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ABSTRACT

Asset pricing models, originally designed for the US market, assume sufficiency of local market in capturing systematic market risk in the stock returns. The models were extended to other developed markets that are fully integrated with the US market by replacing the local market with the global market. However, the ability of these models to capture systematic risks and explain stock returns in emerging markets is undermined by emerging markets' partial integration with and structural differences from the developed markets. In these markets, relying only on local or global market is expected to cause loss of valuable return-relevant information leading to inaccuracies in the return estimates. To customize the asset pricing models to emerging markets settings, we propose combining local and global markets in the models. In this regard, we extend Koedijk et al. model by replacing global instruments with global market portfolio to propose a two-factor CAPM, and Fama & French three-factor model by adding global market portfolio as the fourth factor. We test the proposed models in three BRICS nations, China, India, and South Africa, using ten-year, monthly data from January 2004 to December 2013 on non-financial firms with positive equity holdings. We apply Fama & French double sort on size and book to market value of equity on listed firms to construct nine dependent portfolios. The sort procedure is also used to construct two portfolios—SMB and HML—used along with market portfolios as explanatory variables in Fama & French models. The test results of the models reveal differences in the behaviors of the markets studied. The Chinese market behaves like a fully segmented market wherein local market portfolio subsumes the effect of the global market in both models. On the other hand, the South African market acts like a partially integrated market where both local and global market portfolios have significant impact on the stock returns. The Indian market behaves like a segmented market in two-factor model and like a partially-integrated market in the four-factor model. Hence, we conclude that incorporation of local and global markets in asset pricing in emerging markets in necessary to insure against inaccuracies in the stock return estimates. The proposed models provide investors and investment managers with tools for gauging risks involved in investing in emerging markets and making well-informed investment decisions.

JEL Classifications: G11, G12, G15.
Keywords: asset pricing, combining local and global markets, emerging markets, BRICS.
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INTRODUCTION

The market portfolio has been at the heart of asset pricing theory since its inception with the introduction of capital assets pricing model (CAPM) by William Sharpe in 1964. CAPM recognizes sufficiency of market portfolio in explaining return on any stock in a market. The extension of CAPM from single-period static model to multi-period dynamic model by Merton (1973) in his intertemporal CAPM entailed addition of state variables to the market portfolio. The succeeding studies on multifactor asset pricing modelling, excluding Ross's (1976) arbitrage pricing theory (APT), maintain the critical role of the market portfolio. APT assumes an investment universe with infinite securities, wherein market portfolio is not needed. However, relaxation of this unrealistic assumption reinstates the prominence of the market portfolio (Connor, 1984). Moreover, the presence of market portfolio facilitates modelling an exact asset pricing relationship and capturing the premia for the factors omitted from the models (Wei, 1988).

Many studies on asset pricing, in early 1980s, identified a number of return-relevant factors, such as size (Banz, 1981), book to market value of equity (B/M) (Stattman, 1980), and earnings to price ratio (Basu, 1983). From these factors, Fama & French (1993) chose size and B/M and combined them with the market portfolio to develop a three-factor model, which they believe captures the effects of the excluded factors. The empirical tests of the model confirm dominance of the market portfolio in explaining stock returns, which is reconfirmed by the extensions of the three-factor model (Carhart, 1997; Pastor & Stambaugh, 2003; Francis, LaFond, Olsson, & Schipper, 2005).

The expansion of the stock markets in developed countries, outside US, necessitated revisiting the asset pricing models. Solnik (1974) and Stulz (1984) propose international versions of CAPM that replace local market portfolio with a global market portfolio, which is assumed to be sufficient for explaining stock returns. The international multifactor models like Dumas & Solnik (1995) and Sercu & Uppal (1995) simply add new factors to the global market portfolio. Koedijk, Kool, Schotman, & Dijk (2002) establish equivalence of the local and global market portfolios in explaining stock returns in developed markets. Pertinently, all these and other models designed for developed markets assume full integration with the US market, which eased customization of the models.

