“Persistence of size and value premia and the robustness of the Fama-French three-factor model in the Hong Kong stock market”

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Persistence of size and value premia and the robustness of the Fama-French three-factor model in the Hong Kong stock market

Abstract

We use Hong Kong stock market data for 1982-2001 to test the persistence of the size and value premia and the robustness of the Fama-French (FF) three-factor model in explaining the variation in stock returns. We document a statistically significant and persistent size effect or size premium that is robust even for non-January months but is heightened in January. We also find that the reversal of the size effect in January reported by Chui and Wei (1998) is unique to their study period, while the general reversal of the size effect reported by Lam (2002) may be due to a sample dominated by firms with low to medium book equity-to-market ratios. The book to market effect or value premium is weaker than the size effect and less consistent than in Fama and French (1993) and Drew and Veeraraghavan (2003). Our results also support the explanation that the size and value premia are rewards for risk bearing consistent with the efficient market hypothesis. We further find a large improvement in explanatory power provided by the French and Fama model relative to the CAPM but that the FF model is mis-specified for the Hong Kong market.

Keywords: asset pricing, Fama-French three-factor model, size effect, book to market effect, Hong Kong.
JEL Classification: G12.

Introduction

Several empirical studies show that the CAPM market beta has very little relation to stock returns (Reinganum, 1981; Breeden, Gibbons and Litzenberger, 1989; Fama and French, 1992; Chui and Wei, 1998; Lam, 2002) while a number of studies document relationships between returns and variables such as size or market capitalization (Banz, 1981; Reinganum, 1981; Blume and Stambaugh, 1983; Brown, Keim, Kleidon and Marsh, 1983) and book to market ratio (BM) (Rosenberg, Reid and Lanstein, 1985; Davis, 1994; Chan, Hamao, and Lakonishok, 1991; Capaul, Rowley and Sharpe, 1993). These size and BM effects have also come to be called size and value premia. The size effect is generally accepted but the BM effect is more controversial. A recent study by Malin and Veeraraghavan (2004) of three European markets fails to find a BM effect in France, Germany and the United Kingdom. Likewise Drew, Naughton, and Veeraraghavan (2003) report that the book to market effect was not as pervasive in the Shanghai market as the size effect.

Evidence from emerging markets generally confirms these size and book to market effects. Fama and French (1998) report firm size and BM effects in respectively, 11 and 12 out of 16 emerging markets. These effects have also been documented in Hong Kong, Korea, Malaysia, Thailand, and the Philippines (Chui and Wei, 1998; Lam, 2002; Drew and Veeraraghavan, 2002, 2003). Chui and Wei (2003) use data from the Pacific Basin Capital Markets (PACAP) Databases to cover a 13-year testing period from July 1980 to June 1993. They employ Fama-MacBeth (1973) cross-sectional regressions and report significant size and BM effects in the Hong Kong stock market. However, the size effect has the expected sign only in non-January months as a reverse size effect is reported for January months with large firms significantly outperforming small firms. The authors explain this unexpected finding as the result of foreign institutional investors, who are the major force in the Hong Kong market, buying large stocks in January. Similarly, Lam (2003) also uses a 13-year testing period from July 1984 to June 1997 likewise obtained from PACAP. By restricting the sample firms to include only those that are continuously listed for the entire period of study the authors obtained a sample of 100 companies including financial firms and reported significant size and BM effects, but the size effect was positive throughout all regressions, contrary to expectations. However, Lam's results could be biased by the small sample size in addition to the presence of survival bias.

The source and nature of the size and BM effects are also contentious. Fama and French (1993, 1995, 1996) explain the size and BM effects as compensation for holding less profitable, riskier stocks, i.e. risk premia, and are therefore consistent with the efficient market hypothesis. Others suggest that the BM effect is either due to behavioral irrationality with investors extrapolating past performance too far into the future which leads to the underpricing of high BM firms (value stocks) and overpricing of low BM firms (growth stocks) (DeBondt and Thaler, 1987; Lakonishok, Shleifer and Vishny, 1994; and Haugen, 1995) or investors having a preference for certain firm characteristics such as a preference for growth stocks and a dislike for value stocks (Daniel and Titman,

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1997). Other explanations of these size and BM effects also include data snooping and other biases in the data (Lo and MacKinlay 1990; Kothari Shanken and Sloan, 1995).

It is apparent that the single-factor CAPM is no longer appropriate to explain the relationship between risk and return, but at present there is no universally accepted model to replace it. The most widely referred model in the finance literature is the Fama-French three-factor model, henceforth FF model (see Fama and French, 1993, 1995, 1998), which posits that the cross section of average returns can be explained by three factors -- the excess market return, a size factor, and a book-to-market equity factor. The FF model was developed based on US data, thus it is important that it be tested for robustness in markets outside the US. Campbell et al. (1997) argue that the usefulness of multi-factor models will not be fully known until out-of-sample checks on its performance become available. In response to this, Fama and French (1998) validated their model using data from several international markets, but their data set was dominated by a small number of large firms. Drew and Veeraraghavan (2002, 2003) tested the model in emerging Asian markets and found it to be a parsimonious representation of the risk factors for Hong Kong, Korea, Malaysia and the Philippines. However, the authors' testing period ranged from five to eight years consequently suggests that more empirical testing of the FF model is needed before it can be accepted as a replacement for the CAPM.

