**Abstract**

Since Doug Breeden and Bob Litzenberger's seminal 1978 method of inferring future probabilities from traded options, risk-neutral probabilities have become instrumental in market pricing for discovering intrinsic values. This study delves into the concept of market-based probabilities within derivative markets, examining their utility in forecasting future asset prices. Our research begins by assessing the potency of risk-neutral probabilities in predicting future market returns and volatility, validated through the construction of confidence intervals. Upon establishing their predictive capability, we utilize Lasso regression analysis to anticipate market prices and trends. We then design and retrospectively evaluate a long-short trading strategy that capitalizes on these probabilities, aiming to profit from the inherent data in option prices. Our findings indicate that, despite potential inaccuracies arising from market constraints and financing issues, risk-neutral probabilities offer a viable avenue for insight and exploitation of future market movements. (This paper not only elucidates the theoretical underpinnings of market-based probabilities) but also presents empirical analysis of their practical application in market strategies, providing valuable insights for investors and policymakers alike.

**Introduction**

Investors often tap into the insights embedded in financial asset prices as a cornerstone for making informed investment decisions. In this context, derivative markets provide them with a rich source of information for gauging market sentiment; due to their forward-looking nature, futures and options prices efficiently encapsulate market perceptions about underlying asset prices in the future [1]. Building on this foundation, an important concept that investors encounter within these markets is the notion of market-based probabilities.

Theoretically, market-based probabilities allow investors to view the expected values of assets through a lens that discounts the varying attitudes towards risk. Since 1978, when Doug Breeden and Bob Litzenberger proposed a method of using traded options to infer those future probabilities, risk-neutral probabilities have been widely used in market pricing to find intrinsic value. It is worth observing that this research is generally portrayed as uncovering and exploiting mispricing in the market. Excess returns might simply be fair compensation for bearing hard-to-hedge risks that are not included in the pricing model. Or the mispricing may reflect the effects of market constraints, such as short sale restrictions and financing issues[2].

In this paper, our area of focus is on how the distribution of expected underlying asset returns, as outlined by the Minneapolis Fed's data, can be used to provide a more accurate and actionable framework for investment decision-making. To demonstrate the effectiveness of our data, we conducted experiments using the S&P 500 as a case study. Firstly, we evaluate the potency of risk-neutral probabilities in forecasting future market returns and volatility—a facet crucial for investors and policymakers alike by constructing confidence interval. Upon confirming their predictive capability, we employ these projections to anticipate market prices and trends through Lasso regression analysis. Subsequently, we devise and retrospectively evaluate a long-short trading strategy that exploits these probabilities, aiming to exploit and profit from the data inherent in option prices.

**Additional Data and Improved Strategy**

To more robustly assess the reversibility of stock trends, we need to construct a more stable reversal factor. Traditional reversal factors assume that individual stocks will regress towards the average level of the market:

However, this method of taking the average return of the entire market's stocks as a uniform benchmark for all stocks is overly simplistic and crude, as it neglects the specific qualitative information among different industries and companies. Therefore, finding a suitable expected return benchmark for each stock is key to determining the performance of the reversal factor. Tsinaslanidis and Kugiumtzis[2014] posit that similar stock patterns are underpinned by similar background conditions, and by identifying the future performance of stocks with similar historical patterns, one can predict the future returns of a stock[3]. In this context, we require a more extensive set of stock price data and provide a unified framework for constructing reversal factors：

where N represents the total number of stocks in the market, and is the correlation function regarding stock *i* and stock *j*, representing the weighted weight of stock *j*. This general form implies that the weighted return of similar stocks serves as the benchmark for their mean reversion. What we need to do is to find the most similar stocks for each individual stock and assign their respective weighted weights. Taking Bank of America as an example, to construct a reversal factor indicator, we can select the 10 stocks with the highest price correlation from the entire banking sector (JPMorgan Chase&Co., Wells Farfo&Co. and so on) and construct the reversal factor according to the previous formula. By constructing reversal factors, investors can discover the true intrinsic value of stocks for reasonable investment strategies, and avoid downside risks when the market is overheated to achieve better risk management.

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**Conclusion**

（根据正文具体结论和图表写）

[1] P. E. Tsinaslanidis and D. Kugiumtzis, "A prediction scheme using perceptually important points and dynamic time warping," *Expert Systems with Applications*, vol. 41, no. 15, pp. 6848-6860, 2014.

[2] Figlewski, S. (2018). Risk-Neutral Densities: A Review. Annual Review of Financial Economics, 10, 329-359. https://doi.org/10.1146/annurev-financial-110217-022944

[3] Bahra, B. (1997). Implied Risk-Neutral Probability Density Functions from Option Prices: Theory and Application (Bank of England Working Paper No 66). Bank of England. Posted: 19 Apr 1998.