Recently, emerging markets have arisen as attractive investment destinations that offer higher returns. However, they are partially integrated with the developed markets (Bekaert & Harvey, 1995), which limits the ability of the asset pricing models in explaining returns in these markets (Harvey, 1995). Pereiro (2010) argues that emerging markets' partial integration with and structural difference from developed markets demand customization of the asset pricing models to the local conditions. Recognizing these facts, many studies have proposed customized versions of asset pricing models for the emerging markets. Bekaert & Harvey (1995) extend the local CAPM (LCAPM) to emerging markets by adding covariance between local and global market as a factor; the coefficient of the factor represents the degree of integration. Carrieri, Errunza, & Majerbi (2006) add covariance between returns on local market and exchange rates of different countries to the Bekaert & Harvey model. Arouri & Foulquier (2012) argue that these models "attempt *ad hoc* tests of market integration" (p.383). They propose a model that besides local and global variables uses integration variables. However, the addition of integration variables—difference between the global and local dividend yield and difference between

G7 and local short-term interest rates—is akin to adding a country risk premium to the asset pricing equation. Sabal (2004) refutes the addition of the country risk premium saying that it assumes equality of default risk across the firms in a country and that the country risk is fully systematic.

In this study we extend Koedijk, et al. (2002) model to the emerging markets by using global market portfolio as a proxy for the global market instruments. Furthermore, recognizing partial integration of emerging markets with the global market, we relax the assumption of full integration and do not test for the equivalence of the local and global markets. Instead, we test joint relevance of the two markets. The rationale for using global market portfolio as proxy for global instruments is drawn from Wei (1988) study, which illustrates market portfolio's role in capturing the effects of factors excluded from asset pricing models. It implies that the role of the global market is expected to have a direct relationship with the amount of risk in stock returns that is not diversifiable locally (Koedijk et al., 2002). It is expected that combining local and global markets will make for the deficiencies in local and international asset pricing models in explaining stock return under the condition of partial integration. This study also combines local and global market portfolios in Fama & French three-factor model to investigate their joint impact in a multifactor setting.

We test the proposed models in three emerging markets from the BRICS bloc, namely China, India and South Africa. We find that when local and global markets are combined in two- and four-factor models, the local market appears as the dominant factor. In Chinese market, it is sufficient to explain returns, while in India and South Africa, total reliance on it will leave out portion of risk that is systemic in the global market. Hence, we recommend combining both markets in asset pricing modelling in the emerging markets. The rest of the paper is organized as follows. Next, we present the models of this study, which are followed by data and methodology, empirical results, and conclusion.

THE MODELS

Stulz (1984) demonstrates that in presence of a fully-diversified global market portfolio, international CAPM (ICAPM) can be used to explain returns on stocks as well as markets in the global market. Accordingly, Koedijk, et al. (2002) combine Solnik (1974) & Sercu (1980) ICAPM with LCAPM to draw the following model:

$$r_i = \alpha_i + \beta_i LMK + \lambda_i Z' + \nu_i, \quad (1)$$

where, r_i is the return on stock i in the local market, LMK is the return on the local market portfolio, and β_i is the local market beta of the stock i. Z represents the vector of global instruments and λ_i the vector of their coefficients. $H_0: \lambda_i = 0$ tests relevance of the global factors to stock returns in the local market. Rejection of the null implies that relying solely on LCAPM will lead to pricing error as it fails to capture the part of risk that is systematic in the global market.

We use global market portfolio as a proxy for all the global factors in (1), such that

$$r_i = \alpha_i + \beta_{iL} LMK + \beta_{iG} GMK + \epsilon_i, \quad (2)$$

where, GMK is the return on global market portfolio, and β_{iL} and β_{iG} are stock i's local market beta and global market beta, respectively. Equation (2) represents the two-factor CAPM of this study.

In addition, we add global market portfolio to Fama & French (1993) three-factor model in order to investigate the joint significance of domestic and global market portfolios in a multifactor setting. The resultant four-factor model is of the form

$$r_i = \alpha_i + \beta_{iL}LMK + \beta_{iG}GML + \beta_{iS}SMB + \beta_{iH}HML + \epsilon_i, \quad (3)$$

where, SMB and HML represent returns on small minus big portfolio and high minus low portfolio respectively, with corresponding beta coefficients of β_{iS} and β_{iH}. SMB and HML proxy for the risks associated with size and B/M of firms respectively. These factors have also been included and found significant in explaining stock returns in number of multifactor studies, such as Carhart (1997) and Pastor & Stambaugh, (2003).

