

The Application of the Fama and French Factor Model for the Sri Lankan Stock Market

R. Randeniya¹, J.K.Wijerathna²

¹*New Business Developments & Group Initiatives, John Keels Holdings PLC*

²*Department of Mathematics, Faculty of Science, University of Colombo*

Background

The explanation of the movement of stock returns is a complex task and has been the subject of research with the objective of identifying potential investment opportunities. A single-factor model, where the stock returns are driven by one variable, is often used to identify the mispricing of stocks. One such single-factor model is the Capital Asset Pricing Model (CAPM) which uses the market beta (the sensitivity of an asset against the movement of the market) as the explanatory variable to model stock return. However a single factor alone is not sufficient to model the dynamics of the market. Often multiple factors are used for modelling purposes such as size, value each of which captures a different characteristic of the market thereby improving the fit of the model.

Fama & French (1992) identified that the CAPM model does not sufficiently explain the average stock returns in the US market. Thus the CAPM was further improved with the introduction of two additional factors. This three-factor model of Fama and French (1993) indicates that expected returns can be explained by excess market returns, a size-factor and a book-to-market equity factor. The FF model is defined as follows:

$$r_A = r_f + \beta_A (r_M - r_f) + s_A SMB + h_A HML + \alpha + e \quad (1)$$

Where,

r_A – Expected return on the asset

β_A – Beta

r_f – Returns on Weighted Average Deposit Rate of Commercial Banks

r_M – Returns on the All Shares Price Index

s_A – Securities sensitivity to the size premium

SMB – Size premium

h_A – Securities sensitivity to the value premium

HML – Value premium

α – Intercept

e – Standard error

The Fama & French (FF) model has been extended to markets such as New Zealand, Hong Kong etc by researches and it has been adapted to Emerging Markets as well such as India and Thailand.

Additionally, the FF theory allows portfolio construction tilted in terms of size and value. Therefore this study identifies similar investment opportunities in the context of Sri Lankan.

Justification and Rationale

Stock selection in Sri Lankan is ad-hoc, mostly driven on inside information rather than a fundamental or technical basis. With the incorporation of FF-model a standardized method of identifying potential investment opportunity would be possible; however given the nature of the Sri Lankan market the success of the model is questionable. This study has three main objectives:

- To conduct a factor analysis to identify the performance of the factors to identify their predictability and relationship with the FF factor portfolios.
- Assess the suitability of the FF-model over the CAPM model, and to evaluate the performance of the former for the periods during the war, after the war and across time as well.
- Identify the most suitable FF factor portfolios to be used as a base for an Index Fund

Methodology

The analysis period considered was January 2000 to December 2010. As the Sri Lankan stock market is an Emerging Market, there has been a vast change in the market over the past 10 years as shown in Figure1.

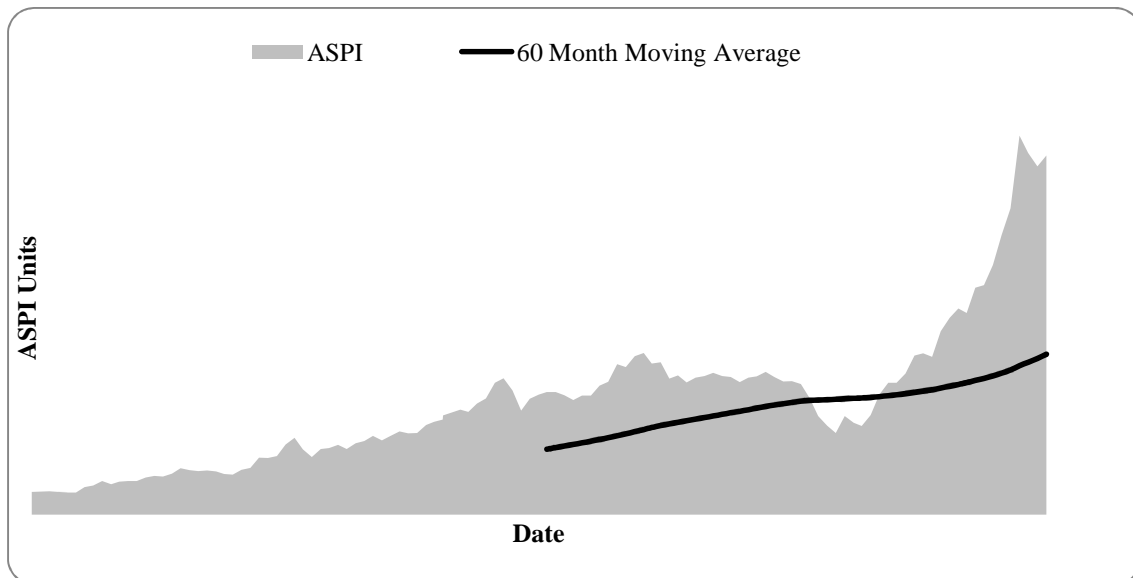


Figure 1 : ASPI and 60 month moving average for April 2001 to December 2010

For the purpose of calculating the FF factors the universe was partitioned into 6 portfolios. For the size effect, into big (B) and small (S) stocks, using the median market capitalization for each month. For the value factor, the segments are 30% of securities

