This is a summary of the thesis "Perceived market dependence and its effect on stock returns: An empirical analysis of European markets" written by Luna Geens under supervision of Prof. dr. Jan Annaert. The full thesis can be found on Github.

TO BETA OR NOT TO BETA… THAT IS THE QUESTION.

Markowitz's Modern Portfolio Theory (1952) highlights the importance of diversification to mitigate unsystematic risk. Building on this, Sharpe's Capital Asset Pricing Model (CAPM) (1964) demonstrates that a stock's expected return is directly proportional to its systematic or market risk alone, as unsystematic risks can be eliminated through diversification. The CAPM formula, $E(R_i) = R_f + \beta_i * (E(R_m) - R_f)$, illustrates this relationship, where R_f is the risk-free rate, $E(R_m)$ is the expected market return, and β_i measures a stock's market risk. This model posits that higher beta stocks, which react more strongly to market changes, should offer higher expected returns as compensation for higher market risk. In the past and common practice, researchers have used correlation between historical stock and market returns as a proxy for beta.

Despite its popularity, empirical research has questioned the validity of beta in the CAPM (Fama & French, 2003), offering several reasons why beta may not be priced. The first major critique is that market risk alone fails to fully explain expected returns, leading to the development of multifactor models. Fama and French expanded CAPM by introducing size and value factors (1993), later adding profitability and investment factors (2015). Carhart (1997) further developed a Four-Factor Model by including momentum. The literature provides additional examples (Asness et al., 2017; Frazzini & Pedersen, 2014; Kelly & Jiang, 2014; Keloharju et al., 2016; Koijen et al., 2016; Pastor & Stambaugh, 2001; Sadka, 2003).

Secondly, the CAPM's assumptions have been critiqued for being overly simplistic and unrealistic (Blitz et al., 2013). The model assumes the existence of the risk-free asset, which does not exist. Even if it did, the risk-free rate fluctuates over time (DeJong & Collins, 1985) and differs between borrowing and lending (Black, 1972; Friend & Blume, 1970). Additionally, the true market portfolio, encompassing all assets, is unobservable (Roll, 1977), requiring the use of stock indexes as proxies. Further critiques appear in the literature (Aghion et al., 2003; Constantinides, 1986; Merton, 1973; Pastor & Stambaugh, 2001; Reilly & Brown, 2011).

Thirdly, the CAPM faces empirical testing difficulties. Beta measurements are unstable over time (Blume, 1971, 1975; Ferson & Harvey, 1991; Jagannathan & Wang, 1996). The notion of correlation neglect suggests that investors might not fully consider the dependency between a stock's return and the market return (Enke & Zimmermann, 2013; Eyster & Weizsacker, 2016). However, recent studies show that people do not neglect dependence in pricing assets (Laudenbach et al., 2019) but perceive dependence differently than historical correlation suggest (Ungeheuer & Weber, 2020). Bossaerts and Plott (2004) find that the CAPM's pricing implications hold when market participants' beliefs about beta are unbiased.

THE FREQUENCY OF COMOVEMENT

Ungeheuer and Weber (2020) propose the frequency of comovement as a measure of perceived dependence between stocks. Unlike correlation, which measures the magnitude of returns moving together, frequency of comovement counts how often returns move in the same direction (i.e., share the same sign). This approach underweights extreme returns compared to correlation. Their studies found that participants understood dependence changes in moderate returns but struggled with extreme cases. When asked about overall dependence, participants relied on their perception of moderate returns, even when they understood changes in dependence of extreme returns. Thus, they proposed the frequency of comovement as an indicator of perceived dependence, suggesting that investors use a simple "counting heuristic" to assess dependence in returns rather than understanding complex statistical measures like correlation.

Ungeheuer and Weber's (2020) findings indicate that stocks with a higher frequency of comovement are perceived as having greater market risk, which translates into a higher return premium. Their analysis of U.S. stocks listed on the NYSE, AMEX, and NASDAQ between 1963 and 2015 confirms this hypothesis. Using a high-minus-low comovement strategy—buying portfolios with the highest comovement and selling those with the lowest—they observed a statistically significant annual return premium of 4.28% after controlling for beta and other risk factors. The return premium remains statistically significant when controlling for other factors.

This paper aims to test the following hypothesis: In the European market, stocks with a higher frequency of comovement result in a return premium compared to stocks with lower frequency of comovement. Stock and market returns are used to calculate monthly beta and comovement frequencies. The STOXX Europe 600 index represents market returns. Stocks in the index are sorted into portfolios based on their monthly beta and comovement values. This results in five distinct portfolios each month that are in the same comovement quintile across beta quintiles. Expected returns of these portfolios are analyzed using the CAPM and extended factor models, covering monthly data from January 2002 to February 2024. Newey-West estimators (1986), adjusted for a single lag, correct for time-dependency in the returns.

APPLICATION TO THE EUROPEAN MARKET

The main results strongly support the hypothesis. Patton and Timmerman monotonicity tests (2010) confirm an increasing return trend across comove ranks, though the monthly difference of 0.50% between the highest and lowest comove levels is not significant. Adjusting for Carhart's Four-Factor Model (1997), the annual return premium is 5.41% and significant, with other models (Fama & French, 1993, 2015; Sharpe, 1964; …) showing premiums of 6.77% to 10.59%. A stronger premium was observed in the earlier sub-sample period. Robustness tests using alternative measures, indexes, value-weighted portfolios, and Fama-MacBeth regressions (1973) confirm the comovement premium's consistency, except for some comove calculation methods, which yielded small and insignificant premiums.

Compared to Ungeheuer and Weber (2020), the European market shows lower comovement frequency and slightly higher beta values than the U.S. market. The negligible correlation between comovement and beta (0.01) indicates that comovement does not align closely with systematic risk as defined by beta. High-low strategies based on comovement produced positive cumulative returns, while those based on beta yielded negative returns. Contrary to CAPM predictions, beta consistently showed a significant negative coefficient in Fama-MacBeth regressions. These findings highlight comovement frequency as a distinct and valuable factor in portfolio construction and risk assessment, complementing or replacing traditional beta measures.

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