The Post-issue Market Performance of Initial Public Offerings: Empirical Evidence from the Malaysian Stock Markets

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Abstract

This paper examines the long-run performance of the Malaysian initial public offerings (IPOs) listed in the Main and ACE alternative markets at economy and industry level. Using event-time and calendar-time approaches, we provide novel evidence on whether IPOs investments in the Main Malaysian stock market has superior performance compared with the ACE (alternative) market, and whether sector-specific characteristics differ from the aggregate market characteristics in predicting and determining the IPOs performance for eight discrete sector groupings. Using monthly data for the period January 2000 to December 2011, our results from the event- and calendar-time approaches confirm that underperformance anomaly exists in the Malaysian market, and the underperformance is more intense in the ACE market. In addition, we found that the overall underperformance is dominated by performance associated with the Consumer Products and Industrial firms, while the Construction, Property and Technology firms significantly overperform. The findings are robust to a wide range of other sensitivity checks including parametric and non-parametric tests.

Keywords: Initial public offerings (IPOs); Long-run performance; Underperformance; Emerging economy.
JEL Classification: G14, G15, G30, G34, G32, G38.

1 Introduction

The long-run abnormal performance of initial public offering (IPOs) is widely reported in the literature. One possible explanation for long-run underperformance is the divergence of opinion hypothesis proposed by Miller and Reilly (1987), which assumes investors to be optimistic about the future cash flow and growth potential of an IPO. Overoptimism drives investors to value the IPO stocks at higher than their intrinsic values and as more information are revealed over time, the optimistic investors will downward-adjust the stock valuation towards its intrinsic values and this narrows the divergence of opinion between optimistic and pessimistic investors. As stock price drops, return subsequently drops in the long-run and Ritter (1991) hypothesised that IPOs with the highest initial returns will perform worst in the long-run.

The ongoing debates revolve around whether underperformance exists and if the abnormal returns are sensitive to the method employed in calculating the stock returns. A more recent strand of research conducted in the area extended the analysis by comparing the abnormal performance of IPOs across countries, types of IPOs and listing boards to better understand if IPOs behaviour may be attributed to different characteristics.

Gregory et al. (2010) conducted a study on IPOs listed on the main and alternative boards of the London Stock Exchange and found that although IPOs on all markets underperform, the Main market beats the performance of the alternative boards. Vismara et al. (2012) conducted a similar study by comparing IPOs listed on different boards in France, Germany and Italy and find similar behaviour in France and Italy. In Germany, however, the Alternative Market IPOs perform better than the Main market IPOs. In the context of developing countries, Komenkul et al. (2012) have considered the Thai market and find that the IPOs in the Market for Alternative Investments (MAI) outperform their Main market (known as the Securities Exchange of Thailand) counterparts. Komenkul et al. (2012) employ the cumulative abnormal returns (CAR) and buy-and-hold return (BHAR) approaches using different benchmarks to in calculating the IPO abnormal returns and find that the results tend to differ based on the adopted method.

In the Malaysian market, the alternative market was established in 2002 as the MESDAQ Market. The market provides a listing avenue for younger, smaller and growth-driven firms. In 2009, the MESDAQ Market was renamed ACE ("Access, Certainty and Efficiency") Market. The differences between the two markets are in terms of size, age and financial status and the listing requirements are more stringent for the Main market. The leniency for the ACE market listing imply that the stocks carry more ex ante uncertainties compared to their Main market counterparts. Furthermore, most of the ACE market stocks are from the technology

sector, that are often associated with higher ex ante risks. Hence, it is expected that the IPOs listed in the two markets will portray different long-run behaviour. Ahmad-Zaluki and Kect (2012) studied the long-run performance of the MESDAQ Market IPOs. To date, no studies provide a direct comparison between the Main and the ACE markets. Hence, this study fills the gap.

We further supplement the literature by comparing the three-year abnormal returns by sector grouping. Commonly, the literature compare between technology IPOs to their non-technology counterparts (see Gao and Jain (2011); Saade (2015) among others). Ahmad-Zaluki et al. (2007) study cross-sectional returns of Malaysian IPOs by sector grouping. We take a step further by comparing the abnormal returns for three years.

Our next contribution lies in terms of methodology where we ensure robustness in our abnormal returns models by applying the self-constructed size/book-to-market matching portfolio and industry indices as benchmark, on top of the traditional market index. We employ both parametric and non-parametric techniques to determine the significance of abnormal returns. Further, for calendar-time approach, we employ three asset pricing models, namely, Fama-French 3-Factor model, Carhart Momentum model and liquidity-adjusted capital asset pricing model. Our study focuses on newer data set, using IPOs listed from January 2000 to December 2011.

The Malaysian context deserves attention as it is the third best emerging economy behind China and South Korea (Bloomberg, 2014) and ranked 20th in the Global Competitiveness Index 2014, being one of the only two South East Asian economies along with Singapore, that made it in the Top 20 (Schwab, 2014). Furthermore, Malaysian GDP growth rate of 4.7% is said to be expanding faster than Singapore (3.9%) and Thailand (1.8%) (World Bank, 2015). The Malaysian capital market is also forecasted to grow at a compounded annual growth rate (CAGR) of 8.5% from 2010 to 2020 (Securities Commission Malaysia, 2011) and expected to double in size from MYR1.28 trillion in 2010 (USD366 billion) to MYR2.43 trillion (USD695 billion) in 2020. Furthermore, the Malaysian government continues to improve its economic policies to accommodate the dynamic global economic climates to ensure that the capital market remains attractive to foreign direct investors.

Our main analysis indicates that the underperformance anomaly exists in the Malaysian market, and the magnitude is higher in the ACE market. We further find the magnitudes of long-run underperformance to change when different methods are employed. Our calendar-time analysis consistently shows evidence of underperformance in Malaysian IPOs in both the whole market and segmented markets. The remainder of this paper is organised as follows. The following section discusses the framework of IPO long-run abnormal performance. Section

3 describes the data and methodology employed in the current study. Sections 4 and 5 present empirical findings using event-time and calendar-time approaches, respectively. The final section concludes the paper.

2 The Framework of IPO Long-Run Abnormal Returns

One of the main anomalies of initial public offerings (IPOs) is the long-run underperformance, i.e., the IPOs exhibiting poorer performance in comparison to their benchmarks. The majority of the studies provide empirical evidence of underperformance. Studies also show that the level of abnormal returns is sensitive to the methodologies employed in calculating the performance of IPOs.

The early finding of Ritter (1991) triggers global attention on this strand of research. More recent studies in the US market consistently document long-run under-performance the US IPOs (Eckbo and Norli, 2005; Gao and Jain, 2011; Brau et al., 2012), thus supporting Ritter (1991). Similar studies conducted across the global market, such as in the UK (Khurshed et al., 1999; Espenlaub et al., 2000), Spain (Álvarez and González, 2005), Germany (Bessler and Thies, 2006), Japan (Kirkulak, 2008) and Mauritius (Agathee et al., 2014), all report poor long-run abnormal performance of IPOs.

Although the majority of the literature report underperformance, overperformance are being reported in markets such as Australia (da Silva Rosa et al., 2003), Indonesia (Emasari and Tamara, 2010), and France and Italy (Vismara et al., 2012). The mixed evidence may be attributed to market characteristics, time period of study, or methodological factor. The literature suggests that the magnitude, direction and statistical significance of IPO long-run abnormal returns are sensitive to the methods employed in measuring the returns (Kothari and Warner, 1997; Fama, 1998). A change in method, benchmark or weighting measurement, may cause the abnormal performance to change. For example, Chorruk and Worthington (2010), Emasari and Tamara (2010), Erdogan (2010), Thomadakis et al. (2012) and Agathee et al. (2014) document that cumulative abnormal returns (CAR) may vary from buy-and-hold abnormal returns (BHAR) when the same benchmark is used. On the other hand, large variations in abnormal returns across different benchmarks are documented by Espenlaub et al. (2000), Drobetz et al. (2005), Gregory et al. (2010), Gao and Jain (2011) and Brau et al. (2012). Further, equal-weighting of abnormal returns may produce different abnormal returns from value-weighting, as documented by Levis (1993), Kooli and Suret (2004), Locke and Gupta (2009), Erdogan (2010) and Agathee et al. (2014).

The event-time approach carries some limitations. Fama (1998) and Mitchell

and Stafford (2000), highlight that event-time approach suffers from cross-sectional correlations amongst individual firms, hence suggesting the use of calendar-time approach to mitigate such potential misspecification. Fama and French (1993) 3-Factor Model is commonly employed due to the notion that firm size and book-to-market effects play a role in explaining stock returns. Previous studies also document that the long-run underperformance documented using event-time approach disappear when calendar-time approach is used (Levis, 1993; Erdogan, 2010; Moshirian et al., 2010; Su and Bangassa, 2011), among others. In contrast, Mazouz et al. (2008) find consistent evidence of underperformance using the calendar-time approach.

The more recent strand of research focuses on comparative analysis between two groups of IPOs, segmented by firm characteristics related to ex-ante uncertainties such as listing boards. Gregory et al. (2010) and Vismara et al. (2012) conduct comparative analysis on IPOs listed in the Main markets and alternative markets in the UK and European countries (France, Germany and Italy), respectively. Such studies allow further understanding on the effects of market characteristics on long-run aftermarket performance of the IPOs. Gregory et al. (2010) report that IPOs listed in the UK's Alternative Investment Market (AIM) perform poorer than the Main market IPOs in 36-month period using equally-weighted BHAR. Vismara et al. (2012) report similar findings in France and Italy, indicating that larger IPOs perform better than smaller IPOs. Conversely, in the German market, Alternative Market IPOs perform better than the Main market IPOs (Vismara et al., 2012).

