Advanced computation for intelligent investment

Drs Marc Wildi and Boris Rankov outline their development of a forecasting system that supports decision making for asset allocation and portfolio management under variable financial market conditions.

What are the biggest challenges facing Swiss asset managers today?

BR: The asset management industry in Switzerland is currently facing two major challenges: new compliance requirements from the Swiss Financial Market Supervisory Authority, the regulator; and low interest rates.

New regulatory-driven compliance challenges have a high impact on the complexity and costs of running an asset management business. Significant investment in skilled human resources and IT infrastructure is necessary to implement all the compliance rules. Then there is the challenge of achieving positive returns in a very low, or even negative, interest rate environment.

Why is it important to detect turning points when monitoring the economy?

MW: Turning points are local extrema of a time series: maxima or minima, which mark the end of an era and announce the start of a new development (trajectory) of an observed ensemble. They are generally disruptive and unexpected: turning points cannot be forecast but their impact can be tracked in real time by suitable monitoring systems. Close tracking allows economic actors to reallocate resources in accordance with the new development. Failing to adjust swiftly after a turning point is generally associated with high costs and losses.

How might the fAST|View project be used to improve the robustness of the Swiss pension fund system?

BR: Studies have shown that Swiss pension funds have to generate a minimum annual return of 4 per cent on average to finance future pension liabilities, though we currently have a zero risk-free interest rate. So this is only possible by taking risk and harvesting risk premiums embedded in different asset classes. Research on asset pricing has shown that risk premiums are time-varying and show long-term predictability. Assets that co-vary strongly with the aggregate marginal utility of investors, or more simply, assets that show strong correlation with bad economic times, require higher compensation for risk and therefore offer a higher risk premium. Academic research has also empirically shown that the cycles of expected risk premiums coincide with business cycles (economic expansion, contraction and recession).

The fAST|View project aims to estimate these cycles and to detect real-time turning points in risk premiums and economic cycles. This allows asset managers to optimise the timing of their asset and risk exposures: to decrease exposure when expected risk premiums are low and to increase exposure when expected risk premiums are high. In particular, we have developed recession indicators for the European, the US and emerging economies to avoid large losses in portfolios during recessions. This is particularly important for pension funds to avoid large funding gaps during economic and/or financial shocks.

What method do you use for forecasting?

MW: We developed the Multivariate Direct Filter Approach for extracting signals from interesting time series: this task is more general than 'forecasting' in the sense that it encompasses classic forecast approaches.

One of the main novelties of our design is that the speed at which a turning point can be detected, and the degree of confidence one can place in the estimate, can be addressed explicitly through suitable customisation.

Another outstanding feature of our approach is that both timeliness and reliability can be tackled and improved simultaneously. The resulting new and rich trade-off can be expressed in mathematical terms as a fundamental trilemma that generalises the classic paradigm in time series analysis.

In what way will your novel method help clients in the real world?

MW: Our approach emphasises user priorities and problem structures. As an example, rebalancing the portfolio of an institutional investor typically emphasises long-term reliability and accuracy aspects; disinvestment from risky assets during protracted economic down-turns is a key success factor. In contrast, high-frequency trading, which targets ephemeral market dynamics, mainly highlights timeliness and speed issues. Entering into a potentially interesting position ‘as fast as possible’ then becomes a key success factor.

Our forecast methodology allows users to prioritise accuracy, timeliness and smoothness/reliability aspects, either separately or in any paired combination in accordance with their particular set of priorities.

Do you anticipate any important long-term impacts from fAST|View?

BR: One of the major outcomes is a mixed-frequency design of turning-point filters in order to construct fast and accurate recession indicators for different economic regions; we use daily, weekly and monthly financial data to forecast the economic state and expected returns of risky assets and risk premiums. Those indicators will help to achieve the return requirements of asset management portfolios and Swiss pension funds.
Smartly tailored fund management

An academic-industry partnership in Switzerland, the fAST|View project, has developed an innovative method and toolkit that supports asset allocation based on customisable forecasting of performance with high reliability in real time.

SWITZERLAND IS ONE of the biggest financial markets in the world. Partly because of its long tradition of institutionalised banking secrecy, this mountainous country in Central Europe has a formidable reputation for efficiently and successfully protecting global private wealth from all forms of political, economic, social and currency risk. However, recent regulatory changes introduced by the Swiss Financial Market Supervisory Authority seek to align Swiss banking systems more closely with those of other developed countries, especially where foreign clients are concerned. Client banking requirements have also become more sophisticated, and international competition for wealth management services is growing. As a result, investment and private banking business is declining, making a negative impact on the Swiss economy.

THE ROLE OF ASSET MANAGEMENT

Diversification of the Swiss financial market is considered necessary to offset the economic impacts of modernisation and change. Among the options for diversification, expansion of the country’s asset management services for pension and other funds is now seen as especially attractive. However, better tactical and strategic capabilities are urgently needed because asset management has been relatively neglected in the Swiss financial industry.