DATA AND METHODOLOGY

Data

We use ten-year monthly data, from January 2004 to December 2013, on non-financial firms listed on stock exchanges in three BRICS nations, namely China, India, and South Africa. China and India are the largest economies in the bloc and South Africa the youngest member. The stock markets in these countries are expected to behave differently and provide an opportunity to test the models in different settings. The firms are selected for the study if they: 1) have data available for at least two years, and 2) do not carry negative equity (Fama & French, 1993). All firms are screened for negative equity at the beginning of each year, using end of preceding year's data. The numbers of firms that met the set criteria are given in Table 1 below:

TABLE 1. NUMBER OF FIRMS USED IN THE STUDY

	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
China	2098	2089	1804	1455	1369	1302	1192	1135	1138	1051
India	2430	2481	2289	2099	1891	1631	1279	909	713	616
South Africa	226	229	226	221	217	194	163	150	147	138

Inputs to the Models

The explanatory variables in two-factor model consist of excess returns on domestic and global market portfolios. In four-factor model, the additional variables are returns on SMB and HML portfolios. The dependent variables in both the models are nine portfolios created at the intersection of 3x3 sorts of firms on size and B/M.

The Explanatory Variables

Return on Market Portfolios

In each market, the return on the domestic market index is used as a representative of the return on local market portfolio and the return on the global market index proxies for the return on global market portfolio.

TABLE 2. LIST OF THE MARKET INDICES

Country	Market Index
China	Shanghai Stock Exchange Composite Index
India	S&P BSE 500 Index
South Africa	FTSE/JSE Africa Top40 Tradable Index
Global	MSCI World Index

The excess return on local market portfolio is computed as portfolio's return in excess of return on 3-month Treasury securities. The data on the returns on all market indices and 3-month Treasury security in India is obtained from the Bloomberg Professional Database, while data on the returns on Chinese and South African 3-month Treasury securities is obtained from the US Federal Reserve at St. Louis. The excess return on the global portfolio is computed as return on MSCI World Index net of the return on 3-month Eurodollar. The data on MSCI World Index is obtained for the Bloomberg and that on 3-month Eurodollar deposits is obtained from the Federal Reserve.

Return on SMB and HML

Small minus big (SMB) and high minus low (HML) are zero-investment mimicking portfolios that proxy for the risks associated with size and book to market value of equity (B/M) of firms. The size of firms is measured as their market capitalization, which is the product of price per share and the number of shares of outstanding. We follow Fama & French (1993) procedure for creating SMB and HML portfolio. The firms in each market are sorted on size into small (S) and big (B) groups using median as divider. Each size group is further sorted on B/M into three groups: high B/M (H), medium B/M (M), and low B/M (L) using ratio of 35:30:35. Form the six portfolios thus obtained, SMB is created as the difference between average returns on three small size (SH, SM, SL) and three big size (BH, BM, BL) portfolios. Similarly, HML is created as the difference between average returns on two high B/M (SH, BH) and two low B/M (SL, BL) portfolios. We use value-weighted returns of the portfolios, which replicates the realistic behavior of the investors (Fama & French, 1993). The portfolios are updated annually.

The Dependent Variables

The dependent variables used in this study consist of excess returns on nine portfolios created at 3x3 intersection of the double sort on size and B/M. In both sorts, firms are

divided in the ratio of 33:34:33. The nine portfolios, thus created, are: small size and high B/M (SH), small size and medium B/M (SM), small size and low B/M (SL), medium size and high B/M (MH), medium size and medium B/M (MM), medium size and low B/M (ML), big size and high B/M (BH), big size and medium B/M (BM), and big size and low B/M (BL). The portfolios are updated annually.

Model Testing

We use generalized method of moments (GMM) of Hansen (1982) for data analysis and model testing. GMM obviates the need for observing strong distributional assumption of normality and offers a heteroskedasticity and autocorrelation consistent estimation method (Jagannathan, Skoulakis, & Wang, 2002). However, GMM requires that the data series are stationary and ergodic time series with finite fourth moment (Jagannathan, Skoulakis, & Wang, 2002). The descriptive statistics (not reported) show that the fourth moment or kurtosis of the data distribution of all variables is finite and the unit root tests confirm that all variables are stationary at level. To investigate the relevance of local and global markets on portfolio returns, we test null hypotheses that say that the market portfolios have no impact on portfolio returns, or

$$H_{01}: \beta_{iL} = 0, \text{and}$$
$$H_{02}: \beta_{iG} = 0.$$

For model testing, we use LCPAM, ICAPM, and Fama & French three-factor (FF3F) as null models to assess the impact of combining local and global markets on the explanation of stock returns. In addition, we use adjusted coefficient of determination, adjusted R^2, for evaluating the explanatory power of the models.

