THE RELATIONSHIP BETWEEN MUTUAL FUND FLOWS AND STOCK MARKET RETURNS: A COMPARATIVE EMPIRICAL ANALYSIS

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Abstract

This paper examines the relationship between aggregate equity mutual fund flows and excess stock market returns in Hong Kong and Singapore. Our findings demonstrate that, in Hong Kong, two-way causality exists between aggregate equity mutual fund flows and stock market returns. In comparison, despite their close proximity and reputation as global hubs no such finding is reported in the case of Singapore. We find that in Singapore, neither aggregate equity mutual fund flows Granger-cause subsequent excess stock market returns nor excess stock market returns Granger-cause subsequent aggregate equity mutual fund flows. The difference in findings is attributed to the degree of openness for each country. Additionally, for both Hong Kong and Singapore, we find that contemporaneous aggregate unexpected equity mutual fund flows positively affect excess stock market returns and vice versa. The study contributes to the literature by providing support with what is already known in regards investor heuristics, that excess stock market returns has a positive effect on aggregate equity mutual fund flows.

Key words: Mutual funds, Endogeneity, Excess Stock Returns, Fund Flows, Granger-Causality.
JEL Classification: G15, G23.

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1. Introduction

Mutual funds have experienced significant growth in most countries in the ten years prior to 2008 and are now an integral component within the financial services industry of these countries. Mutual funds offer a number of benefits to investors that direct investment in the stock market do not offer, such as: lower cost at the entry level; portfolio diversification; and unbiased professional fund management.

The existing literature has already demonstrated the existence of a positive relationship between excess stock market returns and mutual fund flows in various markets around the world. Substantial research exists on the relationship between mutual fund flows and stock market returns in the U.S., such as Warther (1995), Remolona, Kleiman and Gruenstein (1997) and Edwards and Zhang (1998) amongst others[35]. Limited work has however addressed this issue outside the U.S. investment management industry. With Asia fast becoming the growth region in the new world more work is required to investigate important issues, such as the relations between mutual fund flows and excess stock market returns, in this important geographical territory. Oh and Parwada (2007) have conducted a study that challenges the US findings in Asian markets and identify a positive relationship between stock market returns and mutual fund flows in Korea using daily data.

In this paper we extend the literature based in the Asia-Pacific region and examine the relationship between mutual funds and the stock market in both Hong Kong and Singapore between October 1998 and June 2007. Following most notably Warther (1995) and Edwards and Zhang (1998), we

[35] Other prominent studies that have investigated fund flows and stock market returns in the U.S. setting include: Davidson and Dutia (1989); Ippolito (1992); Patel, Zeckhauser and Hendrics (1994); Fortune (1998); Fant (1999); Mosebach and Najand (1999); Cha and Lee (2001); Edelen and Warner (2001); Karceski (2002); Goetzman and Massa (2003); Carpoerale, Philipppas and Pittis (2004); Ben-Rephael, Kandel and Wohl (2008); Humphrey, Benson and Brailsfor (2009).

investigate these relations at the macro-level. This means we are more concerned with aggregate mutual fund flows rather than flows movement from one mutual fund to another which is more relevant in micro-level studies (Ippolito 1992; Patel, Zeckhauser and Hendrics 1994).

As Khorana, Servaes and Tufano (2005) point out, there has been little empirical research performed on mutual funds outside the U.S. This paper contributes to the literature by investigating both the Hong Kong and Singapore mutual fund markets that have a history dating back to 1960 and 1959 respectively (Khorana et al. 2005, p. 37). Hong Kong and Singapore are worthy of separate investigation given their respective size and importance within the Asian-Pacific region (refer to Figure 1), the difference in market structure with regards pension schemes[36] in both Hong Kong and Singapore being mandatory in nature and finally the dominance of non-resident investors in the Asian markets compared with that of the U.S.

Hong Kong and Singapore are also worthy of a comparative analysis given they are both major fund management centres in the Asia- Pacific region and that these two financial centres compete with each other for businesses (Sagaram and Wickramanayake 2005). Additionally, demographic and economic conditions are quite similar between these two fund management centres.

It has been argued in the literature that increased fund flows due to changing economic conditions is positively related with excess stock market returns in the case of weekly data (Warther 1995). It has also been argued that increased stock-returns have a positive impact on fund flows (Edwards and Zhang 1998). Conversely it could be argued that one activity does not necessarily lead the other. That is, activity in the stock market resulting in excess market returns does not necessarily lead or lag the flow of funds in the mutual fund market, but that they move up and down in concert as economic conditions change.

Driven by these motivations, we address the following two research questions at the macro-level:

1. Does a lead-lag relationship exist between aggregate equity mutual fund flows and excess stock market returns in Hong Kong and Singapore?
2. What is the relationship between unexpected aggregate equity mutual fund flows and excess stock market returns in: (i) Hong Kong? (ii) Singapore?

The rest of this paper is organised as follows. Section 2 reviews the existing relevant literature that has previously investigated the relationship between aggregate mutual fund flows and stock market returns. Data description is provided in Section 3 and the research design is discussed in section 4. Section 5 outlines the empirical results and their significance before concluding remarks are presented in section 6.

[36] Pension schemes in Hong Kong and Singapore are different from that of the U.S. Both Hong Kong (Mandatory Provident Fund) and Singapore (Central Provident Fund) have mandatory pension schemes. In the U.S., many pension plans exist, such as Individual Retirement Account (IRA), 401(k), and profit sharing plans. However, they are not mandatory and can be accessed by individuals.

