves various sectors, including defense, energy, telecommunications, and medical,

with a global approach to meet specific high-tech needs. Its growth has been primarily driven by investments in technology and by the expansion of its facilities into new markets. Kitron operates in several countries such as Norway, Sweden, Denmark, Lithuania, Germany, Poland, Czech Republic, India, China, Malaysia, and the United States. This global presence allows it to achieve more competitive costs.

Valuation

After analyzing the company, the company's horizon can be divided into two scenarios. The most optimistic, in which it is estimated that the objectives proposed by management will be accomplished. In the second case, a more conservative approach was used, considering the current macroeconomic and geopolitical instability.

In recent quarters, the CEO has reinforced his objectives in which he is committed to reaching SKK 7500 million by 2027, realizing a CARG 24-27 of around 20.9%. In this most recent quarter, the CEO reinforced the idea that in the long term he expects the industry to grow at an average of 7% per year, until 2030. He also reinforced the idea that the company could reach 10 billion in revenue. In addition to this growth, the company is committed to achieving an EBIT margin of over 10%. Taking these parameters into account, the following DCF (Discounted Cash Flow) was carried out, considering a maturity of -1%, a discount of 8.5% and a ROIC of 2.5%. These results in a market capitalization of 8449 million SEK, which corresponds to a share price of around 292 SEK.

In a more conservative case, it is considered that the company does not achieve the proposed goals. The company has faced several difficulties in the last quarter and has only shown sustainable growth in the industrial sector. Many of these difficulties are justified by the CEO, due to the high growth of the previous year. Which led to an excessive increase in customer inventories, causing a disinvestment effect. That would only normalize in the last two quarters of this year. It is therefore possible to conclude that the industrial sector at Western Europe is the jewel in the company's crown. howing great growth even in more troubled times. In this DCF, this sector has maintained its strong growth, while the other sectors have grown below the industry average, resulting in a CARG of 4.5%. EBIT margins remain at around 10% and with the same parameters as the previous DCF, the company is valued at around SEK 5258 million, resulting in a share price of around SEK 181.

Conclusion

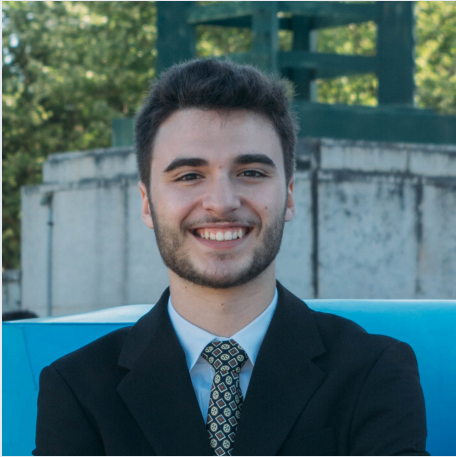
To conclude the evaluation of *Note*, it is crucial to gain a deeper understanding of the risks to which the company is exposed. The company has a high dependence on a few large clients which is particularly normal in many EMS companies. However, *Note* may

find itself in serious danger if these relationships are impaired.

Once again, supply chain management should be taken into consideration when talking about risk. The company has stock accumulation and needs to deal with this problem as fast as possible because its complexity can lead to vulnerabilities, including delays and increased costs.

Note has shown an increase in revenue in the last few years and has been growing at quite a considerable rate, even if it is mainly due to the Industry sector. Compared to competitors of similar size, the company proves to be the superior entity in terms of growth and margins, even though Kitron is right behind it. Overall, we can expect growth from the company as the uncertainties regarding geopolitical issues force various European countries to turn to companies such as *Note* to improve their defensive capabilities. As *Note* is clearly established as a leading figure in the area, it will most definitely benefit from this.

Still, they must address underlying inefficiencies in their other sectors, especially Greentech. Even though the company has pledged to align themselves with more sustainable alternatives, it isn't viable to be losing 11% of revenue growth in one single year, with predictions of continuous losses. *Note* should invest more into Greentech to develop it and try to turn the sector profitable, or look into other solutions regarding its role in the company, possibly even dropping it.



