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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Macroeconomic factors or firm-specific factors? An examination of the impact on corporate profitability before, during and after the global financial crisis

Carol Cheong[1*] and Huy Viet Hoang[1,2]

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*Corresponding author: Carol Cheong, Department of Financial and Business Systems, Faculty of Agribusiness and Commerce, Lincoln University, Christchurch, New Zealand
E-mail: carol.cheong@lincoln.ac.nz

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David McMillan, University of Stirling, Stirling, United Kingdom

Additional information is available at the end of the article

Abstract: The purpose of this paper is to examine the impact of macroeconomic variables and firm-specific factors on corporate profitability in Singapore and Hong Kong before, during and after the global financial crisis. This paper uses the two-step system Generalized Method of Moments to examine the impact of macroeconomic and firm-specific factors on corporate profitability. The model includes firm-specific factors (firm size, leverage, liquidity, sales growth and previous year's profitability) and macroeconomic factors (real GDP growth and inflation rate). Corporate profitability is represented by ROA, ROE and Tobin's Q. Results from the pooled sample showed that past profitability, firm size and leverage have a strong relationship with firm performance. Our pooled sample results also showed that Hong Kong firms are more affected by macroeconomic factors during the global financial crisis than Singapore firms. Our study provides insights into the relationship between firm-specific factors, macroeconomic factors and firm performance under three different economic periods in two developed economies in the Asia-Pacific.

ABOUT THE AUTHORS

Dr. Carol Cheong is a Senior Lecturer in Accounting at Lincoln University, New Zealand. Her professional background is in Finance and Accounting. She has worked in several public listed, privately owned & multinational companies and government agencies across the Asia Pacific region in various senior finance and accounting roles. She is a Fellow of the Institute of Chartered Accountants of Singapore (FCA) and CPA Australia (FCPA). Her research interests are in Financial Accounting, Corporate Reporting and Corporate Governance with a particular focus on the determinants of corporate performance. Other areas of research interest include Accounting Education and Franchising.

Huy Viet Hoang received his Master's degree in Financial Economics at Ohio University, USA. He is currently a Ph.D. candidate at Lincoln University, New Zealand and Lecturer in Business Management at National Economics University, Vietnam. His current research interests include corporate finance, earnings management and corporate social responsibility.

PUBLIC INTEREST STATEMENT

The critical question of how macroeconomic factors or firm-specific factors affect corporate profitability is of immense interest to researchers and practitioners. The macroeconomic/firm-specific factors-corporate profitability relationship attracted even more interest after the Global Financial Crisis. This paper extends the understanding of corporate profitability by examining the impact of four firm-specific factors and two macroeconomic factors on corporate profitability in Singapore and Hong Kong from 1998 to 2018, under three different economic phases: before, during and after the Global Financial Crisis Corporate profitability is represented by Return on Assets (ROA), Return on Equity (ROE) and Tobin's Q. The results of the study showed that firm size is a significant factor in all three economic phases, indicating that larger firms are able to weather an economic storm better. The study also found that Hong Kong firms are more affected by macroeconomic factors during the global financial crisis than Singapore firms.

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Subjects: Economics; Finance; Business, Management and Accounting

Keywords: Crisis; profitability; firm-specific factors; macroeconomic variables; determinants of firm performance
JEL Classifications: C23; E32; G32; L25

1. Introduction

The critical question of whether factors from the external environment or factors within the firm affect performance has been of immense interest to many researchers. The research on the determinants of firm performance is usually approached from two perspectives: the resource-based theory and the system theory. The resource-based theory asserts that a firm's internal factors and resources drive the competitiveness of the firm, and hence, the firm's profitability. On the other hand, the system theory argues that external factors from the macroeconomic environment affect a firm's performance. Within the field of strategy, Porters (1997) views external factors as more important than firm-specific factors. As such, decisions on internal resources should, therefore, be made based on the results of the analysis of external factors (Porters, 1997). However, evidence from the literature seems to suggest that firm-specific factors outweigh external factors in explaining firm performance (Hawawini et al., 2003; Makhija, 2003).

Notwithstanding the findings from the empirical studies, external factors continue to attract interest from researchers, primarily due to the managers' inability to accurately predict and effectively manage the impact of macroeconomic factors on the firm's performance. Globalisation has also increased the exposure of firms to external factors, adding to the already complex challenges faced by managers.

The macroeconomic factors-firm performance relationship attracted even more attention after the Asian Financial Crisis and the Global Financial Crisis. The Global Financial Crisis (GFC), which began in the United States of America, has been described as one of the most severe financial crises with wide-ranging impact on the equity markets and economies around the world. Many economies experienced a recession, and the value of many companies declined during the GFC. The loss of wealth to shareholders as a result of the massive fall in equity values amounted to about 50% of the global Gross Domestic Product (GDP) of 2007 (Bartram & Bodnar, 2009). The recession has also been cited as a possible cause of weak firm profitability (Richardson et al., 1998). Chow et al. (2018) argued that macroeconomic uncertainty such as the global financial crisis presents a considerable challenge to the firm's resource allocation decisions. However, Shakina and Barajas (2014) observed that some firms have managed to weather the global financial crisis to achieve superior results. Therefore, it is still unclear how and to what extent macroeconomic factors and firm-specific factors affect firm performance during a period of crisis.