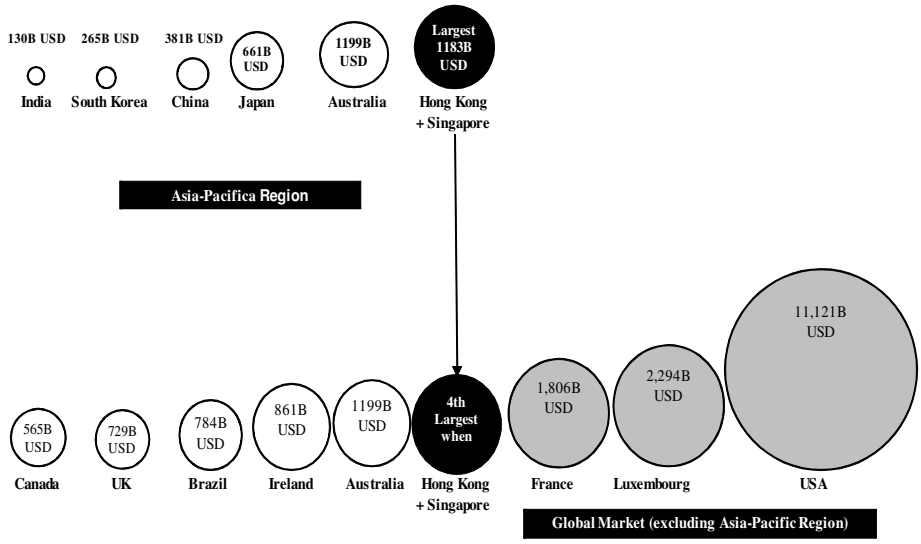

Figure 1. Global Significance of Hong Kong + Singapore's Investment Fund Pool

Source: Investment Company Fact Book 2010, Worldwide Total Net Assets of Mutual funds.
The figure reports the size of Investment fund industries around the world. All dollar values are represented in billions of U.S. dollars at the end of the calendar year 2009

Relevant Literature

Warther (1995) pointed out that micro-level relationship is fundamentally different from macro-level relationship. Investors often moved money from one mutual fund to another. However, not all the mutual fund movements represented changes in aggregate mutual fund flows. Some inflows were at the expense of the outflows of another mutual fund. As a result, the micro-level studies focused on how fund managers competed against each other for business. However, at macro-level, flows among mutual funds were offsetting. Only the aggregate flows into (or out of) all mutual funds were relevant. Therefore, macro-level studies focus on whether aggregate mutual fund flows will affect stock market returns or vice versa.

Warther (1995) examined the dynamic relationship between aggregate mutual fund flows and security returns in U.S by using weekly and monthly data for the period from January 1984 to June 1993. Flows were decomposed into expected and unexpected components by Warther. Unexpected flows were defined as the residual from the expected flow regression. Results of Warther (1995) suggested that unexpected aggregate mutual fund flows were positively associated with the contemporaneous stock market returns. In addition, in terms of the lead-lag relationship, there was evidence of a positive relationship between aggregate mutual fund flows and subsequent stock market returns in weekly data, and a negative relationship between stock market returns and subsequent flows in monthly data.

Similar to Warther (1995), Remolona et al. (1997) also divided mutual fund flows into expected and unexpected components. However, as an additional contribution they improved the model by using instrumental variables rather than Ordinary Least Squares (OLS) regression to examine the relationship between flows and returns, in an attempt to correct for possible endogeneity between returns and fund flows. They found that unexpected equity fund flows were not affected by either contemporaneous or lagged stock returns. Their study concluded that the short-term effect of market returns on mutual fund flows was too weak to sustain a spiral.[37]

Edelen and Warner (2001) found a strong positive contemporaneous relationship between aggregate mutual fund flows and stock market returns in daily frequency. They also suggested a positive association between stock market return and subsequent aggregate mutual fund flows. However, their findings showed that there was no statistically significant relationship between aggregate mutual fund flows and subsequent stock market returns. Contrary to Edelen and Warner (2001), who found that aggregate mutual fund flows were negatively serially autocorrelated, Goetzman and Massa (2003) found that aggregate mutual fund flows were positively autocorrelated.

Rather than just identify the relationship between fund flows and market returns, Fortune (1998) explored the causality between flows and returns in U.S by conducting an unrestricted VAR model, using monthly data for the period January 1984–December

37 A spiral means a decline in market returns leads to decrease in fund flows and the decrease in fund flows results in further decline in market returns.

1996. Empirical findings in Fortune's study were opposite to those earlier studies mentioned above. Fortune found some evidence for feedback trading and concluded that equity fund flows were affected by only contemporaneous stock returns rather than the lagged stock returns.

Edwards and Zhang (1998) examined the causal relationship between fund flows and market returns in U.S. from January 1961 to February 1996, by using Granger Causality model. Results of this paper suggested that only market returns would granger-cause aggregate equity mutual fund flows but not the opposite.

In another study, Mosebach and Najand (1999) investigated the relationship between the aggregate equity mutual fund flows and S&P 500 index return in U.S by using monthly data from January 1984 to July 1998. They used the Engle and Granger error correction methodology (Engle and Granger 1987) and suggested that a causality relationship between the equity fund flows and stock market returns existed. Another finding was that the aggregate mutual fund flows were influenced by the returns of the stock market in previous month. They also suggested that a high return on the stock market encouraged more investment into the mutual fund market. Therefore, two-way causality exists between the stock market return and equity mutual fund flows.