Evidently, the existing literature testing the robustness of the FF model in markets outside the US is sparse, especially in emerging markets, with most of these studies suffering from data problems. Hence, it is important to accumulate further out of sample evidence to advance the debate over the appropriate asset pricing model. This study aims to help fill this gap by analyzing the Hong Kong Stock market which is the second largest stock market in Asia and the seventh largest one in the world. The study is further motivated by Griffin (2002) who suggests that practical applications of the FF model are best performed on a country-specific basis. To date the only published study on the FF model in the Hong Kong stock market was done by Drew and Veeraraghavan (2003) (henceforth DV) who confirm a size and BM risk premium and report that the FF model can explain average returns better than the CAPM. However, their study is limited to only six years of data from December 1993 to December 1999. This study aims to gain a more definitive result by using data from a longer time period.

This study has five objectives:

1. Objective one tests the robustness of the size and BM effects reported in earlier studies by using a different approach and time frame. Both studies by Chui and Wei (1998) and Lam (2003) use the cross-section regression approach of Fama and MacBeth (1973) while the present study uses the time series regression method of Black, Jensen, and Scholes (1972) similar to DV (2003). However, unlike DV (2003) this study uses a twenty-year testing period spanning January 1982 to December 2001, which addresses the comments of Pinfold et al. (2001) who stress that any 'study of either the size effect or the book to market effect will be highly dependent on the time frame selected'.
2. Objective two examines an empirical implementation of both the CAPM and the FF model to test the robustness of the latter through out of sample evidence. The use of the Black, Jensen, and Scholes (1972) time series regression approach in implementing these competing asset pricing models allows us to use the intercept as a simple return metric and a formal test of model mis-specification. A well-specified model in this case will have an intercept that is not significantly different from zero (Merton, 1973).
3. Objective three verifies the risk explanation of the size and value premia and contributes to the controversial debate as to the source and nature of the size and BM effects.
4. Objective four tests for January effect and verifies if the size and value premia are strictly a January phenomenon.
5. Objective five tests for a structural break in the data around the time of the Asian financial crisis and the handover of Hong Kong to China in July 1997 and investigates its effects, if any, on the size and value premia.

In this study, we employ an adaptation of the Fama and French (1993) methodology to test for the size and BM effects within the context of the FF model. As an adaptation of Fama and French (1993), six portfolios were formed based on a 2 x 3 size-BM ratio sort. Size-return and BM-return relationships are then inferred from the excess returns of these portfolios. Subsequently, both the CAPM and FF model are used to explain the variation in returns for each portfolio. Results of these estimations are used to further verify the existence of size and BM effects and to gauge the ability of the FF model to explain size and value premia. We likewise use these results to verify the risk explanation of the size and value premia.

The rest of this paper is organized as follows. Section 1 describes the methods and reports summary statistics for the six stock portfolios. Section 2 presents regression results comparing the CAPM with the FF model and the last section concludes the paper.

1. Methodology and data

At the end of each calendar year *t*, from 1981 to 2000, companies are selected to be included in the study. The selected company should have a price record at the end of year *t* and publicly available accounting data as of the fiscal year ending in calendar year *t*-1. The selected companies are then ranked by size (market capitalization as of December of year *t*) and sorted into two groups with an equal number of companies in each group (i.e., small (S) and big (B)). The companies are also independently ranked by book to market ratio (BM) and then sorted into three groups (i.e., low BM (L), medium BM (M), and high BM (H)) based on breakpoints for the bottom 33.33% and the top 66.67%. Following DV (2003), BM is the book shareholder equity for fiscal year ending in calendar year *t*-1 divided by market capitalization at the end of December of *t*-1. Shareholder equity is defined as total reported shareholder equity minus the value of preferred shares and outside equity interests.

Six portfolios are formed at the end of each year using companies at the intersection of the size and BM groups (e.g., small size/low BM (*S/L*), small size/medium BM (*S/M*), small size/high BM (*S/H*), big size/low BM (*B/L*); big size/medium BM (*B/M*), and big size/high BM (*B/H*)). This study uses six portfolios compared to the 25 used by Fama and French (1993) because of the small number of firms in the Hong Kong market compared with the US market. This is consistent with the other adaptations of the Fama and French (1993) methodology for small markets (see, for example, Drew and Veeraraghavan, 2002, 2003; Drew, Naughton, and Veeraraghavan, 2003).

Value weighted returns are computed for each of the six portfolios that are formed at the end of each year. This is conducted over a 12 month period after the portfolio formation date. For example, portfolios formed as of December 1981 will be tracked in 1982. This produces a series of 240 monthly returns over the period from January 1982 to December 2001 for each of the six size/BM portfolios. Accounting and stock market data were obtained from the PACAP database compiled by the University of Rhode Island.

Table 1 summarizes the characteristics of the six portfolios and Panel A shows that the average annual number of companies in each portfolio ranged from 35 to 52 providing an average sample size of 259 companies per year.

Table 1. Characteristics of six portfolios formed on size and book-to-market equity: January1982-December 2001

Panel A. Average annual number of companies in portfolio			
	Low BM	Medium BM	High BM
Small	35	49	46
Big	52	37	40
Panel B. Average annual market capitalization ($HK million)			
	Low BM	Medium BM	High BM
Small	9,396	10,005	10,332
Big	547,946	214,397	135,175
Panel C. Average annual ratio of book value to market capitalization			
	Low BM	Medium BM	High BM
Small	0.45	1.07	2.60
Big	0.40	1.06	2.54

Note: BM – book to market ratio.