The purpose of this paper is to examine the effect of macroeconomic and firm-specific factors on firm performance in Singapore and Hong Kong before, during, and after the global financial crisis. Singapore and Hong Kong are chosen as they shared many similarities. They were both former British colonies and inherited the legacy of British business, policies, and legal administration. Both economies are small, very open, export-oriented and therefore, depend on international trade for survival and growth. They both have experienced rapid economic transformations and growth since the sixties. Due to the smallness and openness of the economy, firms in the two countries are especially vulnerable to the elements of the global economic uncertainties. However, they differ in many aspects. The two countries adopted different economic and monetary policies in the pursuit of economic growth. For example, Hong Kong pegs its exchange rate to the US dollar whilst Singapore follows a policy of trade-weighted exchange rates. The two countries also have very different corporate structures. The corporate landscape in Hong Kong is dominated by family-owned firms whilst in Singapore, most of the big firms are controlled by the government. Family-owned firms in Hong Kong are usually helmed by an insider from the family and the responses to macroeconomic changes and the allocation of a firm's resources in response to changes in the environment are dependent on the unique essence of the family structure and the

family's ethical values. On the other hand, government controlled firms are likely to be well managed with strong corporate governance structure. With these similarities and differences, Hong Kong and Singapore are an ideal pair to compare and contrast the impact of macroeconomic factors and firm-specific factors on firm performance. This study is an attempt to find the common and unique predictors of corporate profitability in the two economies under three different economic scenarios.

Although previous studies have addressed firm performance during the global financial crisis (Dietrich & Wanzenried, 2011; Işık, 2017; Killins, 2020), none of the studies address the difference in firm performance during the crisis in comparison with itself before and after the crisis. Our study contributed to the current literature by extending the understanding of firm performance by investigating firm performance from 1998 to 2018 and in three different economic phases: pre-GFC, during GFC, and post-GFC. By using the system Generalized Method of Moments (sys-GMM) method to estimate our dynamic panel data, we corroborate previous findings on determinants of firm performance (e.g., Asimakopoulos et al., 2009; Yazdanfar, 2013). More importantly, we identify some discrepancies in macroeconomic and firm-specific effects on firm performance among different phases, thus revealing that firms act according to ongoing market conditions. Lastly, we have also identified the common and unique predictors of firm performance in both countries under the three different economic scenarios.

This paper is organised as follows: Section 2 reviews the empirical research on the impact of macroeconomic factors and specific-factors on firm performance during the crisis period. Section 3 describes the data sample and methodology used in the study. Section 4 presents the findings and implications of our empirical study. Section 5 concludes this study.

2. Literature review

Different economic phases cause firms to act differently in order to respond to changes in the economic conditions. Literature has documented the discrepancy of corporate behaviours between calm and adverse economic conditions; that is, some practices that are recommended in one phase may not be appropriate in others. For example, during normal times, firms are advantageous if the size is big since they benefit from economies of scale and low cost of equity (Whited, 1992). This size advantage, however, vanishes at the onset of an economic crisis since large firms are unable to quickly adapt themselves to the changing situation due to their complex structure (Smallbone et al., 2012). Moreover, although the agency theory of free cash flow contends the build-up of corporate cash holding since managers may spend free cash flow on value-decreasing projects, keeping high cash holding is recommended during the crisis as corporate liquidity is assured (Bates et al., 2009; Jensen, 1986). The aforementioned theoretical evidence suggests that macroeconomic conditions determine firms' course of actions, and this diversion could turn around some key corporate financial indicators.

The 2008 global financial crisis had brought about a massive downturn on global, regional, and national economic systems and lowered firm profitability as well as investors' returns. Since most investors face risks of undiversified portfolios, they rely greatly on firms' reported performance (Breitenfellner & Wagner, 2010). Aboura and Wagner (2016) found that the volatility caused by GFC decreases the price of assets, and Liu and Di Iorio (2016) added that such volatility creates macroeconomic threats to the economy. Economic crises lead to GDP plunge, decreased demand or more severe, unemployment, and moral hazard, thus results in lower firm performance (Pearce II & Michael, 2006; Richardson et al., 1998). Dayanandan and Donker (2011) find that the 2008 GFC negatively influences the oil price and the profitability of the U.S. listed oil and gas firms while the Asian financial crisis and the 9/11 event do not have any impact on the performance of these firms. Catte et al. (2011) claim that the indecisive and untimely policy has pushed the U.S. economy into deep financial turmoil and caused a domino effect spreading over the globe.