EMPIRICAL RESULTS

In this section, the results of CAPM models are presented first, followed by those of Fama & French factor models.

CAPM Models

Single Factor Models

LCAPM results (see table 3.A) show that the local market portfolio is significant in all portfolios in all market at 1% significance level. The ranges of the coefficients of local market portfolio in China, India and South Africa are [0.90, 1.01], [0.84, 1.19] and [0.42, 0.96] respectively. The respective explanatory powers of the model have ranges of [0.55, 0.85], [0.40, 0.86] and [0.16, 0.75]. Similarly, the global market portfolio in ICAPM is significant at 1% in all portfolios in all markets. The coefficients of the global market fall in the ranges of [0.59, 0.76] in China, [0.86, 1.38] in India, and [0.42, 0.78] in South Africa. However, the explanatory power of the model is significantly lower in all markets. In China, it is insignificant in comparison to that of LCAPM; the adjusted R^2 ranges from

0.05 to 0.12. Adjusted R^2 in India and South Africa fall in ranges of [0.16, 0.48] and [0.16, 0.48] respectively. For details see table 3.B.

TABLE 3.A. GMM ESTIMATES OF LCAPM

$$r_i = \alpha_i + \beta_{iL}LMK + \epsilon_i,$$

Port-folio	CHINA α	CHINA LMK	CHINA Adj R^2	INDIA α	INDIA LMK	INDIA Adj R^2	SOUTH AFRICA α	SOUTH AFRICA LMK	SOUTH AFRICA Adj R^2
SH	1.56	0.97	0.63	2.68	0.84	0.39	0.64	0.42	0.16
	(2.63)***	(8.23)***		(3.31)***	(9.39)***		(1.48)	(3.42)***	
SM	1.67	0.99	0.55	1.47	0.89	0.43	0.80	0.42	0.17
	(2.24)**	(7.36)***		(2.19)**	(10.70)***		(1.57)	(5.98)***	
SL	1.43	0.95	0.59	1.22	0.83	0.40	-0.32	0.71	0.33
	(2.19)**	(8.01)***		(1.86)*	(10.21)***		(-0.67)	(6.39)***	
MH	0.98	1.01	0.63	0.88	1.19	0.55	0.05	0.57	0.35
	(1.56)	(7.98)***		(1.28)	(10.61)***		(0.12)	(7.81)***	
MM	0.97	0.99	0.64	0.11	1.13	0.60	-0.13	0.66	0.44
	(1.67)*	(8.90)***		(0.18)	(11.69)***		(-0.38)	(9.69)***	
ML	0.90	0.94	0.62	0.12	1.01	0.57	1.30	0.53	0.26
	(1.53)	(8.55)***		(0.19)	(10.40)***		(2.1)**	(4.25)***	
BH	0.09	1.00	0.85	-0.19	1.28	0.78	0.19	0.81	0.64
	(0.24)	(21.58)***		(-0.48)	(10.92)***		(0.75)	(11.55)***	
BM	0.29	1.00	0.79	-0.12	1.14	0.85	0.06	0.96	0.75
	(0.77)	(12.19)***		(-0.50)	(17.92)***		(0.26)	(20.07)***	
BL	0.46	0.90	0.77	-0.34	0.93	0.86	-0.01	0.95	0.68
	(1.19)	(13.36)***		(-1.44)	(13.80)***		(-0.03)	(16.22)***	