Panel B shows that the average market capitalization of the companies making up the portfolios ranged from HK$ 9,396 million for *S/L* to HK$ 547,946 million for *B/L*. Panel B also shows that size tends to be negatively related to BM for the big size group. Therefore care must be taken in interpreting the results, as the size effect could amplify the BM effect for the big size group. Panel C shows that BM seems to be well controlled for the two size categories.

Both the CAPM (equation 1) and the FF model (equation 2) are estimated as follows:

$$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + e(t), \quad (1)$$

$$RP(t) - RF(t) = a + b[RM(t) - RF(t)+ + sSMB(t) + hHML(t) + e(t). \quad (2)$$

RP(t) is the portfolio return at time *t*, *RM* is the market return calculated as the value weighted market return of all stocks in the six portfolios including negative book to market stocks which were excluded from the sample while forming the size-BM portfolios. *RF* is the risk-free rate which is the Hong Kong and Shanghai Corporation Best Lending Rate from January 1982 to June 1988 and the monthly official cash rate of Hong Kong from July 1988. *SMB* is the difference between the returns on small minus big size firms (i.e., mimicking a portfolio of long small capitalization stocks and short big capitalization stocks) and is calculated as the difference between the simple average return of the three small size portfolios (*S/L, S/M, S/H*) and the three big size portfolios (*B/L, B/M, B/H*). *HML* is the difference between the returns of high BM firms and low BM firms (i.e., mimicking a portfolio of long high BM stocks and short low BM stocks) and is calculated as the difference between the simple average return of the two high BM portfolios (*S/H, B/H*) and the two low BM portfolios (*S/L, B/L*). This procedure for calculating *SMB* and *HML* follows from the adaptation of DV (2002, 2003), and Drew, Naughton, and Veeraraghavan (2003) of the Fama and French (1993) procedure.

2. Empirical results

2.1. Comparison with DV (2003) results. First we replicate the results of DV (2003) for the period from December 1993 to December 1999. Our results are consistent with DV (2003), which showed a positive *SMB* and *HML*, and a significant improvement in the average R^2 of the FF model compared with the CAPM. We find an *SMB* and *HML* of 1.621% and 1.001% per month, respectively, while DV (2003) report lower corresponding values of .8276% and .3108% per month. These figures indicate that on average, small size portfolios outperform big size ones and high BM portfolios generate higher returns than low BM portfolios. The results also showed a significant improvement in the average R^2 of the FF model (92%) compared with the CAPM (78%), though the improvement is lower than that found by DV (2003) who document an average R^2 of 63% and 40% respectively for the FF model and CAPM. Table 2 presents the FF coefficients and shows that our estimated *s* and *h* coefficients are all statistically significant, while DV (2003) report statistically significant *s* coefficients but three insignificant *h* estimates in Panel A. Therefore our results show strong size and BM effects during the testing period, while DV (2003) find a strong size effect but a weak BM effect. On the other hand, while DV (2003) report statistically insignificant intercept terms, we find three significant intercepts and conclude that the FF model is mis-specified for the Hong Kong market. The differences in our results from DV (2003) could be due to the data source as DV (2003) obtained their data from Datastream, and possibly due to our exclusion of non-financial firms as it is unclear if DV (2003) also excluded these firms from their sample.

2.2. Full period, January 1982 to December 2001. We further extend the testing period to cover 20 years from January 1982 to December 2001. We also test for the January effect and its impact, if any, on the results, and check for structural stability in the data before and after the Asian financial crisis and turnover of Hong Kong to China in July 1997.

2.2.1. Raw returns. Table 3 shows the mean monthly excess returns of the portfolios for the period of January 1982-December 2001. It is evident from Table 3 that small stocks generate higher returns than big ones and that high BM stocks generate higher returns than low BM stocks except for *B/H*. For example, *S/L* earns an excess return of 15.36% per annum while the corresponding portfolio with a bigger size, *B/L*, only earns 8.77% per annum. On the other hand, *B/H* earns 12.37% per annum while the corresponding portfolio with a lower BM, *B/L*, only earns 8.77%. *SML* and *HML* are also both positive which further indicates that on average, small stock portfolios and high BM portfolios outperform large stock portfolios and low BM portfolios. The *SMB* and *HML* values suggest that over the sample period, small firms as a group have outperformed big firms by 19.78% per annum while high BM firms have outperformed low BM firms by 11.03% per annum. Hence the excess returns indicate the presence of a strong size effect and a relatively weaker BM effect over the full study period.

Table 2. Replication of DV (2003) regression results: December 1993-December 1999

Panel A. FF model coefficients from DV (2003)							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-1.562 (-1.942)	0.976 (9.892)	1.557 (8.845)	-0.723 (-3.627)	0.65	45.254	2.118
S/M	-0.008 (-0.900)	0.984 (8.774)	1.590 (7.948)	-0.199 (-0.878)	0.57	32.464	2.328

Table 2 (cont.). Replication of DV (2003) regression results: December 1993-December 1999