Swiss pension funds account for the highest proportion of the value of worldwide assets after private wealth. Large pension funds typically employ professional asset management services to balance the inherent opportunities, costs and risks of their asset base against performance over time, at all stages of the asset lifecycle, to optimise the delivery of value when people come to take an income from their pension scheme.

In Switzerland, the national pension system and private pension schemes are well funded because of high per capita incomes and inherited wealth. Yet pension fund asset managers face significant challenges due to legal and market constraints. “By law, pension funds have to pay a minimum interest rate of 1.75 per cent and a minimum asset conversion rate of 6.8 per cent,” explains Dr Boris Rankov of the Swiss-based FinTech company InCube Group. “With zero or even negative interest rates, it is difficult to extract the necessary minimum returns from assets, particularly when risk and return have to be matched to liabilities in the balance sheet.”

This challenging environment is further compounded by the rapidly ageing population, as well as continuing low interest rates, structural market changes after the last global recession and the speed with which fluctuations in financial markets can impact asset values.

ACADEMIC-INDUSTRY COLLABORATION IN FAST|VIEW

InCube provides advice, project management services and innovative software products to financial institutions and trading firms. As an investment management partner at InCube, Rankov became interested in the work of Dr Marc Wildi at the Zurich University of Applied Sciences School of Engineering when searching for a possible solution to the problems of optimal asset management in the changing Swiss financial market.

Wildi had developed a technique employing multivariate real-time filters (MDFA), which had won Neural Network Forecasting competition awards and had been used for such applications as detecting early signs of recession in the US and in time-related Eurostat and OECD projects. Rankov therefore contacted Wildi, whose curiosity was piqued by the prospect of using his MDFA method to enhance specific investment decisions – and their collaboration in the fAST|View project started.

TRADE-OFFS IN FORECASTING

In forecasting future positions, there is an antagonism between two fundamental requirements: smoothness, or degree of reliability of the forecast, and timeliness of the detection of key turning points in the trend or cycle under examination. There may, however, be a need to detect indications of negative change quickly so that appropriate action can be taken before the situation worsens. This creates a dilemma: is rapidity preferable to reliability or vice versa? To resolve this, Wildi’s MDFA forecasting method incorporates accuracy as an additional attribute – and this gives rise to a trilemma.

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Wildi’s trilemma is based on the premise that by decomposing the mean square error of each filter data element into accuracy, smoothness and timeliness (AST) components, it is possible to achieve tradeoffs between these conflicting priorities while simultaneously improving the reliability and timeliness of results. The name
IAST|View reflects the combination of Wildi’s AST trilemma-solving forecasting framework – and it has the ability to integrate fundamental financial and macro-economic views into the asset allocation process.

OPTIMAL ASSET ALLOCATION USING FAST|VIEW

In IAST|View, Wildi and Rankov have exploited the MDFA method to enable real-time economic forecasting and portfolio optimisation that uniquely takes into account multiple time periods. Using machine learning to transform portfolio optimisation requirements into individual problem elements, and applying advanced computational simulation algorithms and techniques, the fast|View collaboration has now produced an innovative decision support tool. This tool allows InCube users to determine the optimal asset allocation for a particular client, given the client’s circumstances, horizons and priorities, and the likely prevailing market conditions. Thus, the resulting portfolio designs can integrate the client’s life balance sheet with anticipated changes in their age, risk tolerance and wealth in the future. “Experience confirms that such customisation is the key to systematic outperformance,” Wildi observes.

The attributes of accuracy, smoothness or reliability can be offset or prioritised separately or in paired combinations according to requirements, meaning that the IAST|View toolset supports the detection of turning points in prices of assets or in different economic cycles. It also produces future-oriented views of likely overall investment performance, while taking into account transaction and impact costs. These features enable the user to tactically construct a portfolio of multiple assets based on their individual performances over varying time periods.

“The fast|View forecasts are fed into our portfolio optimisers to calculate optimal exposures to different kind of risk premiums,” explains Rankov. As it runs in a state-of-the-art parallel computing environment, the IAST|View toolset can produce forecasts within seconds, enabling fast turnaround of adjustments. Later, the user is also able to track and verify asset and portfolio actual performance against the results predicted.

WIDER IMPACTS OF FAST|VIEW

Wildi and Rankov consider that the methods and techniques developed in IAST|View have the potential to contribute significantly to the effectiveness of asset management and advisory businesses in any country. They also point to their utility in managing other funds beyond pensions, such as in insurance and private client asset management, where fluctuations in financial market conditions can have major impacts and the need for customisation is high. However, their ultimate hope is that the IAST|View methodology will help the Swiss retirement system to become safer, more robust and better funded, thus augmenting Switzerland’s overall financial strength in the future.

THE FUTURE OF INVESTMENT: SWITZERLAND!

The latest research reports from the Swiss Federal Institute of Technology (ETH) in Zurich have concluded that Switzerland’s financial sector is healthier than ever. The future of investment in the country is looking stronger than ever, with a growing demand for asset and risk management tools.

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