

ON COUNTRY-FUND PRICE BEHAVIOR – AN EMPIRICAL ANALYSIS OF COINTEGRATING FACTORS

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ABSTRACT

This paper provides empirical evidence on the price behavior of closed-end country funds. Using the data from 47 closed-end single-country funds, we examine three cointegrating factors to describe the long-run behavior of country-fund share prices. They are: the net asset value (NAV), foreign stock-market indexes, and the U.S. stock market index. In the long run, country-fund prices are more highly cointegrated with the NAV and foreign stock indexes, but less cointegrated with the U.S. stock index, indicating that potential long-term international diversification benefits through investing in country-funds, especially in emerging-country funds. However, in the short run, country-fund returns are highly sensitive to all three variables. U.S. market returns have a more significant role in explaining the country-fund return movement in the short run than it does in the long run. The evidence also shows that the error-correcting representation based on information derived from all three variables provides a most appropriate model for predicting the subsequent changes of the country-fund prices.

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I. INTRODUCTION

A growing interest in international diversification by U.S. investors has led to the creation of numerous closed-end country funds.¹ Closed-end country funds have expanded rapidly in recent years.² One of the reasons for their rapid growth is that they provide U.S. investors with an investment instrument to hold a particular foreign country's stocks and, at the same time, to achieve international diversification without incurring large costs.

In an integrated and high-technology financial environment, rational behavior suggests that investors would continually assess the country-fund price in comparison with its corresponding net asset value (NAV), which is the aggregate value of a particular country's stocks evaluated in local currencies and then translated into U.S. dollar prices. As such, should significant disparities exist between fund price and NAV, a cross-border arbitrage would lead to a new equilibrium and re-establish a parity relationship between the country-fund price and the NAV. Therefore, the closed-end country-fund price is expected to move closely with the NAV. Since country funds are listed and traded on U.S. stock markets, fund prices would also be affected by U.S. market factors. Therefore, country-fund prices are influenced by the NAV as well as by foreign (local) market and U.S. market fundamentals.

It is perceivable that these assets prices are correlated to some extent. This is due to the fact that asset prices tend to react sensitively to common shocks or interact with each other in an integrated and well-informed global capital market. Nevertheless, there are at least two reasons why we need to identify which factor is more significantly cointegrated with country-fund prices. First, for U.S. investors who want to gain from international diversification through investing in country funds, it is very important to understand the degree of country-fund prices correlated with NAVs, foreign stock indexes, and the U.S. stock index. If country-fund prices move more closely with NAVs or foreign stock indexes, U.S. investors are more likely to achieve international diversification benefits by investing in country funds. However, if country funds act more like U.S. stocks, international diversification benefits via investment in country funds would be limited.

Second, the error-correction theorem tells us that identifying an appropriate cointegrated variable is important since it will help us to construct an error-correcting term, which will possess significant information content to predict country-fund price movements in the subsequent period.

Although a number of studies have shown that country-fund prices are sensitive to the NAV, the U.S. stock index, or foreign stock indexes,³ these studies focus on either the short-term (country-fund return generating function) or the long-term (cointegration) relationship of country-fund prices with NAVs, foreign stock

indexes, and the U.S. stock index, respectively. Further, these research results show that movements of country-fund prices in response to the NAV, U.S. stock index, and foreign stock indexes, respectively, are somehow different in the long run versus the short run. This study incorporates both short-run and long-run information into an integrated framework in an error-correction model (ECM) proposed by Engle and Granger (1987). Thus, the ECM representation of country funds provides more insight into the nature of country-fund price behavior for assisting prediction and investment decisions in both the long run and the short run.

The paper is organized as follows. Section II specifies three different long-run cointegrating relationships of the country-fund price with the following economic variables: (i) NAV; (ii) foreign stock index; and (iii) the U.S. stock index. Section III describes the data and provides the estimates of long-run equilibrium relationships and the results of unit-root and cointegration tests. Section IV presents and discusses the estimation results of the integrated ECM, which incorporates all relevant information for explaining country-fund return behavior. The impact of the 1997 Asian crisis in the context of country funds is also reported. Section V contains concluding remarks.

II. COINTEGRATING HYPOTHESES

To model country-fund price behavior in the U.S. market, it is convenient for us to specify a long-run relationship between the prices of country fund “ i ” and its cointegrated economic variables. The candidate variables to be used in a long-term cointegration relation with the country-fund price are the net asset value (NAV) for country fund i , the foreign stock market index corresponding to country fund i , and the U.S. stock market index. The rationale for each specification is discussed briefly below.

International Arbitrage Hypothesis

In an efficient international capital market, investors will assess the country-fund price with its corresponding NAV, which is the aggregate value of the constituency stocks evaluated at local market prices and translated into U.S. dollars. If the market is efficient, frictionless, and highly integrated, the country-fund price should be equal to its NAV. Any disparities between the fund price and its NAV would be eliminated through a cross-border arbitrage.

However, it is recognized that a truly frictionless market does not exist (Rozeff, 1991), and the existence of market segmentation, transaction costs, investor

preferences, or risk factors can cause closed-end fund premiums or discounts. Also, Bodurtha, Kim and Lee (1995) point out that closed-end fund arbitrage strategies are neither costless nor riskless due to market frictions and inefficiencies.⁴ It is anticipated that the short-run dynamic adjustments are continually going on even though the growing integration and improving efficiency in international tend to force a country-fund price in the U.S. market into alignment with its underlying assets in the foreign stock market. In the long run, a closed-end country-fund price and its NAV will be linked by an equilibrium relationship. Expressing this notion in a cointegrating equation, we write:

$$P_{i,t} = \alpha_1 + \beta_1 P_{i,t}^* + u_{1,t}, \quad (1)$$

where α_1 and β_1 are estimated parameters; $P_{i,t}$ is the natural log price of country fund i at time t ; $P_{i,t}^*$ is the natural log NAV (expressed in U.S. dollars) of country fund i at time t ; and $u_{1,t}$ is a random error term. A parity relationship between $P_{i,t}$ and $P_{i,t}^*$ implies the restriction that $(\alpha_1 \text{ and } \beta_1)' = (0 \text{ and } 1)'$ and that the error term follows a random process. In practice, this parity relation is rarely achieved due to the presence of transaction costs, non-instantaneous adjustments, or market frictions. As a result, the error term in the short run may capture some information about price spreads, which are bound to be corrected in order to help restore the long-run equilibrium if these two prices $\{P_{i,t}\}$ and $\{P_{i,t}^*\}$ are cointegrated.

Formally, let us consider the price series $\{P_{i,t}\}$ and $\{P_{i,t}^*\}$. Each is first-differenced stationary, that is, integrated of order 1, $I(1)$. It is generally true that any linear combination of these two prices is also $I(1)$. However, if there is a linear combination of these two prices such that the $\{u_{1,t}\}$ is level stationary, $I(0)$, then $\{P_{i,t}\}$ and $\{P_{i,t}^*\}$ are considered to be cointegrated of order (1,1).

Note that even though the restriction $(\alpha_1 \text{ and } \beta_1)' = (0 \text{ and } 1)'$ is rejected, the error term $u_{1,t} = P_{i,t} - (\alpha_1 + \beta_1 P_{i,t}^*)$ may still have informational content for projecting the subsequent changes of country-fund prices. Apparently this notion is consistent with some sort of market frictions. The error-correction model (ECM) under this perspective can be expressed as:

$$\Delta P_{i,t} = C_1 + \sum_{j=1}^m \phi_{1,j} \Delta P_{i,t-j} + \sum_{j=0}^n \pi_{1,j} \Delta P_{i,t-j}^* - \psi_1 u_{1,t-1} + \varepsilon_{1,t}, \quad (2)$$

where C_1 , ϕ_1 , π_1 , and ψ_1 are estimated parameters and $\varepsilon_{1,t}$ is an error term. The sign on the error-correcting term should be negative, indicating that if the fund price is higher (lower) than the corresponding NAV, the future country-fund price is expected to fall (rise) to restore a long-run equilibrium relationship.⁵ The ECM theorem suggests that if there is a cointegration between country-fund prices and corresponding NAVs, country-fund prices and NAVs share a common factor

in the long run, indicating that country-fund prices would not deviate too far from their underlying asset values. This suggests that U.S. investors could achieve international diversification benefits in the long run through investing in country funds and that the error-correcting term from the equilibrium relationship can be used to predict the subsequent movements of country-fund prices.

International Diversification Hypothesis

Since country funds involve investment activities where U.S. investors trade securities on “Wall Street” while foreign investors trade in their local markets, this provides an additional instrument to allow investors to allocate their funds in international stock markets. In particular, a country fund can be viewed as a cost-effective investment vehicle for achieving international diversification. As such, it is expected a priori that closed-end fund prices have some degree of sensitivity to foreign market conditions. Studies by Bailey and Lim (1992), Diwan, Errunza and Senbet (1993), Chang, Eun and Kolodny (1995), Ben-Zion, Choi and Hauser (1996), Bekaert and Urias (1996, 1999), Errunza, Senbet and Hogan (1998), Errunza, Hogan and Hung (1999), and Richard and Wiggins (2000) document that potential diversification benefits for U.S. investors can be achieved through investing in country funds. Following this line of argument, it is expected that closed-end country-fund prices vary closely with foreign market indexes. Thus, it can be hypothesized that closed-end country-fund prices are linked with foreign markets in a long-run equilibrium relationship. A cointegrating equation between the closed-end country-fund price and the foreign stock market index can be expressed as:

$$P_{i,t} = \alpha_2 + \beta_2 P_{m,t}^* + u_{2,t}, \quad (3)$$

where α_2 and β_2 are estimated parameters and $P_{m,t}^*$ is a natural-log foreign (local) stock-market index corresponding to country fund i at time t . The corresponding representation of short-run dynamics is given by:

$$\Delta P_{i,t} = C_2 + \sum_{j=1}^m \phi_{2,j} \Delta P_{i,t-j} + \sum_{j=0}^n \pi_{2,j} \Delta P_{m,t-j}^* - \psi_2 u_{2,t-1} + \varepsilon_{2,t}, \quad (4)$$

where C_2 , ϕ_2 , π_2 , and ψ_2 are estimated parameters and $\varepsilon_{2,t}$ is an error term. The short-run dynamics in Eq. (4) may be termed an international diversification ECM specification since country-fund prices are assumed to reflect the corresponding foreign country’s stock index. The cointegration between country-fund prices and corresponding foreign stock indexes would indicate U.S. investors are more likely to achieve international diversification benefits in the long run through investing

in country funds. In addition, the error-correcting term from the equilibrium relationship can be used to predict the subsequent movements of country-fund prices.

