Which factors are relevant for asset prices?

Much research effort has focused on developing estimation methodologies and models aiming to identify the relevant factors for pricing the cross-section of stock returns, meaning the change in average returns across different stocks. Traditional asset pricing models with many factors can no longer cope with the dimensionality of present-day problems. Moreover, relying on misleading results could end in disastrous financial consequences.

Professor Francesco Audrino at the University of St. Gallen and Swiss Finance Institute, Switzerland, is using methods developed by the machine learning community to overcome this problem. He demonstrates the suitability of Lasso-type methods for predicting the cross-section of returns and reveals how the true firm characteristics driving these forecasts are determined. He also describes how machine learning models can improve on the predictive accuracy in the selection of relevant firm characteristics for predicting future cross-sections of stock returns.

Audrino uses simulated data to verify that his method produces reliable results. This verification process allowed Audrino to understand any deficiencies that appear as well as interpreting the outcomes of the analysis correctly. Methods for Asset Pricing Factor Zoo

The second phase of this investigation involved the application of the methods to a large dataset made up of cross-section of US stock returns together with 62 published firm characteristics covering the period from 1974 to 2020. Audrino limited his selection and prediction procedure based on a multivariate regression consistent with the original methods used in the literature. Rather than relying on multivariate regression, he employed the adaptive Lasso method.

Audrino describes how machine learning offers alternative methods that allow a small bias in order to reduce the variance incurred in estimating linear models. These include the Lasso (least absolute shrinkage and selection operator) method. Reducing the effects of sampling variation is known as shrinkage. The Lasso method selects and regularises variables to improve both the accuracy and interpretation of the ensuing statistical model. A modified model, the adaptive Lasso, maintains the advantages of absolute shrinkage under less stringent conditions.

Predicting Cross-section of Returns

The comparison of a particular company with its industry peers is known as cross-sectional analysis. This analysis involves the examination of cross-sectional returns to find out how the average returns vary across different portfolios. Audrino examines various Lasso and factor models to establish whether he can improve on the predictive accuracy of ordinary least squares in the selection of pertinent firm characteristics to forecast the future cross-section of stock returns. Employing these shrinkage methods for predicting stock returns allows the researcher to examine which characteristics contain true predictive information for the cross-section of expected returns.

Using simulated data, Audrino analysed the methods’ properties to verify that the results are reliable and accurate in an artificial setting. Machine learning techniques are highly sophisticated and usually rely on many tuning parameters, so they can be unstable, and their results can be difficult to estimate. This verification process allowed Audrino to understand any deficiencies that appear as well as interpreting the outcomes of the analysis correctly.

The main firm characteristic for prediction was price information, whereas the characteristic selected most often was short-term reversal.
Behind the Research
Professor Francesco Audrino

Small-capitalised stocks can be reliably predicted using shrinkage models based on a rich ‘zoo’ of firm characteristics.

Linear Methods for Small and Micro-Capitalised Stocks
The empirical analysis also demonstrates that small-capitalised stocks can be reliably predicted using shrinkage models based on a rich ‘zoo’ of firm characteristics. This study concur with previous literature that the use of linear methods for prediction is primarily limited to small and micro-capitalised stocks. In contrast, large-capitalised stocks are not predictable with these linear methods. This means that determining the predictive differences between the various linear methods for predicting differences in expected cross-sectional returns. He also reveals how the true firm characteristics driving these forecasts are measured, as well as discussing their comparison with traditional approaches. Together with their empirical evaluation, the simulation study elucidates the properties of the methods. His research also contributes to several threads within the literature. In analysing the suitability of Lasso-type methods for the selection of relevant firm characteristics for the estimation and prediction of expected cross-sectional stock returns, it contributes to the asset pricing literature. This is evident through the reviews of the various estimation methods, research questions and the introduction of firm characteristics in relation to asset pricing. This study also links to the literature surrounding the properties of shrinkage approaches within financial settings. Moreover, it demonstrates how the desire to improve the predictability of ordinary least squares estimates and avoid the limitation of traditional selection and regression inspired the development of the Lasso-type asset pricing models.

References

Personal Response
What has been the most rewarding outcome of your research to date?

Starting in the early 2000s, my contributions to the literature were among the first pioneering studies investigating the suitability of methods coming from statistical learning for concrete financial applications. It is extremely rewarding to see how nowadays a large body of methods dealing with the same questions is related directly or indirectly to the results of my studies and that methods coming from the machine learning community are becoming a standard also in economics and finance. Lasso-type asset pricing models are one example of this phenomenon. All this means that my innovative research agenda had a lot of potential as I suspected.

Research Objectives
Professor Audrino analyses the predictive performance of different machine learning based asset pricing models.

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