According to Caporale et al., (2004), if a two-way relationship between aggregate mutual fund flows and stock market returns existed, a change in market returns may lead to a change in mutual fund flows, which in turn led to a further change in market returns. The reason was that a shock to stock prices such as 9/11 attack on 11th September 2001 might lead to a large amount of redemption of shares from equity mutual funds. This might create an incentive for fund managers to sell stocks. Such selling might pull down the price further and causing more redemption. The existence of this dynamic relationship might amplify the fluctuations of returns and flows when there was a shock in stock market. Finally, it ended up with a prolonged decline in market returns.

The studies mentioned above focus on the U.S market. Oh and Parwada (2007) have conducted one of the few studies that investigates the relations between mutual fund flows and stock market returns in the Asian setting. They investigated the Korean market over the sample period between 1997 and 2003 immediately following the fall-out from the Asian-crisis and identified not only a positive relationship between stock market returns and mutual fund flows but that mutual fund investors are negative feedback traders. A negative feedback trader is an individual who buys securities in down markets and aims to sell later when the market is bullish. The finding reported by Oh and Parwada (2007) is consistent with the theory that mutual fund investors are the least informed investors (Cao, Chang and Wang 2008). In a recent study by Ding (2010) the causality relation between US and several Asia-pacific markets (Japan, China, Hong Kong, Taiwan, Singapore, Korea, and Indonesia) is investigated. In this study by Ding all of the Asian markets (excluding Japan and China) were found to have high correlation but weak granger causality relation amongst each other. In summary, the empirical results on the relationship between mutual fund flows and returns are mixed and further investigation is required, particularly outside the US (Khorana et al. 2005).

3. Data, Sources and Variable Identification and Construction

The data used in this study covers the sample period October 1998 to June 2007. Two major factors are considered when deciding the sample period. First, data for aggregate equity mutual fund flows in Singapore is only available from 1998. Second, from 2007 to present, markets have been experiencing the impact of the global financial crisis (GFC) triggered by a liquidity shortfall in the United States banking system. Thus, data during the time period affected by the GFC have outliers and as a result are excluded from the sample period so as to not distort our findings.

Fund flow data is not readily available so a proxy is adopted consistent with prior literature (Goetzmann and Peles 1997; De Guercio and Tkac 2002, 2008). Monthly and quarterly net assets value data for both Hong Kong and Singapore are collected from the Morningstar Direct database along with both monthly and quarterly return data. The total number of observations in our sample is 8267 mutual funds consisting of 5427 Hong Kong funds and 2840 funds in the case of Singapore. The stock market indexes for Hong Kong (Hang Seng Index) and Singapore (Straits Times Index) are collected from www.yahoo.com.hk and www.yahoo.com.sg, respectively.

The independent variables in our study include: data on the industrial production index; the prime lending rate; the long-term government bond yield; the 3-month treasury bills rate; and 1-year treasury bills rate; for both Hong Kong and Singapore. The independent variables data are collected from DataStream with the following exceptions, Household savings data for Singapore are collected from Monetary Authority of Singapore, and GDP per capita data for Hong Kong are obtained from Census and Statistics Department of Hong Kong. All data for the independent variables in this paper are collected on a quarterly basis.

3.1 Aggregate Equity Mutual Fund Flows

Monthly and quarterly cash flows into and out of the mutual funds over the sample period are used when constructing aggregate equity mutual fund flows. Consistent with the existing literature (Goetzmann and Peles 1997; De Guercio and Tkac 2002, 2008), mutual fund flows are defined as:

$$Flows_t = NAV_t - NAV_{t-1}(1 + R_t) \quad (1)$$

Where 'NAV' represents net assets value at the end of month t and quarter t, whereas 'R' represents returns on a mutual funds at the end of month and quarter t. All fund flows are calculated using fund-by-fund basis. The aggregate equity mutual fund flows are defined as the sum of all equity mutual fund flows.

Total market value of the stock market increased substantially over time. Thus, in order to control for this strong rising trend during the sample period, aggregate equity mutual fund flows are normalized by dividing them by the mutual fund market's total net assets in the previous month. Therefore, flows are stated as a percentage of mutual fund market's total net assets (Remolona et al. 1997).

3.2 Excess stock market returns

Stock market returns are then calculated following Remolona et al (1997) as the changes in the logarithms of the end-of-month market indexes. Hence, excess stock market returns are calculated as follows:

$$Returns_t = (logP_t - logP_{t-1}) \quad (2)$$

Where 'Returns' represents stock market returns and 'P' represents stock market's index. In assessing the relationship between aggregate equity mutual fund flows and stock market returns, excess returns will be used rather than normal stock market returns (Edwards and Zhang, 1998). Excess returns are defined as difference between stock market returns and three months treasury bills rate.

3.3 Independent Variables

Having constructed aggregate monthly and quarterly fund flows and excess stock market returns, independent variables are then identified and constructed. However, first the Hausman test is initially conducted to examine whether endogenity between aggregate mutual fund flows and excess stock market returns exists[38]. For both Hong Kong and Singapore, excess stock market returns and aggregate equity mutual fund flows are found not be endogenous. Therefore, standard OLS regression can be employed rather than two stage least square method to test the contemporaneous association between excess stock market returns and unexpected aggregate equity mutual fund flows.

The independent variables are selected following Edwards and Zhang (1998). Only quarterly data is collected for the independent variables as data did not exist in all cases at the monthly level. Provided below are definitions used in this study for the instrumental variables.