In the context of emerging market, Komenkul et al. (2012) adopt a similar approach by comparing 36-month abnormal performance of Thai IPOs listed in the main and alternative markets, known as Securities Exchange of Thailand (SET) and the Market for Alternative Investments (MAI), respectively. They report that MAI IPOs outperform their SET counterparts, consistent with the findings of Vismara et al. (2012) in the German market.

In short, the debates in the literature of IPO long-run abnormal performance revolve around whether underperformance exists in the focal market(s) around the study period, and how methodology causes variations in the abnormal performance level. Some studies offer further insights with comparative analysis between two or more groups of IPOs.

Comparative analysis between two listing boards is still non-existent in the Malaysian market. Previous studies that conduct comparative analysis focus on privatisation vs. non-privatisation IPOs (Paudyal et al., 1998), and growth vs. value IPOs (Corhay et al., 2002). Other studies tend to focus either on the entire market or on one listing board (Jelic et al., 2001; Ahmad-Zaluki et al., 2007; Ahmad-Zaluki and Kect, 2012). Generally, in the Malaysian context, studies that

are robust in terms of methodology, is still scant. By far, the most methodologically robust study in the Malaysian context is that of Ahmad-Zaluki et al. (2007), whereby they employ both event- and calendar-time approaches and use different benchmarks and weighting methods.

Previous studies in Malaysia (Corhay et al., 2002; Ahmad-Zaluki et al., 2007; Ahmad-Zaluki and Kect, 2012) show variations in results when using different methods, indicating that the abnormal returns of Malaysian IPOs are as sensitive to the methodology as IPOs in other markets. The majority of the literature show no evidence of underperformance in the Malaysian market. Paudyal et al. (1998), Jelic et al. (2001), Corhay et al. (2002) and Ahmad-Zaluki et al. (2007), among others, report overperformance in Malaysian IPOs. These studies focus on the Main market IPOs. However, a recent study by Ahmad-Zaluki and Kect (2012) show evidence of long-run underperformance in the MESDAQ Market (currently known as the ACE market). It is worthy to mention that the majority of the existing studies cover the period pre-2000, prior to the 1997 Asian Financial Crisis.

In the pioneer study that focuses on the MESDAQ Market, Ahmad-Zaluki and Kect (2012) highlights the possible influence of listing board on IPO long-run abnormal returns. The difference in long-run behaviours of IPOs listed in the Main market and the ACE market is not yet documented in the literature. Hence, it is worthy to conduct a comparative analysis on the long-run abnormal performance of IPOs listed in the two markets. This study fills the gap in the literature by attempting to determine whether the IPOs listed in the Main and ACE markets portray different long-run behaviours.

We further contribute to the literature by extending the work of Ahmad-Zaluki et al. (2007) by constructing a new benchmark portfolio based on size and book-to-market mimicking the small- minus-big (SML) and high-minus-low (HML) factors of Fama and French (1993) 3-Factor (FF3F) model. We attempt to examine how Malaysian IPOs perform in comparison to firms with similar size and BTM characteristics. The reference portfolio portfolio construction in the Malaysian market using this approach is novel to this study. In addition, we also study industry effect on long-run abnormal return of IPOs. For calendar-time approach, we employ three asset pricing models. First, we employ the Fama and French (1993) (FF3F) model to consider the impact of size and book-to-market values in long-run abnormal returns. Next, we employ the Carhart (1997) Momentum model (MOM) that considers the impact of security returns in the previous period on the IPO returns, and liquidity-adjusted capital asset pricing model (L-CAPM) that considers the impact of stock liquidity on IPO long-run abnormal performance. We further contribute to the literature by incorporating the three asset pricing models in the calendar-time analysis. This study is the first to employ MOM and LCAPM in the Malaysian environment.

Finally, we focus on newer data set using IPOs listed from January 2000 to December 2011. Since the full recovery from the Asian Financial Crisis in 1998, the Malaysian economy has grown dramatically. Hence, by using a more recent set of data, we provide current insights of development of Malaysian IPO market in particular, and the Malaysian capital market in general.

To summarise, the primary objective of this study is to test the hypothesis that in the long-run, Malaysian IPOs show negative abnormal performance. Secondly, this study is conducted to determine whether IPOs behave differently when listed in markets with distinct characteristics. Thirdly, we attempt to determine whether the IPO long-run abnormal returns in Malaysia are sensitive to the method in calculating the returns.

3 Data and Methodology

3.1 Data

3.1.1 Segmentations of Bursa Malaysia

Since the deregulation of the Malaysian Capital Market in 1996, it has experienced tremendous development. Previously known as the Kuala Lumpur Stock Exchange (KLSE), the Malaysian capital market became *Bursa Malaysia* in 2004. Securities are listed in two distinct markets, the Main and the ACE markets. In this study, we conduct comparative analysis of 36-month performance of the Main and ACE markets IPOs.

The Main and ACE markets are different in a number of aspects, with the main difference being size. As at 31 December 2104, the total market capitalisation of Bursa Malaysia was MYR1,643 billion (USD470 billion), comprised of MYR1,633 billion (USD467 billion) Main market securities and MYR9.7 billion (USD 2.8 billion) ACE market securities. Of the total 906 stocks listed on Bursa Malaysia, where 799 (88.2%) listed in the Main market, and 107 (11.8%) in the ACE market.

In terms of age, the ACE market is considerably 'young' as it has only been established in 2002, originally named as MESDAQ Market and subsequently renamed as the ACE market in 2008. The market serves as a listing platform for smaller and younger firms that have been established in less than three years. The ACE market firms consisting of technology firms.

Firms seeking listing on the Main market are subject to different requirements than the ACE market in terms of financial history, market capitalisation and IPO price. To qualify for listing on the Main market, a firm must have an uninterrupted profit after tax (PAT) for a minimum of three financial years with a minimum

aggregate of MYR20 million (USD5.72 million) and a minimum PAT of MYR6 million (USD1.72) for the most recent financial year. A firm must also have a minimum market capitalisation of MYR500 million (USD143 million) upon listing, and has been incorporated for at least one financial year prior to the submission of listing application. The firm must also have generated operating revenue for the financial year prior to the listing application. In terms of IPO pricing, a Main market IPO must be priced at a minimum of MYR0.50.

There are no minimum requirements for ACE market firms in terms of the above criteria. ACE market firms tend to be younger, smaller and less financially established than their Main market counterparts. The Main market firms are more diverse in terms of industry membership, while the ACE market firm mainly belong to the technology sector, hence driven by high growth.

The different characteristics and listing requirements between the Main and ACE markets indicate that stocks listed in respective markets carry different risk profiles. For example, ACE market stocks appear to be riskier, hence investors would expect higher returns to adequately compensate for the associated level of risks borne by them.

3.1.2 Description and Sources of Data

The data used in this study are IPOs listed in Bursa Malaysia from January 2000 to December 2011. January 2000 was chosen as the start of the study period because the Malaysian market had just recovered from the 1998 Asian Financial Crisis. A total of 476 IPOs were listed in Bursa Malaysia during the whole study period. We exclude financial services (including banking, investment houses and insurance companies), real estate and real estate investment trusts IPOs from the sample due to differences in financial reporting requirements.

The filtration resulted in exclusion of 28 IPOs. The final sample size is 448 IPOs, representing 94.12% of the total Malaysian IPOs listed during the study period. Out of this final sample, 296 (66.07%) and 152 (33.93%) IPOs are listed on the Main and ACE markets, respectively. Two IPO firms that were delisted within less than 36 months are also included to avoid survivorship bias.

Table 1 represents the sample distribution by year and industry, segregated by listing boards. As indicated in Panel A, the maximum number of IPO sample is in year 2005 ($n = 72$) while the minimum is in 2009 ($n = 14$). The highest and lowest number of sample from the Main market is $n = 43$ (2002) and ($n = 11$) (2009), respectively. From the ACE market, the highest is ($n = 46$), appearing in 2005, while the lowest is ($n = 3$), appearing in 2007 and 2009.

[Insert Table 1 about here]

As can be seen in Panel B in Table 1, IPO samples cover eight sector groupings, namely Construction, Consumer Products, Industrial, Heavy Machinery,[1] Plantation, Property, Technology, and Trading and Services. When IPO samples are segregated by sector, the maximum number of sample comes from the Industrial sector ($n = 138$), while the minimum comes from the construction sector ($n = 7$). The majority of the Main market sample is from the Industrial sector ($n = 110$) and the lowest is from the Heavy Machinery sector ($n = 5$). In contrast, the majority of the firms listed in the ACE market is from the technology sector ($n = 80$) with no firms from the construction, plantation and property sectors.

The data are obtained from a number of sources. IPO offer prices are obtained from the Information Department of Bursa Malaysia. Share prices, the market-to-book equity values, market capitalisations, and the market and industry indices prices are obtained from Datastream.

3.2 Methodology

3.2.1 Model of Abnormal Returns

We investigate the long-run performance of IPO stocks from month 1 to 36 post-listing, excluding the initial returns due to the abnormally high returns that are often found in the first trading day IPOs. The monthly raw returns of stock i, R_i is identified using the closing price of stock i at the end of the last trading day of month t, P_{it}.[2] The benchmark-adjusted abnormal return (AR) of IPO stock i is the difference between monthly raw return (R_{it}) and a monthly benchmark return (R_{mt}), excluding the initial returns. Therefore, AR_{it} is identified as:

$$AR_{it} = R_{it} - R_{mt} \tag{1}$$

In our analysis, we employ the market index as benchmark. R_{mt} in Equation 1 represents the market returns. We use the FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI) to benchmark the Main market IPOs, while ACE market IPOs are benchmarked against the FTSE Bursa Malaysia ACE Index (FBM ACE). It is well documented in the literature that abnormal returns are sensitive to the benchmark used (Barber and Lyon, 1997; Kothari and Warner, 2004). As there is no consensus on the most accurate benchmark, this highlights the importance of testing multiple models to control for potential misspecification and to compare the sensitivity of outcomes. In this study, we use reference portfolio matching portfolio, and industry indices returns as alternative benchmarks.