The U.S. Market Sentiment Hypothesis

Since country funds are listed and traded on U.S. stock exchanges, their pricing is likely to be related to U.S. market developments. Bailey and Lim (1992) observe that country funds behave more closely to U.S. stocks than to foreign stock portfolios. Also, the evidence provided by Hardouvelis, LaPorta and Wizman (1994), Bodurtha, Kim and Lee (1995), and Arak and Taylor (1996) suggests that fund prices are overly sensitive to movements in U.S. stock prices.⁶ Therefore, a cointegrating equation between the closed-end country-fund price and the U.S. stock-market index can be written as:

$$P_{i,t} = \alpha_3 + \beta_3 P_{m,t} + u_{3,t}, \quad (5)$$

where α_3 and β_3 are estimated parameters and $P_{m,t}$ is the natural-log U.S. stock-market index. The corresponding error-correction specification is given by:

$$\Delta P_{i,t} = C_3 + \sum_{j=1}^m \phi_{3,j} \Delta P_{i,t-j} + \sum_{j=0}^n \pi_{3,j} \Delta P_{m,t-j} - \psi_3 u_{3,t-1} + \varepsilon_{3,t}, \quad (6)$$

where C_3 , ϕ_3 , π_3 , and ψ_3 are estimated parameters and $\varepsilon_{3,t}$ is an error term. Equation (6) may be called the U.S. market-sentiment ECM since the changes of country-fund prices are assumed to be correlated with the U.S. stock-market index. The cointegration between country-fund prices and the U.S. stock index might result from the fact that two variables share a common factor in the long run. Under this perspective, the benefits of international diversification through investing in country funds would be limited for U.S. investors. Yet if country-fund returns are highly sensitive to U.S. stock index returns, U.S. market sentiment may play a significant role in explaining the short-term movements of fund prices.

III. DATA AND TIME-SERIES PROPERTIES

Data

The sample consists of 47 country funds that were offered prior to December 1994 and were publicly traded on either the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX) as of the end of November 1997. The sample time frame covers the period from January 2, 1987, through November 27, 1998.

Appendix 1 presents the list of 47 funds in the sample, along with their ticker symbols, trading stock exchanges, IPO dates, and sample starting dates. Only one sample fund – First Australia Fund – is traded on the AMEX; all others are traded on the NYSE. Some 68% of sample funds were initiated after 1990, which indicates the recent proliferation of country funds and the pace of their growth. These 47 closed-end single-country funds can be classified into 31 emerging-market and 16 developed-market country funds.⁷

For each fund, we obtain from *Lipper Analytical Services* weekly fund prices and net asset values (NAVs) adjusted for splits, rights offerings, and in-kind distributions. For most funds, the NAVs are computed in local currency as of Friday's close in the foreign country's major stock exchange and are converted into U.S. dollars using the contemporaneously observed exchange rates. Typically, both fund prices and NAVs are reported in U.S. dollars as of Friday's close.⁸ Since on a given day, a foreign country's stock markets close prior to the close of markets in New York, reported fund prices and NAVs are only approximately synchronous even though they correspond to the same calendar day's trading sessions.

The weekly foreign stock-market indexes are obtained from *Datastream* and foreign exchange rates are obtained from the *Federal Reserve Bank of Chicago* and *Datastream*.⁹ The foreign-exchange rates from the *Federal Reserve Bank* are noon buying rates in New York and those from *Datastream* are rates available at close of business in the country of origin. The exchange rates are defined as foreign currencies per U.S. dollar, with the exception of the British pound which is stated in terms of pounds per dollar. The last column of Appendix 1 lists the specific foreign-market indexes used in this study. We also collect from *Datastream* weekly Standard and Poor's 500 index data as a proxy for the U.S. stock market.

Basic Statistics

To obtain a general picture of the time-series properties of country-fund returns and their relation to NAVs and stock-index returns, we examine some basic statistics (not reported) of the time series under investigation. These results may be summarized here briefly. In general, average returns are positive for European funds and negative for Japanese and other funds. The display of the negative numbers for Japanese and most emerging-market funds results mainly from the Asian crisis that occurred during the period from mid-1997 through most of 1998. Statistics from the second moments show that country-fund returns for emerging markets appear to be more volatile than those for developed markets. Viewed from a mean-variance perspective, it is apparent that, for the period under investigation, investors would have been much better off placing their funds in advanced markets.

With respect to cross correlations, the statistics show that country-fund returns are more highly correlated with NAV returns and foreign stock-market returns than with U.S. stock-market returns. The correlations of fund returns with NAV returns are similar to those with foreign stock-market returns, indicating that there is a potential international diversification benefit for U.S. investors from investing in country funds.¹⁰ As far as autocorrelation is concerned, country-fund returns in general show negative first-order and positive second-order correlations, deviating from the standard random-walk hypothesis.

Long-Run Equilibrium Relation

To conduct the estimation of the long-run equilibrium relation represented by Eqs (1), (3), and (5), respectively, the data are grouped into Latin American, Asian-Pacific, and European funds. This classification allows us to differentiate the behavior displayed in the different regions. The results reported in Table 1 show that the R -squares are quite high in most of the estimated equations. This is not surprising since the stock prices in general follow a common trend and appear to correlate with each other. With respect to the estimated coefficients, the slopes of the test equations are highly significant. In particular, the estimated β_1 values consistently display a positive value, with most of them fluctuating around unity. This indicates that the country-fund prices in the long run correspond closely with their NAVs. Additionally, since in most cases the values of α_1 are negative and those of β_1 are less than unity, country funds are on average traded at discounts.

Next, the estimated coefficients for β_2 in general are positive and statistically significant, meaning that these country-fund prices are correlated with their own country stock indexes. The exceptions are found in cases of the Chinese-related funds, which display negative signs but where most of the coefficients are statistically insignificant. Finally, looking at the coefficients of the U.S. stock index, all the emerging markets, including Latin America and Asia-Pacific, bear a negative sign for β_3 . This unusual performance is attributable mainly to the Asian crisis that began in mid-1997. During this period of time, the country-fund prices for emerging countries dropped dramatically, while the U.S. stock index was rising continually. Further, the estimated values for β_1 are closer to unity than those of β_2 and β_3 , suggesting that fund prices and NAVs move more closely in the long run.¹¹

Unit-Root and Cointegration Tests

A general procedure to estimate an error-correction model proposed by Engle and Granger (1987) is that all the time-series variables in the cointegrating equation are

Table 1. Regression Estimates of Long-Term Equilibrium Equations.

Fund	Specification 1 [NAV]				Specification 2 [Foreign Stock Index]				Specification 3 [US Stock Index]			
	α_1	β_1	R^2	F_1	α_2	β_2	R^2	F_2	α_3	β_3	R^2	F_3
A. Emerging-Country Funds												
<i>Latin American Funds</i>												
Argentina	-0.221**** (28.80)	0.619*** (17.57)	0.46	1051.32** (0.00)	-0.181*** (36.16)	0.705*** (27.26)	0.67	931.45*** (0.00)	-0.111*** (8.47)	-0.067*** (2.77)	0.02	3331.54*** (0.00)
Brazil	0.261*** (45.58)	0.827*** (62.58)	0.89	1118.19*** (0.00)	-0.175*** (11.59)	0.378*** (36.29)	0.74	6762.71*** (0.00)	0.001 (0.04)	0.556*** (13.88)	0.30	160.97*** (0.00)
Brazilian Equity	-0.228*** (31.68)	1.003*** (47.80)	0.87	511.02*** (0.00)	-0.225*** (8.59)	0.088** (2.50)	0.02	939.99*** (0.00)	-0.004 (0.12)	-0.446*** (8.27)	0.17	879.20*** (0.00)
Chile	-0.229*** (19.73)	0.921*** (86.59)	0.94	2162.73*** (0.00)	-0.304*** (18.65)	0.767*** (65.78)	0.90	5174.10*** (0.00)	0.468*** (18.39)	0.538*** (11.78)	0.23	183.56*** (0.00)
Mexico	-0.013 (0.91)	1.038*** (101.12)	0.95	33.41*** (0.00)	0.007 (0.37)	0.727*** (78.04)	0.91	3490.81*** (0.00)	0.992*** (27.12)	0.575*** (11.98)	0.20	709.84*** (0.00)
Emerging Mexico	0.031*** (4.31)	1.012*** (62.21)	0.90	14.31*** (0.00)	-0.433*** (10.21)	0.811*** (17.11)	0.41	728.94*** (0.00)	0.648*** (20.15)	-0.675*** (14.68)	0.34	900.26*** (0.00)
Mexico Equity & Income	-0.178*** (18.02)	1.074*** (42.59)	0.81	296.92*** (0.00)	-0.407*** (15.80)	0.659*** (23.02)	0.55	2511.65*** (0.00)	0.321*** (13.16)	-0.334*** (8.91)	0.16	1072.52*** (0.00)
<i>Asian-Pacific Funds</i>												
China	-0.062*** (7.74)	0.977*** (24.48)	0.64	34.26*** (0.00)	-0.075*** (3.08)	-0.113*** (3.30)	0.03	1656.46*** (0.00)	0.134*** (7.73)	-0.356*** (10.57)	0.25	1459.19*** (0.00)
Greater China	-0.090*** (12.67)	1.011*** (45.62)	0.86	99.39*** (0.00)	0.060** (2.41)	-0.009 (0.11)	0.00	256.50*** (0.00)	0.196*** (7.98)	-0.342*** (7.14)	0.13	610.91*** (0.00)
JF China Region	-0.142*** (22.48)	1.220*** (50.27)	0.88	289.47*** (0.00)	-0.159** (5.88)	-0.099 (1.23)	0.00	111.05*** (0.00)	0.140*** (6.69)	-0.701*** (17.17)	0.47	163.36*** (0.00)
TM China World	-0.181*** (24.56)	1.135*** (41.18)	0.86	443.45*** (0.00)	-0.421*** (16.32)	-0.289*** (5.76)	0.11	341.68*** (0.00)	-0.068*** (3.34)	-0.642*** (15.44)	0.47	2141.28*** (0.00)
TM Dragon	-0.206*** (51.33)	0.948*** (54.26)	0.93	1408.99*** (0.00)	-0.171*** (9.32)	0.057 (0.83)	0.00	324.85*** (0.00)	-0.043 (1.59)	-0.260*** (5.28)	0.11	1299.69*** (0.00)
India	-0.203*** (16.70)	0.929*** (29.90)	0.78	346.42*** (0.00)	-0.213*** (23.20)	1.069*** (39.58)	0.86	901.26*** (0.00)	-0.258*** (19.64)	-0.627*** (23.87)	0.70	7982.24*** (0.00)
India Growth	-0.010 (0.87)	1.046*** (33.74)	0.68	1.23 (0.29)	-0.093*** (4.01)	0.595*** (18.78)	0.40	721.89*** (0.00)	0.414*** (17.36)	-0.182*** (5.69)	0.06	1049.75*** (0.00)