Quarterly Growth Rate of Industrial Production:

Growth in industrial production is defined as the quarterly percentage increase in industrial production (includes manufacturing, mining, and construction) and is used to capture real systematic production risk in the economy.

[38] In order to test whether instrumental variables analysis or OLS is appropriate the Hausman test for endogenity is conducted. For Hong Kong the HResidual is -0.0103 and is statistically insignificant (p-value = 0.860). For Singapore the HResidual is 0.0094 (p-value = 0.8468) and therefore is not found to be statistically significant at any level of significance.

$$QIP_{t+1} = \log\left(\frac{IP_{t+1}}{IP_t}\right) \quad (3)$$

Where 'QIP' represents the percentage change in production and 'IP' represents the quarterly industrial production index. Equity market performance is related to changes in industrial production in the long run. However, since stock market prices involve the evaluation of expected future cash flows, quarterly excess stock market returns may not have a relationship with quarterly growth rate of industrial production. Current quarter's changes in excess stock market returns will most likely reflect only changes in industrial production anticipated ahead in the future. Therefore, following Fama (1981) and Chen, Roll and Ross (1986), QIP will lead all other variables by one quarter to make it consistent with the timing of other variables.

Risk Premium on Lending Rate:

The risk premium is the spread between prime lending rate and the long-term government bond yield. Risk premium is defined as:

$$RP_t = Prime_t - LGB_t \quad (4)$$

Where 'PRIME' is the prime lending rate and 'LGB' is the average yield on 10-year government bonds.

Term Structure Premium:

The term structure premium, TSP_t, is defined as:

$$TSP_t = LGB_t - TB1y_{t-1} \quad (5)$$

Where 'LGB' is as defined previously and 'TB1y' is the one-year T-bill rate.

Interest Rates:

Three months treasury bills rate reflect the level of short-term interest rate. It changes with the business cycle (Fama and French 1989). Therefore, '$TB3m_t$' which is the quarterly discount yield on three-month T-bills at the end of quarter *t* is used.

Savings:

Generally speaking, not all the household savings will be spent. Some of the savings will be invested in financial assets. An increase in aggregate household savings will raise the demand in the equity market. Thus, the market demand for equity mutual fund shares should increase correspondingly (Kennickell, Starr-McCluer and Sunden 1997; Reid 1997). As a result, quarterly growth rate of aggregate household savings (*QS*) is used as an independent variable in modelling mutual fund flows.

Growth Rate of GDP per capita:

The gross domestic product (GDP) or gross domestic income (GDI) is a measure of a country's economic performance. It represents the total market value of all final goods and services made within the borders of a nation. It is expected that the higher the income generated by a region, the larger the investment is, therefore, the larger the aggregate equity mutual fund flows. Level of GDP, to some extent, is determined by the population of the country. The larger the population is, the higher the GDP. Therefore, GDP per capita is a better measure of economic performance and it will be used instead of GDP. Growth rate of GDP per capita GPGDP is given by:

$$GDPC = \log\left(\frac{PGDP_t}{PGDP_{t-1}}\right) \quad (6)$$

Where PGDP is GDP per capita, GDP is real GDP in this study.

4. Research Design

Following Edwards and Zhang (1998), two types of relationships are tested on the link that exists between aggregate equity managed fund flows and excess share market returns. First, the Granger causality test is used to test the lead-lag relationship and causal relationship between aggregate equity managed fund flows and excess share market returns. Second, OLS regression is undertaken to examine the contemporaneous relationship between unexpected aggregate equity managed fund flows and excess share market returns. We discuss the two types of relationships and how we test for these relationships before providing a discussion about our findings in section 5.

4.1 Association versus Causation

According to Remolona et al. (1997), a strong relationship between aggregate equity mutual fund flows and stock market returns is insufficient to conclude causality. There is one possible explanation for the existence of these associations in the absence of causality. A common third factor such as favourable information arrival in stock market, might affect both flows and returns at the same time. For instance, if there is favourable information stating that future earnings will increase, this might

encourage more investments into mutual funds forces up asset prices simultaneously. In this case, the association between fund flows and market returns would not imply the existence of causality. Similarly, if there is an increase in interest rate, both aggregate equity mutual fund flows and stock market returns will decrease at the same time (Remolona et al. 1997). Therefore, both associations and causality will be tested in this study.

4.2 Granger Causality Analysis

Granger Causality test examine the 'causality' between two variables (Granger 1969). In order to determine whether aggregate equity mutual fund flows Granger-cause excess stock market returns, or vice versa, the following equations are used:

$$\text{Returns}_t = \alpha_{1t} + \sum_{i=1}^{11} \beta_{1i} \text{Flows}_{t-i} + \sum_{i=1}^{11} \gamma_{1i} \text{Returns}_{t-i} + \varepsilon_{1t} \quad (7)$$

$$\text{Flows}_t = \alpha_{2t} + \sum_{i=1}^{11} \beta_{2i} \text{Flows}_{t-i} + \sum_{i=1}^{11} \gamma_{2i} \text{Returns}_{t-i} + \varepsilon_{2t} \quad (8)$$

All the variables in the above equations are the same as earlier defined.