[1]The official sector name as per Bursa Malaysia is *Industrial Products*. However, to avoid confusion, the name *Heavy Machinery* is used in this study.Heavy Machinery

[2]The raw return of an IPO stock is calculated as: $R_{it} = (P_{it} - P_{it-1})/P_{it-1}$, where R_{it} is the closing price of IPO at the end of last trading day of month t, and P_{it-1} is the closing price of IPO at the end of last trading day of month $t-1$. One month consists of 21 trading days.

3.2.2 Cumulative Abnormal Returns (CAR)

The cumulative abnormal return (CAR) is a traditional performance measure (Ritter, 1991; Fama and French, 1993). The CAR from event month q to event month s is the summation of the mean benchmark-adjusted abnormal returns during the 36-month aftermarket period. The cumulative abnormal returns involves monthly rebalancing of the portfolio to achieve equal weighting each month. The mean benchmark-adjusted abnormal returns in event month t, AR_t is the equally-weighted arithmetic mean of the benchmark-adjusted returns, calculated as follows:

$$AR_t = \frac{1}{n}\sum_{i=1}^{s} AR_{it} \tag{2}$$

The CAR is consequently calculated using the following formula:

$$CAR_{q,s} = \sum_{t=q}^{s} \omega_i AR_t \tag{3}$$

where ω is the equal or value weighting of the abnormal returns.[3]

To estimate whether the CARs are significantly different from $n = 0$, we employ conventional t-statistic. For the CAR in event month t, $CAR_{1,t}$ is:

$$CAR_{t,month} = \frac{\overline{CAR_{i,t}}}{\sigma(CAR_{i,t}/\sqrt{n}} \tag{4}$$

where σ is the standard deviation of the abnormal return in the sample, and n is the number of IPOs in event month t.

3.2.3 Buy-and-Hold Abnormal Returns (BHAR)

BHAR approach does not involve monthly rebalancing of portfolios. It is assumed that the securities are held from the purchase date up to the selling date, reflecting the actual experience of investors. In this study, we assume 36-month holding period starting from the day after the listing day. We exclude listing day due to the abnormally high initial returns usually found in the first listing day. BHAR is used to mitigate the potential upwards bias in CAR due to the accumulation of the monthly abnormal returns, as suggested by Barber and Lyon (1997) and Kothari and Warner (2006). Following (Loughran and Ritter, 1995), buy-and-hold returns for IPO stock i is defined as the geometrically compounded return on the stock in time t and identified as:

$$BHR_{i,T} = \left[\prod_{t=start}^{min(T,delist)} (1 + r_{it}) - 1\right] * 100\% \tag{5}$$

[3]The equal weighting is calculated as $1/n$, where n is the number of IPO firms in each event month. The value weighting is calculated as $MV_i/\sum MV_i$, where MV_i is the market capitalisation of IPO firm i on the first trading day, and $\sum MV_i$ the total market capitalisation of all IPO on the first trading day.

where r_i is the monthly raw return on IPO stock i in event month t, *start* is the first event listing month, and $min(T, delist)$ is the earlier of the 36-months window or the final month of listed trading.

The mean buy-and-hold returns for IPO stocks and the benchmarks are calculated as follows:

$$\overline{BHR_T} = \sum_{i=1}^{n} \omega_i BHR_{iT} \tag{6}$$

Consequently, the benchmark-adjusted buy-and-hold return for IPO stock i for holding-period T, $BHAR_{iT}$ is calculated as:

$$BHAR_{iT} = \left[\prod_{t=start}^{min(T,delist)} (1 + r_{it}) - 1 \right] - \left[\prod_{t=start}^{min(T,delist)} (1 + r_{mt}) - 1 \right] \tag{7}$$

where r_{it} is the IPO stock's monthly raw return and r_{mt} is the benchmark monthly return at time t. An overperformance (underperformance) over the benchmark is indicated by a positive (negative) BHAR value.

As long-run abnormal returns suffer from potential skewness bias (Lyon et al., 1999), we employ Johnson (1978) bootstrapped skewness-adjusted t-statistics to determine whether the abnormal returns are significantly different from zero, using:

$$t_{sa} = \sqrt{n} \left(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma} \right) \tag{8}$$

where:

$$S = \frac{\overline{BHAR}}{\sigma(BHAR_t)} \tag{9}$$

and

$$\hat{\gamma} = \frac{\sum_{i=1}^{n} \left(BHAR_{i,t} - \overline{BHAR_t} \right)^3}{n\sigma(BHAR_t)^3} \tag{10}$$

3.2.4 Wealth Relatives (WR)

Following Ritter (1991), we calculate wealth relatives (WR) which refers to the ratio of the end-of-period wealth from holding a portfolio of issuers to the end-of-period wealth from holding a portfolio of matching companies or market benchmarks. Wealth relative serves as an indicator of overall long-run relative performance, and calculated s:

$$WR = \frac{1 + \overline{BHR_{i,36}}}{1 + \overline{BHR_{m,36}}} \tag{11}$$

where $BHR_{i,36}$ is the 36-month buy-and-hold returns of IPO i and $BHR_{m,36}$ is the 36-month buy-and-hold returns of the respective benchmarks. A wealth relative of higher

than 1.00 indicates overperformance, while value of less than 1.00 indicates underperformance.

3.2.5 Alternative Benchmark - Size/Book-to-Market Reference Portfolio

Following Komenkul et al. (2012), the size/book-to-market matching portfolios were constructed using the value-weighted average returns on six portfolios derived from the FF3F model: Big-High (BH), Big-Medium (BM), Big-Low (BL), Small-High (SH), Small-Medium (SM) and Small-Low (SL). We follow Fama and French (1993) procedure in constructing portfolios for the size[4] and book-to-market equity (BTM)[5].

3.2.6 Alternative Benchmarks - Industry Indices

In addition to listing board effect, we further study the industry impact on IPO long-run abnormal returns. The IPOs are segregated into eight sectors as per Bursa Malaysia classifications, as illustrated in Table 1. The industry-adjusted abnormal return (AR) of IPO stock i is the difference of its monthly raw return (R_{it}) with a monthly industry indices return (R_{st}), excluding the initial returns. Here, the industry-adjusted AR is calculated as:

$$AR_{it} = R_{it} - R_{st} \tag{12}$$

where R_{st} is the monthly industry index returns of the sector in which the IPOs are first listed in. The sector indices are as per FTSE Bursa Malaysia Industry Indices for each of the eight industries are listed in Table 1.

3.2.7 Calendar-Time Approach

Event-time approach suffers from cross-sectional correlations amongst individual securities (Fama, 1998; Mitchell and Stafford, 2000; Gao and Jain, 2011). Therefore, the statistical significance of mean abnormal returns may be overstated. Kothari and Warner (2006) argue that most return models employed in the event-time approach of calculating abnormal stock performance appear misspecified over different periods. Hence, to mitigate the potential cross-sectional correlations and misspecification issues, previous researchers suggest the calendar-time approach (Fama and French, 1996; Gompers and Lerner, 2003; Ahmad-Zaluki et al., 2007; Agathee et al., 2014). Here, we employ the Fama and French (1993) 3-Factor model (FF3F), the Carhart (1997) Momentum model (MOM) and liquidity-adjusted Capital Asset Pricing Model (LCAPM). For calendar-time approach, the preceding 36-months excess returns of IPO is regressed against the

[4]Size is calculated as the share price times the number of outstanding shares in June every year.

[5]BTM ratio was calculated as book common equity for the fiscal year ending in calendar year $t-1$, divided by the market equity at the end of December of $t-1$.

factors over the whole study period to obtain the Jensen's α value that indicates the magnitude and direction of abnormal performance of the IPOs.

Fama-French 3-Factor Model (FF3F)

Fama and French (1993) report that firm size and book-to-market (BTM) values are significant in explaining stock returns. In the same vein, Drew and Veeraraghavan (2002) find evidence that the stock return variation in Malaysia are also explained by size and BTM. Following Espenlaub et al. (2000) and Komenkul et al. (2012), we employ FF3F model as a benchmark, in which the abnormal return is estimated as:

$$R_{it} - R_{ft} = \alpha + \beta_i(R_m - R_{ft}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \epsilon_{it} \tag{13}$$

where R_{it} is the return on IPO stock i in month t, R_{mt} is the return on the market in event month t calculated using the FBM KLCI; R_{ft} is the 1-month Malaysian Government Security return in month t; SMB is the value-weighted return on a portfolio of small minus big firms; and HML is the value-weighted return on a portfolio of high book-to-market (BTM) firms minus the value-weighted return on firms with low BTM. The betas are estimated by regressing the preceding 36-month IPO_i monthly excess returns on the monthly market excess returns, book-to-market, and size factor returns for the 36-month estimation period.