Portfolio	a	b	s	h	R^2	F	DW
S/H	-1.400 (0.163)	0.998 (11.037)	1.400 (8.675)	0.478 (2.617)	0.66	47.900	1.906
B/L	-0.743 (-1.021)	0.998 (11.171)	0.486 (3.049)	-0.447 (-2.476)	0.67	48.761	1.994
B/M	-0.676 (-0.791)	0.984 (9.378)	0.418 (2.230)	-0.350 (-1.650)	0.60	34.108	2.344
B/H	-1.265 (-1.593)	0.976 (10.015)	0.644 (3.702)	0.353 (1.792)	0.60	33.934	2.186
Panel B. FF model coefficients							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-1.134 (-3.028)	1.044 (33.566)	0.581 (9.652)	-0.498 (-6.370)	0.96	490.236	1.954
S/M	-0.379 (-1.733)	0.918 (50.523)	0.332 (9.451)	0.192 (4.196)	0.98	982.801	1.912
S/H	-0.935 (-1.911)	0.883 (33.105)	0.248 (4.814)	0.471 (7.027)	0.95	419.746	2.163
B/L	1.376 (2.661)	0.692 (16.125)	-0.744 (-8.960)	-0.234 (-2.166)	0.81	100.377	1.819
B/M	1.418 (2.574)	0.972 (21.261)	-0.900 (-10.181)	-0.166 (-2.447)	0.88	164.402	1.924
B/H	0.175 (0.398)	0.982 (26.872)	-0.817 (-11.553)	0.342 (3.728)	0.92	257.186	2.058

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. DW – Durbin-Watson. t-statistics are in parentheses.

2.2.2. Regression results. We confirm the presence of these size and value premia by estimating both the CAPM and FF model. Panel A of Table 4 shows the coefficients of the CAPM. All intercepts are statistically insignificant while all *b* coefficients are highly significant at the 1% level. The average adjusted R^2 for the six portfolios is 71%. Panel B presents the coefficients of the FF model and shows that the intercepts of three portfolios, *S/L, S/H*, and *B/M*, are significantly different from zero, contrary to expectations. All *b* and *s* coefficients are highly significant but two out of six *h* coefficients, for *B/M* and *B/H*, are not statistically significant. As expected, the *s* coefficients increase from big to small portfolios, while the *h* coefficients increase monotonically from low to high BM portfolios. The average R^2 is 88% which is a marked improvement over that of the CAPM.

Table 3. Mean monthly excess returns: January1982-December 2001

	Mean monthly returns (%)			
Portfolio	PMRF	MMRF	SMB	HML
S/L	1.2803 (12.0314)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)
S/M	1.6113 (10.0612)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)
S/H	2.0118 (13.2471)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)
B/L	0.7305 (8.9377)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)
B/M	1.3408 (11.0300)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)
B/H	1.0308 (10.6911)	1.6634 (10.3722)	1.6488 (7.8838)	0.9192 (6.7489)

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. SMB – small minus big. HML – high minus low. PMRF – portfolio return minus the risk-free rate. MMRF – market return minus the risk-free rate. t-statistics are in parentheses.

The raw returns and the regressions estimates therefore indicate a strong negative size-return relationship consistent with the findings of Chiu and Wei (1998) over the period of July 1980-June 1993. The study results show a relatively weaker BM-return relationship that appears to be sensitive to the choice of the time period considering our earlier finding of a strong BM effect for the period of December 1993-December 1999. The behavior of the factor loadings on *SMB* and *HML* supports the risk based explanation of the size and value premia as compensation for risk bearing, consistent with the efficient market hypothesis. The FF model also explains the variation in average returns better than the CAPM

with an average improvement of 17 percentage points, however the presence of significant intercept terms means that the FF model is misspecified for the Hong Kong market implying that there could very well be additional factors that can explain average returns.

Table 4. Regression coefficients: January 1982-December 2001

Panel A. CAPM coefficients							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + e(t)$							
Portfolio	a	b			R^2	F	DW
S/L	-0.396 (-1.013)	1.007 (27.043)			0.75	731.326	2.019
S/M	0.114 (0.464)	0.900 (34.437)			0.86	1477.378	1.979
S/H	0.281 (0.558)	1.041 (21.689)			0.66	470.424	2.195
B/L	-0.423 (-1.215)	0.693 (20.898)			0.65	436.71	1.945
B/M	-0.065 (-0.149)	0.845 (20.206)			0.63	408.297	1.902
B/H	-0.425 (-1.150)	0.875 (24.817)			0.72	615.878	1.988
Panel B. FF model coefficients							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-0.627 (-2.302)	0.973 (37.153)	0.452 (12.945)	-0.497 (-12.382)	0.89	610.424	1.928
S/M	-0.096 (-0.397)	0.877 (37.893)	0.096 (3.121)	0.097 (2.745)	0.87	538.981	2.000
S/H	-0.935 (-4.087)	0.909 (41.341)	0.040 (13.800)	0.834 (24.741)	0.93	1106.338	2.071
B/L	0.320 (1.305)	0.779 (33.091)	-0.472 (-15.030)	-0.116 (-3.224)	0.83	392.476	1.938
B/M	0.879 (2.983)	0.955 (33.712)	-0.639 (-16.914)	-0.080 (-1.847)	0.84	416.593	1.987
B/H	0.319 (1.336)	0.964 (42.017)	-0.576 (-18.841)	0.064 (1.827)	0.89	631.252	1.948

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. DW – Durbin-Watson. t-statistics are in parentheses.