4.3 Ordinary Least Squares Analysis

As argued by Edwards and Zhang (1998), one drawback of Granger causality analysis is that it does not utilize current information to identify causality. Strictly speaking, variable x does not cause variable y only if y is exogenous to x. A necessary condition for such exogeneity is that both current and past values of x do not affect y. Granger causality tests, however, satisfy a weaker condition, i.e. only past values of x do not affect y. The proposed OLS model utilizes current information to test the association between fund flows and returns. In addition, according to Edwards and Zhang (1998), only unexpected components of mutual fund flows are considered when the association is examined. This is because only unexpected mutual fund flows should have an effect on excess stock market returns. For instance, if investors correctly forecast the mutual fund flows in the next period, returns should be adjusted before the mutual fund flows actually occur. In order to divide aggregate equity mutual fund flows into expected and unexpected components, the autocorrelation function AR (4) is conducted. The following equation shows the AR (4) process:

$$Flows_t = \alpha_0 + \beta_1 Flows_{t-1} + \beta_2 Flows_{t-1} + \beta_3 Flows_{t-3} + \beta_4 Flows_{t-4} + \varepsilon_t \quad (9)$$

All the variables in the above equation are the same as earlier defined. Unexpected aggregate equity mutual fund flows are estimated by the residual of equation (9) as per Edwards and Zhang (1998).

In contrast to Edwards and Zhang (1998), who used instrumental variables, this study employs standard OLS procedure as no endogeneity was detected via Hausman tests. Therefore, simple OLS models are used instead of the Instrumental Variables approach. The two regressions models are:

$$Returns_t = \gamma_0 + \delta_1 uFlows_t + \delta_2 RP_t + \delta_3 TBL3m_t + \delta_4 QIP_{t+1} + u_t \quad (10)$$

$$uFlows_t = \theta_0 + \mu_1 Returns + \mu_2 QS_t + \mu_3 GDPC_t + v_t \quad (11)$$

Where $Returns_t$ are excess returns, $uFlows_t$ are unexpected aggregate flows, RP_t is the credit risk premium, $TBL3m_t$ is the three month treasury bill rate, QIP_{t+1} is the lead growth in quarterly production, QS_t is the quarterly change in savings and $GDPC_t$ is the growth in GDP per capita. As in Santini and Aber (1998), the *levels* of our variables are used rather than *changes* in level with the exception being *QIP* as mentioned in section 3.3.

5. Empirical Results
5.1 Diagnostic Tests

Prior to addressing the major research questions posed in this study we first provide evidence that variables are not highly correlated (see Table 1) and then additionally test for seasonality and unit roots.[39]

Based on the two panels in Table 1, term structure premium (TSP) is highly correlated with two variables, namely, 3-month treasury bills rate (TB3m) and risk premium (RP). In order to avoid the potential problem of multicollinearity, term structure premium will be excluded from the OLS model. Further, variance inflated factor tests were run on equation (10) with the addition of TSP and it was found that the VIF measure for TSP was approximately 10 for the two countries.

Previous empirical studies have identified some seasonality effects that may exist on mutual fund flows and excess stock market returns. Seasonality means time series data experiences regular and predictable changes in each year. In the context of this paper, it is characterised by a large amount of money flows into the mutual fund market and a positive abnormal excess stock market returns in some time period. For example, Matallin-Saez (2006) suggests that seasonality effect in Spain is particularly significant from year-end to the beginning of next year, the beginning of July and at the month end. Holmes and Faff (2004) identify the monthly seasonality in Australian mutual funds context. They find some evidence to support seasonal effects in both January and July, and they are especially significant in July. As the seasonal effects will introduce a large positive inflow of money and a high positive abnormal return, it might bias the overall result of the tests. Therefore, an examination of seasonality is necessary before running the models. Following Gujarati (2009), the following regressions are run to test the quarterly seasonal effect

Table 1. Correlation Matrix

This table presents the correlation coefficient between independent variables between October 1998 and June 2007. Panel A presents the correlation coefficients for Hong Kong whereas the coefficients for Singapore are presented in Panel B. *TB3m* is the yield on 3-months treasury bills. *TSP* represents term structure premium, which is defined as the difference between long-term government bond yield and 1-year treasury bills rate. *RP* is the risk premium defined as spread between prime lending rate and the long-term government bond yield. *QIP* represents quarterly growth rate on industrial production index. *QS* is quarterly growth rate of aggregate household savings. *GDPC* is quarterly growth rate on GDP per capita.

Panel A: Hong Kong

	TB3M	TSP	RP	QIP	QS	GDPC
TB3M	1.0000					
TSP	-0.7336	1.0000				
RP	0.4592	-0.7838	1.0000			
QIP	-0.0063	-0.1183	0.1291	1.0000		
QS	0.1884	-0.4775	0.6318	0.2774	1.0000	
GDPC	-0.0350	-0.0630	0.0639	0.3542	0.2341	1.0000

Panel B: Singapore

	TB3M	TSP	RP	QIP	QS	GDPC
TB3M	1.0000					
TSP	-0.6910	1.0000				
RP	0.0247	-0.6181	1.0000			
QIP	0.0355	0.2071	-0.3402	1.0000		
QS	0.2247	-0.4921	0.1620	-0.1266	1.0000	
GDPC	-0.0321	0.1703	-0.2006	0.0328	-0.2296	1.0000

[39] Multicollinearity is tested for using EViews and is found that it does not bias the results. Large standard errors are produced in the related independent variables. With sufficient data it is acknowledged within the literature that these errors will disappear. (O'Brien, 2007) Given the relative small sample size (35 quarterly observations for both Hong Kong and Singapore), correlation among independent variables need to be considered.

$$\text{Returns}_t = q_0 + q_1 Q2_t + q_2 Q3_t + q_3 Q4_t + \varepsilon_{14t} \quad (12)$$

$$\text{Flows}_t = s_0 + s_1 Q2_t + s_2 Q3_t + s_3 Q4_t + \varepsilon_{15t} \quad (13)$$

Q1 is the benchmark quarter. Q2, Q3 and Q4 are quarterly dummy variables. None of the dummy variables for aggregate equity mutual fund flows are found to be significant[40]. Therefore, no seasonality adjustment is required. However, in both Hong Kong and Singapore, the Q4 dummy variable is found to be significant. This can be interpreted as meaning that excess stock market returns in Q4 are higher than the other three quarters. As a result, Q4 dummy variable is added to the OLS model.