The SMB and HML portfolios in Equation 13 are constructed using Fama and French (1993) methodology by considering each event month t and sorting the stocks listed in Bursa Malaysia by market capitalisation and book-to-market (BTM) value. First, the stocks are segregated into *small* (S) and *big* (B) according to their market capitalisation, divided using the median market capitalisation at end of June every year. Next, the stocks are divided into three BTM groups based on the top 30% (low, L), middle 40% (medium, M) and bottom 30% (high, H) BTM value. The BTM value is the reciprocal of market-to-book value at the end of December each year. Finally, six portfolios are constructed. They are: SL, SM, SH, BL, BM and BH. Then, the SMB_t value is derived from the difference between the average returns of small firms and big firms. The HML_t value is the average returns of IPOs with high BTM ratio minus low BTM ratio. Hence:

$$SMB_t = \frac{(SL + SM + SH)}{3} - \frac{(BL + BM + BH)}{3}$$

$$HML_t = \frac{(SH + SL)}{2} - \frac{(BH + BL)}{2}$$

Carhart Momentum Model (MOM)

Thomadakis et al. (2012) estimated the Carhart (1997) four-factor momentum (MOM) model as a benchmark to calculate abnormal return of IPO in Greece and reported that stock returns momentum is significant in explaining stock performance. Securities returns in the previous period are found to have impact on returns (Carhart, 1997). We use the model in our study to assess its impact on abnormal returns on Malaysian IPOs. The MOM model is defined as:

$$R_{it} - R_{ft} = \alpha + \beta_i(R_m - R_{ft}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \beta_{MOM}MOM_t\epsilon_{it} \quad (14)$$

where MOM is the value-weighted average return of the top 30% securities with the maximum returns in the preceding year, and bottom 30% securities with the lowest securities in the preceding year. The MOM value is derived from the difference between returns of high-and-low momentum securities.

Liquidity-Adjusted Capital Asset Pricing Model (L-CAPM)

In addition to FF3F and MOM models, we employ LCAPM that considers the liquidity risk factor of a security, and presented as:

$$R_{it} - R_{ft} = \alpha + \beta_i(R_m - R_{ft}) + \beta_{LIQ}LIQ_i + \epsilon_{it} \quad (15)$$

where $\beta_{LIQ}LIQ_i$ is the liquidity risk factor of stock i (Amihud, 2002), and calculated as:

$$LIQ_{it} = \frac{1}{D_{iy}} \sum_{t=1}^{Diy} \frac{|r_{it}|}{Dvol_{it}} \quad (16)$$

where LIQ_{iy} is the measure of IPO firm i estimated in month t (Amihud, 2002); D_{it} is the number of nonzero trading days in month t, $|r_{it}|$ is the absolute value of returns of stock i in month t; and $Dvol_{it}$ is MYR trading volume for stock i in month t.

4 Findings

4.1 Descriptive Statistics

We begin our analysis with the summary statistics. Table 2 provides the descriptive statistics data, more specifically, the mean, standard deviation, minimum and maximum of the market value, the gross proceeds and the initial returns of Malaysian IPOs. Panel A in Table 2 presents the market value of the IPO firms in Malaysian Ringgit (MYR). The total market capitalisation of the Main market IPOs is MYR195.28 billion (mean = MYR659.73 million), and MYR10.92 billion (mean = MYR71.85 million) for the ACE market. When the two markets are combined, the total market capitalisation of the IPO firms is MYR205.70 billion (mean = MYR460.27 million). The mean size (represented by the market capitalisation) of the Main market firms is notably higher than the whole economy. This is driven by the fact that many of the Main market firms are pronouncedly larger than the ACE market firms, and the whole market is dominated by the Main market firms, giving it more weightage. The size of Main market IPO firms is also more dispersed than the ACE market, as implied by the standard deviation of 3,351.70 and 58.57 for the respective markets. In the Main market, the size difference between the largest and smallest IPO firms is extremely large, i.e. MYR40.32 billion

for the largest and only MYR44 million for the smallest. The difference between the maximum and minimum market values in the ACE market is much smaller. The highest market capitalisation is MYR322 million, while the smallest is MYR16 million.

Panel B in Table 2 reports the statistics of offer size and indicates that on average the offer size of Malaysian IPOs is MYR128.51 million. The Main market firms have larger average issuance size (MYR186.99 million) as compared to their ACE market counterparts (MYR14.61 million). The dispersion of issuance size in the Main market is higher than the ACE market, as depicted by the standard deviation of 999.01 and 19.46 for the respective markets. The largest issuance is for Petronas Chemicals Group Berhad (MYR 12.5 billion), while the smallest issuance is by Nikko Electronics Berhad.

Panel C in Table 2 displays the Initial Returns of IPOs and claim that the average initial returns of Malaysian IPOs is 27%. The ACE market IPOs are more underpriced than theACE market IPOs at 36% and 23% respectively, implying that the global phenomenon of IPO underpricing also exists in the Malaysian markets. It is worth noting that the listing regulation allows the ACE market to list younger firms, even those without prior operational and financial track record. Hence, the information asymmetry between investors and lPO firms is higher in the ACE market than in the Main market, leading to the higher underpricing. Importantly, the underpricing reported during our study period is lower than those recorded in previous studies in Malaysia (see Dawson (1987): 166.7%; Yong (1991): 167.4%; Loughran et al. (1994): 80.3%; Paudyal et al. (1998): 61.8%; Jelic et al. (2001): 99.1%; and Ahmad-Zaluki et al. (2007): 95.2%). This implies a downward trend in the underpricing of Malaysian IOPs, reflecting the increased efficiency of the Malaysian market.

Panel D in Table 2 further illustrates the initial returns by sector groupings. As can be seen from the Table, events in each industry have distinct impacts on IPOs and the impact of sector characteristics on IPOs returns varies between sectors. For sector groupings, we find that IPO underpricing is mainly dominated by the characteristics associated with the Properties sector (4%,) followed by Technology and Trading and Services sectors (35%). This is justified as Technology firms are generally younger and smaller, thus suffered from higher ex ante uncertainty. In addition, the majority of those firms are listed in the ACE market, which also partially explain the higher underpricing found in the market.

[Insert Table 2 about here]

4.2 Event-Time Approach

4.2.1 Cumulative Abnormal Returns

Now we move on to examine the performance of Malaysian IPOs in whole economy, the Main (MM) and the ACE markets (AM), as well as sector groupings using the market index and reference portfolio. While Panels A and B in Table 3 report the three-year equally- and value-weighted cumulative abnormal returns (CAR) of Malaysian IPOs for the whole market, Panel C presents the results of test of differences of the CARs between the two markets.

For equally-weighted cumulative abnormal return (EWCAR) using market index, we find significant underperformance in the Main market (MM) IPOs at (-14.16%). In contrast, the ACE market (AM) IPOs overperform less significantly at 19.0%. For the reference portfolio, we find marginal underperformance (-0.9%) with MM IPOs and overperformance at (6.9%) with AM IPOs.

When turning our attention to value-weighting scheme (Panel B), we found significant evidence of underperformance ($p < 0.001$). Notably, the level of underperformance intensified. This implies that larger firms tend to perform worse than smaller firms in the long-run. Our findings are in contrast with previous findings in the Malaysian market. For MM IPOs, our findings contradict previous studies on the Malaysian market. For example, the findings associated with MM IPOs contradict with those reported by Jelic et al. (2001); Ahmad-Zaluki et al. (2007). However, the findings for AM IPOs are in line with Ahmad-Zaluki and Kect (2012) that report high underperformance in the MESDAQ Market[6]. Based on the initial analysis, we find that the abnormal returns are sensitive to benchmark and weighting scheme employed to calculate stock performances.

To determine whether the CAR results of MM and AM IPOs are significantly different, using parametric (two-sample t-test) and non-parametric (Mann-Whitney test) tests, our finding as seen in Panel C in Table 3 imply that the CAR of MM and AM IPOs are significantly different when using market index. However, we find insignificant evidence supporting the difference in CARs when using reference portfolio benchmark.

[Insert Table 3 about here]

To further examine the IPO performance in the 36-month period, we supplement our result with trend analysis of three-year CARs. As illustrated in Figure 1, when using equal weighting, we find that AM IPOs outperform both benchmarks throughout the 36-month period. The long-term positive EWCARs are driven by the high proportion of firms that consistently generate monthly abnormal return of more than 100% throughout the 36-month period. However, MM IPOs generate negative abnormal returns beginning month 19 and 32 with market benchmark and reference portfolio, respectively. For value-weighting estimates, we find that both that MM and AM IPOs underperform, and mainly driven by large IPO firms. Notably, the abnormal return of AM IPOs significantly drops when value-weighting scheme is adopted. The high underperformance is driven by the constant negative monthly abnormal returns generated by the three largest IPOs in the AM that represent 52% of the total market capitalisation of AM IPOs. To the end, the subfigures included in Figure 1suggest that the return of AM IPOs are more volatile than their MM counterparts.

4.2.2 Buy-and-Hold Abnormal Returns

Next is the abnormal return estimates using the buy-and-hold approach. We report the equally-weighted (EWBHAR) and the value-weighted buy-and-hold (VWBHAR) in Panels A and B in Table 4, respectively. Starting with the equally-weighted portfolio, we find insignificant result across all markets and benchmarks, with the exception of the

[6]The ACE market was previously known as The MESDAQ Market.

MM, with significant underperformance at 10% level. In contrast, although insignificant, we note that AM IPOs overperform the market index.

The result is found to be sensitive to the benchmark used. With reference portfolio, EWBHAR in MM IPOs turn to be overperforming (2.53%), while AM IPOs turn to be underperforming (12.9%). For the VWBHAR reported in in Panel B in Table 4 there are clear evidences supporting the underperformance across all markets and benchmarks 1 per cent level level of significance. Importantly, since BHAR reflects the actual investor experience, the findings indicate that IPO is not a promising investment option in the long run.

When the VWBHAR of the two markets are compared, we find MM IPOs perform better than AM IPOs. This results are in line with Gregory et al. (2010) and Vismara et al. (2012), but contradict with Komenkul et al. (2012). In agreement to the findings reported with CAR, it is worth noting that the negative BHARs are magnified in value-weighted portfolios. Overall, our EWBHAR results in are consistent with Paudyal et al. (1998) and Ahmad-Zaluki and Kect (2012), but in contrast with Ahmad-Zaluki et al. (2007). However, for VWBHAR, our findings are supportive to those reported by Ahmad-Zaluki et al. (2007). In addition, the medians of MM and AM IPOs are significantly different as indicated by the non-parametric Mann-Whitney test.