Table 1. (Continued)

Fund	Specification 1 [NAV]				Specification 2 [Foreign Stock Index]				Specification 3 [US Stock Index]			
	α_1	β_1	R^2	F_1	α_2	β_2	R^2	F_2	α_3	β_3	R^2	F_3
JF India	-0.102*** (9.24)	1.119*** (44.27)	0.89	239.48*** (0.00)	-0.126*** (11.96)	1.479*** (44.42)	0.89	773.23*** (0.00)	-0.141*** (8.62)	-0.876*** (26.85)	0.75	5503.69*** (0.00)
MS India Investment	-0.117*** (8.55)	0.987*** (24.25)	0.70	103.67*** (0.00)	-0.109*** (10.97)	1.028*** (35.06)	0.83	194.46*** (0.00)	-0.184*** (11.20)	-0.523*** (15.94)	0.51	4029.23*** (0.00)
Indonesia	-0.140*** (17.29)	0.697*** (60.10)	0.89	343.58*** (0.00)	-0.139*** (13.74)	0.578*** (47.77)	0.83	749.72*** (9.24)	-0.193*** (9.24)	-0.638*** (18.06)	0.42	3750.66*** (0.00)
Jakarta Growth	-0.169*** (23.28)	0.747*** (69.13)	0.91	327.01*** (0.00)	-0.045*** (4.61)	0.641*** (60.49)	0.89	1193.72*** (0.00)	-0.220*** (8.94)	-0.605*** (14.70)	0.33	2867.35*** (0.00)
Korea	-0.025* (1.73)	0.995*** (35.01)	0.66	4.10*** (0.02)	-0.286*** (11.20)	0.685*** (27.79)	0.56	1500.93*** (0.00)	0.673*** (30.03)	-0.563*** (17.62)	0.33	1318.34*** (0.00)
Korea Equity	-0.114*** (12.61)	0.899*** (73.43)	0.95	79.82*** (0.00)	-0.361*** (33.84)	0.811*** (47.80)	0.90	578.42*** (0.00)	-0.045** (2.16)	-1.403*** (33.14)	0.81	4197.60*** (0.00)
Korean Investment	-0.009 (1.51)	0.909*** (75.27)	0.94	28.92*** (0.00)	-0.135*** (17.63)	0.854*** (55.14)	0.90	190.50*** (0.00)	0.260*** (12.60)	-1.095*** (27.11)	0.68	2160.86*** (0.00)
FA Korea	-0.141*** (16.98)	0.904*** (71.60)	0.96	171.62*** (0.00)	-0.157*** (15.98)	0.659*** (59.42)	0.94	516.22*** (0.00)	0.013 (0.46)	-1.247*** (24.28)	0.74	3669.51*** (0.00)
Malaysia	-0.031*** (4.51)	0.802*** (64.68)	0.87	184.66*** (0.00)	-0.235*** (21.98)	0.855*** (50.74)	0.81	721.28*** (0.00)	0.092*** (3.31)	0.068 (1.54)	0.00	405.64*** (0.00)
Pakistan Investment	-0.192*** (15.99)	1.036*** (71.82)	0.95	534.78*** (0.00)	-0.350*** (34.99)	1.254*** (73.98)	0.96	2674.28*** (0.00)	-0.414*** (16.11)	-1.324*** (25.22)	0.71	4065.03*** (0.00)
First Philippines	-0.457*** (77.66)	0.936*** (77.65)	0.93	4683.73*** (0.00)	-0.235*** (33.00)	0.751*** (51.37)	0.85	741.35*** (0.00)	-0.183*** (6.55)	-0.051 (1.04)	0.00	836.92*** (0.00)
Taiwan	-0.424*** (16.15)	0.650*** (17.69)	0.34	2341.08*** (0.00)	0.022 (0.45)	-0.008 (0.30)	0.00	11336.3*** (0.00)	0.239*** (17.25)	-0.468*** (21.80)	0.44	3832.04*** (0.00)
ROC Taiwan	-0.294*** (32.01)	0.817*** (31.57)	0.67	1040.85*** (0.00)	-0.310*** (24.23)	0.467*** (20.37)	0.46	307.07*** (31.53)	-0.454*** (6.73)	-0.160*** (6.73)	0.08	7597.02*** (0.00)
Taiwan Equity	-0.239*** (34.24)	0.532*** (17.03)	0.56	586.25*** (0.00)	-0.254*** (38.04)	0.625*** (17.03)	0.56	726.52*** (0.00)	-0.277*** (15.85)	-0.032 (1.01)	0.00	3581.85*** (0.00)
Thai	-0.279*** (47.24)	0.653*** (78.08)	0.92	4385.39*** (0.00)	-0.471*** (51.73)	0.670*** (64.10)	0.88	7392.58*** (0.00)	0.219*** (7.95)	-0.408*** (10.72)	0.17	1499.88*** (0.00)

Thai Capital	-0.096*** (17.34)	0.743*** (78.58)	0.93	465.16*** (0.00)	0.014** (2.15)	0.723*** (68.99)	0.92	428.79*** (0.00)	0.070** (2.43)	-0.545*** (10.39)	0.20	874.61*** (0.00)
Turkish Investment	-0.078*** (7.22)	0.620*** (35.46)	0.73	403.98*** (0.00)	-0.453*** (38.38)	0.319*** (11.69)	0.23	1881.07*** (0.00)	-0.246*** (15.78)	-0.344*** (12.28)	0.24	4172.81*** (0.00)
B. Developed-Country Funds												
<i>Asian-Pacific Funds</i>												
First Australia	0.054*** (15.79)	0.934*** (46.90)	0.78	185.32*** (0.00)	-0.037*** (5.76)	0.273*** (11.60)	0.18	607.49*** (0.00)	-0.052*** (4.70)	0.067*** (4.28)	0.03	5610.80*** (0.00)
Japan Equity	0.091*** (16.29)	0.817*** (46.35)	0.87	145.66*** (0.00)	-0.064*** (8.52)	1.236*** (45.74)	0.86	43.58*** (0.00)	0.391*** (23.38)	-0.529*** (16.37)	0.45	1330.18*** (0.00)
Japan OTC Equity	-0.054*** (7.82)	0.849*** (53.73)	0.86	46.80*** (0.00)	-0.124*** (10.58)	1.159*** (24.02)	0.56	149.47*** (0.00)	-0.013 (1.13)	-0.646*** (32.68)	0.70	9077.55*** (0.00)
Singapore	-0.003 (0.61)	1.098*** (60.85)	0.90	16.52*** (0.00)	-0.181*** (11.29)	0.698*** (23.89)	0.57	598.63*** (0.00)	0.248*** (10.52)	-0.241*** (6.33)	0.08	894.09*** (0.00)
<i>European Funds</i>												
Austria	-0.347*** (59.29)	0.815*** (27.28)	0.61	1983.28*** (0.00)	-0.374*** (53.48)	1.017*** (22.37)	0.51	1720.82*** (0.00)	-0.337*** (24.96)	0.069*** (2.82)	0.02	3954.55*** (0.00)
France Growth	-0.287*** (55.94)	0.858*** (36.36)	0.75	3465.14*** (0.00)	-0.189*** (45.95)	0.650*** (32.78)	0.71	1472.23*** (0.00)	-0.291*** (38.12)	0.315*** (23.00)	0.54	7970.24*** (0.00)
Germany	0.147*** (10.69)	0.786*** (36.00)	0.70	57.20*** (0.00)	0.242*** (17.00)	0.468*** (28.30)	0.59	815.53*** (0.00)	0.339*** (22.90)	0.393*** (20.55)	0.43	531.90*** (0.00)
Emerging Germany	-0.153*** (42.74)	0.970*** (55.66)	0.87	1080.46*** (0.00)	-0.321*** (44.01)	0.422*** (21.91)	0.52	2747.02*** (0.00)	-0.400*** (36.03)	0.343*** (18.23)	0.42	5796.25*** (0.00)
New Germany	-0.622*** (135.96)	0.746*** (34.74)	0.72	12387.16*** (0.00)	-0.647*** (117.30)	0.419*** (30.16)	0.66	15578.3*** (0.00)	-0.704*** (76.17)	0.316*** (20.66)	0.48	17728.6*** (0.00)
Irish Investment	-0.165*** (51.22)	1.008*** (109.84)	0.96	1464.76*** (0.00)	-0.174*** (34.34)	0.696*** (68.92)	0.91	1648.53*** (0.00)	-0.451*** (55.04)	0.878*** (63.21)	0.90	4982.03*** (0.00)

Table 1. (Continued)