A vast literature on firm performance confirms the directional impact of critical macroeconomic indicators on corporate profitability. For instance, real GDP growth is identified as having a positive effect on corporate profitability during the GFC (Egbunike & Okerekeoti, 2018; Killins, 2020; Pattitoni et al.,

2014). However, the impact of inflation, another key economic indicator, is mixed. While Broyles et al. (1983) assert that an increase in inflation raises borrowing costs, Perry (1992) identifies that firms can benefit from rising inflation if they anticipate such rise and accommodate the rise of inflation in their management of their prices and costs of their products/services. However, the GFC not only affects macroeconomic factors but also alters the impact of internal factors on businesses. Notta and Vlachvei (2014) study Greek dairy firms from 2006 to 2011 and conclude that although leverage and liquidity do not affect profitability before the GFC, both factors are significant during the GFC period. Notta and Vlachvei (2014) emphasize that keeping reasonable liquidity ratio helps firms survive and sharpens their competitiveness during the crisis. Pittiglio et al. (2014) assert that younger firms with higher liquidity and domestic market concentration have higher performance than others. Saleh et al. (2017) apply agency theory to examine the impact of ownership structure on firm performance and find that higher ownership concentration improves profitability of both family and non-family firms during the crisis period, which is consistent with Jensen and Meckling (1976) scheme. Djaja (2009) confirms that the crisis reduces both manufacturing firms' investment and their confidence in capital market.

The studies on the impact of the 2008 GFC on the relationship between firm performance and profitability determinants usually focus on the discrepancy of influence between crisis and non-crisis periods. Lee et al. (2017) study the influence of crisis (2007–2010) periods, as suggested by Grammatikos and Vermeulen (2012), on firm performance in China in a sample stretching from 1999 to 2010. Lee et al. (2017) apply firm-specific, industry and macroeconomic factors into their analysis and confirm that the crisis lessens the efficiency of the Chinese financial system due to information diffusion. Lee et al. (2017) also point out that the crisis influences firm profitability through its impact on multiple firm-specific factors. Vieira's (2017) empirical findings on a sample of listed Portuguese firms also suggest that the economic adversity negatively affects the business result of non-financial firms. Vieira (2017) reckons that the financial crisis started at the end of 2007 and only ended in 2014, thus setting the period of 2007–2014 as the crisis period. Işık (2017) approaches the research on the crisis effect differently as he uses a dummy variable "*Financial Crisis*" which equals to 1 for the year of 2008–2009 and breaks the full sample into small-big and young-old subsamples. Işık (2017) then identifies that although the crisis has negative impacts on firm performance, the impact is only significant in the full sample and big firm sub-sample. This result is consistent with Varum and Rocha (2013) proposition that small and medium size enterprises play the role of stabilizer during economic downturns while large firms' performance seem to fall more quickly. Small firms are more flexible and easier to adapt to changes from the external environment, hence suffer less from economic hardship. Killins (2020) measures life insurance firms' performance by ROA and ROE ratios and divides his sample into pre-2007 and post-2008 periods to account for the crisis effect on firm performance. Killins (2020) identifies that although the impact of macroeconomic factors is stable during both periods, industry concentration seems to be more negatively significant and firm size is less positively relevant to performance in the post-2008 subsample. The performance of banks as a financial intermediary also receives extensive attention from the academia. Dietrich and Wanzenried (2011) investigate the profitability of Swiss banks from 1999 to 2009 and break down their sample into pre-crisis (1999–2006) and crisis (2007–2009) periods. They provide evidence that 2008 GFC had a significant impact on Swiss bank profitability, such as large banks have a lower net interest margin in comparison to smaller-sized banks in the crisis period. Inheriting from other studies, Adelopo, Lloydking and Tauringana (2018) separate three periods of pre-crisis, crisis and post-crisis in order to examine bank profitability in the Economic Community of West African States. Adelopo et al. (2018) identify that although the impacts of some internal characteristics on ROA are stable throughout the periods, other bank-specific and macroeconomic factors are dependent on both investigated periods and profitability proxies. In their large-scaled cross-country study, Bamiatzi et al. (2016) examine the economic adversity in 10 developed and 10 emerging countries. Bamiatzi et al. (2016) explore that during the economic adversity time, while the industry, country and their interaction effect weaken, the firm characteristics become more prominent. They imply that; not only do firms determine their fate themselves, the role of internal capacity is also amplified during the economic crisis. This result is in line with Oliver's (1997) opinion regarding the highlighted contribution of a firm heterogeneity to help the firm overcome the crisis tragedy.

Although there has been a myriad of research works explaining the effect of the crisis on firm performance, no study has attempted to examine the determinants of both accounting and market-based measures of firm profitability over the pre-crisis, crisis and post-crisis periods. Furthermore, current studies have not compared the effect of the crisis on firm profitability on Singapore with their Hong Kong counterparts. Lastly, these studies tend to focus on a single industry (frequently the banking industry) or on a single country. This study aims to fill this gap and provides a more comprehensive and comparative empirical evidence for the effect of the crisis on firm performance in two hugely successful economic regimes in Asia.