[Insert Table 4 about here]

As a further check to the movement of BHARs in the three year aftermarket, the results are illustrated graphically in Figure 2. For the entire sample, our findings imply that overoptimism exists in investors about the future prospect of the Malaysian IPOs. The optimistic investors initially overvalue the IPOs and then, as more information are available, they begin to revalue the IPOs pessimistically. Thus, the IPO returns are driven downwards, which leads to the negative long-run abnormal returns.

For the value weighting, interestingly, we find that AM IPOs substantially underperform the reference portfolio by -71.16%. The result is dominated by the largest IPO firm in the AM that unreasonably underperform (-51.11%.) in month 36. The result is clearly a size effect and not an outlier. For the IPO firm, the raw return in the month is only -3.2%, proportionally smaller than the worse performance in the month of -42.9%. However, due to the fact that this firm represents 27% of the total market capitalisation in AM portfolio, the BHAR is amplified.

4.3 Industry Effect on IPO Long-Run Abnormal Returns

In this section, we provide more robustness analysis by investigating industry effect. We divide the samples into eight sector groupings based on the Bursa Malaysia sector classification. The results of industry-specific CAR and BHAR are presented in Table 5 and in Figures 3. Focusing first on the three-year equally-weighted portfolio, it is evident from the Table that the highest positive abnormal return is achieved by the IPOs in Technology sector, for which the EWCAR is 50.45% (t-stat = 5.27). IPO firms classified in the Trading and Services sector produce a three-year EWCAR of 21.93% (t-stat = 2.19).

These findings suggest that investors may generate significant cumulative abnormal return if they buy Technology IPOs at the closing price on the first trading day and hold them for a 36-month period. The Malaysian government has taken initiatives to stimulate the growth of the Technology sector. For example, in 1996, the Multimedia Super Corridor was established to attract local and foreign entrepreneurs to set up technology companies in the country. In the regional IPO market, the Malaysian technology IPOs play a competitive role, where the IPO firms tend to be the largest in terms of market capitalisation.

Our EWBHAR findings further justify that the abnormal return is sensitive to the methods employed. For example, in the Technology sector, while EWCAR is upward-trending, EWBHAR shows a downward trend. When we turn attention to the value-weighted portfolios, we find that the IPOs from the Technology sector is still outperforming, which is similar to the case of the equally-weighted portfolios. Likewise, it can be clearly seen in Figure 3 that VWCAR of IPOs in the Technology sector increase between month 27 and 36, although we can also see some volatility. The volatility in abnormal return mirrors the price volatility of the largest IPO in the technology portfolio. The Consumer Products ($-13.58\%, t-stat = 13.58$), Industrial ($-21.40\%, t-stat = -11.20$) and Trading and Services ($-12.15\%, t - stat = -8.36$) sectors exhibit significant underperformance in the long run. The Consumer Products and Industrial sectors consistently exhibit underperformance regardless of methods employed. Notably, for Consumer Products sector, the underperformance is statistically significant with EWCAR, EWBHAR and VWCAR methods. For Industrial sector, the results are significant only with VWCAR and VWBHAR. The industry analysis support our early observation that long-run abnormal returns of IPOs are sensitive to the methodology employed to calculate stocks performance. Our initial findings suggest that underperformance exists in both the Main and ACE markets. Strikingly, based on the industry analysis, underperformance is not wide-spread to all industries, but only appear in some sectors. The results also persistently show that the abnormal returns are method-sensitive. Our industry-based analysis shed the light that long-run abnormal performance return is not only related to listing market, but also partially driven by sector groupings. The sector impact is more apparent when a higher number of stocks are associated to a particular sector.

[Insert Table 5 about here]

4.4 Long-Run Abnormal Return Using Calendar-Time Approach

With event-time approach, long-run abnormal returns may suffer from cross-sectional relations of IPOs (Brown and Warner, 1980). To mitigate the issue, we employ the calendar-time portfolio approach as robustness test, using the Fama-French 3-factor (FF3F) model (Fama and French, 1993), Carhart (1997) momentum model (MOM), and liquidity-adjusted capital asset pricing model (LCAPM) (Amihud, 2002).

The dependent variables is defined as monthly returns on IPO portfolios between January 2000 to December 2011. For the entire sample and the Main market IPOs, the sample size covers a total of 143 months from March 2003 to December 2014. The ACE

market was established in 2002. Thus, the sample size for the market covers 116 months, beginning from May 2005. The maximum number of firms in the IPO portfolio in the aggregate sample is 200, occurring in May 2009. The minimum number of observation is 2, which occurred in February and March 2003. For the Main (ACE) Market samples, the maximum number of firms in the IPO portfolio is 127 (105), occurring in March 2008 (November 2009). The minimum is 2 (3) which occurred in February and March 2003 (May to July 2005).

The equally-weighted and value weighted excess returns of the IPO portfolios returns are regressed on risk premium ($R_m - R_f$), small minus big (SMB), high minus low (HML), momentum (MOM) and liquidity (LIQ) variables using the ordinary least squares (OLS) regression. We perform the regression on the entire sample, and repeat the procedure for the Main market and ACE market IPOs separately. The intercept α from the regressions indicates the monthly risk-adjusted performance of the IPOs.

Focusing first on the equally-weighted portfolio and using all three asset pricing models, our findings indicate that underperformance exist in MM IPOs as presented in Panel A of Table 6. Notably, the abnormal return is only significant ($p < 0.01$) with liquidity-adjusted capital asset pricing model (LCAPM), but not with the Fama and French 3-Factor (FF3F) and the Carhart Momentum (MOM) models. The negative intercept of -0.002 in the LCAPM model indicates that MM IPOs underperform at -0.2% monthly, which turns to a -6.95% three-year abnormal return.[7] Our results are in line with previous studies (Ahmad-Zaluki et al., 2007; Moshirian et al., 2010; Su and Bangassa, 2011; Agathee et al., 2014) For AM IPOs, seen in Panel B of Table 6, all our models exhibit positive intercept, indicating overperformance in the IPOs. In agreement with the findings associated with MM IPOs, the LCAPM model shows weak significance at 10% level, but not in the FF3F and MOM models. Based on the LCAPM model, AM IPOs overperform at 0.2% monthly, or 7.45% in three years.

[Insert Table 6 about here]

As a final robustness test, we repeat the regressions using value-weighted IPO portfolio returns (Table 7). The results for MM IPOs are consistently showing underperformance, as can be seen in Panel B. Subsequently, for AM IPOs, we also report negative intercepts for all models. The results, as shown in Panel C of Table 7, suggest that AM IPOs also underperform in the long-run.

Our calendar-time regressions provide stronger supports to our event-time results that MM IPOs significantly underperform in the long-run. Due to the larger proportion of MM IPOs to AM IPOs in terms of size and number of IPOs, the abnormal return in the whole sample is heavily influenced by the behaviour of MM IPOs. Hence, in aggregate, the Malaysian IPOs underperform in the period of 36-month aftermarket.

To conclude, our analysis using calendar-time show strong evidence of underperformance in MM and AM IPOs, and also at the overall economy level. The underperformance are higher in AM, which is in line with Ritter's (1991) hypothesis that higher underpricing will lead to higher underperformance. The statistical significance is particularly stronger ($p < 0.001$) with value-weighted portfolio, indicating that size effect

[7] The three-year abnormal return is calculated as: $(1 - 0.002)^{36} - 1$.

plays a role in driving abnormal returns. As the underperformance tend to be higher in value-weighted portfolio, this implies that larger IPOs tend to perform worse in the long-run. All in all, the results here answer our research questions of whether underperformance exists in the Malaysian market, and whether the Main and ACE markets portray different long-run abnormal performance.

[Insert Table 7 about here]

5 Conclusion

Most of the previous literature claim that stocks of firms that go public underperform their peers over the two to five years following their issue date. This long-term abnormal return anomaly is a debatable and puzzled issue that contradicts all forms of the efficient market hypothesis. The major purpose of this paper is to investigate the long-term stock performance of 448 Malaysian IPOs listed between 2000 and 2011 in the Main and ACE alternative markets. The three-year stock returns of the IPOs were investigated using cumulative abnormal return (CAR), buy-and-hold abnormal return (BHAR) and wealth relatives (WR). We employ the market index, size/book-to-market matched reference portfolio and eight industry indexes returns as benchmarks, and utilise more robust statistical tests. The calendar-time approach based on the market model with additional liquidity factor as well as Fama-French and Carhart models were applied for verifying long-run abnormal returns.

Based on our analysis, we draw four important findings. Firstly, in line with the majority of the literature, the anomaly of long-run underperformance also exists in the Malaysian market. In addition, we find distinguishable long-run performance between IPOs during pre-and post-2000 period. Unlike the IPOs listed in the post-2000 period, we find that Malaysian IPOs generally overperform in the period of 36-month aftermarket, indicating that the publicly available information is reflected on the IPO performance and the market is relatively efficient. Secondly, there is evidence supportive of the differences in the long-run performance of the Main and ACE market IPOs. Further, we found that the ACE market IPOs are more underperformed, and its investors are more optimistic about the future prospect of the IPOs compared to the Main market investors. However, given the characteristics of the Main market that generally lists more mature and financially stable firms, the overall IPOs performance show a lower level of risk and hence reflect a lower rate of expected returns by investors. This is in favour of the hypothesis that IPOs with better initial returns are the worst long-run performer. Furthermore, although underperformance exists in the Malaysian market as a whole, the anomaly is not wide-spread throughout all sector groupings. We found that the Consumer Products and Industrial sectors underperform in the long-run, while the Construction, Property and Technology sectors overperform along with a significant variation in the level of abnormal returns across sector groupings. Finally, our findings are robust to a wide range of sensitivity checks including parametric and non-parametric tests.