TABLE 3.B. GMM ESTIMATES OF ICAPM

$$r_i = \alpha_i + \beta_{iG}GMK + \epsilon_i$$

Port-folio	CHINA α	CHINA GMK	CHINA Adj R^2	INDIA α	INDIA GMK	INDIA Adj R^2	SOUTH AFRICA α	SOUTH AFRICA GMK	SOUTH AFRICA Adj R^2
SH	1.71	0.68	0.08	2.99	0.86	0.16	0.81	0.47	0.19
	(1.46)	(3.71)***		(2.96)***	(4.71)***		(1.89)*	(3.66)***	
SM	1.88	0.61	0.05	1.77	0.95	0.19	1.00	0.42	0.16
	(1.49)	(3.23)***		(1.95)*	(5.68)***		(1.74)*	(6.33)***	
SL	1.61	0.61	0.06	1.50	0.90	0.18	-0.04	0.78	0.39
	(1.34)	(3.29)***		(1.74)*	(5.82)***		(-0.08)	(7.77)***	
MH	1.19	0.62	0.06	1.25	1.33	0.27	0.33	0.56	0.32
	(1.01)	(3.13)***		(1.28)	(6.29)***		(0.78)	(6.26)***	
MM	1.18	0.59	0.06	0.46	1.27	0.30	0.16	0.70	0.48
	(1.01)	(3.06)***		(0.51)	(6.42)***		(0.45)	(9.06)***	
ML	1.07	0.61	0.07	0.40	1.21	0.32	1.55	0.52	0.23
	(0.98)	(3.30)***		(0.48)	(6.29)***		(2.59)***	(4.04)***	
BH	0.28	0.65	0.09	0.23	1.38	0.36	0.70	0.58	0.31
	(0.27)	(4.03)***		(0.30)	(5.75)***		(2.11)**	(7.57)***	
BM	0.42	0.76	0.12	-0.17	7.10	0.37	0.66	0.70	0.38
	(0.41)	(4.44)***		(-0.44)	(6.65)***		(1.81)*	(10.95)***	
BL	0.58	0.67	0.12	-0.08	1.10	0.48	0.59	0.65	0.31
	(0.60)	(4.27)***		(-0.17)	(7.10)***		(1.39)	(8.46)***	

*In parentheses, t-statistics; ***significant at 1%; **significant at 5%; *significant at 10%*

Two-factor CAPM

In two-factor CAPM (see table 4), the global market portfolio experiences significant drop in its coefficients in all markets. In Indian market, the coefficients recede by 93 to 140

basis points and are reduced to maximum of 20 basis points around zero. Similarly, in China, the coefficients slip by 66 to 76 basis points and fall within 15 basis points from zero. As a result, in each of these markets, the global market portfolio ceases to be significant in all but one portfolio. In South Africa, the global market coefficients drop by 17 to 40 basis points in small and medium portfolios and by 64 to 77 basis points in big portfolios. The global market loses significance in all big portfolios.

The coefficients of the local market portfolio in China and India are almost same as those in LCAPM. However, in South Africa, the coefficients decrease by 17 to 40 basis points in small and medium portfolios and increase by 3 to 8 basis points in big portfolios. As a result, the local market portfolio loses its significance in SH and its level of significance changes to 10% and 5% in SM and SL portfolios respectively.

TABLE 4. GMM ESTIMATES OF TWO-FACTOR MODEL

$$r_i = \alpha_i + \beta_{iL}LMK + \beta_{iG}GMK + \epsilon_i$$

		CHINA		
Portfolio	A	LMK	GMK	Adj R^2
SH	1.57	0.98	-0.04	0.62
	(2.61)***	(7.86)***	(-0.40)	
SM	1.73	1.02	-0.14	0.55
	(2.30)**	(7.14)***	(-1.17)	
SL	1.48	0.97	-0.10	0.59
	(2.22)**	(7.63)***	(-0.87)	
MH	1.04	1.04	-0.14	0.63
	(1.62)	(7.69)***	(-1.29)	
MM	1.03	1.02	-0.15	0.64
	(1.76)*	(8.37)***	(-1.37)	
ML	0.94	0.96	-0.09	0.62
	(1.56)	(8.20)***	(-0.80)	
BH	0.13	1.02	-0.10	0.85
	(0.36)	(20.35)***	(-1.76)*	
BM	0.28	0.99	0.03	0.79
	(0.71)	(11.37)***	(0.40)	
BL	0.45	0.90	0.01	0.77
	(1.18)	(12.61)***	(0.14)	
		INDIA		
Portfolio	A	LMK	GMK	Adj R^2
SH	2.70	0.89	-0.10	0.39
	(3.29)***	(6.96)***	(-0.59)	
SM	1.47	0.90	-0.03	0.43
	(2.19)**	(7.19)***	(-0.17)	
SL	1.22	0.83	0.00	0.39
	(1.85)*	(7.15)***	(0.00)	
MH	0.87	1.16	0.08	0.55
	(1.26)	(7.37)***	(0.43)	
MM	0.10	1.10	0.07	0.59
	(0.16)	(8.02)***	(0.46)	
ML	0.10	0.93	0.20	0.58
	(0.15)	(6.95)***	(1.16)	
BH	-0.19	1.29	-0.02	0.77