Fund	Specification 1 [NAV]			Specification 2 [Foreign Stock Index]			Specification 3 [US Stock Index]					
	α_1	β_1	R^2	F_1	α_2	β_2	R^2	F_2	α_3	β_3	R^2	F_3
Italy	0.140*** (20.21)	0.877*** (38.61)	0.71	762.66*** (0.00)	0.097*** (13.59)	0.805*** (32.10)	0.62	412.35*** (0.00)	-0.147*** (11.40)	0.142*** (7.70)	0.09	4436.52*** (0.00)
Portugal	-0.261*** (57.23)	0.832*** (51.88)	0.85	1760.11*** (0.00)	-0.098*** (17.49)	0.851*** (49.04)	0.84	153.23*** (0.00)	-0.454*** (36.24)	0.496*** (22.51)	0.52	3625.27*** (0.00)
Spain	-0.078*** (7.84)	0.919*** (24.43)	0.52	48.55*** (0.00)	-0.046*** (3.85)	0.622*** (15.16)	0.30	74.69*** (0.00)	-0.019 (0.81)	0.072** (2.19)	0.01	1339.28*** (0.00)
Growth Fund of Spain	-0.220*** (64.35)	1.013*** (88.60)	0.95	2866.39*** (0.00)	-0.134*** (39.97)	0.879*** (78.88)	0.93	1079.44*** (0.00)	-0.354*** (36.75)	0.625*** (39.05)	0.77	4363.86*** (0.00)
Swiss Helvetia	0.080*** (17.72)	0.865*** (121.46)	0.96	188.13*** (0.00)	0.157*** (26.67)	0.675*** (92.60)	0.94	1059.74*** (0.00)	0.063*** (6.50)	0.854*** (63.73)	0.88	71.11*** (0.00)
United Kingdom	-0.151*** (53.33)	0.955*** (65.91)	0.88	1957.31*** (0.00)	-0.213*** (49.47)	0.511*** (50.73)	0.81	7854.84*** (0.00)	-0.195*** (49.55)	0.381*** (52.69)	0.82	13002.3*** (0.00)

Notes:

1. The numbers in the parentheses in the first two columns of each specification are the absolute value of t -statistics for testing $H_0: \alpha = 0$ and $H_0: \beta = 0$, respectively.
2. The numbers in the parentheses in the last column of each specification are p -values of associated test statistics.
3. The third column of each specification contains R^2 of long-term equilibrium equation.
4. The fourth column of each specification contains F -statistics for testing $H_0: \alpha = 0$ and $\beta = 1$.
5. ***, **, and * indicate the significance at the 1%, 5%, and 10% levels, respectively.

nonstationary and must be of the same order of integration. Thus, each country-fund price and its related asset-price variables in the cointegrating equations are tested for first-order integration employing univariate Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF), and Phillips and Perron (PP) tests.¹² The null hypothesis is that the fund price (or other variables) under investigation has a unit root against the alternative that it does not. Both DF and PP tests produce very similar results (not reported). In most cases, the null hypothesis of having a unit root cannot be rejected, indicating that in general price levels are nonstationary.¹³ However, the null is uniformly rejected for the first difference of the price levels, suggesting that the differenced series, the return series, are themselves stationary. These results are consistent with the findings by Chang, Eun and Kolodny (1995), Ben-Zion, Choi and Hauser (1996), and Hong and Lee (1998).

In addition, unit-root tests are performed on the residuals of the long-run cointegrated equations by employing DF, ADF, and PP procedures (not reported). The evidence indicates that the hypothesis of nonstationarity (no cointegration) is mostly rejected for the residuals in which country-fund prices are regressed on their corresponding NAVs. The rejection rate declines when we move to the cases of the cointegrated relation between country-fund prices and foreign stock indexes to country-fund prices and U.S. stock index. Specifically, our testing results suggest that 89.4% (42 out of 47 cases) of country funds are found to be cointegrated with the NAV (in U.S. dollar prices), 61.7% (29 out of 47 cases) are cointegrated with the foreign stock indexes (in U.S. dollars), and only 31.9% (15 out of 47 cases) are cointegrated with the U.S. stock index.¹⁴ Our statistics lead to two additional conclusions. First, the presence of high cointegration between country-fund prices and foreign stock indexes (also NAVs) and the lack of cointegration between country-fund prices and the U.S. stock index suggest the existence of potential long-term diversification benefits for U.S. investors through investing in country funds (Ben-Zion, Choi & Hauser, 1996). Second, the changes of country-fund prices in the short run can appropriately be specified in an error-correcting form by using the changes of NAV, foreign stock indexes, and the U.S. stock index, respectively, as an independent argument (Richard & Wiggins, 2000).

IV. EMPIRICAL EVIDENCE

Prior to the estimation of the short-run model of country-fund returns (changes in the country-fund prices in natural log), several issues need to be taken into account. First, it is useful to construct a general model that includes all of the relevant arguments pertinent to the existing literature. Second, among alternative hypotheses, it is of interest to ask which variable, or which hypothesis, appears to

be more dominant. Third, the sample period in our study spans both tranquil and turmoil periods, when the “Asian crisis” shocked most emerging markets for the period from mid-1997 through most of 1998, the estimated coefficients are likely to have experienced a structural change.¹⁵

For these reasons, we conduct the *J*-test proposed by Davidson and MacKinnon (1981) to evaluate alternative model specifications. At the same time, we perform *F*-tests to identify the structural changes. The *J*-tests are conducted on a pair-wise basis for three different error-correction models as represented by Eqs (2), (4), and (6). The *J*-test results are reported in Table 2. By investigating the value of the *J*-statistics, the NAV (international arbitrage hypothesis) appear to produce higher values, although we find that the foreign-stock returns (international-diversification hypothesis) become more significant for Mexico, India, Indonesia, Thai, Japan, and Spain funds. Moreover, with the exceptions of India and Indonesia funds, the NAV model appears to be more significant than the combined effect from both foreign and U.S. stock market returns. Yet the data do suggest that both foreign and U.S. stock indexes have some incremental power to explain country-fund returns.¹⁶ In sum, although the NAVs play a significant role in explaining country-fund price movements, the exclusion of foreign and U.S. stock index returns in the short-run dynamics may lose useful information in predicting country-fund price movements.

Next, we conduct both Chow and Wald tests to examine the null hypothesis of no structural change. The break point is chosen at mid-1997.¹⁷ As seen from Table 3, with only a few exceptions, the null hypothesis of no structural change for testing the long-run cointegrated relation is decisively and consistently rejected. With respect to the estimates of ECMs, the null hypothesis of no structural change is also rejected although the magnitude of the changes is moderate. This is attributable to the fact that the data have been differenced and the short-run models do capture at least part of the dynamic changes as compared with the long-run models.

Thus far, the data analysis reveals three important empirical conclusions. First, the evidence suggests that country-fund returns can be explained significantly by returns from all three variables: the NAV, foreign stock indexes, and the U.S. stock index. Thus, it is relevant to include all those arguments in the predicting equation of country-fund returns. Second, all the coefficients of the error-correction terms may also capture the information pertinent to the long-run relation, suggesting that the changes of country-fund prices are in proportion to errors departing from their long-run equilibrium. Third, testing results also indicate that in many cases the absence of structural change for the Asian-crisis period has been rejected for the return equations, meaning that some sort of econometric treatment is required to capture the Asian-crisis effect. By incorporating these three pieces of information

Table 2. Davidson and MacKinnon's J-Test Results.

Fund	NAV vs. Foreign Index		NAV vs. U.S. Index		Foreign vs. U.S. Index		NAV vs. U.S. & Foreign Indexes	
	sig(NAV)	sig(Foreign)	sig(NAV)	sig(U.S.)	sig(Foreign)	sig(U.S.)	sig(NAV)	sig(Stock Indexes)
A. Emerging-Country Funds								
<i>Latin American Funds</i>								
Argentina	8.61***	0.88	16.37***	3.53***	8.27***	3.60***	8.12***	2.28**
Brazil	6.96***	2.44**	7.65***	4.62***	5.42***	6.42***	6.51***	5.12***
Brazilian Equity	5.58***	2.38***	9.41***	2.59***	9.31***	2.67***	5.28***	3.12***
Chile	7.16***	1.38	14.74***	3.97***	8.91***	4.80***	6.28***	3.58***
Mexico	0.90	11.31***	12.03***	6.02***	15.43***	3.35***	1.73*	12.35***
Emerging Mexico	3.40***	4.26***	10.16***	3.49***	16.51***	2.60***	4.11***	4.81***
Mexico Equity & Income	5.37***	3.10***	11.65***	3.20***	16.87***	3.11***	5.68***	3.88***
<i>Asian-Pacific Funds</i>								
China	10.27***	0.01	9.03***	4.93***	0.24	4.97***	9.22***	4.68***
Greater China	17.87***	0.99	16.69***	5.20***	2.69***	8.05***	16.36***	4.83***
JF China Region	11.27***	1.14	10.94***	5.10***	2.26**	5.27***	10.21***	4.25***
TM China World	10.06***	0.18	10.75***	4.09***	1.01	6.49***	10.44***	4.01***
TM Dragon	10.61***	1.58	10.26***	3.27***	4.37***	4.58***	8.73***	3.09***
India	2.80***	4.10***	10.44***	6.45***	12.47***	5.69***	3.28***	7.80***
India Growth	1.97***	2.75***	7.31***	4.74***	7.27***	4.79***	2.22**	5.36***
JF India	2.90***	1.51	10.62***	5.67***	10.15***	5.42***	2.87***	4.70***
MS India Investment	0.34	5.68***	7.86***	6.13***	9.83***	4.64***	0.86	5.33***
Indonesia	3.62***	0.80	9.99***	4.28***	8.16***	5.06***	2.65***	3.10***
Jakarta Growth	2.46**	4.49***	9.88***	4.68***	13.32***	5.30***	2.08**	7.53**
Korea	2.46**	4.39***	16.06***	4.40***	9.66***	4.14***	2.28**	7.50***
Korea Equity	1.70*	1.89*	9.90***	2.93***	11.64***	3.29***	1.00	3.35***
Korean Investment	2.46**	0.46	13.71***	3.07***	17.46***	2.97***	2.05**	2.68***
FA Korea	3.92***	0.01	9.21***	2.49***	8.10***	2.43**	5.08***	2.86***
Malaysia	5.66***	2.63***	13.45***	4.70***	6.51***	4.86***	6.22**	4.73***
Pakistan Investment	6.57***	0.49	12.95***	6.39***	9.16***	5.90***	6.76***	3.39***

Table 2. (Continued)