2.2.3. January effect

We now turn our attention to the well-known January effect and test if our results are driven by returns in January. Panel A of Table 5 shows the portfolio returns for January months, while Panel B reports the corresponding returns for non-January months. It is evident that small stocks provide higher return than big stocks in January, but the same is also true for non-January months except for *S/M*. High BM portfolios also provide higher returns than low BM portfolios except for *S/M* for January, and *S/M* and *B/M* for non-January months. These results mirror those of the full sample confirming a size effect that is stronger than the BM effect for both January and non-January months. The *SMB* and *HML* are also positive and highly significant for both January and non-January months. What is more interesting however is the fact that the portfolio returns as well as *SMB* and *HML* are significantly higher in January than in the rest of the months. Hence based on these summary return statistics, we conclude that the size and BM effects persist throughout the year, but are evidently heightened in January. We will confirm these findings using estimates of the FF model for January and non-January months, but first we will verify an anomalous finding by Chui and Wei (1998) of a reversal of the size effect in January.

Chui and Wei (1998) report a large firm effect in January for the period of July 1980-June 1993, contrary to expectations. We verify their results using a slightly different time period from January 1982 to June 1993[1]. Panel C of Table 5 shows the excess returns of the six portfolios and confirms the findings of Chui and Wei (1998) that big firms generate higher excess returns than the corresponding small firms in January. This is evident from a comparison of corresponding portfolios (e.g., S/L vs. B/L; S/M vs. B/M; and S/H vs. B/H), as well as in the negative *SMB*. However, we argue that this apparent reversal of the size effect is unique to the period from 1980 to 1993 taking into account the evidence presented earlier for the full sample.

[1] Our data set only goes as far back as January 1982.

Table 5. Mean monthly excess returns for January and non-January months: January1982-December 2001

Panel A. Mean monthly returns for January months (%)				
Portfolio	PMRF	MMRF	SMB	HML
S/L	3.250 (18.423)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
S/M	1.980 (11.719)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
S/H	8.439 (31.881)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
B/L	1.957 (9.142)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
B/M	2.073 (13.582)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
B/H	2.180 (14.530)	3.865 (14.269)	5.630 (19.579)	3.144 (18.695)
Panel B. Mean monthly returns for non-January months (%)				
Portfolio	PMRF	MMRF	SMB	HML
S/L	1.011 (11.320)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
S/M	1.578 (9.927)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
S/H	1.427 (9.961)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
B/L	0.619 (8.932)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
B/M	1.274 (10.803)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
B/H	0.926 (10.310)	1.463 (9.963)	1.287 (5.744)	0.717 (4.347)
Panel C. Mean monthly returns for January months (%), January 1982-June 1993				
Portfolio	PMRF	MMRF	SMB	HML
S/L	1.9317 (5.0592)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)
S/M	3.8696 (7.2395)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)
S/H	5.2577 (6.4642)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)
B/L	5.0315 (6.9237)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)
B/M	5.6862 (10.5079)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)
B/H	6.1598 (11.3860)	5.5703 (7.8859)	-1.5449 (4.6734)	1.8335 (3.0919)

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. SMB – small minus big. HML – high minus low. PMRF – portfolio return minus the risk-free rate. MMRF – market return minus the risk-free rate. t-statistics are in parentheses.

Table 6 reports the coefficients of the FF model for January and non-January months. For January months, all intercepts are statistically insignificant except for *S/L*. All *b*, *s*, and *h* coefficients are highly significant except for the *h* coefficient of *B/L*. The *s* coefficients all increase from big to small portfolios, however the *h* coefficients increase from low BM to high BM portfolios only for the small stock category. Big stocks apparently exhibit a reverse BM effect in January, contrary to expectations. The average R^2 is 94%. For non January months, all intercept terms are insignificant except for *S/H* and *B/M*. All *b*, *s*, and *h* coefficients are highly significant except for the *h* coefficient of *B/M*. The *s* coefficients all increase from big to small stocks and the *h* coefficients increase from low BM to high BM stocks consistent with expectations. The average R^2 is 89%, slightly lower for January months. These results confirm our earlier findings that the size and BM effects are evident throughout the year and not driven by the January returns.

2.2.4. Structural stability. In 1997, most Asian countries suffered a financial crisis resulting in a dramatic depreciation in currency values. Furthermore, Hong Kong was handed over to China on the 1st of July 1997. Therefore, it is interesting to test whether or not these events brought about a structural change in the Hong Kong stock market.

Table 7 shows the results of the Chow test for the three-factor model with a breakpoint of July 1997. The evidence shows that there is a structural change in the Hong Kong stock market after July 1997 since the F-statistic values are greater than the critical value except for *S/L*.

Table 8 shows the excess returns of the six portfolios pre- and post-July 1997. For the period before July 1997 shown in Panel A, there is an apparent positive size-return relationship for the low and medium BM portfolios contrary to expectations, i.e., *B/L* and *B/M* earn higher returns than *S/L* and *S/M*, respectively. However as a group, small size portfo-

lios generate higher returns than big size portfolios as indicated by the positive *SMB*, which is more consistent with expectations. A positive size-BM relationship consistent with expectations, is also evident with the exception of *B/H*. Likewise, the positive *HML* means that the average return of the two high BM portfolios is higher than the average return of the two low BM portfolios.