having the highest book-to-market (H), the second is the 40% of securities having the middle book-to-market (M) and the balance 30% as the last segment (L). The FF-factors are calculated as follows:

$$\text{SMB} = \text{Average Returns of Small Size minus Big Size} \quad (2)$$

$$= 1/3(\text{SH}+\text{SM}+\text{SL}) - 1/3(\text{BH}+\text{BM}+\text{BL})$$

$$\text{HML} = \text{Average Returns of High Book-to-Market Ratio minus Low Book-to-Market Ratio} \quad (3)$$

$$= 1/2(\text{SH}+\text{BH}) - 1/2(\text{SL}+\text{BL})$$

The calculated factors were in turn analysed using the information coefficient and descriptive statistics. The FF-model and CAPM-model were fitted using multivariate regression analysis and the residuals were analysed to test the fit of the model. The analysis was conducted in two time phases, namely the period during the civil war in Sri Lanka (before May 2009) and the period after the conclusion of the war. The results were backtested using 60 month rolling windows to identify the consistency of the fit across time.

Outcome

As shown in Figure 2 the FF factor model explains the excess returns on the 6 portfolios better than the CAPM, both in the periods before and after the war. The same conclusion was drawn by the results of the backtest

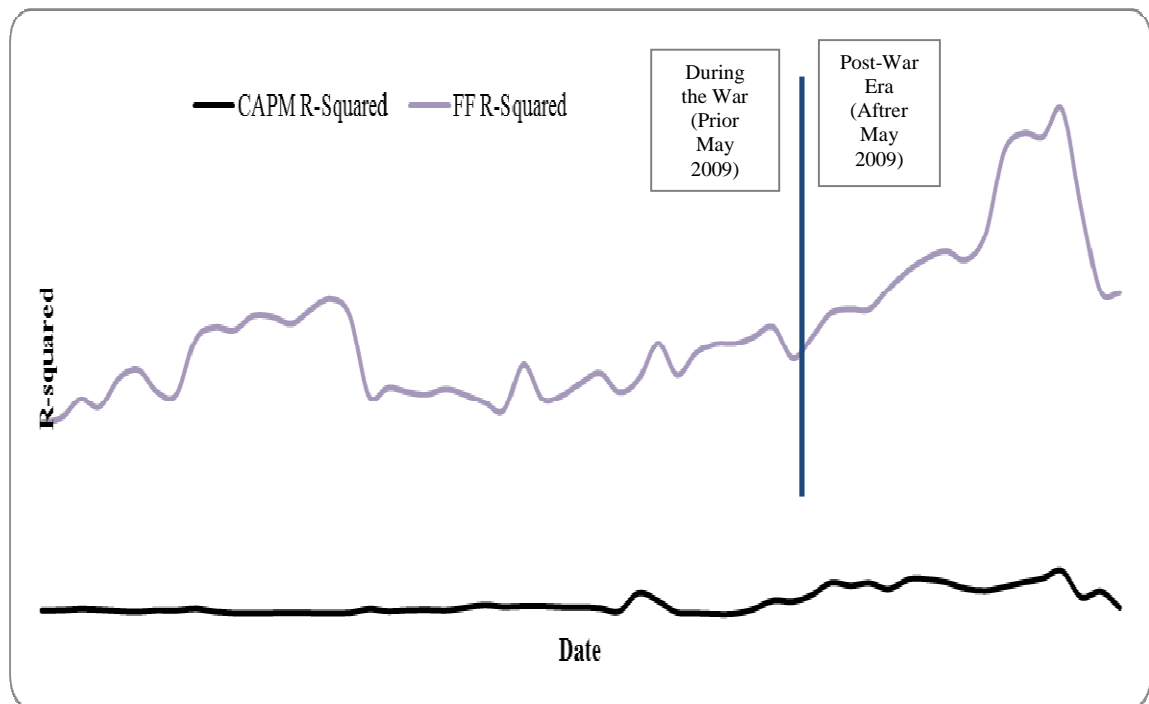


Figure 2 : Fitted models measured by R-squared from April 2001 to November 2010

On observing the size factors, it was identified that small stocks outperform large stocks during the post war stage but not during the war. However the value factor is in-line with the FF model, where high value stocks outperform growth stocks during both phases.