Overall, our paper illustrates the long-term stock performance of Malaysian IPOs in the Main and ACE alternative stock markets at economy and industry level. Therefore,

our study offers insights to policy maker interested in pricing future new security offerings. For issuing firms, our results provides them with rooms for price adjustments by reducing information asymmetry in general and between investors. Finally, the results presented in this study may have broader policy implications for many other emerging markets similar to Malaysia, which are expanding globally by implementing economic, trade and financial reforms. Our findings may be, therefore, also helpful for regulators overseeing other emerging markets beyond Malaysia.

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Table 1: Distribution of Malaysian IPOs Listed Between 2000 and 2011

	Entire Sample	% of Total	Main market IPOs	% of Total	ACE market IPOs	% of Total
Panel A: IPO sample distribution by year and listing board						
2000	38	8.48	38	12.88	n/a	n/a
2001	20	4.46	20	6.78	n/a	n/a
2002	49	10.94	43	14.58	6	3.92
2003	56	12.50	37	12.54	19	12.42
2004	69	15.40	39	13.22	30	19.61
2005	72	16.07	26	8.81	46	30.07
2006	35	7.81	14	4.75	21	13.73
2007	21	4.69	18	6.10	3	1.9
2008	22	4.91	14	4.75	8	5.23
2009	14	3.13	11	3.73	3	1.96
2010	27	6.03	21	7.12	6	3.92
2011	25	5.58	14	4.75	11	7.19
Total	448		295		153	
Panel B: IPO sample distribution by industry and listing board						
Construction	7	1.56	7	2.36	0	0.00
Consumer Products	86	19.20	80	27.03	6	3.95
Industrial	138	30.80	110	37.16	28	18.42
Heavy Machinery	21	4.69	5	1.69	16	10.53
Plantation	9	2.01	9	3.04	0	0.00
Property	12	2.68	12	4.05	0	0.00
Technology	93	20.76	13	4.39	80	52.63
Trading and Services	82	18.30	60	20.27	22	14.47
Total	448		296		152	

Table 2: Descriptive Statistics of Market Value, Gross Proceeds and Initial Returns of Malaysian IPOs

	Mean	Std Dev	Minimum	Maximum
Panel A: Market Value of IPOs (MYR million)				
All IPOs (n=448)	460.27	2,737.28	16.00	40,320.00
MM (n=296)	659.73	3,351.70	44.00	40,320.00
AM (n=152)	71.85	58.57	16.00	322.00
Panel B: Gross Proceeds of IPOs (MYR million)				
All IPOs	128.51	815.70	0.05	12,499.20
MM	186.99	999.01	0.05	12,499.20
AM	14.61	10.46	1.10	80.80
Panel C: Initial Returns of IPOs by Markets				
All IPOs	0.27	0.48	-0.71	2.64
MM	0.23	0.37	-0.39	1.94
AM	0.36	0.63	-0.71	2.64
Panel D: Initial Returns of IPOs by Industry				
Construction	0.27	0.36	-0.01	1.05
Consumer Products	0.27	0.44	-0.67	1.80
Industrial	0.20	0.40	-0.71	2.64
Heavy Machinery	0.32	0.37	-0.26	0.93
Plantation	0.16	0.19	-0.06	0.60
Properties	0.04	0.22	-0.29	0.42
Technology	0.35	0.61	-0.51	2.46
Trading and Services	0.35	0.53	-0.52	2.62

MYR1 is equivalent to USD0.2860 as at 31 December 2014 (Source: Bank Negara Malaysia).

Table 3: Three-year Cumulative Abnormal Returns

	Market Index				Reference Portfolio			
	CAR (%)	**Para. t-stat**	**Para. Adj t-stat**	**Non-para. s-stat**	**CAR (%)**	**Para. t-stat**	**Para. Adj t-stat**	**Non-para. s-stat**
Panel A: Equally-weighted Cumulative Abnormal Returns (EWCAR)								
All IPOs	-2.86	-0.69	-0.72	-1.92*	1.70	0.40	0.69	-0.45
MM	-14.16	-3.05**	-3.72**	-4.11***	-0.90	-0.19	-0.18	-1.09
AM	19.23	2.40*	2.83*	2.16*	6.90	0.80	0.43	0.59
Panel B: Value-weighted Cumulative Abnormal Returns (VWCAR)								
All IPOs	-24.20	-23.05***	-13.74***	-6.01***	-15.10	-23.49***	-13.26***	-10.23***
MM	-20.44	-18.94***	-11.65***	-9.43***	-10.66	-18.4***	-12.06***	-9.72***
AM	-47.16	-14.90***	-8.59***	-7.90***	-34.64	-7.262***	-7.094***	-5.32**
Panel C: Main market vs ACE market IPOs								
	Para. t-stat	**Non-para. z-stat**			**Para. t-stat**	**Non-para. z-stat**		
EWCAR	-3.86***	3.96***			-0.855	0.99		
VWCAR	-4.32***	4.02***			-5.33	4.52		

[1] The abnormal returns are calculated up to a 36-month period post-listing, excluding the initial return. Market indices returns and size/book-to-market matching portfolio return are used as benchmarks.

[2] The parametric conventional t-statistics (Para. t-stat) and Crude Dependence Test (Para. Adj t-stat) are the two-tailed results of the null hypothesis that the means are equal to zero. The non-parametric Wilcoxon Signed Rank test (Non-para. s-stat) is used to test the null hypothesis that the median abnormal return in zero. Panel C indicate the difference in mean and median between Main and ACE market IPOs, based on the parametric independent t-test and the non-parametric Mann-Whitney U test. ***, ** and * indicate statistical significance at the 1, 5 and 10% respectively.

Table 4: Three-year Buy-and-Hold Abnormal Returns

	Market Index					Reference Portfolio				
	BHAR (%)	**Para. t-stat**	**Non-para. Adj t-stat**	**Non-para. s-stat**	**Wealth Relative (WR)**	**BHAR (%)**	**Para. t-stat**	**Non-para. Adj t-stat**	**Non-para. s-stat**	**Wealth Relative (WR)**
Panel A: Equally-weighted Buy-and-Hold Abnormal Returns (EWBHAR)										
All IPOs	-6.55	-1.23	-1.67	-7.25***	0.94	-2.69	-0.03	0.02	-5.21***	0.98
MM	-12.85	-1.93*	-1.87	-6.61	0.9	2.53	0.38	-0.42	-3.28**	1.02
AM	5.77	0.48	0.36	-3.28**	1.06	-12.90	0.80	0.93	-4.21***	0.89
Panel B: Value-weighted Buy-and-Hold Abnormal Returns (VWBHAR)										
All IPOs	-35.77	-10.27***	-12.73***	-5.01***	0.74	-31.27	-8.17***	-918***	-10.23***	1.1
MM	-35.31	-9.02***	-10.57***	-8.73***	0.71	-21.80	-5.17***	-6.06***	-9.72***	0.81
AM	-37.74	-4.83***	-5.43***	-9.80***	0.76	-71.16	-8.97***	7.09***	-5.32**	0.64
Panel C: Main market vs ACE market IPOs										
	t-stat	**z-stat**				**t-stat**	**z-stat**			
EWBHAR	1.57	2.23*				-0.855	0.99			
VWBHAR	1.43	2.38*				-5.33	4.52			

[1] The parametric conventional t-statistics (Para. t-stat) and the non-parametric skewness-adjusted bootstrapped t-statistic (Non-para. Adj. t-stat.) are the two-tailed results of the null hypothesis that the means are equal to zero. The non-parametric Wilcoxon Signed Rank test (Non-para. s-stat) is used to test the null hypothesis that the median abnormal return in zero. Panel C indicate the difference in mean and median between Main and ACE market IPOs, based on the parametric independent t-test and the non-parametric Mann-Whitney U test. ***, ** and * indicate statistical significance at the 1, 5 and 10% respectively.
[2] Refer to Table 3 for explanation on tests of differences.

Table 5: Three-year Abnormal Returns Based on Sector Groupings

	Cumulative Abnormal Returns				Buy-and-Hold Abnormal Returns				
	CAR (%)	**Para. t-stat**	**Para. Adj t-stat**	**Non-para. s-stat**	**BHAR (%)**	**Para. t-stat**	**Non-para. Adj t-stat**	**Non-para. s-stat**	**Wealth Relative (WR)**
Panel A: Equally-weighted Portfolios									
Construction	19.63	0.70	0.94	0.85	35.67	0.92	0.05	0.68	1.31
Consumer Products	-46.61	-6.89***	-6.72**	-4.75***	-52.95	-1.70*	-1.55	-6.10***	0.96
Industrial	-9.44	-1.27	-1.07	-1.51	-1.06	-0.33	-0.53	-3.42***	0.98
Heavy Machinery	-23.79	-1.32	-1.65	-0.94	-8.49	-1.04	-1.43	-3.35***	0.92
Plantation	2.18	0.07	0.16	0.77	-54.26	0.12	0.02	-0.89	1.04
Property	16.52	0.60	0.22	0.16	0.43	-0.09	-0.57	-0.31	0.98
Technology	50.45	5.27***	4.37**	0.92	18.57	0.03	0.94	-4.46***	1
Trading and Services	21.93	2.19*	2.22*	1.45	20.13	0.32	0.33	-0.05	1.02
Panel B: Value-weighted Portfolios									
Construction	35.67	2.55*	0.36	0.49	26.55	2.61*	2.71*	0.48	1.23
Consumer Products	-4.00	-13.58***	17.31***	15.51***	-59.95	-0.17	-0.17	-7.70	0.99
Industrial	-21.40	-11.20***	-4.57***	9.24***	-26.78	-5.28***	-6.35***	-4.32***	0.99
Heavy Machinery	14.30	2.70*	2.56*	2.84*	-42.60	-6.15***	-6.89	-3.32*	0.89
Plantation	2.33	0.77	0.39	0.41	-0.69	0.45	0.61	0.79	1.43
Property	12.86	3.33**	1.98*	1.45*	19.70	-1.41	-1.47	-0.37	0.82
Technology	50.46	10.52***	5.56***	6.52***	5.04	-2.82**	-3.01**	-5.54**	0.99
Trading and Services	-12.15	-8.36***	-6.25***	-7.35***	-20.02	2.69**	2.75**	4.35**	1.03

Refer to Table 3 for explanation on calculations of abnormal returns, and Tables 3 and 4 for explanation on calculations of tests of differences for CAR and BHAR respectively.