When the classical approaches of estimation are applied, such as OLS regressions, it is assumed that means and variances of variables are well defined, invariant and independent of time (Rao, 1994). If means and variances of variables are not constant or they change over time, they are called non-stationary variables or variables, which contain unit roots. If the variables in an OLS regression are stationary, classical statistical measures such as t-statistics and R^2 are useful measure of the validity of the regression model (Baffes, 1997). If the variables are non-stationary, using classical methods to estimate relationships no longer have the usual interpretation and may give misleading inferences as well as spurious results (Pindyke and Rubinfeld, 1990; Rao, 1994).

Before testing the Granger causality between aggregate equity mutual fund flows and excess stock market returns, it is essential to conduct an analysis of unit roots tests. This is because the estimated statistics become time dependent given that the variables are non-stationary. As a result, even if the sample size is large, those statistics are not good estimation of the true mean values (Rao, 1994). Furthermore, the probability of committing a type one error is increased. For this reason, it is necessary to examine whether the variables are stationary or contain unit roots. To test for the presence of unit roots, the Augmented Dickey-Fuller test (Dickey and Fuller, 1979, 1981; Fuller, 1996) and the Phillips-Perron test (Phillips and Perron, 1988) have been applied. We find that in both the case for Hong Kong and Singapore, the Augmented Dickey-Fuller and Phillips-Perron tests generate consistent results[41]. The full tables are not presented here due to space constraints but we can report that aggregate equity mutual fund flows and excess stock market returns are stationary over time. Hence, first differencing is not required.

5.2 The lead-lag relationship

The equations (7) and (8) used to test Granger causality are examined using different lag structures of up to 13 monthly lags. The rationale behind this is because there may be some delayed response in the designated relationship between aggregate equity mutual fund flows and excess stock market returns (Edwards and Zhang, 1998). Results for the case consisting of 11 lags are presented (Table 2).

[40] Seasonality tests were conducted with no statistically significant findings found for mutual fund flows in the case of Hong Kong or Singapore. For excess stock market returns Q4 for Hong Kong at the 5% level of significance (statistic=0.1256 with p-value=0.0366) and Q4 for Singapore at the 10% level of significance (statistic=0.1096 with p-value=0.0909).

[41] Unit roots are tested making use of monthly and quarterly data for both Hong Kong and Singapore in the case of flows and returns. In all cases (for both flows and returns) the Augmented Dickey-Fuller and Phillips-Peron tests allow for the null hypothesis (there is a unit root in a variable) to be rejected at the 1% level of significance.

Table 2. Results of Granger-Causality Test

This table presents the results of the Granger-causality tests. Findings for Hong Kong are presented in Panel A while findings for Singapore are presented in panel B. Flows are aggregate equity mutual fund flows and Returns are excess stock market returns. The reported F-statistics are for equations using 11 lags (of independent variables). We additionally tested lag structures as long as 13 months. The results were unchanged. (***), (**), (*) denote significance at 1%, 5% and 10% levels respectively.

	F-Statistic	Probability
Panel A: Hong Kong		
(1) Flows do not Granger Cause Returns	2.3809	0.0143(**)
(2) Returns do not Granger Cause Flows	3.2787	0.0011(***)
Conclusion: Based on the two regressions: Two-way Granger causality (flows Granger cause returns and returns Granger cause flows).		
Panel B: Singapore		
(3) Flows do not Granger Cause Returns	1.4019	0.1912
(4) Returns do not Granger Cause Flows	0.6161	0.8092
Conclusion: Based on the two regressions: Returns do not Granger cause flows and flows do not Granger cause returns.		

The findings are consistent in all remaining cases for lags exceeding 11 months and therefore are not presented here due to space constraints. Granger causality test results for Hong Kong and Singapore are presented in Panel A and Panel B of Table 2 respectively. We will address the two panels and provide a brief discussion as to our main findings individually.

First, with reference to panel A and our findings for Hong Kong, we reject the null hypothesis that excess stock market returns do not Granger-cause aggregate equity mutual fund flows. In interpreting this result we therefore conclude at the 1% level of significance that excess stock market returns Granger Cause aggregate equity mutual fund flows. In addition, the null hypothesis that aggregate equity mutual fund flows Granger-cause excess stock market returns can also be rejected, at the 5% level of significance, which means aggregate equity mutual fund flows Granger-Cause excess stock market returns. The signs of the coefficients for both (1) and (2) are positive meaning that an increase in aggregate equity mutual fund flows will cause an increase in excess stock market returns and vice versa.

We now turn our attention to the panel B where we document that the findings are not so convincing in the case of Singapore. Here it can be identified that the Granger causality test statistics in the case of (3) and (4) cannot be rejected. In other words, in the case of (3) aggregate equity mutual fund flows do not Granger-cause excess stock market returns and in the case of (4) excess stock market returns do not Granger-cause aggregate equity mutual fund flows.