Fund	NAV vs. Foreign Index		NAV vs. U.S. Index		Foreign vs. U.S. Index		NAV vs. U.S. & Foreign Indexes	
	sig(NAV)	sig(Foreign)	sig(NAV)	sig(U.S.)	sig(Foreign)	sig(U.S.)	sig(NAV)	sig(Stock Indexes)
First Philippines	6.23***	4.69***	9.97***	4.62***	10.46***	4.34***	5.23***	5.82***
Taiwan	4.24***	0.90	5.46***	5.59***	5.66***	5.86***	4.29***	3.06***
ROC Taiwan	7.66***	0.47	14.36***	6.03***	7.94***	5.37***	8.97***	2.79***
Taiwan Equity	7.52***	4.18***	15.14***	3.44***	13.51***	4.51***	7.13***	6.60***
Thai	1.66*	4.90***	7.89***	4.78***	13.48***	4.09***	1.38	6.34***
Thai Capital	3.81***	2.71***	10.85***	3.92***	8.20***	3.49***	4.08***	4.36***
Turkish Investment	5.34***	1.97**	11.12***	4.36***	10.17***	5.41***	4.94***	4.64***
B. Developed-Country Funds								
<i>Asian-Pacific Funds</i>								
First Australia	8.35***	3.23***	10.33***	2.85***	4.95***	3.49***	9.81***	4.01***
Japan Equity	2.82***	3.73***	8.79***	3.31***	9.75***	2.97***	3.03***	4.59***
Japan OTC Equity	2.26**	9.27***	7.50***	6.36***	12.78***	5.20***	2.57**	11.46***
Singapore	2.68***	2.44**	5.95***	6.49***	4.23***	5.36***	3.15	4.60***
<i>European Funds</i>								
Austria	3.40***	2.31**	7.07***	4.73***	6.37***	5.12***	3.91***	5.76***
France Growth	2.60***	2.80***	14.88***	2.85***	16.32***	2.63***	5.37***	3.06***
Germany	4.54***	1.61	9.76***	3.33***	6.88***	2.94***	4.95***	2.93***
Emerging Germany	1.90*	3.20***	10.20***	5.63***	10.93***	5.39***	3.40***	5.87***
New Germany	6.05***	3.58***	12.70***	7.30***	10.56***	4.82***	6.28***	4.20***
Irish Investment	8.05***	6.41***	8.09***	6.37***	5.13***	6.84***	7.79***	7.99***
Italy	3.82***	1.80*	12.18***	3.80***	10.96***	4.20***	4.38***	3.59***
Portugal	4.73***	0.67	9.17***	2.95***	8.75***	3.42***	4.75***	1.75*
Spain	1.11	3.11***	8.85***	3.68***	8.79***	2.99***	1.59	4.08***
Growth Fund of Spain	4.40***	4.14***	12.92***	4.38***	15.09***	4.95***	4.53***	5.02***
Swiss Helvetia	8.54***	1.32	11.58***	5.76***	9.89***	7.60***	7.91***	3.99***
United Kingdom	4.59***	5.58***	10.67***	6.71***	8.53***	6.01***	5.12***	7.06***

Note: ***, **, and * indicate the significance at the 1%, 5%, and 10% levels, respectively.

Table 3. A Summary of Testing Structural Change for the Post Asian-Crisis Period.

	NAV		Foreign Stock Index		US Stock Index	
	Chow	Wald	Chow	Wald	Chow	Wald
A. Long-Run Cointegrating Equation						
<i>Emerging-Country Funds</i>						
Latin and Other (7)	7	7	7	6	7	6
Asian-Pacific (24)	24	24	24	22	24	20
Total (31)	31	31	31	38	31	26
<i>Developed-Country Funds</i>						
Asian-Pacific (4)	4	4	4	4	4	4
European (12)	11	12	11	12	12	12
Total (16)	15	16	15	16	16	16
Grand Total (47)	46	47	46	44	47	42
B. Error-Correction Models						
<i>Emerging-Country Funds</i>						
Latin and Other (7)	6	7	7	6	7	7
Asian-Pacific (24)	16	17	20	16	20	20
Total (31)	22	24	27	22	27	27
<i>Developed-Country Funds</i>						
Asian-Pacific (4)	3	4	3	3	3	4
European (12)	4	9	5	10	5	8
Total (16)	7	13	8	13	9	12
Grand Total (47)	29	37	35	35	36	39

Notes:

1. The null hypothesis is for no structural changes.
2. The number in parentheses in the first column is the number of total samples in each category and the numbers in the table are the numbers of cases of rejecting the null.

into our model, the estimated equation is rewritten as follows:

$$\begin{aligned}
 \Delta P_{i,t} = & C + \phi \Delta P_{i,t-1} + \pi_1 \Delta P_{i,t}^* + \pi_2 \Delta P_{m,t}^* + \pi_3 \Delta P_{m,t} - \psi_1 u_{1,t-1} \\
 & - \psi_2 u_{2,t-1} - \psi_3 u_{3,t-1} + \gamma_1 (D_1 \Delta P_{i,t}^*) + \gamma_2 (D_2 \Delta P_{m,t}^*) \\
 & + \gamma_3 (D_3 \Delta P_{m,t}) + \varepsilon_t.
 \end{aligned} \tag{7}$$

Several comments may be considered in relation to Eq. (7). First, Eq. (7) can be viewed as a general specification of the country-fund model. Each hypothesis in Section II can be obtained by imposing appropriate restrictions. The effects of the Asian crisis on the asset returns are captured by the dummies D_1 , D_2 , and D_3 .

These variables take a value of “0” for the period from 1988:6:3 to 1997:6:27 (pre-Asian-crisis period) and “1” for the period from 1997:7:4 to 1998:11:27 (Asian-crisis period). Third, to estimate an ECM as Eq. (7), it is necessary to include an autoregressive term. In order to avoid an unnecessary over-parameterization problem, we include only contemporaneous terms of return variables and one-period lagged error-correcting terms in the right side of the equation. Fourth, in order to gain the efficiency, a seemingly unrelated regression method is used to account for the cross correlation of the disturbance terms for particular region.

The estimates of Eq. (7) are contained in Table 4. The evidence shows that all of the estimated regressions have high *R*-squares, ranging from 0.19 to 0.65. Several empirical findings are worth noting. First, the estimated autocorrelation for the country-fund return displays a negative sign for the first lag, suggesting that the country-fund returns are self-correcting and stabilizing over time and do not follow a random walk process.

Second, the estimated contemporaneous terms on the cross-asset returns are all positive, although not all of the estimates are statistically significant. Among three explanatory return variables, the estimated coefficients on NAV returns have a more significant sign, while some of those on foreign and U.S. stock index returns are less significant. This indicates that NAV returns play a more dominant role in explaining country-fund price movements, while U.S. stock-index returns play a secondary role. This evidence suggests that even if some country funds do not share a long-term factor with the U.S. stock index, their returns in the short run are very sensitive to U.S. stock market developments. From the investors' point of view, this sensitive response to U.S. stock returns may result from the fact that U.S. stock returns are perceived as an immediate indicator and, hence, serve as benchmark portfolio returns for engaging in international portfolio investments. This finding is consistent with the U.S. sentiment hypothesis that country-fund returns are highly sensitive to U.S. stock market returns (Bodurtha, Kim & Lee, 1995; Chang, Eun & Kolodny, 1995).

Third, the results from the error-correction terms are consistent with the specification of the ECM. Most of the coefficients of the error-correction terms from the NAV return equation are negative and significant, meaning that country-fund prices tend to be revised in proportion to errors departing from their long-run equilibrium. This feature does not appear consistently in the estimated slopes for the alternative specifications. It is due mainly to the fact that country-fund prices and their corresponding NAVs are highly cointegrated and the cointegration of country-fund prices with U.S. and foreign stock indexes are less significant.

Fourth, for country funds (Indonesia, Korea, Malaysia, and First Philippines funds) which were infected by the Asian disease, the coefficients of the interaction dummies on the NAV returns and foreign index returns display a significant

Table 4. Estimates of Multi-Dimensional ECM with Dummy for Asian Crisis: Fund Prices vs. NAV, Foreign and U.S. Stock Market Indexes.

