



# The price linkages between the equity fund price levels and the stock markets: Evidences from cointegration approach and causality analysis of Hong Kong Mandatory Provident Fund (MPF)

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## ABSTRACT

This paper is the first study to examine the short and long term price level linkages between the equity funds under the Hong Kong Mandatory Provident Fund (MPF) scheme and the benchmark indices proxied by different indices designed by the Hong Kong Investment Fund Association (HKIFA) over the period 2001–2008. Cointegration test is used to identify the long run relationship between the price levels and the stock market index, short run relationship between them is analyzed by the Granger causality test. We find that there is 56.43% of the equity funds have their price levels cointegrated with stock market index. In the short run, the Granger causality test indicates that some funds' price levels have both long and short run comovements with the stock market indices; on the other hand, some equity funds are found to have short run comovements with the stock market index but no long run comovements with the index, this indicates that some equity fund managers have ever tried to design their portfolios trying to win the market. Cointegration analysis is also done to investigate the long run relationship between the price levels of non-Hong Kong equity fund price levels and the local stock market index, Hang Seng Index, to evaluate the existence of benefit from global diversification by investing in the foreign equity funds. The results indicate that the scheme participants may have global diversification benefit by investing in US and Japanese equity funds.

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## 1. Introduction and previous research

Like many other countries, Hong Kong has an aging population – where people aged 65 and over accounted for only 6.6% of the population in 1981, by 2003, this figure had risen to 11.5% and it is expected to increase to 14% by 2016 and to 24% by 2031. The government is grappling with the policy implications of how best to provide for the retirement needs of this ever increasing group. The first major policy initiative has been the introduction of the Mandatory Provident Fund (MPF) system, which was implemented on 1 December, 2000. Under this scheme, most employees and their employers are required by law to make monthly contributions to a MPF, which are based on the level of salary and the period of employment. These MPFs are managed by approved private organizations according to criteria set out by the government. Prior to the implementation of the MPF system, only one-third of the 3.4 million person Hong Kong workforce had some form of retirement protection, and with the introduction of the MPF system, this figure had risen to 86% by the end of 2001.

The launch of the MPF system has created an entirely new class of asset in the Hong Kong financial markets, which has a very broad base of investor support. These funds represent the cornerstone of the government's policy to deal with the financial burden of the retired population. Given their importance and investor interest in these funds, there is a need for research on the performance of MPFs. It is an important empirical issue as to whether these funds are able to provide a reasonable rate of return to the investors whose future welfare depends so much on their performance. The literature on the performance of mutual funds is extensive in these several decades and many of these studies compare the fund's return with that of the market. Most of them confirm the inability of mutual funds to outperform the market benchmarks or indices (Jensen, 1968; Lehmann & Modest, 1987; Grinblatt & Titman, 1989; Malkiel, 1995; Gruber, 1996; Carhart, 1997). The findings of the studies on performance of mutual funds traded in other countries are consistent with the U.S. evidence (Bauer, Otten, & Tourani Rad, 2006; Cai, Chan, & Yamada, 1997; Hallahan & Faff, 1999; Sawicki & Ong, 2000).

It is interesting to note that while there has been a substantial amount of research undertaken on Hong Kong security and futures markets, the mutual funds industry, and MPFs in particular, have received only scant attention. Chu and McKenzie (2008) is the first study on the MPF equity fund managers' stock-selection and market-

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timing ability during the period 2001–2006. The findings indicate that US equity funds in the scheme consistently underperform relative to the market, while the other fund groups, including Hong Kong equity funds, Japan equity funds, Asia excluding Japan equity funds, Asia excluding Japan and Hong Kong equity funds, European equity funds, and Global equity funds, consistently outperform the market. The stock-selection ability of MPF constituent equity funds in times of changing economic condition is also investigated; the conditional models which incorporate five economic variables decrease the individual fund traditional alpha measure. The market timing models of Treynor–Mazuy and Henriksson–Merton, provide evidence of superior market timing ability except Japan equity funds and Asia excluding Japan and Hong Kong equity funds.

The aim of this paper is to add further evidences of long-run and short-run associations between the MPF equity funds' prices and stock market indices. There are several studies examining the degree of association of country funds and their underlying market returns. [Bosner-Neal, Brauer, Neal, and Wheatley \(1990\)](#) document that a relation exists between announcements of changes in investment restrictions and changes in country fund price-net asset value ratios; suggest that these ratios may be traceable to the existence of government controls and provide the evidence that some foreign markets are at least partially segmented from the U.S. capital market. [Bailey and Lim \(1992\)](#) compare the correlation of country fund and U.S. market returns to the correlation of foreign fund and U.S. index returns to evaluate the benefit of international diversification, and document that the returns of new country funds have significant correlation with the returns of market index.