3. Data and methodology

3.1. Data

Most studies that examine firm profitability usually use Return on Assets (ROA), Return on Equity (ROE) or Tobin's Q (Tobinq) as measures of firm profitability (Asimakopoulos et al., 2009; Goddard et al., 2005; Dietrich & Wanzenried, 2011; Lazăr, 2016; Larmou & Vafeas, 2010; Sánchez-Ballesta & García-Meca, 2007). Therefore, this study uses the same indicators as proxies for firm profitability to represent both accounting and market-based measures of profitability. Muchtar et al. (2018) study the impact of listed Indonesia firms' financial behaviors on firm performance and find that the impact is more salient on the market-based measure of performance as compared to accounting-based measures. ROA is derived by dividing net income by total assets. ROE is net income divided by total common equity. Tobinq is the summation of market capitalization, total liabilities, preferred equity and minority interest divided by total assets.

The firm-specific variables are represented by firm size (Firmsize), leverage (Leverage), liquidity (Liquidity), sales growth (Salesgrowth) and previous year's profitability ($ROA_{t-1,}$ ROE_{t-1} and $Tobinq_{t-1}$). Previous studies have used these indicators as proxies for firm-specific factors (Asimakopoulos et al., 2009; Dang et al., 2018; Dietrich & Wanzenried, 2011; Pattitoni et al. (2014); Zaid et al., 2014). Firm size is computed as the logarithm of the firm's market value so as to capture market expectations and firms' growth opportunities (Dang et al., 2018). Whited (1992) points out that large-sized firms have the advantages of economies of scale and lower cost of capital. Firm size is an important determinant of firm profitability and we, therefore, expected firm size to positively correlate with profitability. Leverage, on the other hand, is regarded as having a negative relationship with firms' profit because the higher the debt the firm owed, the higher the interest expense obligated to firms. The financial burden hinders firms from investing in new projects, thus losing the opportunities for growth (Asimakopoulos et al., 2009; Işık, 2017). We divide total debt by total assets to arrive at Leverage. Liquidity is defined as current assets divided by current liabilities in our study. It is found that liquidity's relationship with profitability varies with time effect. In the short run, liquidity is found to be negatively related to profitability, while the relation in the long run is positive (Goddard et al., 2005; Ross et al., 2008; Zaid et al., 2014). Sales growth (Salesgrowth) is computed as the percentage of sales increase in the year of study as compared to the previous year's sales. Pattitoni et al. (2014) assert that growth of sales creates additional fund for investment and motivate employees. A rise in sales growth rate, hence, leads to an increase in firms' profit. Dietrich and Wanzenried (2011), Lee et al. (2017), and Muchtar et al. (2018) believe that the inclusion of lagged profitability reflects the persistence of earnings throughout a period. They also find that the previous profit is a significant determinant of current profitability, thus justifies the use of previous year's profitability to explain current year's performance.

In addition to firm-level data, we also consider the impact of two key macroeconomic factors on firm profitability. The first macroeconomic factor is the growth of real GDP (GGDP). Real GDP growth (the rate of Real GDP change from one year to another) indicates that the general economic state of a country is healthy and therefore, is likely to positively influence firm profitability (Pattitoni et al., 2014). The second macroeconomic factor is inflation (INF), which controls for the general rise in the price level of an economy. While many studies found that inflation is negatively correlated with firm

profitability because it reduces consumers' demand and raises corporate borrowing costs (Broyles et al., 1983), Goddard et al. (2011) did not find a significant relationship between the two variables. Perry (1992) reasons that the mixed outcome from these studies is attributable to the fact that rising inflations harm firms that are unaware of the threat, whereas rising inflations benefit well-prepared firms who are then able to alter their pricing and costing strategies accordingly. The firm data used in this study are collected from Bloomberg Financial database, while the macroeconomic factor data (GGDP and inflation rate) are retrieved from the World Bank database. This study covers firms in Hong Kong and Singapore. The sample period is divided into three sub-periods: pre-crisis (1998–2006), crisis (2007–2009) and post-crisis (2010–2018). All listed firms, except financial firms, are included in the data as they follow different practices of operation and accounting and are regulated differently (Raithatha & Komera, 2016). The variables and the respective description are listed in Table 1.

3.2. Methodology

This study focuses on the influence of internal and external factors of firms on firm profitability for Hong Kong and Singapore non-financial listed firms under different economic scenarios. First, we regress the pooled sample of each market from 1998 to 2018 to observe the general impact of firm-specific and macroeconomic factors on firm profitability. We then divide each sample into three subsamples covering three economic periods: pre-crisis (1998–2006), crisis (2007–2009) and post-crisis (2010–2018) periods. The results of the three subsample periods are closely examined to investigate how the crisis alters the mechanism of the firm-specific, macroeconomic factors and profitability relationship.