Fund	Constant	$\Delta P_{t,t-1}$	$\Delta P_{t,t-1}^*$	$\Delta P_{m,t}^*$	$\Delta P_{m,t}$	$u_{t,t-1}$	$u_{t,t-1}^*$	$u_{t,t-1}$	$u_{t,t-1}^*$	$D \times \Delta P_{t,t-1}^*$	$D \times \Delta P_{m,t}^*$	$D \times \Delta P_{m,t}$	χ^2	R^2	SEE
A. Emerging-Country Funds															
<i>Latin American Funds</i>															
Argentina	-0.00224 (1.49)	-0.079** (2.30)	0.890*** (10.3)	0.059 (0.57)	0.244 (1.57)	0.011 (0.32)	-0.063 (1.39)	-0.017 (1.52)	0.079 (0.84)	-0.257 (1.03)	0.004 (0.02)	0.004 (0.02)	2.68 (0.44)	0.50	0.0349
Brazil	-0.00056 (0.12)	-0.169*** (4.08)	0.553*** (6.90)	0.037* (1.86)	0.529*** (3.58)	-0.018 (0.41)	-0.079 (1.12)	0.039 (1.26)	0.539*** (4.62)	0.212 (1.50)	-0.670*** (3.43)	-0.670*** (3.43)	42.38*** (0.00)	0.50	0.0446
Brazilian Equity	-0.00161 (0.70)	-0.170*** (4.15)	0.642*** (6.49)	0.270*** (4.16)	0.377* (1.78)	-0.167*** (7.15)	0.092*** (5.79)	-0.088*** (5.46)	0.432*** (3.70)	-0.167* (1.65)	-0.263 (1.07)	-0.263 (1.07)	14.24*** (0.00)	0.60	0.0448
Chile	-0.00174 (1.12)	-0.084* (1.83)	0.827*** (9.30)	0.152 (0.88)	0.732*** (4.27)	-0.074** (2.23)	0.003 (0.09)	0.006 (1.13)	0.307*** (2.63)	-0.078 (0.33)	-0.806*** (4.04)	-0.806*** (4.04)	18.21*** (0.00)	0.45	0.0363
Mexico	0.00104 (0.47)	-0.265*** (2.61)	0.599*** (12.9)	0.774*** (11.5)	0.566*** (3.45)	-0.105*** (2.63)	0.014 (0.50)	0.006 (0.90)	0.094 (1.09)	0.075 (0.64)	-0.529* (1.87)	-0.529* (1.87)	3.80 (0.28)	0.50	0.0504
Emerging Mexico	-0.00092 (0.67)	-0.073* (1.67)	0.780*** (9.89)	0.569*** (3.78)	0.278* (1.71)	-0.062*** (5.25)	0.007 (1.31)	-0.005 (0.98)	0.169** (2.00)	-0.817*** (2.76)	-0.135 (0.62)	-0.135 (0.62)	10.56*** (0.01)	0.60	0.0379
Mexico Equity & Income	-0.00224 (1.46)	-0.153*** (3.26)	0.862*** (13.9)	0.334*** (2.77)	0.428** (2.04)	-0.053*** (3.01)	0.010 (0.68)	0.007 (0.97)	0.063 (0.66)	-0.347** (2.53)	-0.172 (0.44)	-0.172 (0.44)	7.72** (0.05)	0.57	0.0364
<i>Asian-Pacific Funds</i>															
China	-0.00359* (1.75)	-0.091** (2.21)	0.670*** (3.75)	0.023 (0.67)	0.531*** (2.87)	-0.066*** (3.88)	0.083*** (2.75)	-0.089*** (2.93)	-0.154 (0.81)	-0.023 (0.39)	0.782*** (3.10)	0.782*** (3.10)	10.24** (0.02)	0.43	0.0376
Greater China	-0.00291 (1.49)	-0.092** (2.45)	0.869*** (7.67)	0.022 (0.67)	0.448*** (2.96)	-0.141*** (6.64)	0.135*** (6.21)	-0.136*** (6.21)	-0.077 (0.66)	0.324* (1.77)	0.212 (0.91)	0.212 (0.91)	3.63 (0.30)	0.58	0.0356
JF China Region	-0.00360* (1.73)	-0.096* (1.80)	0.752*** (7.06)	0.044 (0.87)	0.433*** (3.19)	-0.102*** (6.96)	0.043*** (4.02)	-0.058*** (4.00)	-0.107 (0.90)	0.390** (2.03)	0.316 (1.35)	0.316 (1.35)	5.37 (0.15)	0.46	0.0363
TM China World	-0.00409** (2.13)	-0.154*** (4.13)	0.813*** (9.05)	0.019 (0.47)	0.391*** (3.00)	-0.110*** (5.06)	0.071*** (5.02)	-0.099*** (5.67)	-0.106 (0.85)	0.088 (1.85)	0.482* (1.85)	0.482* (1.85)	4.11 (0.25)	0.53	0.0328
TM Dragon	-0.00431** (2.44)	-0.147*** (2.67)	0.710*** (7.50)	0.083 (1.45)	0.233** (2.08)	-0.215*** (6.26)	0.073*** (3.62)	-0.074*** (4.03)	-0.044 (0.32)	-0.054 (0.27)	0.797*** (2.87)	0.797*** (2.87)	13.63*** (0.00)	0.65	0.0253
India	-0.00300 (1.47)	-0.128** (2.21)	0.934*** (7.87)	0.308 (0.84)	0.354*** (2.41)	-0.026 (1.35)	-0.031 (2.59)	-0.051*** (2.59)	0.098 (0.63)	0.262 (0.64)	0.121 (0.65)	0.121 (0.65)	1.51 (0.68)	0.44	0.0359
India Growth	-0.00134 (0.72)	-0.038 (0.93)	0.393*** (5.61)	0.287** (2.41)	0.417*** (3.02)	-0.028** (2.19)	0.007 (0.69)	-0.007 (0.72)	0.209 (1.40)	0.620** (1.99)	0.192 (1.03)	0.192 (1.03)	26.13*** (0.00)	0.19	0.0441
JF India	-0.00298 (1.44)	-0.040 (0.92)	0.782*** (9.63)	0.326* (1.69)	0.310 (1.43)	-0.036 (1.38)	-0.020 (2.97)	-0.045*** (2.97)	0.235 (1.33)	-0.034 (0.76)	0.118 (0.49)	0.118 (0.49)	2.75 (0.43)	0.39	0.0381
MS India Investment	-0.00309 (1.32)	-0.189*** (3.78)	0.764*** (5.54)	0.533** (2.44)	0.322 (1.29)	-0.018 (0.61)	0.007 (0.19)	-0.042** (2.06)	0.200 (1.01)	0.299 (0.84)	0.196 (0.69)	0.196 (0.69)	2.59 (0.46)	0.36	0.0406

Table 4. (Continued)

Fund	Constant	ΔP_{j-1}	ΔP_{j-1}^*	$\Delta P_{m,j}^*$	$\Delta P_{m,j}$	$u_{1,j-1}$	$u_{2,j-1}$	$u_{3,j-1}$	$D \times \Delta P_{1,j}^*$	$D \times \Delta P_{m,j}^*$	$D \times \Delta P_{m,j}$	χ^2	R^2	SEE
Indonesia	-0.00338* (1.69)	-0.132*** (3.73)	0.860*** (7.29)	0.658*** (3.67)	0.474*** (3.17)	-0.131*** (4.23)	0.036 (1.73)	0.002 (0.16)	-0.407*** (3.04)	-0.707*** (3.23)	0.618*** (1.96)	21.87*** (0.00)	0.35	0.0517
Jakarta Growth	-0.00308 (1.64)	-0.095*** (2.81)	1.059*** (6.61)	0.722*** (4.74)	0.654*** (5.35)	-0.120*** (3.09)	0.040 (1.23)	0.000 (0.03)	-0.500*** (3.00)	-0.431** (2.39)	0.261 (0.66)	10.89*** (0.01)	0.40	0.0469
Korea	-0.00260 (1.40)	-0.094*** (2.10)	0.864*** (10.6)	0.789*** (9.00)	0.608*** (3.53)	-0.033** (2.28)	0.021 (1.23)	-0.017* (1.81)	-0.155 (1.47)	-0.84*** (3.28)	0.143 (0.28)	18.24*** (0.00)	0.40	0.0479
Korea Equity	-0.00399 (1.61)	-0.101** (2.34)	0.781*** (6.94)	0.261 (0.99)	0.269** (2.02)	-0.156 (1.49)	0.080 (1.29)	-0.010 (0.43)	-0.269** (2.25)	0.389 (1.00)	0.670*** (2.98)	11.39*** (0.01)	0.53	0.0381
Korean Investment	-0.00203 (0.92)	-0.008 (0.14)	0.519*** (7.03)	0.396*** (3.34)	0.116 (0.77)	-0.077 (1.42)	0.018 (0.42)	0.156 (1.46)	0.156 (1.54)	-0.808** (2.27)	0.318 (1.22)	9.92** (0.02)	0.47	0.0397
EA Korea	-0.00544** (2.32)	0.030 (0.62)	0.616*** (7.32)	0.407 (1.46)	0.462*** (2.67)	-0.128** (2.34)	-0.009 (0.15)	-0.007 (0.39)	0.005 (0.05)	-0.504 (1.52)	0.471 (0.99)	3.80 (0.28)	0.59	0.0387
Malaysia	-0.00232 (1.19)	-0.110* (1.87)	0.666*** (9.30)	0.509*** (2.66)	0.767*** (3.22)	-0.048*** (3.22)	-0.005 (0.37)	0.002 (0.44)	-0.201** (2.15)	-0.280 (1.32)	0.430 (1.61)	7.49* (0.06)	0.35	0.0511
Pakistan Investment	-0.00637*** (3.00)	-0.160*** (2.98)	0.560*** (5.67)	0.092 (0.22)	0.511*** (3.09)	0.028 (0.65)	-0.062 (1.16)	-0.010 (1.23)	0.261** (2.29)	-0.072 (0.28)	0.063 (0.24)	5.52 (0.14)	0.41	0.0370
First Philippines	-0.00278* (1.88)	-0.076** (2.22)	0.929*** (16.1)	0.220*** (3.37)	0.385*** (4.59)	-0.089*** (3.17)	-0.016 (1.32)	0.005 (1.12)	-0.302*** (2.62)	-0.013 (0.04)	0.117 (0.41)	9.93** (0.02)	0.41	0.0393
Taiwan	-0.00320 (1.27)	-0.167*** (3.04)	0.609*** (4.84)	0.043 (0.42)	0.895*** (4.83)	-0.038 (1.61)	0.039* (1.65)	-0.065*** (3.75)	0.212* (1.66)	-0.109 (0.75)	-0.235 (1.08)	3.96 (0.27)	0.46	0.0636
ROC Taiwan	-0.00264 (1.47)	-0.137*** (3.98)	0.839*** (11.9)	0.119 (0.77)	0.612*** (3.90)	-0.113*** (4.20)	0.066*** (2.69)	-0.035*** (2.78)	0.165* (1.73)	-0.041 (0.23)	-0.112 (0.52)	3.64 (0.30)	0.47	0.0425
Taiwan Equity	-0.00316 (1.27)	-0.051 (0.95)	0.631*** (6.33)	0.639*** (3.31)	0.292** (1.97)	-0.097* (1.65)	0.021 (0.46)	-0.001 (0.06)	0.068 (0.55)	-0.075 (0.29)	0.285 (1.46)	3.33 (0.34)	0.56	0.0314
Thai	-0.00216 (1.13)	-0.099* (1.84)	0.549*** (10.1)	0.511*** (4.95)	0.484*** (3.46)	-0.099** (2.21)	0.007 (0.24)	0.001 (0.26)	-0.029 (0.39)	-0.088 (0.39)	0.017 (0.07)	0.28 (0.96)	0.34	0.0478
Thai Capital	-0.00244 (1.33)	-0.062 (1.43)	0.683*** (11.8)	0.017 (0.16)	0.603*** (4.79)	-0.144*** (3.62)	0.046 (1.24)	0.010 (1.48)	0.003 (0.02)	0.482** (2.36)	0.155 (0.27)	10.37** (0.02)	0.44	0.0435
Turkish Investment	-0.00206 (0.88)	-0.090* (1.72)	0.346*** (6.55)	0.276*** (3.81)	0.413*** (2.58)	-0.131*** (4.66)	0.057*** (2.98)	-0.031*** (2.64)	0.462*** (5.27)	-0.179 (1.26)	-0.047 (0.21)	28.82*** (0.00)	0.37	0.0506
B. Developed-Country Funds														
<i>Asian-Pacific Funds</i>														
First Australia	-0.00088 (0.51)	-0.230*** (3.26)	0.581*** (8.10)	0.530*** (3.70)	0.322** (2.40)	-0.109*** (3.47)	0.015 (0.38)	-0.006 (0.17)	0.230* (1.86)	-0.364** (2.02)	0.221 (0.84)	16.20*** (0.00)	0.32	0.0392
Japan Equity	-0.00076 (0.42)	-0.072 (1.21)	0.694*** (8.07)	0.405*** (2.71)	0.389*** (2.89)	-0.079*** (3.22)	-0.006 (0.23)	0.011 (0.74)	0.066 (0.38)	-0.228 (0.92)	0.108 (0.38)	10.08 (0.82)	0.36	0.0349
Japan OTC Equity	-0.00214 (1.11)	-0.092** (1.85)	0.548*** (7.61)	0.459*** (4.61)	0.782*** (4.64)	-0.042 (1.48)	0.007 (0.53)	-0.028** (2.20)	0.216** (2.54)	-0.204* (1.69)	-0.415 (1.60)	15.13*** (0.00)	0.39	0.0395