	(-0.47)	(8.74)***	(-0.14)	
BM	-0.11	1.18	-0.10	0.85
	(-0.45)	(14.65)***	(-1.25)	
BL	-0.36	0.85	0.17	0.87
	(-1.62)	(14.54)***	(2.13)**	

SOUTH AFRICA

Portfolio	A	LMK	GMK	Adj R^2
SH	0.70	0.19	0.33	0.20
	(1.71)*	(1.56)	(2.28)**	
SM	0.85	0.25	0.23	0.18
	(1.67)*	(1.78)*	(1.77)*	
SL	-0.22	0.31	0.55	0.42
	(-0.51)	(2.46)**	(4.11)***	
MH	0.10	0.37	0.28	0.38
	(0.26)	(4.90)***	(2.85)***	
MM	-0.05	0.35	0.44	0.53
	(-0.17)	(4.80***	(5.72)***	
ML	1.34	0.35	0.25	0.28
	(2.25)**	(3.05)***	(2.38)**	
BH	0.18	0.85	-0.06	0.64
	(0.71)	(8.58)***	(-0.62)	
BM	0.06	0.99	-0.04	0.75
	(0.23)	(13.53)***	(-0.69)	
BL	-0.03	1.03	-0.12	0.69
	(-0.09)	(11.74)***	(-1.44)	

*Notes: In parentheses, t-statistics; ***significant at 1%; **significant at 5%; *significant at 10%*

Fama & French Models

Three-Factor Model

The local market portfolio is significant in all portfolios in all markets at 1% significance level. The ranges of its coefficients are [0.96, 1.02], [0.80, 1.13], and [0.64, 0.97] in China, India, and South Africa respectively. The explanatory power of three-factor is better than that of CAPM models in small and medium portfolios. The explanatory power of three-factor model has ranges of [0.82, 0.92], [0.84, 0.91], and [0.29, 0.78] in China, India, and South Africa respectively. For detailed results, see table 5.

TABLE 5. GMM ESTIMATES OF FAMA & FRENCH THREE-FACTOR MODEL

$$r_i = \alpha_i + \beta_{iL}LMK + \beta_{iS}SMB + \beta_{iH}HML + \epsilon_i,$$

Portfolio	α	LMK	SMB	HML	Adj R^2
		CHINA			
SH	0.34	0.98	1.29	-0.04	0.88
	(0.98)	(15.96)***	(12.55)***	(-0.27)	
SM	0.17	1.02	1.63	-0.18	0.89
	(0.58)	(20.08)***	(13.01)***	(-1.53)	
SL	0.14	1.00	1.47	-0.42	0.92
	(0.40)	(20.23)***	(14.36)***	(-3.52)***	
MH	-0.33	0.99	1.31	0.26	0.88
	(-1.19)	(15.30)***	(11.99)***	(1.85)*	
MM	-0.16	1.01	1.23	-0.18	0.86
	(-0.54)	(17.72)***	(11.18)***	(-1.21)	
ML	-0.09	1.00	1.20	-0.63	0.87
	(-0.30)	(15.52)***	(11.60)***	(-4.50)***	
BH	-0.31	0.96	0.29	0.50	0.89
	(-1.11)	(23.38)***	(3.61)***	(4.41)***	
BM	-0.05	1.02	0.41	-0.19	0.82
	(-0.15)	(13.49)***	(3.12)***	(-1.14)	
BL	0.36	0.98	0.32	-0.84	0.85
	(1.24)	(19.34)***	(3.40)***	(-7.19)***	
		INDIA			
SH	0.97	0.80	0.96	0.80	0.88
	(2.92)***	(13.70)***	(14.52)***	(8.77)***	
SM	-0.17	0.96	1.12	0.37	0.91
	(-0.67	(22.12)***	(20.71)***	(4.09)***	
SL	-0.22	0.95	1.11	0.11	0.87
	(-0.79)	(18.74)***	(14.91)***	(0.89)	
MH	-0.75	1.13	0.87	0.83	0.85
	(-1.70)*	(15.48)***	(9.21)***	(6.73)***	
MM	-1.32	1.13	0.87	0.54	0.89
	(-4.04)***	(18.55)***	(15.01)***	(4.35)***	
ML	-1.07	1.06	0.81	0.30	0.84
	(-2.61)***	(13.79)***	(11.58)***	(2.82)***	
BH	-0.84	1.10	0.06	0.86	0.89
	(-2.88)***	(16.64)***	(1.29)	(7.82)***	
BM	-0.32	1.07	0.003	0.29	0.87
	(-1.19)	(17.88)***	(0.02)	(2.44)**	
BL	-0.49	0.96	0.15	-0.05	0.87
	(-2.02)**	(13.42)***	(4.42)***	(-0.68)	
		SOUTH AFRICA			
SH	0.33	0.64	0.46	0.22	0.29
	(0.98)	(5.56)***	(5.01)***	(1.87)*	
SM	0.36	0.73	0.67	0.29	0.45
	(1.04)	(7.56)***	(4.86)***	(2.23)**	
SL	-0.70	0.97	0.75	-0.14	0.52
	(-2.01)**	(10.79)***	(6.88)***	(-1.19)	
MH	-0.31	0.83	0.59	0.16	0.57
	(-1.25)	(10.56)***	(6.75)***	(1.48)	
MM	-0.39	0.84	0.53	-0.15	0.58
	(-1.65)*	(13.97)***	(6.74)***	(-1.70)*	