Table 6: Calendar-Time Abnormal Returns Using Equally-Weighted Portfolio

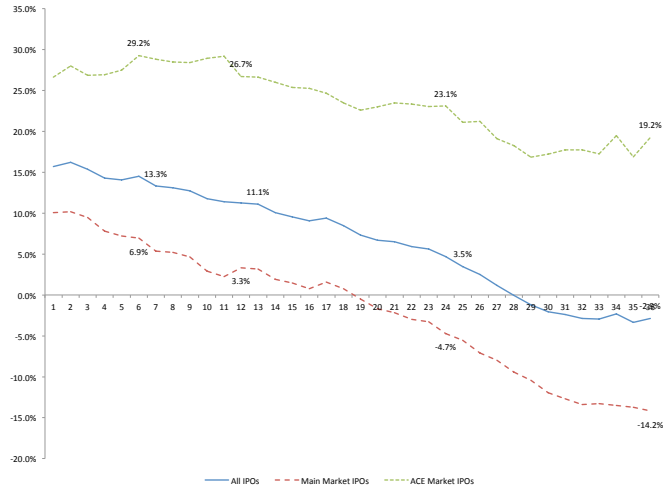
	α	β_{Rm-R_f}	β_{SMB}	β_{HML}	β_{MOM}	β_{LIQ}	*Adj.* R^2
Panel A: All IPOs							
FF3F Model	-0.004	0.565***	0.057	-0.065			
	(-0.008)	(-0.104)	(-0.213)	(-0.228)			
MOM Model	-0.003	0.575***	0.096	-0.063	-0.068		0.225
	(-0.008)	(-0.105)	(-0.211)	(-0.226)	(-0.099)		
LCAPM Model	-0.002**	0.150*				-0.001**	
	(-0.009)	(-0.126)				(-0.002)	0.222
Panel B: Main market IPOs							
FF3F Model	-0.005	0.587***	0.055	-0.046			0.239
	(-0.008)	(-0.101)	(-0.213)	(-0.231)			
MOM Model	-0.005	0.595***	0.090	-0.045	-0.061		0.240
	(-0.008)	(-0.103)	(-0.213)	(-0.230)	(-0.107)		
LCAPM Model	-0.002**	0.158				-0.001**	0.301
	-0.007	-0.124				(-0.002)	
Panel C: ACE market IPOs							
FF3F Model	0.000	0.401**	0.058	-0.013			0.084
	(-0.009)	(-0.165)	(-0.265)	(-0.279)			
MOM Model	0.000	0.406**	0.090	-0.012	-0.056		0.085
	(-0.009)	(-0.166)	(-0.265)	(-0.279)	(-0.070)		
LCAPM Model	0.002*	0.204				0.001**	0.085
	(-0.008)	(-0.168)				-0.002	

This table presents the regression results of calendar-time market-adjusted monthly abnormal returns using the following models: (1) Fama-French 3-factor model FF3F): $R_{it} - R_{ft} = \alpha_i + \beta_i(R_m - R_{ft}) + \beta_{SMB}SMB_t + \beta_{HML}HML_t + \epsilon_{it}$ where R_{it} is the return on IPO stock i in month t, R_{mt} is the return on the market in event month t calculated using the FTSE Bursa Malaysia Kuala Lumpur Composite Index (FBM KLCI), R_{ft} is the 1-month Malaysian Government Security return in month t, SMB is the value-weighted return on a portfolio of small minus big firms, and HML is the value-weighted return a portfolio of high book-to-market (BTM) firms minus the value-weighted return on firms with low BTM; (2) Carhart (1997) four-factor model, with momentum (MOM) factor added to the FF3F equation, representing the difference between returns of high-and-low momentum securities in the previous year; and (3) the capital asset pricing model (CAPM) with controlling liquidity factor (LCAPM). The t-statistics (shown in brackets) are calculated using the time-series standard deviation of the mean monthly abnormal returns. The statistical significance is generated after White heteroskedasticity adjustments. ***, ** and * indicate statistical significance at the 1, 5 and 10% respectively.

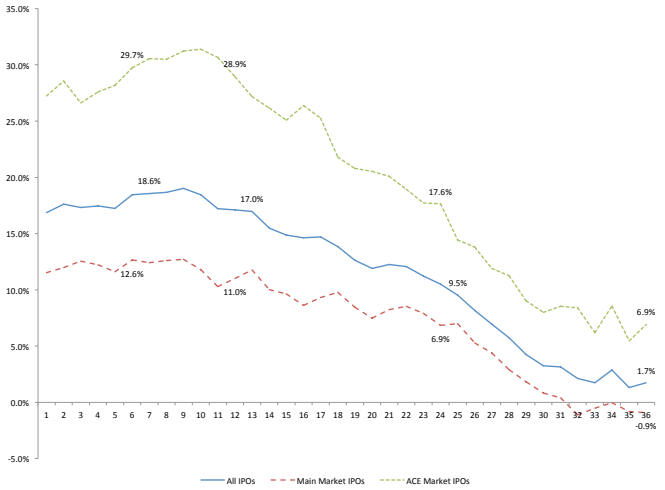
Table 7: Calendar-Time Abnormal Returns Using Value-Weighted Portfolio

	α	β_{Rm-R_f}	β_{SMB}	β_{HML}	β_{MOM}	β_{LIQ}	*Adj.* R^2
Panel A: All IPOs							
FF3F Model	-0.00003	0.49200***	0.00104	0.00083			0.13500
	(-0.00005)	(-0.13300)	(-0.00119)	(-0.00154)			
MOM Model	-0.00003	0.49900***	0.00125	0.00084	-0.00037		0.13700
	(-0.00005)	(-0.13700)	(-0.00120)	(-0.00153)	(-0.00069)		
LCAPM Model	-0.0129	0.04290				0.00099	
	(-0.01000)	-0.19900				(-0.01050)	
Panel B: Main market IPOs							
FF3F Model	-0.00005	0.53500***	0.00103	0.00090			0.14500
	(-0.00005)	(-0.14800)	(-0.00127)	(-0.00163)			
MOM Model	-0.00005	0.540***	0.00117	0.00091	-0.00025		0.14600
	(-0.00005)	(-0.15400)	(-0.00130)	(-0.00162)	(-0.00084)		
LCAPM Model	-0.0155	0.07670				0.00149	0.16400
	(-0.00780)	-0.13680				(-0.00170)	
Panel C: ACE market IPOs							
FF3F Model	-0.00342***	0.50300***	0.0683*	-0.02990			0.59200
	(-0.00109)	(-0.05540)	(-0.03730)	(-0.03290)			
MOM Model	-0.00343***	0.502***	0.0666*	-0.03000	0.00299		
	(-0.00108)	(-0.05570)	(-0.03870)	(-0.03310)	(-0.01840)		0.59200
LCAPM Model	-0.00128	0.15420				-0.0002**	
	(-0.35800)	(-0.60600)				(-0.94900)	

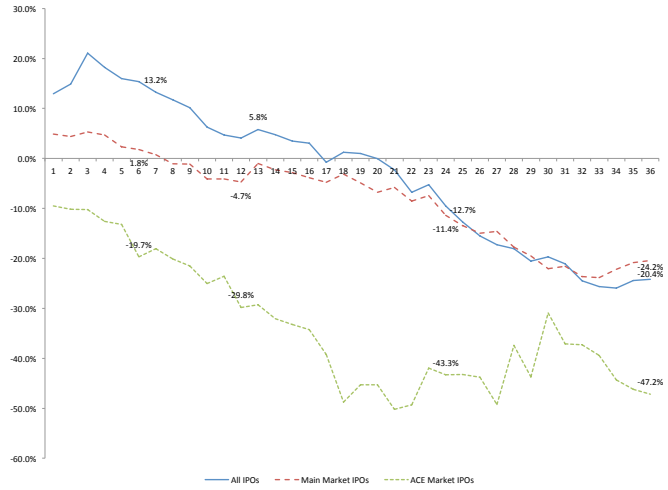
See Table 6 for detailed description.