By António Trovão



By Miguel Xavier

MACROECONOMICS

DYNAMICS OF THE MARKET



By Luís Melo

It is important to mention that treasury bond yields are influenced more by expectations of future interest rates and inflation than by the rates themselves. This explains why the U.S. economy remains resilient this year even amid high interest rates. The expectation that the Federal Reserve would cut rates in the summer of 2024 encouraged Americans to maintain high spending levels, as they expected better economic conditions ahead. This remains the case, even after the Federal Reserve announced that it would not be cutting rates this year's summer. Instead, the expectation for a rate cut has simply been postponed by a few months.

Monetary policy intervention

It is commonly referred that macroeconomic regulators such as the ECB or the Federal Reserve only change interest rates to impact inflation. Although controlling inflation is their primary target, these institutions also pay close attention to specific situations like unemployment and financial instability.

Cutting interest rates means more money available, which, unless you live in a country with an economy like Japan, will increase spending. In economies with high unemployment, central banks may opt for this strategy to stimulate job creation. Lower interest rates boost consumer spending, which increases the demand for labour. However, in times of financial instability, such as the 2008 financial crisis and, more recently, the COVID-19 pandemic, central banks might lower interest rates to provide liquidity and stabilize markets. This helps to keep the availability of loans and prevents a shortage of credit, which could have a huge impact on the markets.

Inflation VS Unemployment

Inflation and unemployment often exhibit an inverse relationship—when one rises, the other typically falls—though this connection is complex and has frequently diverged over the past 50 years. During periods of high unemployment, wages tend to remain stagnant as the supply of labour exceeds demand, resulting in minimal wage inflation.

Conversely, in times of low unemployment, employers must offer higher wages to attract workers, leading to wage inflation. This dynamic, first highlighted by A.W. Phillips through the Phillips Curve, shows that low unemployment drives wage increases due to higher labour demand, which in turn raises production costs and overall inflation. This relationship adds another layer of complexity, further complicating central bank interventions.

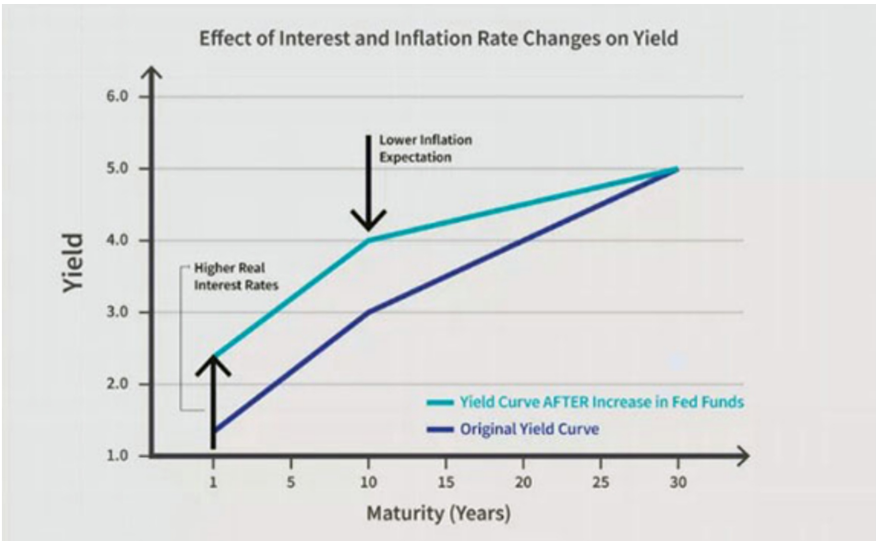
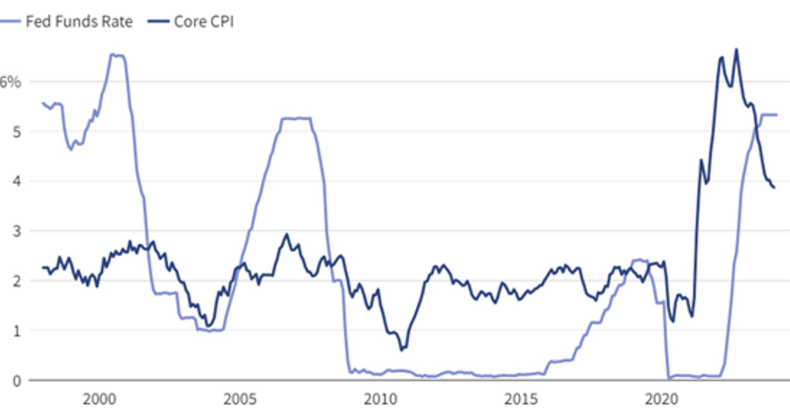
Central banks, like the ECB or the Federal Reserve, use this relationship to guide monetary policy, aiming to balance low inflation with full employment. However, policymakers must exercise caution when intervening, as abrupt changes in interest rates can lead to significant economic consequences, such as stifling growth or triggering inflation. The Phillips Curve's predictions do not always hold, as seen in various economic periods over the past decades, complicating policymakers' efforts to balance inflation and unemployment effectively.