The model measuring the crisis effect is designed as follows:

$$Prof_{i,t} = \beta_0 + \beta_1 Prof_{i,t-1} + \beta_2 firmsize_{i,t} + \beta_3 leverage_{i,t} + \beta_4 liquidity_{i,t} + \beta_5 salesgrowth_{i,t} + \beta_6 GGDP_{i,t} + \beta_6 Inf_{i,t} + \varepsilon_{i,t}$$

where:

- $Prof_{i,t}$ *represents the profitability of the firm i at time t*
- $Prof_{i,t-1}$ *is the one-period lagged variable*
- β_0 *is the intercept of the equation*
- $\beta_{1to}\beta_6$ *are the beta coefficients for the independent variables*
- $\varepsilon_{i,t}$ *is the error term*

This study includes both the accounting-based measures (ROA, ROE) and market-based measure (Tobin's Q) as the proxy for profitability. While ROA and ROE ratios are drawn from the accounting report, Tobin's Q reflects market expectations with regard to firms' growth opportunities and underlying value. Since Muchtar et al. (2018) identify that market-based measures of firm performance are more sensitive to managerial decisions than accounting-based measures, the use of both types of measures could reveal additional implications about the impact of the crisis on firm profitability in two highly successful economies in Asia.

Several studies on the determinants of firm profitability used either the Ordinary Least Square estimation models (Asimakopoulos et al., 2009; Işık, 2017; Issah et al., 2017) or fixed effects models (Adelopo et al., 2018; Killins, 2020; Varum & Rocha, 2013) while a small number of studies employed the random effects models (Notta & Vlachvei, 2014). A few recent studies such as Dietrich and Wanzenried (2011), Lee et al. (2017), and Saleh et al. (2017) use the sys-GMM to overcome the endogeneity problems in the model. Having analysed our data, we feel that there is a possibility that the lagged dependent variable may potentially introduce the endogeneity problem into the model, the application of OLS and other static estimation methods could therefore, lead to biased coefficients (Goddard et al., 2005). Consequently, we decided to employ the sys-GMM, a dynamic panel estimator used in many studies (e.g., Dietrich & Wanzenried, 2011; Tan &

Table 1. List of variables used

Variables	Formula	Expected sign
ROA	Net income/Total assets	
ROA_{t-1}	One-period lag of ROA	+
ROE	Net income/Total common equity	
ROE_{t-1}	One-period lag of ROE	+
Tobinq	(Market capitalization + Total liabilities + Preferred equity + Minority interest)/ Total assets	
$Tobinq_{t-1}$	One-period lag of Tobinq	+
Firmsize	Logarithm of market value	+
Leverage	Total debt/Total assets	-
Liquidity	Current assets/Current liabilities	+
Salesgrowth	$(Revenue_t—Revenue_{t-1})/ Revenue_{t-1}$	+
GGDP	$(Real\ GDP_t—Real\ GDP_{t-1})/ (Real\ GDP_{t-1})$	+
INF	Inflation rate	±

Floros, 2012; Pervan, Pervan, & Ćurak, 2017) to estimate the equation in the model. The application of sys-GMM, which controls for potential endogenous variables by its lagged values in levels and differences, helps our estimations overcome the endogeneity problem (Arellano & Bover, 1995; Pervan et al., 2019), control for the unobserved heterogeneity (Dietrich & Wanzenried, 2011), and yield consistent estimations (Tan & Floros, 2012).

3.3. Descriptive statistics

Panel A of Table 2 shows the descriptive statistics of the variables included in the model for the pooled sample whilst Panel B of Table 2 shows the descriptive statistics of the variables in the three sub-periods. All variables are winsorized at 1% and 99% to minimize any possible outlier effects. It can be seen that the general statistics of the two markets in Table 2 are quite similar. ROA values show a huge variation among firms, which range from −99.20% to 47.68% in Hong Kong and from −93.63% to 51.59% in Singapore. ROE values show even larger spectrum, roughly double that of the ROA's range. ROE values in both markets are very similar, indicating that firms in both jurisdictions deliver about the same value to shareholders. Sales growth in Hong Kong firms are higher than their counterparts in Singapore. This shows that Hong Kong firms offer better revenue growth opportunities than firms in Singapore. The GGDP of firms in both countries are the same. This is an interesting observation as the government in the two countries pursue rather different economic policies, but end up with the same average GGDP in the period studied. Singapore has a slightly higher average inflation rate than Hong Kong. The government of Singapore and Hong Kong pursue very different exchange rate policies. Hong Kong pegged its dollar value against the U.S. dollar while Singapore uses the managed float system. Ghosh et al. (1997) studied the exchange rate and inflation rate of 165 countries and find that countries with pegged exchange rates tend to have lower inflation rates. Panel B of Table 2 shows that Hong Kong firms perform better (in terms of all three measures of firm performance) in a crisis as compared to the Singapore firms.