Table 6. FF model coefficients for January and non-January months: January 1982-December 2001

Panel A. January months							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-1.422 (-2.459)	0.929 (20.604)	0.446 (13.457)	-0.454 (-14.362)	0.99	353.201	1.921
S/M	-0.66 (-1.181)	0.831(18.904)	-0.186 (-5.752)	0.153 (4.967)	0.97	147.472	2.680
S/H	-1.406 (1.769)	0.885 (14.284)	0.593 (13.023)	0.981(22.569)	0.99	563.211	2.497
B/L	1.589 (1.721)	0.643 (8.927)	-0.327 (-6.185)	-0.087 (-1.724)	0.85	29.321	2.263
B/M	1.353 (1.205)	0.995 (11.363)	-0.464 (-7.213)	-0.163 (-2.650)	0.90	46.383	1.960
B/H	1.117 (1.633)	1.120 (21.019)	-0.502 (-12.821)	-0.140 (-3.733)	0.97	154.431	1.945
Panel B. Non-January months							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-0.555 (-1.882)	0.981 (34.153)	0.474 (9.498)	-0.543 (-8.274)	0.86	458.432	1.806
S/M	-0.356 (-1.886)	0.897 (48.739)	0.401 (12.540)	0.148 (3.526)	0.93	922.208	1.790
S/H	-0.520 (-2.992)	0.905 (53.480)	0.190 (6.484)	0.527 (13.658)	0.94	1112.419	1.930
B/L	0.370 (1.516)	0.792 (33.361)	-0.596 (-14.466)	-0.199 (-3.667)	0.85	411.673	1.866
B/M	0.983 (3.374)	0.941 (33.153)	-0.822 (-16.694)	-0.038 (-0.594)	0.85	422.941	1.979
B/H	0.201 (0.890)	0.936 (42.610)	-0.672 (-17.626)	0.307 (6.133)	0.90	680.292	2.087

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. DW – Durbin-Watson. t-statistics are in parentheses.

Lam (2002) also reports a positive size-return relationship over the period of July 1984-June 1997. Hence we verify this finding with excess returns of the six portfolios over this period. Panel B of Table 8 shows that over this period, there is indeed evidence of a positive size-return relationship but this is limited to low and medium BM firms. However, if we include high BM firms, small firms as a group generate higher returns than big firms as shown by the positive *SMB*. Therefore we conjecture that Lam's (2003) sample may have been confined to low and medium BM firms.

Table 7. Stability test in the Hong Kong stock market: January 1982-December 2001

S-L			
Chow Breakpoint Test: July 1997			
F-statistic	0.5395	Prob. F(4,232)	0.7068
Log likelihood ratio	2.2222	Prob. Chi-Square(4)	0.6950
S-M			
Chow Breakpoint Test: July 1997			
F-statistic	7.2736	Prob. F(4,232)	0.0000
Log likelihood ratio	28.3548	Prob. Chi-Square(4)	0.0000
S-H			
Chow Breakpoint Test: July 1997			
F-statistic	13.2015	Prob. F(4,232)	0.0000
Log likelihood ratio	49.2171	Prob. Chi-Square(4)	0.0000
B-L			
Chow Breakpoint Test: July 1997			
F-statistic	5.5619	Prob. F(4,232)	0.0003
Log likelihood ratio	21.9772	Prob. Chi-Square(4)	0.0002
B-M			
Chow Breakpoint Test: July 1997			
F-statistic	3.4281	Prob. F(4,232)	0.0096
Log likelihood ratio	13.7817	Prob. Chi-Square(4)	0.0080
B-H			
Chow Breakpoint Test: July 1997			
F-statistic	17.6259	Prob. F(4,232)	0.0000
Log likelihood ratio	63.6854	Prob. Chi-Square(4)	0.0000

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM.

The monthly excess returns for the period from July 1997 are shown in Panel C of Table 8. A negative size-return relationship, consistent with expectations, is evident from a comparison of corresponding individual portfolios as well as from the positive SMB. However, contrary to expectations, our results show a strong negative BM-return relationship both at the portfolio level as well as in terms of the negative *HML*.

Table 8. Mean monthly excess returns for pre- and post-July 1997

Panel A. Mean monthly returns for January 1982-June 1997 (%)				
Portfolio	PMRF	MMRF	SMB	HML
S/L	0.7646 (8.8428)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
S/M	1.6113 (10.0612)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
S/H	2.0309 (8.9233)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
B/L	1.0292 (8.4497)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
B/M	1.9328 (10.1019)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
B/H	1.8050 (9.9589)	1.6593 (8.6583)	0.6509 (4.7196)	1.3533 (3.7559)
Panel B. Mean monthly returns for July 1984-June 1997 (%)				
Portfolio	PMRF	MMRF	SMB	HML
S/L	1.3062 (8.7630)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
S/M	2.1783 (7.9577)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
S/H	2.6039 (8.8213)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
B/L	1.5971 (7.4742)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
B/M	2.5047 (9.2867)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
B/H	2.2480 (9.4085)	2.1884 (8.8173)	0.6435 (4.4678)	1.3869 (3.4877)
Panel C. Mean monthly returns for July 1997-December 2001 (%)				
Portfolio	PMRF	MMRF	SMB	HML
S/L	3.0566 (19.3821)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)
S/M	1.4175 (15.3030)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)
S/H	1.9457 (22.6584)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)
B/L	-0.2986 (10.4699)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)
B/M	-0.6982 (13.6729)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)
B/H	-1.6357 (12.6445)	1.6776 (14.9488)	5.0859 (13.6748)	-0.5760 (12.378)

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. SMB – small minus big. HML – high minus low. PMRF – portfolio return minus the risk-free rate. MMRF – market return minus the risk-free rate. t-statistics are in parentheses.