Thus this trend shows a change in early 2009 as shown in Figure 3, where investment strategies have changed and the FF-model captures this transitioning.

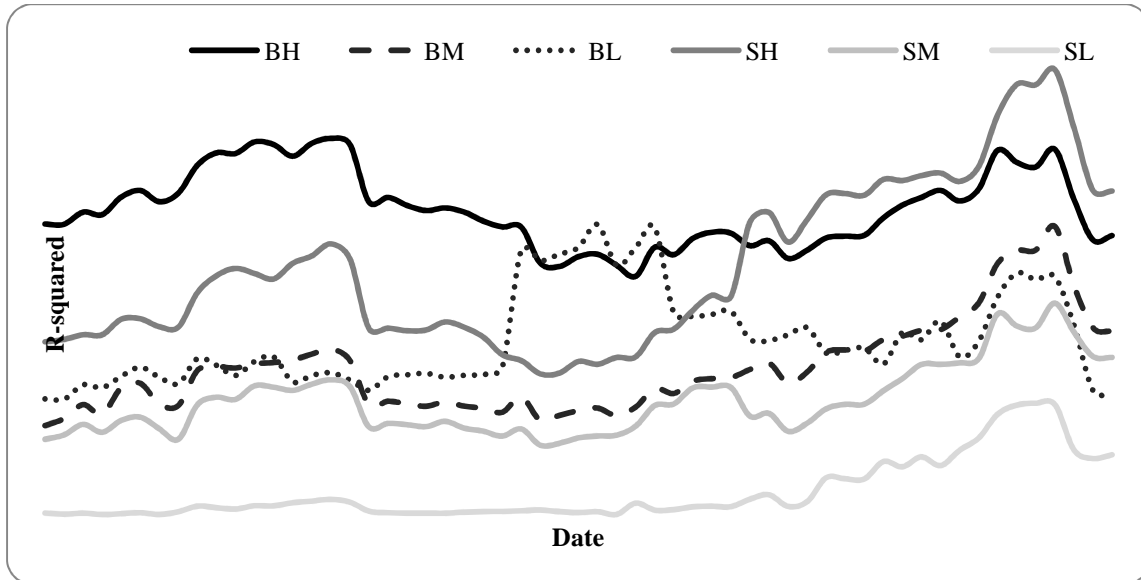


Figure 3 : Fitted models measured by R-squared from April 2001 to November 2010

Table 1 provides the monthly geometric return on the portfolios. Clearly smaller stocks with high value provide better returns. Additionally the Sharpe Ratio on the portfolios, also indicate that the ‘small-cap-high-value’ portfolio and ‘large-cap-high-value’ portfolio performs better over time given the volatility of their return. Thus an Index Fund for these two portfolios was constructed, and the FF model would be used as a forecasting model.

Table 1 : FF portfolio average returns

		Monthly Geometric Return			Sharpe Ratio		
		Book-to-market					
Company Size (Market Cap)		High (Value)	Medium	Low (Growth)	High (Value)	Medium	Low (Growth)
Overall (April 2001 to 2010)	Large	0.0320	0.0163	(0.0070)	0.31	0.15	(0.11)
	Small	0.0379	0.0115	(0.0066)	0.35	0.10	(0.11)
Pre – May 2009 (2004 to 2009)	Large	0.0100	(0.0051)	(0.0282)	0.15	(0.01)	(0.23)
	Small	0.0187	(0.0091)	(0.0275)	0.22	(0.06)	(0.28)
Post – War (2006 to 2010)	Large	0.0268	0.0141	(0.0128)	0.25	0.12	(0.16)
	Small	0.0378	0.0121	(0.0093)	0.32	0.10	(0.16)

Conclusion and Recommendations

This research concludes that the cross sectional returns on the Sri Lankan stock market are explained by the FF-factors and it has a better fit when compared to the CAPM-model. The study also shows that the FF theory of ‘small-cap- high-value’ stocks tend to outperform the market is true in the Sri Lankan context, and using this theory is possible to construct an Index Fund and trade it based on expectations by using the FF forecast.

The FF has approximately 36% R-square on average, hence the addition of other factors would be a better fitting and more suitable model.

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