Figure 1 presents the trend of the selected variables during the period from 1998 to 2018. The movement of ROA and ROE in the two markets follows a similar pattern. Tobinq in Hong Kong firms also shares the same pattern until 2012 before its trends upwards, while the movement of Tobinq in Singapore firms follows the trend for ROA and ROE in the first half, but rises in the second half of the study period. While Hong Kong firms continue to grow after 2002, Singapore firms' size drops drastically after 2002. Profitability of electronics firms in Singapore were badly affected by the

Table 2. Descriptive statistics

Panel A: Hong Kong and Singapore—pooled sample					
	Observations	Mean	Minimum	Maximum	Std. dev.
Hong Kong					
ROA	22,093	1.11	−99.20	47.68	19.99
ROE	21,851	2.37	−188.07	104.79	40.35
Tobinq	19,360	1.82	0.36	18.18	2.37
Firmsize	18,882	5.32	1.13	10.50	2.00
Leverage	23,560	0.20	0	1.11	0.20
Liquidity	23,399	2.61	0.12	22.65	3.26
Salesgrowth	21,645	0.28	−0.93	7.96	1.05
GGDP	37,320	0.03	−0.03	0.08	0.03
Inf	39,186	1.29	−4.01	5.28	2.77
Singapore					
ROA	7,948	1.69	−93.63	51.59	18.32
ROE	7,895	2.36	−171.24	102.77	36.91
Tobinq	7,307	1.34	0.36	8.22	1.11
Firmsize	7,064	4.27	0.53	9.68	1.81
Leverage	8,320	0.20	0	0.93	0.19
Liquidity	8,321	2.47	0.20	19.89	2.80
Salesgrowth	7,829	0.18	−0.96	5.11	0.73
GGDP	10,800	0.03	−0.04	0.13	0.04
Inf	11,340	1.46	−0.53	6.63	1.90
Panel B: Hong Kong and Singapore by sub-periods					
Hong Kong					
	Observations	Mean	Minimum	Maximum	Std. dev.
Pre-crisis					
ROA	5,875	1.036	−99.197	47.678	22.511
ROE	5,756	2.067	−188.07	104.794	45.021
Tobinq	5,104	1.679	.358	18.182	2.095
Firmsize	4,997	4.557	1.133	10.499	1.887
Leverage	6,441	.208	0	1.111	.205
Liquidity	6,382	2.333	.122	22.647	2.85
Salesgrowth	5,562	.325	−.933	7.959	1.134
GGDP	14,928	.042	−.002	.079	.029
Inf	16,794	−1.059	−4.009	2.913	2.396
Crisis					
ROA	3,010	1.638	−99.197	47.678	20.793
ROE	2,989	3.408	−188.07	104.794	39.919
Tobinq	2,657	1.903	.358	18.182	2.529
Firmsize	2,562	5.245	1.133	10.499	2.033
Leverage	3,179	.197	0	1.111	.202
Liquidity	3,155	2.797	.122	22.647	3.657
Salesgrowth	2,985	.334	−.933	7.959	1.129
GGDP	5,598	.015	−.027	.056	.034
Inf	5,598	2.301	.577	4.296	1.531
Post-crisis					

(*Continued*)

ROA	13,208	1.024	−99.197	47.678	18.551
ROE	13,106	2.268	−188.07	104.794	38.226
Tobinq	11,599	1.868	.358	18.182	2.442
Firmsize	11,323	5.668	1.133	10.499	1.94
Leverage	13,940	.198	0	1.111	.203
Liquidity	13,862	2.688	.122	22.647	3.341
Salesgrowth	13,098	.248	−.933	7.959	.99
GGDP	16,794	.026	.006	.06	.015
Inf	16,794	3.301	1.481	5.277	1.192
Singapore					
	Observations	Mean	Minimum	Maximum	Std. dev.
Pre-crisis					
ROA	2,558	4.754	−93.627	51.594	16.783
ROE	2,530	7.825	−171.237	102.773	37.291
Tobinq	2,211	1.477	.357	8.224	1.024
Firmsize	2,189	4.186	.529	9.68	1.703
Leverage	2,810	.213	0	.928	.187
Liquidity	2,811	2.187	.198	19.891	2.42
Salesgrowth	2,531	.289	−.96	5.114	.77
GGDP	4,320	.045	−.037	.085	.035
Inf	4,860	.586	−.392	1.663	.676
Crisis					
ROA	1,296	3.342	−93.627	51.594	17.64
ROE	1,293	6.298	−171.237	102.773	33.676
Tobinq	1,201	1.241	.357	8.224	.99
Firmsize	1,149	4.184	.529	9.68	1.836
Leverage	1,337	.181	0	.928	.18
Liquidity	1,337	2.612	.198	19.891	2.835
Salesgrowth	1,291	.176	−.96	5.114	.667
GGDP	1,620	−.006	−.034	.046	.036
Inf	1,620	3.11	.597	6.628	2.563
Post-crisis					
ROA	4,094	−.752	−93.627	51.594	19.095
ROE	4,072	−2.278	−171.237	102.773	37.053
Tobinq	3,895	1.294	.357	8.224	1.181
Firmsize	3,726	4.34	.529	9.68	1.86
Leverage	4,173	.192	0	.928	.193
Liquidity	4,173	2.619	.198	19.891	3.011
Salesgrowth	4,007	.117	−.96	5.114	.721
GGDP	4,860	.038	.016	.125	.032
Inf	4,860	1.777	−.532	5.248	1.993