The primary objective of this paper is to study the possible pattern of cointegration and causality between the price levels of the equity funds in the Hong Kong MPF scheme and their underlying stock market indices and Hong Kong stock market index respectively. Correlations measure the co-movement of two variables, while cointegration analysis tests whether two time series tend to move together with time without deviating from each other and maintaining a long run equilibrium state. The presence of cointegration indicates the existence of long-term equilibrium relationship between MPF's prices and the underlying stock market index; and suggests that the MPFs may be an appropriate substitute for directly investing in the stock market for retirement because it implies that the MPFs may replicate the stock market index over the long run. However, the lack of cointegration between the price levels of non-HK equity funds in MPF scheme and the local stock market index, i.e. Hang Seng Index, indicates that the foreign-equity MPFs do not have co-movement with the local stock market index in the long run and suggests that the Hong Kong investors may be benefit from diversification and may have potential portfolio gain. The Granger causality test may reveal which time-series variable is exogenous and which time-series variable is endogenous. A unidirectional causality from the stock market index to the MPF prices implies that the MPF is representing the pre-existing conditions in the stock market; conversely, a unidirectional causality from the MPF prices to stock market index indicates there may be a possibility of a spillover from the ETF to the local stock market and the reason of such spillover may be due to the role of the fund to serve international investors (see [Ben-Zion, Choi, & Hauser, 1996](#)).

There are some studies on the existence of cointegration between the funds' prices and their underlying benchmark index in the literatures. [Chang, Eun, and Kolodny \(1995\)](#) document the existence of cointegration between the closed-end country funds' value and their net asset value for the majority of closed-end country funds from North America and Europe. However, there is no evidence of cointegration between these two time series for Asian emerging markets such as India, Korea, Malaysia, Taiwan and Thailand. [Allen and MacDonald \(1995\)](#) find no evidence of cointegration between the monthly Australian index data supplied by Morgan Stanley Capital International and the other 16 countries including Italy, Japan,

Norway, Malaysia, Singapore, and US etc, which suggests that the Australian investors can be benefit from international diversification. [Ben-Zion, Choi, and Hauser \(1996\)](#) use the cointegration and causality tests to evaluate how three country funds listed in the US are related to market indices of their own national stock markets, which include Germany, UK, and Japan; as well as the US stock markets. The cointegration tests show that pairs of time series of country funds and national stock market indices are not cointegrated, it indicates that the country funds in the sample is far from tight in the long run. The causality test shows the presence of dual causality between the sample fund prices in these three markets and their own stock market indices, but not with the US market. [Matallin and Nieto \(2002\)](#) document little evidence of cointegration between the mutual funds and the Spanish stock market index Ibex 35. Their findings indicate only 11 out of 63 (representing 17.5% of the total) funds are cointegrated with the index. The authors explain that their sample funds have little cointegration with the stock market index may be due to that the funds analyzed are mostly actively managed funds, which portfolios are managed through market timing and asset selection; such trading activities could cause greater or smaller differences with respect to the evolution of the Ibex 35. The authors added that the actively managed mutual funds have to diversify their investments in line with corresponding prevailing legislation and they have to hold a percentage of liquid worth, either to meet legal requirements or as cash for future reimbursements or new share applications, may increase the possibility of little evidences of cointegration.

To limit the scope of this study, only 'equity' funds that are authorized by the Mandatory Provident Fund Scheme Authority to be included in the MPF scheme are considered. The other types of MPF funds: (1) balanced funds, (2) fixed-income funds, (3) money market funds, (4) guarantee return funds, and (5) capital preservation funds, are excluded from this study. Furthermore, mutual funds that are not included in MPF scheme are excluded even though some of them are authorized by the Monetary Authority to sell in Hong Kong. The focus on pension funds to the exclusion of other types of funds is based on the observation that pension fund managers control a larger portion of the aggregate wealth than do mutual fund managers ([Coggin, Fabozzi & Rahman, 1993](#)). Further, pension fund managers and mutual fund managers operate in a different environment. For example, pension fund managers are reviewed periodically by their clients and independent pension consultants. Further, whereas poor performing mutual fund investors may withdraw their money from the funds at any time, such withdrawals are not usually seen in pension funds ([Christopherson, Ferson & Glassman, 1998](#)).

Due to the short history of the MPF scheme, only a relatively small sample of data is available. Further, there is a general lack of information about fund operating characteristics such as the fund size, cash flows, and turnover rates. The MPF funds were not required to release this information to the public before November 2005 and prior to this date, the fund trustees treated such information as confidential. Keeping these data limitations in mind, we argue that while the data is not as comprehensive as would be the case for other markets, a sufficient amount of data is available to allow some preliminary insights into the MPF performance and behavior.

This paper aims to add further evidence on the possible pattern of cointegration and causality between the prices of the equity funds in MPF scheme and their underlying stock market index and Hong Kong stock market index respectively, and the paper is organized as follows. [Section 2](#) describes the data and research methodology employed. [Section 3](#) discusses the findings and the concluding remarks are summarized in [Section 4](#).

## 2. Research methodology and data

Prior to the causality test, we have to certain that the time series are stationary. A time series is said to be stationary if its mean and

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