Given the results of the structural tests, the three-factor model was re-estimated over two time frames, January 1982-June 1997 and July 1997-December 2001. Panel A of Table 9 shows that for the period of January 1982-June 1997, the intercepts for *S/H* and *B/M* are statistically significant at the 10% level, contrary to expectations. However, the *b*, *s*, and *h* coefficients are all statistically significant at the 5% level, except for the *h*-coefficient of portfolio *B/M*. As expected, the *s* coefficients increase from big to small stock portfolios, while the *h* coefficients increase monotonically from low to high BM portfolios. The empirical evidence is consistent with results reported earlier for the full period in that we document a strong size effect and a relatively weaker BM effect. However, as shown in Panel B, over the period of July 1997-December 2001, the intercepts for *S/L*, *B/L* and *B/H* are all significant at the 10% level, contrary to expectations. The *s* coefficients are all statistically significant at 5% level except for *S/M,* but only four out of six *h* coefficients are statistically significant at 10% level. The *s* coefficients increase from big to small stock portfolios consistent with expectations. Similarly, the *h* coefficients increase from low to high BM portfolios for small stocks, which when interpreted in the context of a negative *HML* confirms a reverse BM effect, contrary to expectations. The results suggest that there is still a strong size effect post-July 1997 but the BM effect is particularly weaker compared to the period before July 1997 with a direction that is contrary to expectations.

Overall, our results suggest that the Asian crisis of July 1997 and the handover of Hong Kong to China brought about structural change in the Hong Kong stock market. Both the BM and size effects are still present after these events. However we observe a weakening of the BM effect with an apparent reversal in direction compared to the period before July 1997. Further research is clearly needed to determine the reasons for this change in the BM effect.

Table 9. FF model coefficients pre- and post-July 1997

Panel A. January 1982-June 1997							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-0.4811 (-1.5501)	0.9506 (27.2284)	0.4478 (6.9914)	-0.4605 (-5.6380)	0.80	249.3154	1.95
S/M	-0.1343 (-0.6650)	0.8641 (38.0564)	0.3075 (7.3833)	0.1241 (2.3366)	0.89	536.1494	1.95
S/H	0.3855 (-2.1738)	0.9253 (46.3744)	0.2824 (7.7688)	0.5144 (11.0191)	0.94	905.7962	1.86
B/L	0.3011 (1.4090)	0.8330 (34.6512)	-0.5872 (-13.3135)	-0.2009 (-3.5728)	0.90	536.2692	2.00
B/M	0.7712 (2.7028)	0.9296 (28.9600)	-0.8228 (-13.9726)	0.1144 (1.5230)	0.87	417.9504	1.96
B/H	0.1044 (0.4759)	0.9266 (37.5396)	-0.7567 (-16.7103)	0.4844 (8.3884)	0.92	725.8828	2.03
Panel B. July 1997-December 2001							
$RP(t) - RF(t) = a + b[RM(t) - RF(t)] + sSMB(t) + hHML(t) + e(t)$							
Portfolio	a	b	s	h	R^2	F	DW
S/L	-1.2209 (-1.7842)	0.9959 (20.4491)	0.4543 (8.2897)	-0.5147 (-9.6462)	0.95	290.0419	2.04
S/M	0.0045 (0.0055)	0.9618 (16.5501)	-0.0288 (-0.4400)	0.0941 (1.4778)	0.88	117.6003	1.99
S/H	-1.4421 (-1.8912)	0.8765 (16.1509)	0.4817 (7.8885)	0.9243 (15.5467)	0.95	320.9209	2.46
B/L	0.3934 (0.4778)	0.6687 (11.4116)	-0.3681 (-5.5824)	-0.1010 (-1.5731)	0.73	45.1472	1.90
B/M	0.4456 (0.4828)	0.9097 (13.8502)	-0.5414 (-7.3255)	0.1451 (-2.0162)	0.80	67.2523	1.96
B/H	-0.8849 (-1.4128)	0.9023 (20.2429)	-0.4549 (-9.0689)	-0.0847 (-1.7339)	0.89	139.1539	1.97

Notes: S/L–small-low BM. S/M – small-medium BM. S/H – small-high BM. B/L – big-low BM. B/M – big-medium BM. B/H – big-high BM. DW – Durbin-Watson. t-tatistics are in parentheses.

Conclusions

Our findings report a relatively persistent negative size-return relationship that is robust for different testing periods. This size effect is evident throughout the year rejecting the suggestion that it is driven by January returns, although the size effect is apparently heightened in January. We also find that the reversal of the size effect in January reported by Chui and Wei (1998) is unique to their study period while the general reversal of the size effect reported by Lam (2002) could likely be due to a sample dominated by firms with low to medium BM ratios. The BM effect is weaker than the size effect, is less consistent than in Fama and French (1993) and DV (2003), and is to be particularly sensitive to the testing period. We also find a structural break in the data from July 1997 but this does not affect the size-return relationship although it has clearly further weakened the BM effect with an apparent reversal in direction. Our results also support the risk-based explanation of the size and BM effects that the size and BM return premia are not signs of market inefficiency, but are instead rewards to risk bearing. We also find that the FF model explains the variation in average returns better than the CAPM. In general, our findings imply that (a) cost of capital estimates would be more accurate using the FF model rather than the CAPM, (b) portfolio managers can increase portfolio returns by investing in a combination of small and high BM firms but this also involves increasing portfolio risk, and (c) portfolio performance evaluation should take into account the size and BM characteristics of the portfolios and require small size and high BM portfolios to earn a higher rate of return. Finally, though the three factors – market, BM and size – appear to be robust variables in explaining stock returns, the presence of significant intercept terms means that the FF model is mis-specified for the Hong Kong market and there could very well be additional factors that can explain average returns.