global electronics downturn of 2001–2002. Electronics firms form approximately a third of the manufacturing firms in Singapore and the drastic fall in the demand of electronic components from the U.S. firms resulted in mass retrenchments of Singapore workers (Austin, 2009). Profitability of Singapore firms continued to be affected by the SARS outbreak that happened not long after the global electronic downturn, in 2003. Apart from these, other variables generally follow similar trends of movement, which makes the two markets an ideal pair to compare and contrast.

The Pearson correlation coefficient in Table 3 demonstrates the correlation among the variables. Overall, the correlation coefficient across all variables is low. The only noticeably higher coefficients come from the coefficient between profitability proxies and their lagged terms; however, the coefficients are all significant at 5% level. The overall low correlation coefficient and significance of coefficient refute the presence of multicollinearity problem in the model.

4. Empirical results

The result of the pooled sample of both markets is examined first to see the general impact of each factor on firm profitability for the whole sampled period. Subsequently, three profitability proxies are regressed on their determinants in three sub-divided periods: pre-crisis (1998–2006), crisis (2007–2009) and post-crisis (2010–2018). The division into the three timeframes is to capture the impact of the economic crisis on the relationship between various profitability proxies and their determinants.

4.1. Pooled results—Hong Kong and Singapore

Table 4 presents the results of the pooled sample. In general, while most factors seem to affect corporate profits of two markets to some extent, the impact of the investigated factors are more prominent in Singapore. The result affirms the positive influence of past profitability on current profitability among Hong Kong firms. In line with past literature (Asimakopoulos et al., 2009), firm size is positively correlated with firms' profit for ROA and Tobinq. Among the Hong Kong firms, the greater the debt, the lower the accounting profitability achieved. This result is similar to the findings of Akinlo and Asaolu (2012) but contradicted the findings of Robb and Robinson (2014). In terms of the macroeconomic factors, higher inflation lowers market expectations towards corporate prosperity, thus, reflecting a negative relationship between Tobinq and Inf, and is similar to the study by Egbunike and Okerekeoti (2018).

For the Singapore sample, lagged profitability only affects the accounting-based measures of profitability. An increase of firm size and growth of sales significantly raise firm profitability, while rising debt burden diminishes the corporate's ability to generate profit. The macroeconomic impact on Singapore firms' profit resembles Hong Kong's, wherein inflation has a negative impact on Tobin's Q but is insignificant to the two accounting-based measures.

4.2. Results for the sub-periods—Hong Kong

In this sub-section, we examine the profitability of Hong Kong firms in the three sub-periods: pre-crisis (1998–2006), crisis (2007–2009), post-crisis (2008–2010) and present the result in Tables 5, 6 and 7, respectively. Analysing the sub-periods, we find some interesting results compared to the pooled sample. First, lagged profitability only matters during and after the crisis period for ROA and Tobinq whereas lagged ROE does not affect current ROE in all the three periods. Firm size is positively related to profitability across all measures in all three periods, except only in the case of Tobinq in the crisis period. The effect of firm size is consistent with Whited (1992) and implies that larger-sized firms possess higher endurance during the recession, thanks to their lower costs of production and borrowing. There is therefore, very clear evidence that firm size is a determinant of firm profitability.

Leverage shows a negative sign of impact over the three periods with ROE measure and in the former two with ROA. This result confirms the consensus from prior studies that a substantial debt will