Cautions When Intervening

Even though adjusting interest rates is a powerful tool, macroeconomic regulators must do so with caution, as it could have significant unwanted impacts on the economy. Changes in interest rates take time to affect the economy, so central banks must anticipate future conditions and decide early, which involves a big uncertainty factor. Raising rates too quickly can suffocate growth and increase unemployment while cutting rates too sharply can lead to inflation and asset bubbles (such as the housing bubble in the early 2000's). The fact that financial markets react strongly to both interest rate changes and central bank communications is also very important to remember. Misinterpretations or unexpected moves can skyrocket volatility and uncertainty in financial markets. This is why macroeconomic regulators must carefully manage public and market expectations while maintaining clear and transparent communication, to avoid misunderstandings about their policy intentions.

Inflation and Treasury bond yields are deeply connected, mainly through expectations. When investors anticipate higher future inflation, they demand higher yields on Treasury bonds to compensate for the anticipated loss in purchasing power. This “additional yield” to account for inflation risk is known as the inflation premium. Not only that but supply and demand dynamics also play a crucial role in this relationship. When inflation is expected to be low or stable, Treasury bonds become more attractive as a safe investment, increasing their demand, and, consequently, pushing yields down. In the opposite direction, if inflation is expected to rise, the demand for these bonds decreases as they become less appealing, driving yields up. The government's borrowing needs can also influence bond yields, for example, issuing more debt can lead to higher yields, following the supply and demand rule.

Inflation and Fed Funds Rate



DECODING THE PITFALLS OF ASSOCIATIONAL INVESTMENT IN FACTOR MODELS



By Tomás Juhos

lead to fundamentally flawed investment strategies, lacking a solid economic foundation and resulting in unreliable outcomes.

Investors face the challenge of distinguishing these misleading claims from more substantive strategies. This requires a shift from simply describing data to thoroughly validating the relationships that these models depend on. This validation involves rigorous testing of assumptions, using out-of-sample data, and employing advanced statistical techniques to differentiate between genuine economic relationships and statistical artefacts.

In summary, while associational claims are prevalent in discussions about factor investing, it's crucial to adopt a more critical approach. By examining and questioning the assumptions behind current models, investors can develop strategies that are not only statistically robust but also grounded in economic reality.

Unveiling Deeper Insights: The Role of Causal Inference

Now that we are familiar with the problem at hand, let's dive into the methodology we explored to tackle it: causal inference and discovery.

The concept of causality is something that is innate to the human being. Ever since we are born we observe, experiment and question the world around us to model it in our own minds. These three key actions are precisely the three rungs in the *Ladder of Causation*, association, intervention and counterfactuals, respectively. As expected, analyzing the world, and in turn the factors we use in our models, through this lens gives us a much deeper understanding of the relationships between the factors at hand. Namely, a much deeper understanding than traditional methods which only encompass the first rung, association.

This type of analysis allows us to uncover and eliminate the aforementioned spurious relationships between factors, potentially leading to much stabler and more robust results since the relationships left have evidence that they are based on reality. This is a mere peek into why this flourishing field might help us unlock the full potential of the data and, consequently, the full potential of the models we use when trying to solve the problems we face as investors.

