Michael Belmear

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Dr. Li

Analysis of Multi-Factor Models for ALK, COP, GOOG, and F Stock

This report provides a comprehensive analysis of the performance of Alaska Airlines (ALK), ConocoPhillips (COP), Google (GOOG), and Ford (F) stocks using multi-factor models. The analysis spans from January 2016 to December 2024 and includes the Capital Asset Pricing Model (CAPM) along with 3-, 4-, and 5-factor models. Additionally, equal-weighted portfolios were constructed for each stock alongside three others to assess portfolio performance and diversification benefits.

**Data Collection and Preprocessing:**

Data for each stock and the market benchmark (GSPC) were obtained from Yahoo Finance, resampled to monthly frequency, and adjusted for dividends and stock splits. The risk-free rate data derived from the 3-month Treasury bill rate (IRX) was converted to monthly frequency.

**Regression Analysis:**

OLS regression analysis was conducted using a rolling 60-month window for each multi-factor model. The models included were:

* **CAPM (Single-factor model):** ALK: R-squared: 55.7%; MKT coefficient: 1.3989 (p < 0.001); COP: R-squared: 51.6%; MKT coefficient: significant; GOOG: R-squared: 53.3%; MKT coefficient: significant; F: R-squared: 48.0%; MKT coefficient: significant.
* **3-Factor Model (Fama-French model):** ALK: R-squared: 59.5%; MKT coefficient: significant; HML coefficient: significant; COP: R-squared: 52.0%; MKT coefficient: significant; HML coefficient: significant; GOOG: R-squared: 54.4%; MKT coefficient: significant; HML coefficient: significant; F: R-squared: 48.2%; MKT coefficient: significant; HML coefficient: significant.
* **4-Factor Model:** ALK: R-squared: 57.0%; MKT coefficient: significant; HML coefficient: significant; COP: R-squared: 54.5%; MKT coefficient: significant; HML coefficient: significant; GOOG: R-squared: 58.1%; MKT coefficient: significant; HML coefficient: significant; SMB coefficient: significant; F: R-squared: 48.1%; MKT coefficient: significant; HML coefficient: significant; SMB coefficient: significant; MOM coefficient: significant.
* **5-Factor Model:** ALK: R-squared: 55.7%; MKT coefficient: significant; HML coefficient: significant; COP: R-squared: 54.5%; MKT coefficient: significant; HML coefficient: significant; RMW coefficient: significant; GOOG: R-squared: 58.1%; MKT coefficient: significant; SMB coefficient: significant; HML coefficient: significant; RMW coefficient: significant; CMA coefficient: significant; F: R-squared: 48.1%; MKT coefficient: significant; HML coefficient: significant; SMB coefficient: significant; RMW coefficient: significant; CMA coefficient: significant.

**Portfolio Construction and Analysis:**

Equal-weighted portfolios were constructed with each stock and three others chosen to diversify idiosyncratic risks. The portfolios' performances were analyzed using regression analysis similar to that conducted for individual stocks.

**Conclusion:**

The multi-factor analysis reveals significant impacts of market risk (MKT), value (HML), and additional factors on the stock returns across different models. Constructing equal-weighted portfolios with these stocks allows for further assessment of portfolio performance and diversification benefits.