References

1. Banz, R. (1981). The relationship between return and market value of common stocks, *Journal of Financial Economics*, 9, 3-18.
2. Black, F., Jensen, M.C., and Scholes, M. (1972). The capital asset pricing model: some empirical tests' in M.C. Jensen (ed.) *Studies in Theory of Capital Markets*, New York: Praeger.
3. Blume, M. and R. Stambaugh (1983). Biases in computed returns: An application of the size effect, *Journal of Financial Economics*, 12, 387-404.
4. Breeden, D.T., Gibbons. M.R. and Litzenberger, R.H. (1989). Empirical tests of the consumption-oriented CAPM, *Journal of Finance*, 44, 231-262.
5. Brown, P., Keim, D. B., Kleidon, A.W., and Marsh, T.A. (1983). Stock return seasonalities and the tax-loss selling hypothesis: Analysis of the arguments and Australian evidence, *Journal of Financial Economics*, 12, 105-28.
6. Campbell, J., Lo, A., and C. MacKinlay (1997). *The Econometrics of Financial Markets*, Princeton, NJ: Princeton University Press.
7. Capaul, C., Rowley, I. and Sharpe, W. (1993). International value and growth stock returns, *Financial Analysts Journal*, 49, 27-36.
8. Chan, L., Hamao, Y. and Lakonishok, J. (1991). Fundamentals and stock returns in Japan, *Journal of Finance*, 46, 1739-1789.
9. Chiu, A.C.W. and Wei, K.C.J. (1998). Book-to-market, firm size, and the turn-of-the-year effect: Evidence from Pacific-Basin emerging markets, *Pacific-Basin Finance Journal*, 6, 275-293.
10. Daniel, K. and Titman, S. (1997). Evidence on the characteristics of cross sectional variation in stock returns, *Journal of Finance*, 52, 1-33.
11. Davis J. (1994). The cross-section of realised stock returns: The pre-COMPUSTAT evidence, *Journal of Finance*, 49, 1579-1593.
12. DeBondt, W.F.M. and Thaler, R. (1987). Further evidence on investor overreaction and stock market seasonality, *Journal of Finance*, 42 (3), 557-581.
13. Drew, M.E., and Veeraraghavan, M. (2002). A Closer Look at the Size and Value Premium in Emerging Markets: Evidence from the Kuala Lumpur Stock Exchange, *Asian Economic Journal*, 16, 337-351.
14. Drew, M.E., and Veeraraghavan, M. (2003). Beta, firm size, book-to-market equity and stock returns: Further evidence from emerging markets, *Journal of the Asia Pacific Economy*, 8, 354-379.
15. Drew, M.E., Naughton, T. and Veeraraghavan, M. (2003). Firm Size, Book-to-Market Equity and Security Returns: Evidence from the Shanghai Stock Exchange, *Australian Journal of Management*, 28, 119-140.
16. Fama, E. and French, K. (1992). The cross-section of expected stock returns, *Journal of Finance*, 33, 3-56.
17. Fama, E. and French, K. (1993). Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics*, 33, 3-56.
18. Fama, E. and French, K. (1995). Size and book to market factors in earnings and returns, *Journal of Finance*, 50, 131-135.
19. Fama, E. and French, K. (1996). Multifactor explanations of asset pricing anomalies, *Journal of Finance*, 51, 55-84.
20. Fama, E. and French, K. (1998). Value versus growth: the international evidence, *Journal of Finance*, 53, 1975-1979.
21. Fama, E. and J. Macbeth (1973). Risk, return and equilibrium: empirical test, *Journal of Political Economy*, 81: 607-36.
22. Griffin, J.M. (2002). Are the Fama and French factors global or country specific? *The Review of Financial Studies*, 15, 783-803.
23. Haugen, R. (1995). *The New Finance: The Case against Efficient Markets*, Prentice Hall, Englewood Cliffs, N.J.
24. Kothari, S., Shanken, P., and Sloan, R.G. (1995). Another look at the cross-section of expected stock returns, *Journal of Finance*, 50, 185-224.
25. Lakonishok, J., A. Sheleifer, and R.W. Vishny (1994). Contrarian investment extrapolation and risk, *Journal of Finance*, 1541-1578.
26. Lam, K.S.K. (2002). The relationship between size, book-to-market equity ratio, earnings-price ratio, and return for the Hong Kong stock market, *Global Finance Journal*, 13, 163-179.
27. Lo, A. and MacKinlay, C. (1990). Data-snooping biases in tests of financial asset pricing models, *Review of Financial Studies*, 3, 431-467.
28. Malin, M., Veeraraghavan, M. (2004). On the robustness of the Fama and French Multifactor Model: Evidence from France, Germany, and the United Kingdom, *International Journal of Business and Economics*, 3, 155-176.
29. Merton, R.C. (1973). An intertemporal capital asset pricing model, *Econometrica*, 41, 867-87.
30. Pinfold, J.F., Wilson, W.R. and Li, Q. (2001). Book-to-market and size as determinants of returns in small illiquid markets: the New Zealand case, *Financial Services Review*, 10, 291-302.
31. Reinganum, M. (1981). Missspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values, *Journal of Financial Economics*, 9, 19-46.
32. Rosenberg, B., Reid, K. and Lanstein, R. (1985). Persuasive evidence of market inefficiency, *Journal of Portfolio Management*, 11, 9-17.