Singapore	-0.00225 (1.48)	-0.143*** (2.73)	0.597*** (4.80)	0.293 (1.42)	0.483*** (5.45)	-0.071*** (4.89)	-0.001 (0.13)	0.005 (0.74)	0.109 (0.68)	-0.523* (1.65)	0.343 (1.43)	7.00* (0.07)	0.33 (0.07)	0.33 (0.07)	0.0361
<i>European Funds</i>															
Austria	-0.00242 (1.25)	-0.122 (1.07)	0.430*** (8.64)	0.253*** (2.92)	0.677*** (3.22)	-0.046 (1.51)	0.017 (0.87)	-0.019 (1.62)	0.207** (1.73)	0.011 (0.05)	-0.132 (0.57)	3.68 (0.30)	0.23 (0.30)	0.23 (0.30)	0.0431
France Growth	-0.00133 (0.83)	-0.166*** (3.78)	0.710*** (11.0)	0.628*** (3.89)	0.369* (1.93)	-0.126** (2.03)	-0.023 (0.59)	0.056* (1.75)	0.184** (1.98)	-0.612*** (3.15)	0.022 (0.10)	22.87*** (0.00)	0.42 (0.00)	0.42 (0.00)	0.0301
Germany	-0.00017 (0.09)	-0.168*** (3.11)	0.476*** (5.67)	0.558** (2.37)	0.608*** (2.64)	-0.140** (2.39)	0.176* (1.75)	-0.083* (1.73)	0.161 (1.23)	-0.848*** (3.09)	-0.134 (0.49)	15.58*** (0.00)	0.28 (0.00)	0.28 (0.00)	0.0440
Emerging Germany	-0.00131 (1.01)	-0.083** (2.19)	0.566*** (5.42)	1.081*** (3.44)	0.415*** (4.92)	-0.287*** (6.64)	0.340*** (5.73)	-0.236*** (5.04)	0.002 (0.02)	-0.852** (2.29)	0.234 (1.31)	6.99* (0.07)	0.44 (0.07)	0.44 (0.07)	0.0283
New Germany	-0.00250** (1.98)	-0.098*** (2.74)	0.600*** (5.39)	0.443*** (2.91)	0.439*** (4.63)	-0.111*** (3.36)	-0.087 (1.57)	0.037 (0.99)	0.244* (1.82)	-0.379* (1.86)	-0.070 (0.42)	7.63** (0.05)	0.47 (0.05)	0.47 (0.05)	0.0297
Irish Investment	-0.00109 (0.65)	-0.064* (1.82)	0.424*** (6.59)	0.176*** (3.75)	0.529*** (4.29)	-0.121*** (4.39)	-0.040** (2.18)	-0.028 (1.51)	0.165 (0.66)	0.309** (2.32)	-0.079 (0.39)	6.61* (0.09)	0.36 (0.09)	0.36 (0.09)	0.0293
Italy	-0.00038 (0.21)	-0.091*** (2.85)	0.645*** (6.38)	0.365*** (2.34)	0.222 (1.42)	-0.056 (1.29)	-0.006 (0.17)	-0.003 (0.31)	0.114 (0.86)	-0.246 (0.99)	0.338** (2.02)	6.55* (0.09)	0.24 (0.09)	0.24 (0.09)	0.0429
Portugal	-0.00125 (0.69)	-0.086*** (2.66)	0.585*** (4.37)	0.344 (1.50)	0.478*** (2.77)	-0.082* (1.84)	0.003 (0.10)	0.004 (0.29)	0.260* (1.78)	-0.663*** (2.65)	0.073 (0.33)	11.13*** (0.01)	0.28 (0.01)	0.28 (0.01)	0.0390
Spain	-0.00132 (0.70)	-0.094 (1.50)	0.480*** (6.52)	0.505* (1.70)	0.672** (2.43)	-0.089 (1.53)	0.078 (1.02)	-0.018 (0.89)	0.515*** (4.65)	-0.207 (0.64)	-0.533 (1.59)	23.05*** (0.00)	0.24 (0.00)	0.24 (0.00)	0.0436
Growth Fund of Spain	-0.00088 (0.74)	0.014 (0.36)	0.676*** (9.76)	0.557*** (3.28)	0.384*** (4.09)	-0.060** (2.13)	-0.038** (2.12)	-0.010 (0.76)	0.301*** (3.71)	-0.357** (1.97)	-0.243** (1.97)	15.40*** (0.00)	0.52 (0.00)	0.52 (0.00)	0.0232
Swiss Helvetia	0.00198 (1.44)	-0.098** (2.15)	0.415*** (6.38)	-0.070 (0.92)	0.448*** (4.50)	-0.316*** (5.03)	0.231*** (4.23)	-0.033** (2.18)	0.361*** (2.61)	0.031 (0.26)	-0.084 (0.64)	10.67*** (0.01)	0.32 (0.01)	0.32 (0.01)	0.0272
United Kingdom	-0.00094 (0.69)	-0.158*** (4.38)	0.617*** (5.19)	0.658*** (4.36)	0.497*** (5.56)	-0.114*** (3.20)	-0.018 (0.48)	-0.052 (1.11)	-0.056 (0.39)	-0.251 (1.25)	-0.056 (0.41)	2.48 (0.48)	0.45 (0.48)	0.45 (0.48)	0.0305

Notes:
 1. *D* is a dummy variable which has a value of "0" for the period of 1988:6:3 to 1997:6:27 (pre-Asian-crisis period) and a value of "1" for the period of 1997:7:4 to 1998:11:27 (Asian crisis period).
 2. The numbers in parentheses are the absolute values of *t*-statistics except for the column of χ^2 .
 3. The numbers in the parentheses of the column of χ^2 are *p*-values of χ^2 statistics for testing whether three interaction dummy variables are jointly significant.

negative sign, indicating that the changes of country-fund prices were moderate in response to changes of the NAV for the Asian-crisis period.¹⁸ For the other funds, the coefficients on the interaction dummies for NAV returns and U.S. market returns are in general positive, showing that the sensitivity of country-fund returns to NAV and U.S. stock market returns would have increased during the Asian crisis. This result is consistent with Klibanoff, Lamont and Wizman (1998) who argue that country-fund prices become more sensitive to contemporaneous changes in the NAV in the presence of some dramatic news affecting country funds. However, the coefficients on the interaction dummy for foreign market returns are in general negative, suggesting that country-fund returns were less sensitive to foreign stock-market returns during the Asian crisis. The significance of the joint test for all three dummies partially confirms the test results of structural change after the Asian crisis.

V. CONCLUDING REMARKS

In this paper, we investigate both long-term and short-term country-fund price behavior by analyzing data for 47 single-country funds. In an attempt to explain a long-run equilibrium relation, we relate country-fund prices to the corresponding NAVs, foreign stock indexes, and the U.S. stock index. By conducting cointegration tests, we find that country-fund prices for emerging-country funds are more highly cointegrated with NAVs and foreign stock indexes than with the U.S. stock index. This feature does not apply to developed-country funds, indicating that long-term international diversification benefits are more likely through investing in emerging-market funds rather than developed-market funds.

The empirical estimates show that the country-fund prices in the long run are positively related to the NAV and foreign stock indexes. However, a significant negative sign has been shown in the coefficient of the U.S. stock index. The negative sign is due to the Asian crisis that impacted both the Asian and Latin American stock markets.

In the short-run equation, the estimated coefficients on the cross-asset returns are all positive, although the coefficients for NAV returns have a more significant sign, while some of those on foreign and U.S. stock index returns are less significant. The evidence favors the international arbitrage hypothesis in that NAV returns assume a more dominant position in explaining country-fund price movements. Yet the data suggest that the changes of country-fund prices are positively correlated with changes of the U.S. stock index. This suggests that U.S. market returns appear to have a more significant role in explaining country-fund return movements in the

short run than in the long run. From this perspective, the data are also consistent with the U.S. market sentiment hypothesis as reported by Bodurtha, Kim and Lee (1995), and Arak and Taylor (1996).

Since country-fund prices and NAVs are more highly cointegrated, most of the coefficients of the error-correction terms from the NAV return equation are negative and significant, indicating that the error-correcting term has a significant information content in predicting country-fund prices. Even so, the specification tests indicate that applying the information on all three variables in the error-correction framework appears to be more appropriate in predicting country-fund price movements. The significance of the joint test for all three dummies partially confirms the test results of structural change after the Asian crisis. The evidence suggests country-fund prices become more sensitive to contemporaneous changes in the NAV in the presence of some dramatic news affecting country funds.

NOTES

1. A closed-end country fund is an investment company that is listed and traded on a U.S. stock exchange but invests in a portfolio of equities of a particular foreign country or region. The investors' portfolio adjustment can be done only by trading on secondary stock markets.

2. Prior to 1986, only five single-country funds (ASA, Japan, Mexico, First Australia, and Korea) were listed on U.S. exchanges. By December 1998, 79 closed-end single-country and regional funds were trading on U.S. stock exchanges.

3. For instance, Bailey and Lim (1992), Bodurtha, Kim and Lee (1995), and Chang, Eun and Kolodny (1995) have documented that country funds behave more like U.S. domestic securities than foreign stocks. However, different results are found by Choi and Lee (1996), and Hong and Lee (1998). They report that closed-end country-fund returns are more strongly affected by foreign market factors than by U.S. market factors.

4. Pontiff (1996) also argues that, with domestic closed-end funds, arbitrage costs lead to large deviations of prices from fundamentals.