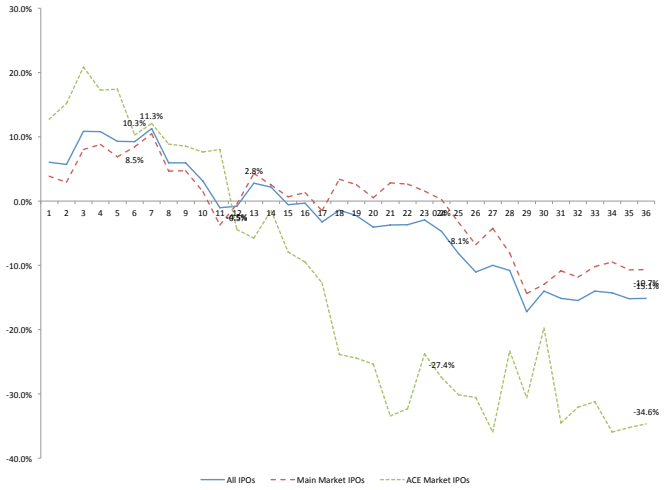
(a) EWCAR (market index)



(b) EWCAR (reference portfolio Portfolio Benchmark)

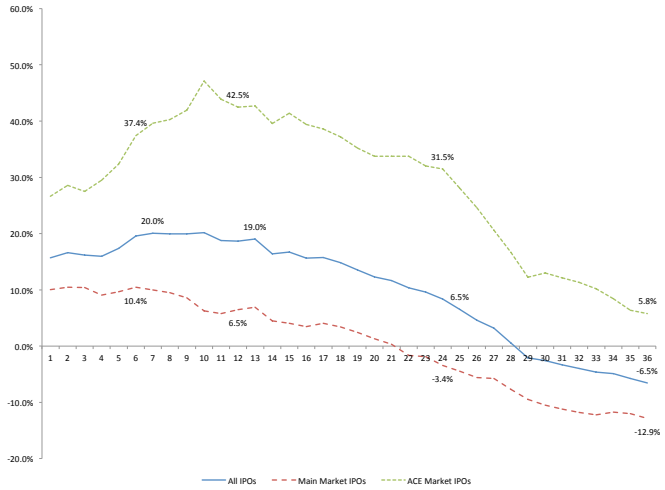


(c) VWCAR (market index)

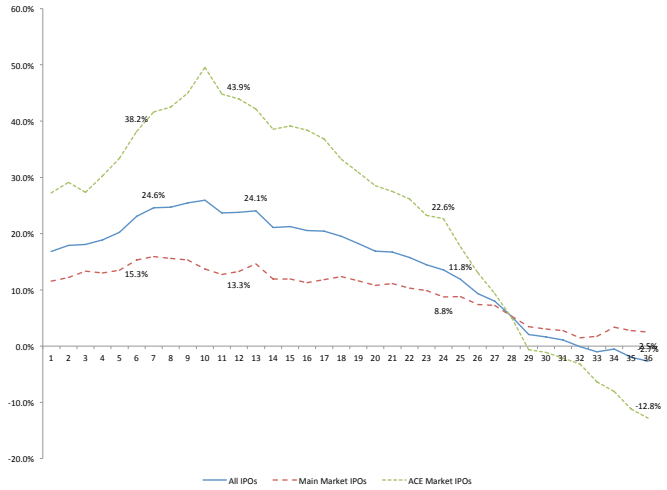


(d) VWCAR (reference portfolio Portfolio Benchmark)

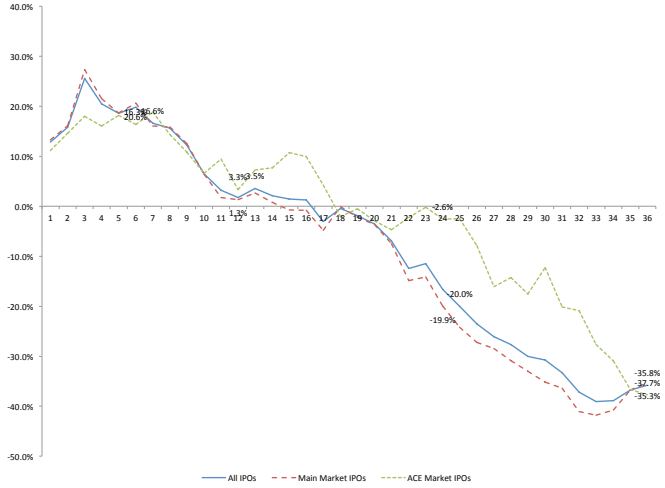
Figure 1: Three-Year Cumulative Abnormal Returns (CAR)



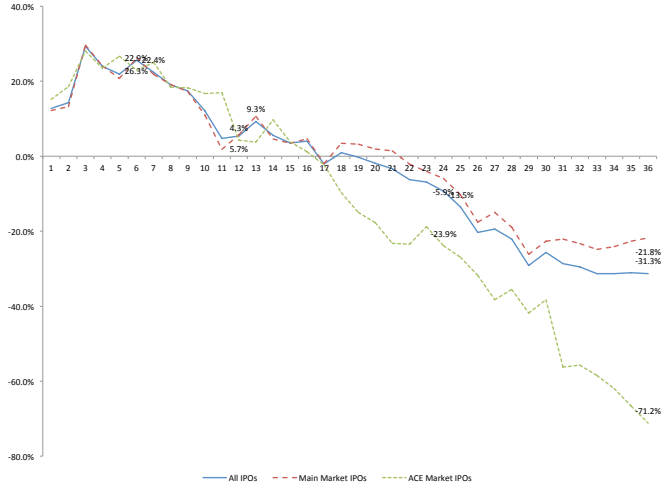
(a) EWBHAR (market index)



(b) EWBHAR (reference portfolio Portfolio Benchmark)

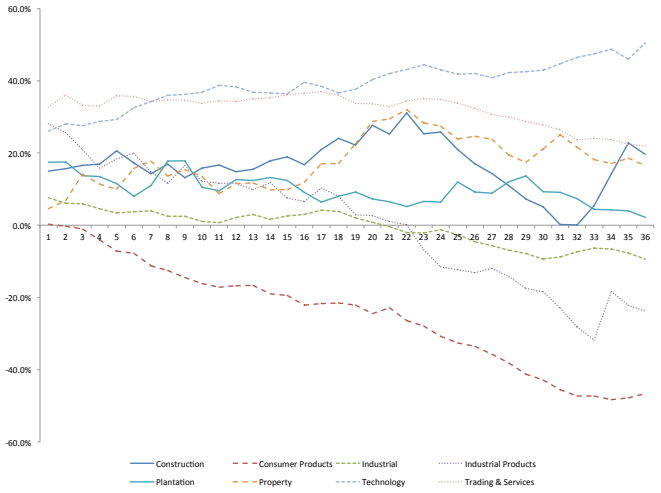


(c) VWBHAR (market index)

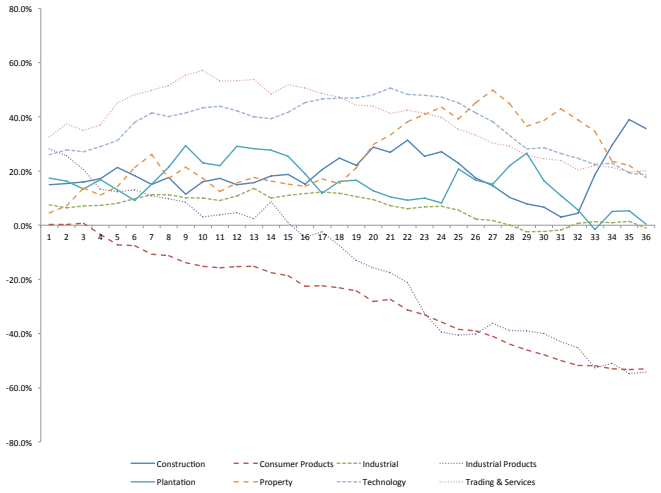


(d) VWBHAR (reference portfolio Portfolio Benchmark)

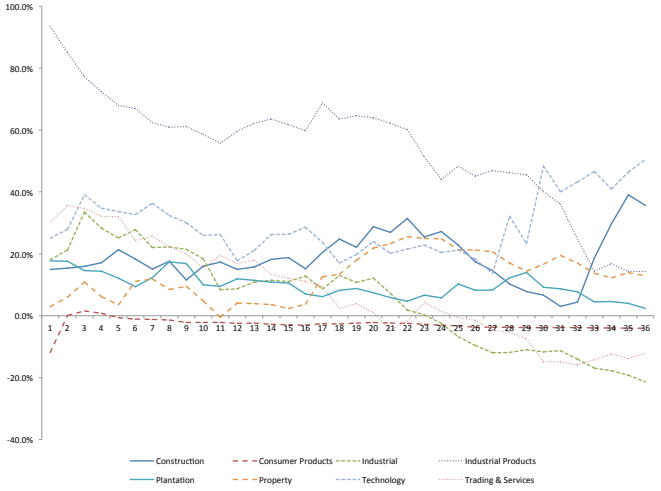
Figure 2: Three-Year Buy-and-Hold Abnormal Returns (BHAR)



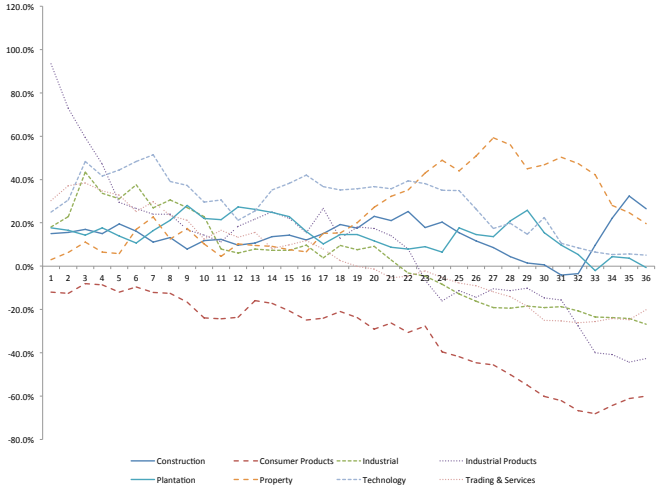
(a) EWCAR by Sector Groupings



(b) EWBHAR by Sector Groupings



(c) VWCAR by Sector Groupings



(d) VWBHAR by Sector Groupings

Figure 3: Three-Year Buy-and-Hold Abnormal Returns by Sector Groupings