So why does such a difference in the findings exist between Hong Kong and Singapore? Our findings demonstrate that 2-way granger causality exists for Hong Kong but no such relation holds in the case of Singapore. A possible explanation for the difference in findings we report in Table 2 between Hong Kong and Singapore can be attributed to the openness degree of each country. Chinn and Ito (2007) published an index that generates a country openness score for each country in their study. From the rankings provided Hong Kong was ranked 81 compared with Singapore who received a ranking of 91. On the surface the ranking difference does not appear that great but is sufficient in terms of providing an explanation for the difference in findings we report in this current paper.

5.3 OLS Regression Models

Our findings (testing the null hypothesis that excess share market returns do not affect aggregate unexpected equity managed fund flows) obtained from running the OLS model for the case of Hong Kong and the case of Singapore are presented in Table 3. We will discuss each country separately in turn.

First, we examine whether aggregate unexpected equity mutual fund flows affect excess stock market returns in Hong Kong (see column 1 and 3 in Table 3). We find that the variable $uFlows_p$ which captures the estimated unexpected aggregate mutual fund flows, is statistically significant at the 1% level of significance in the simple bivariate regression (column 1) and significant at the 5% level in the full multivariate regression (column 3). The null hypothesis that aggregate unexpected equity mutual fund flows do not positively affect excess stock market returns is therefore rejected. We interpret this finding as meaning that aggregate equity mutual fund flows do have an effect on excess stock market returns. An implication of this finding is that an unexpected increase in aggregate equity mutual fund flows in Hong Kong are more likely than not to result in an increase in excess stock market returns. The OLS estimates lend support to our Granger causality findings in section 5.2 with regard to Hong Kong.

The other regressands yield the expected relationships. As previously explained in section 5.1, a seasonal dummy variable was added to the model to test whether any seasonality effects identified in the data impacts on the accuracy of the estimation. The seasonal dummy variable is excluded due to the low degrees of freedom in our sample and regressions. However, its explanatory power was found to be

insignificant. The risk premium variable, RP_t, is found to be positively related to excess returns and statistically significant at the 1% level in column (4). This implies that in Hong Kong, investors are compensated for the risk faced in investing in the investment industry by way of an increased premium. Further, the Treasury bill rate was found to be negatively related to excess stock returns as per the U.S. results in Edwards and Zhang (1998). Industrial production, as measured by QIP_{t+1}, was found to lead excess returns by up to a quarter out. Although the coefficient is small, 0.0685, relative to theother variable coefficients, it is significant at the 1% level. An additional finding is that the adjusted R^2 measure is reasonably high compared to previous literature (Edwards and Zhang 1998) indicating a good fit. We, therefore, conclude that at least in the case of Hong Kong, the OLS model provides a parsimoniously efficient model compared to a more complex instrumental variables approach. Further, we do not find autocorrelation to be an issue with the Durbin-Watson statistic unable to reject the null of no autocorrelation in the residuals.

We now turn our attention to Singapore (see column 4, 5 and 6 in Table 3). In the simple bivariate model, column (4), we again find that the important variable $uFlows_t$ is statistically significant at the 1% level with the strength of the coefficient (2.9147) much stronger than the case of Hong Kong (0.7627). We conclude that aggregate equity mutual fund flows has a positive effect on excess stock market returns in Singapore. In other words we are able to reject the null hypothesis that aggregate equity mutual fund flows do not positively affect excess stock market returns. The finding of a contemporaneous relationship between the two variables is at odds with the Grange-causality tests which found no relationship at the lead-lag level. The use of quarterly data in the OLS regressions and monthly flow data might be the reason for this outcome. In the full model, column (6), we again find that the $uFlows_t$ is statistically significant at the 5% level. None of the other variables were found to be significant in the regression. The overall goodness-of-fit for the Singapore regression is low when compared to the Hong Kong regression with the adjusted R^2 at 0.1100 in the full model in column (6).

We now consider the null hypothesis that aggregate equity managed fund flows do not affect excess share market returns in each of the respective countries. Findings are presented in Table 4 and a brief discussion of the salient points follows.

The important variable to focus attention on in Table 4 is $Returns_t$. We find evidence to support the claim that excess stock market returns has an effect on aggregate equity mutual fund flows in both Hong Kong (columns 1 and 3) and Singapore (columns 4 and 6). Again, the contemporaneous regression results for Hong Kong agree with the lead-lag Granger tests whereas for Singapore there is once again a conflict. The contemporaneous impact is more pronounced in Hong Kong (0.1113) than that of Singapore (0.0693).

Table 3: Test Results for OLS Returns Model

This table presents the test statistics from running the OLS model for the Hong Kong fund industry and the Singapore fund industry using quarterly data series for the sample period October 1998 to June 2007 (sample size = 37 observations). Test results provided test the null hypothesis that excess share market returns do not affect aggregate equity managed fund flows in each of the respective countries. Returns are excess stock market returns. UFlows(fitted) is the estimated unexpected aggregate equity mutual fund flows generated from stage 1. TB3m is the yield on 3-months treasury bills. RP is the risk premium defined as spread between prime lending rate and the long-term government bond yield. QIP represents quarterly growth rate on industrial production index. Probability of rejecting the null hypothesis is in parentheses. (***), (**), (*) denote significant at 1%, 5% and 10% level, respectively. The regression model (10) is used:

Dependent Variable: *Returns$_t$*	**Hong Kong**			**Singapore**		
	(1)	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
Constant	0.0729	-3.6848	-6.0886(***)	0.1358	0.2768	0.3180
	(0.2180)	(0.1198)	(0.0009)	(0.1082)	(0.5163)	(0.4133)
UFlows$_t$	0.7627(***)		0.6078(**)	2.9174(***)		2.9582(**)
	(0.0055)		(0.0340)	(0.0080)		(0.0101)
TB3m$_t$		-26.7497(*)	-46.1488(***)		-8.1921	-9.1557
		(0.0637)	(0.0000)		(0.4881)	(0.3953)
RP$_t$		16.1378(*)	22.5268(***)		-0.6490	-1.5552
		(0.0640)	(0.0011)		(0.9732)	(0.9294)
QIP$_{t+1}$		0.0404	0.0685(***)		0.2072	-0.2708
		(0.1120)	(0.0005)		(0.9065)	(0.8667)
Adjusted R^2	0.1872	0.0308	0.5896	0.1703	0.0000	0.1100
Log-likelihood	-69.96773	-78.7935	-77.6393	-23.4132	-26.8984	-22.9729
F statistic	8.8282	1.3596	13.2124	7.9779	0.1810	2.0504
Durbin-Watson	2.2694	1.8609	1.6016	1.7169	1.8181	1.6638

The adjusted R^2 measure reported in column 4 for Hong Kong (0.5039) and Singapore (0.1456) for the entire sample period 1998-2007 indicates a good fit to the model, particularly for Hong Kong. For Singapore, closer investigation shows that the R^2 measure is comparable existing literature. Edwards and Zhang (1998) report an R^2 0.21 for their entire sample period. Whereas the adjusted R^2 for our Singaporean model is low it is not inconsistent with previous work. Interestingly, in Hong Kong, quarterly household savings have a substantial positive impact on unexpected flows, with the size of the coefficient approximating that reported in Edwards and Zhang (1998). None of the control variables had any impact on the Singaporean model.

Table 4. Test Results for OLS Unexpected Flows Model

This table presents the test statistics from running the OLS for the Hong Kong fund industry and the Singapore fund industry using quarterly data series for the sample period October 1998 to June 2007 (sample size = 35 observations). Test results provided test the null hypothesis that unexpected aggregate equity managed fund flows do not affect excess share market returns in each of the respective countries. $Returns_t$ are excess stock market returns. $uFlows_t$ are unexpected aggregate equity mutual fund flows. QS_t is quarterly growth rate of aggregate household savings. $GDPC_t$ is quarterly growth rate on GDP per capita. Probability of rejecting the null hypothesis is in parentheses. (***), (**), (*) denote significant at 1%, 5% and 10% level, respectively. The regression model (11) is used:

Dependent Variable: $uFlows_t$	**Hong Kong**			**Singapore**		
	(1)	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
Constant	-0.0150	-0.0557(**)	-0.0234	-.0091	-0.0179	-0.0075
	(0.4524)	(0.0468)	(0.1352)	(0.4855)	(0.3235)	(0.6700)
$Returns_t$	0.1577(**)		0.1176(**)	0.0667(***)		0.0693(**)
	(0.0255)		(0.0187)	(0.0080)		(0.0307)
QS_t		2.2694(**)	1.3617(**)		0.5326	-0.1906
		(0.0311)	(0.0118)		(0.2424)	(0.7207)
$GGDPC_t$		0.0187	0.2061		0.4637	0.2175
		(0.9573)	(0.3400)		(0.1221)	(0.4674)
Adjusted R^2	0.1163	0.1399	0.5039	0.1703	0.035266	0.1454
Log-likelihood	-85.0427	-78.2625	-70.9470	42.6978	40.59790	43.2755
F statistic	5.4734	3.7661	12.5132	7.9779	1.621435	2.9287
Durbin-Watson	1.7594	1.4797	1.6631	1.8467	1.958104	1.8963

6. Concluding remarks

The findings presented in this paper demonstrate that, in Hong Kong, two-way causality, between aggregate equity mutual fund flows and excess stock market returns is found. However, in Singapore, the statistically insignificant test statistic indicates that neither excess stock market returns Granger-Cause aggregate equity mutual fund flows nor aggregate equity mutual fund flows Granger-Cause excess stock market returns. The rationale for this dramatic difference in findings is attributed to the openness degree of each country. Chinn and Ito (2007) published an index that generates a country openness score for each country. From the rankings provided Hong Kong was ranked 81 compared with Singapore who received a ranking of 91. The difference in ranking reflects that Hong Kong has a greater degree of openness compared with Singapore.

In investigating the contemporaneous association, for the Hong Kong market, the results suggest that unexpected aggregate equity mutual fund flows positively affect stock market returns and that excess stock market returns do affect the aggregate equity mutual fund flows. Both results hold in the presence of various explanatory variables, including, for example, household savings and the risk premium. For Singapore market, the results are consistent with that of Hong Kong with both aggregate equity mutual fund flows and excess stock returns displaying a positive relationship in either direction.

There exists possible additional work resulting from this study. First, an extension could be made to investigate the relationship between fund flows and excess stock market returns in the retail and wholesale markets at the micro-level. Recent work by Humphrey, Benson and Brailsford (2009) investigates whether the relationship between macro-level fund flow and market returns varies between the retail and institutional fund management markets. Like much of the previous literature in this area this recent study is focussed on the US market. It should be noted that the Humphrey et al. study investigated only the case of equity funds. Therefore potential future research can examine the relationship between aggregate fund flow and stock market returns for other asset classes as it has been identified in previous literature (see Warther, 1995; Potter, 2000) that the relationship between aggregate flow and market return is not homogenous across different fund objectives.

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