5. If the restriction $(\alpha_1 \text{ and } \beta_1)' = (0 \text{ and } 1)'$ cannot be rejected and the error term follows a random process, the cointegration theory suggests that the information from country-fund discounts can be used to project the subsequent changes of future country-fund price. This notion can be written as:

$$\Delta P_{i,t} = C_1 + \sum_{j=1}^m \phi_{1,j} \Delta P_{i,t-j} + \sum_{j=0}^n \pi_{1,j} \Delta P_{i,t-j}^* - \psi_1 (P_{i,t-1} - P_{i,t-1}^*) + \varepsilon_{1t} \quad (2')$$

where C_1 , ϕ_1 , π_1 and ψ_1 are estimated parameters and ε_{1t} is an error term. This dynamic model indicates that the changes of the country-fund price are a function of its own lags, distributed lags of NAV, and a one-period lagged country-fund discount. Alternatively, we

can write an unrestricted representation as:

$$\Delta P_{i,t} = C_1 + \sum_{j=1}^m \phi_{1j} \Delta P_{i,t-j} + \sum_{j=0}^n \pi_{1j} \Delta P_{i,t-j}^* - \psi_1 P_{i,t-1} + \psi_1^* P_{i,t-1}^* + \varepsilon_{1,t} \quad (2)''$$

All of the notations and model properties are the same as we defined in the text. If $\psi_1 = \psi_1^*$ is imposed, Eq. (2)'' will reduce to Eq. (2)'. The difference between Eq. (2)'' and Eq. (2) in the text is that the error-correcting term in Eq. (2) is replaced by lagged price levels which capture the effect involving long-run equilibrium.

6. For the debate about the role of U.S. investors' sentiments in domestic closed-end funds, see DeLong et al. (1990), Shleifer and Summers (1990), Lee, Shleifer and Thaler (1990, 1991), DeLong and Shleifer (1992), Chen, Kan and Miller (1993), and Chopra et al. (1993a, b).

7. The classification between emerging and developed markets follows Morgan Stanley Capital International (MSCI). The only exception is Malaysia, which is considered to be a developed fund in MSCI. Note that we also obtain data for 27 regional funds and three other single-country funds – ASA, First Israel, and New South Africa funds. To save space, we report only the 47 single-country funds listed in Appendix 1.

8. In the sample of 47 country funds, several funds do not report their NAVs as of Friday's close. Specifically, India Growth Fund reports its NAV as of Wednesday's close, and eight other funds (Templeton China World, Jardine Fleming India, Mexico, Mexico Equity and Income, Emerging Mexico, Taiwan, Taiwan Equity, and Singapore Funds) report their NAVs as of Thursday's close. For these funds, we use the fund prices on the day the NAVs are computed.

9. Some countries' foreign exchange rates are not available from the *Federal Reserve Bank of Chicago*: Indonesia, Pakistan, Philippines, Turkey, Argentina, Brazil, Chile, and Mexico. Those countries' foreign exchange rates are obtained from *Datastream*.

10. These results are not consistent with the findings of Bailey and Lim (1992). They find that contemporaneous correlation of daily country fund returns is higher with U.S. market returns than with foreign market returns. This inconsistency may come from the different sample period and frequency of data.

11. When we test the joint hypothesis that $(\alpha_i \text{ and } \beta_i)' = (0 \text{ and } 1)'$, where $i = 1, 2$, and 3, the null is uniformly rejected. This suggests the parity relation that $P_{i,t}$ with $P_{i,1}^*$, $P_{m,t}$ and $P_{m,t}^*$, respectively, are not unbiased. Specially, the rejection of the null hypothesis, $(\alpha_1 \text{ and } \beta_1)' = (0 \text{ and } 1)'$, is consistent with the existence of persistent country-fund discount over time. This disparity implies an existence of risk premia, inefficiency in pricing, preference, or market frictions.

12. Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests take the form: DF test: $\Delta x_t = \alpha + \rho x_{t-1} + \varepsilon_t$ for testing $H_0: \rho = 0$, and ADF test: $\Delta x_t = \alpha + \rho x_{t-1} + \sum_{i=1}^k \gamma_i \Delta x_{t-i} + \varepsilon_t$. The numbers in parentheses are the optimal lag lengths for the ADF test. The choice of optimal-lag length (k) for the ADF test is determined by BIC (Schwartz Bayesian Criterion). Phillips-Perron (PP) test takes the form: PP test: $x_t = \mu + \alpha x_{t-1} + \varepsilon_t$ for testing $H_0: \alpha = 1$. The PP test tends to be more robust to a wide range of serial correlation and time-dependent heteroskedasticity. The PP test uses a consistent covariance matrix of error terms to get t -statistics. The numbers in parentheses are the optimal lag lengths for the PP test for correcting any autocorrelation and heteroskedasticity in the error term (Newey & West, 1987). The choice of optimal lag length (k) for the PP test is determined by BIC.

13. Rejection of the null (having a unit-root) at the level are 11 cases for country-fund prices (Argentina, Mexico, Taiwan, ROC Taiwan, Taiwan Equity, Turkish Investment, First Australia, Austria, Germany, New Germany, and Italy funds), two cases for NAV (Mexico, and Taiwan funds), and four cases for foreign stock index (Chile, Mexico, Emerging Mexico, and Taiwan funds). The critical values for unit-root tests (Fuller, 1976) are -3.43 , -2.86 , and -2.57 , for 1%, 5%, and 10% levels, respectively.

14. These results are somewhat different from Chang, Eun and Kolodny (1995), who find the cointegration between country-fund prices and NAVs for just half the cases in their sample, especially for country funds derived from advanced capital markets. However, the findings here are consistent with previous findings (Hong & Lee, 1998; Olienyk, Schwebach & Zumwalt, 1999), which find substantial cointegration between country-fund prices and foreign stock index.

15. Three different cointegration hypotheses and the corresponding error-correction models are estimated individually. Since the results from Eqs (2), (4), and (6) are similar to the combined Eq. (7), these tables are not reported. However, these tables are available upon request.

16. Hong and Lee (1998) investigate the impact of the Asian crisis on the causal relation between country-fund returns and NAV returns employing Thai, Indonesia, and Korea funds. They find significant differences in the causal relation between pre-1997 and post-1997 periods.

17. To save space, we report only the summary statistics for testing the null. The estimated coefficients for two sub-sample periods and the results for testing structural changes are available upon request.

18. This result is consistent with the arguments of Frankel and Schmukler (1996) and Chandar and Patro (2000) that the NAV and foreign stock index fell much more rapidly than country-fund prices in the 1994 Mexican crisis.

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APPENDIX 1.

Sample of Closed-end Country Funds

Fund	Ticker (Exch)	IPO Date	Sample	Foreign Stock Index
A. Emerging-Country Funds				
<i>Latin American Funds</i>				
Argentina	AF (NYSE)	911011	911025	Data Stream Price Index
Brazil	BZF (NYSE)	880331	900119	Sao Paulo Bovespa
Brazilian Equity	BZL (NYSE)	920403	920403	Sao Paulo Bovespa
Chile	CH (NYSE)	890926	890929	Santiago IPSA
Mexico	MXF (NYSE)	810603	880107	Mexico IPC (Bolsa)
Emerging Mexico	MEF (NYSE)	901002	901011	Mexico IPC (Bolsa)
Mexico Equity and Income	MXE (NYSE)	900814	900816	Mexico IPC (Bolsa)
<i>Asian-Pacific Funds</i>				
China	CHN (NYSE)	920710	920710	Shanghai SE
Greater China	GCH (NYSE)	920715	920717	Shanghai SE
Jardine Fleming China Region	JFC (NYSE)	920716	920717	Shanghai SE
Templeton China World	TCH (NYSE)	930909	930909	Shanghai SE
Templeton Dragon	TDF (NYSE)	940921	940923	Shanghai SE
India	IFN (NYSE)	940214	940218	Bombay SE National
India Growth	IGF (NYSE)	880812	880812	Bombay SE National
Jardine Fleming India	JFI (NYSE)	940303	940303	Bombay SE National
Morgan Stanley India	IIF (NYSE)	940215	940218	Bombay SE National
Indonesia	IF (NYSE)	900301	900302	Jakarta SE Composite
Jakarta Growth	JGF (NYSE)	900410	900413	Jakarta SE Composite
Korea	KF (NYSE)	840822	870102	KOSPI
Korea Equity	KEF (NYSE)	931124	931126	KOSPI
Korean Investment	KIF (NYSE)	920213	920214	KOSPI
Fidelity Advisor Korea	FAK (NYSE)	941031	941104	KOSPI
Malaysia	MF (NYSE)	870508	870508	Kuala Lumpur SE
Pakistan Investment	PKF (NYSE)	931216	931217	Karachi 100
First Philippines	FPF (NYSE)	891108	891110	Philippines SE
Taiwan	TWN (NYSE)	861223	870129	Taiwan SE Weighted
ROC Taiwan	ROC (NYSE)	890512	890512	Taiwan SE Weighted
Taiwan Equity	TYW (NYSE)	940715	940721	Taiwan SE Weighted
Thai	TTF (NYSE)	880217	880219	Bangkok SET
Thai Capital	TC (NYSE)	900522	900601	Bangkok SET
Turkish Investment	TKF (NYSE)	891205	891208	Data Stream Price Index

Appendix 1. (Continued)

Fund	Ticker (Exch)	IPO Date	Sample	Foreign Stock Index
B. Developed-Country Funds				
<i>Asian-Pacific Funds</i>				
First Australia	IAF (AMEX)	851212	870102	All Ordinaries
Japan Equity	JEQ (NYSE)	920717	920814	Nikkei 225 Index
Japan OTC Equity	JOF (NYSE)	900314	900316	Nikkei 225 Index
Singapore	SGF (NYSE)	900724	900802	Straits Times Index
<i>European Funds</i>				
Austria	OST (NYSE)	890921	890922	WBK Index
France Growth	FRF (NYSE)	900510	900511	CAC 40 Index
Germany	GER (NYSE)	860718	880101	DAX 100 Index
New Germany	GF (NYSE)	900124	900126	DAX 100 Index
Emerging Germany	FRG (NYSE)	900329	900330	DAX 100 Index
Irish Investment	IRL (NYSE)	900330	900330	Ireland SE Overall
Italy	ITA (NYSE)	860226	870102	Milan MIB Index
Portugal	PGF (NYSE)	891101	891110	Portugal BVL General
Spain	SNF (NYSE)	880621	880624	Madrid SE General
Growth Fund of Spain	GSP (NYSE)	900214	900216	Madrid SE General
Swiss Helvetia	SWZ (NYSE)	870819	880708	Swiss Market
United Kingdom	UKM (NYSE)	870806	870807	FT 100 Index

Source: IPO dates are from Moody's Bank and Finance Manual.