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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.