Exploring "Causal Inference and Discovery in Python"

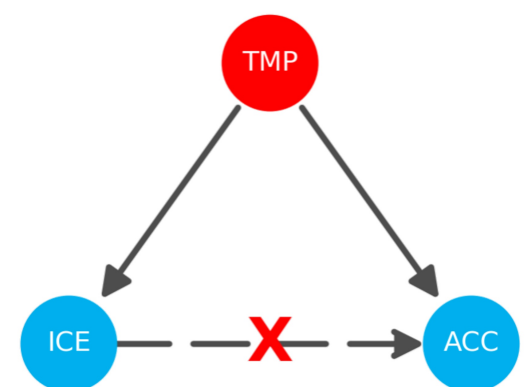
This is the topic of a book we've been analyzing, Causal Inference and Discovery in

Python by Aleksander Molak. The book introduces its readers to causal methods and their implementation in the Python programming language.

The book begins by introducing the concepts of causality. The distinction between correlation and causation is explained thus: if there are more drownings/accidents on beaches when more ice creams are being sold, does this mean ice creams (ICE) cause drownings (ACC)?



Or is there a confounder between them? We learn how to make graphs and use basic statistical tools to perform simple counterfactuals, as well as the basic graph structures: forks, chains, and immoralities. The confounder is temperature: high temperatures cause people to go to the beach, increase drownings, and cause people to buy ice cream.



How strong are these relations of causation? This question is approached in part 2. We now learn how to code using the DoWhy and EconML packages, which break down the problem of causal inference into four steps: modelling the problem, identifying estimands, obtaining estimates and refutation. We look at the assumptions of causal inference and at causal estimators.

Why is the temperature the confounder? It seems intuitive, but is there a way we can see this through data analysis? It turns out there is. This is the concluding part of the book. Here, we learn about the gCastle library and train a DECI algorithm using PyTorch. Finally, we see how these algorithms allow us to use expert knowledge to construct causal graphs and combine observational and interventional data.

Throughout, the book offers concrete examples of implementation in the Python language, without losing sight of the theory and core concepts. The result is a book that is accessible to everyone, no matter their machine learning background, though knowledge of programming is assumed.

Factor investing often relies heavily on associational claims, where historical data correlations are assumed to predict future market performance. This approach can lead to models that excel in back-testing but fail when applied to real-world markets.

The reliance on historical data correlations leads to the risk of spurious relationships, known as type-A and type-B claims. These are connections that appear statistically significant even though they may be purely coincidental or non-causal. Type-A claims involve correlations that appear statistically significant by chance, while type-B claims relate to patterns that are cyclic but not necessarily causative. Both types of errors can

A letter from the President and Vice-President

Dear **TIC Members** and **IST Community**,

As we conclude this semester, we would like to extend our sincere thanks to all of you for your dedication and support. With the assistance of several members, we started planning for next year earlier, exploring new initiatives and best practices. Your contributions have been invaluable, and we are deeply grateful for your help.

This semester, we also evaluated our departments to ensure we are on the right path, making necessary changes to better prepare our members for their future careers in finance. Additionally, some departments faced growing pains, but thanks to our resilient members, we overcame these challenges and solidified our structure.

Special thanks to our department heads: **João Tavares** for leading Asset Management, **Francisco Murta** for Equity Research, **João Le Coroller** for Investment Banking, and **João Martins** for Quantitative Trading. Your leadership and collaboration have greatly enhanced your departments, fostering better practices with both long-standing and new partners.

We also express our gratitude to **Martim Carvalhosa**, who oversees External Affairs, **Madalena Silva** from Human Capital, and **Mariana Custódio** in Marketing. Your efforts have broadened our reach to more students and partners, enhancing both the structure and visibility of our club.

As we wrap up this year, we are proud of our accomplishments and cannot **thank our members** enough for their hard work and support. We hope your journey with TIC is as rewarding for you as it has been for us.

To our readers, congratulations on reaching this far. If you believe TIC offers great opportunities to discuss finance, learn, and grow, we assure you it does. We look forward to meeting you soon.

Wishing you all continued success,

Best Regards

Daniel Quintas
President

João Martins
Vice President



Thank you