ML	1.04	0.72	0.60	-0.28	0.42
	(2.30)**	(6.83)***	(8.22)***	(-2.39)**	
BH	0.17	0.83	-0.16	0.44	0.71
	(0.71)	(12.62)***	(-2.36)**	(5.78)***	
BM	0.18	0.88	-0.27	0.15	0.78
	(0.85)	(16.86)***	(-4.26)***	(2.36)***	
BL	0.20	0.81	-0.21	-0.35	0.75
	(0.70)	(12.99)***	(-2.37)**	(-3.78)***	

*In parentheses, t-statistics; ***significant at 1%; **significant at 5%; *significant at 10%*

Four-Factor Model

In four-factor model, the global market portfolio behaves differently in the markets under study. In China, it is not significant in any portfolio and its coefficient fall within 9 basis points from zero. In India, the global market portfolio with coefficients in the range of -0.06 and 0.26 is significant in four portfolios (three medium and BL), and in South Africa, its coefficients range from -0.12 to 0.30 and are significant in three portfolios (SL, MM, BM).

The coefficients of the local market portfolio are same as those in FF3F in China. However, in India, it is 7 to 12 basis points lower in the portfolios that have significant global market portfolio. The coefficients of the local market portfolio in South Africa are up to 24 basis points lower. For details refer to table 6.

TABLE 6. GMM ESTIMATES FAMA & FRENCH FOUR-FACTOR MODEL

$$r_i = \alpha_i + \beta_{iL}LMK + \beta_{iG}GMK + \beta_{iS}SMB + \beta_{iH}HML + \epsilon_i,$$

Portfolio	α	LMK	GMK	SMB	HML	Adj R^2
			CHINA			
SH	0.32	0.97	0.04	1.29	-0.03	0.88
	(0.90)	(14.79)***	(0.74)	(12.45)***	(-0.20)	
SM	0.19	1.03	-0.05	1.63	-0.18	0.89
	(0.65)	(17.81)***	(-0.73)	(12.85)***	(-1.57)	
SL	0.16	1.01	-0.03	1.46	-0.42	0.92
	(0.44)	(17.11)***	(-0.58)	(14.14)***	(-3.36)***	
MH	-0.31	1.00	-0.04	1.31	0.26	0.88
	(-1.07)	(13.75)***	(-0.48)	(11.80)***	(1.80)*	
MM	-0.11	1.03	-0.09	1.23	-0.20	0.86
	(-0.37)	(14.77)***	(-1.10)	(10.93)***	(-1.31)	
ML	-0.06	1.02	-0.06	1.20	-0.64	0.87
	(-0.18)	(13.87)***	(-0.83)	(11.51)***	(-4.43)***	
BH	-0.29	0.97	-0.05	0.29	0.50	0.89
	(-1.01)	(20.57)***	(-0.83)	(3.55)***	(4.12)***	
BM	-0.08	1.01	0.05	0.41	-0.18	0.82
	(-0.22)	(12.22)***	(0.58)	(3.12)***	(-1.07)	
BL	0.38	0.99	-0.03	0.32	-0.84	0.85
	(1.29)	(16.80)***	(-0.45)	(3.36)***	(-7.17)***	
			INDIA			
SH	0.96	0.79	0.03	0.96	0.80	0.87
	(2.89)***	(13.53)***	(0.33)	(14.44)***	(8.87)***	
SM	-0.18	0.94	0.05	1.12	0.38	0.91
	(-0.69)	(16.68)***	(0.64)	(20.61)***	(4.13)***	

SL	-0.23	0.94	0.04	1.11	0.11	0.86
	(-0.81)	(14.24)***	(0.48)	(14.81)***	(0.91)	
MH	-0.79	1.03	0.21	0.87	0.85	0.86
	(-1.84)*	(10.92)***	(2.06)**	(9.14)***	(6.71)***	
MM	-1.35	1.06	0.17	0.87	0.56	0.89
	(-4.25)***	(15.17)***	(2.13)**	(14.99)***	(4.51)***	
ML	-1.13	0.94	0.26	0.81	0.32	0.84
	(-2.82)***	(10.32)***	(2.21)**	(11.50)***	(3.01)***	
BH	-0.86	1.05	0.11	0.06	0.87	0.89
	(-2.96)***	(14.09)***	(1.04)	(1.26)	(7.94)***	
BM	-0.31	1.10	-0.06	0.001	0.28	0.87
	(-1.15)	(15.85)***	(-0.78)	(0.03)	(2.43)**	
BL	-0.53	0.88	0.17	0.15	-0.03	0.88
	(-2.16)**	(13.64)***	(2.28)**	(4.45)***	(-0.45)	
			SOUTH AFRICA			
SH	0.40	0.44	0.24	0.38	0.29	0.30
	(1.21)	(2.69)***	(1.32)	(2.67)***	(2.39)**	
SM	0.38	0.69	0.04	0.65	0.30	0.45
	(1.08)	(3.62)***	(0.31)	(3.90)***	(2.44)**	
SL	-0.61	0.73	0.30	0.64	-0.05	0.54
	(-1.76)*	(5.47)***	(2.21)**	(5.28)***	(-0.44)	
MH	-0.28	0.74	0.11	0.55	0.19	0.57
	(-1.10)	(7.80)***	(1.20)	(5.53)***	(1.67)*	
MM	-0.30	0.62	0.27	0.43	-0.07	0.60
	(-1.20)	(5.49)***	(2.69)***	(4.08)***	(-0.69)	
ML	1.03	0.74	-0.03	0.61	-0.29	0.42
	(2.30)**	(5.58)***	(-0.21)	(6.61)***	(-2.56)**	
BH	0.20	0.75	0.10	-0.19	0.47	0.71
	(0.82)	(7.48)***	(1.09)	(-2.41)**	(5.47)***	
BM	0.21	0.79	0.11	-0.32	0.18	0.78
	(0.99)	(9.42)***	(1.73)*	(-4.70)***	(2.93)***	
BL	0.16	0.91	-0.12	-0.17	-0.39	0.75
	(0.59)	(10.69)***	(-1.39)	(-1.85)*	(-4.07)***	

*In parentheses, t-statistics; ***significant at 1%; **significant at 5%; *significant at 10%*

In sum, the local market portfolio in China has the ability to capture risks that are systematic in the global market. However, in India and South Africa, although the local market portfolio is dominant, it does not capture the global market risk fully. Hence, combining both markets in the asset pricing models is warranted to insure against the loss of valuable information.

CONCLUSIONS

This study extends Koedijk et al. (2002) and Fama & French (1993) three-factor models by combining local and global markets to propose two- and four-factor models. The test results the models show that the local market plays dominant role in all the three markets studied. The finding is consistent with the findings of the previous studies (Bekaert & Harvey, 1995; Harvey, 1995; Carrieri, Errunza, & Majerbi, 2006). Furthermore, the findings of this study indicate presence of global elements in the stock return. However,

the behavior of the models in capturing these elements is different in each market. Chinese market behaves like a segmented market, wherein the local market portfolio fully captures the return-relevant information that is systematic in the global market. On the other hand, Indian and South African markets behave like partially integrated markets, wherein global market portfolio needs to be combined with the local market portfolio in order to ensure capture of all relevant information. The inconsistencies in the behaviors of the models across the markets in this study mirrors the behavior expected of the emerging markets as they are partially integrated with one another (Fama & French, 1998) and are at different stages in their economic lifecycles (Barry, Peavy, & Rodriguez, 1998; Pereiro, 2010). Hence, we conclude that combining local and global markets in asset pricing models is expected to provide better explanation of the stock returns in emerging markets.

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