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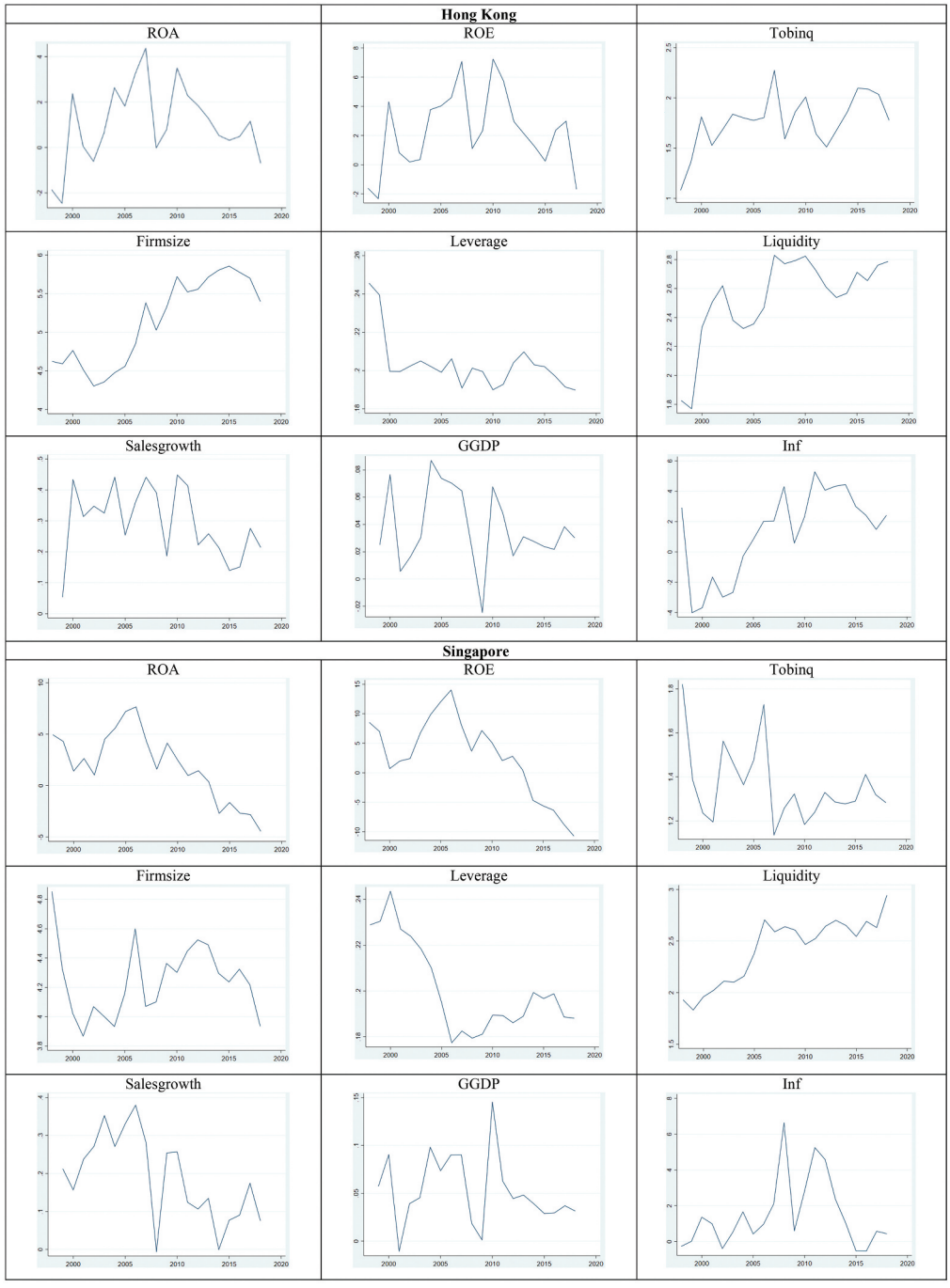
Figure 1. Mean value of profitability determinants from 1998 to 2018.



lead to high interest expenses, hence puts more financial burden on a firm and subsequently lowers its profit (Asimakopoulos et al., 2009; Işık, 2017). On the contrary, Tobinq is not influenced by leverage. This may indicate that leverage does not drive investors' expectation on firm value in Hong Kong's equity market. Liquidity seems not to be a significant factor since it only affects ROE in the post-crisis timeframe. This result is different from the study completed by Notta and Vlachvei (2014) who found that both leverage and liquidity were significant factors during the crisis period. The effect of sales growth is also not obvious as it only positively affects ROA in the post-crisis period and ROE in the pre-crisis period.

Table 3. Pearson correlation coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Hong Kong												
ROA (1)	1.00											
ROA_{t-1} (2)	0.53***	1.00										
ROE (3)	0.76***	0.53***	1.00									
ROE $_{t-1}$ (4)	0.24***	0.28***	0.32***	1.00								
Tobinq (5)	−0.26***	−0.23***	−0.18***	−0.11***	1.00							
Tobinq $_{t-1}$ (6)	−0.17***	−0.27***	−0.15***	−0.11***	0.66***	1.00						
firmsize (7)	0.16***	0.15***	0.17***	0.15***	−0.00	−0.02*	1.00					
leverage (8)	−0.03***	−0.03***	−0.03***	−0.01	0.01	0.01	0.22***	1.00				
liquidity (9)	0.01	0.03***	−0.00	−0.04***	0.04***	0.04***	−0.13***	−0.06***	1.00			
salesgrowth (10)	0.03***	−0.00	0.03***	−0.00	0.01	0.02**	0.03***	0.00	0.01	1.00		
GGDP (11)	0.05***	0.01	0.03***	0.01	0.02**	0.01	−0.07***	−0.01	−0.02**	0.07***	1.00	
Inf (12)	0.01*	0.05***	0.01	0.01	0.00	0.04***	0.18***	−0.01	0.03***	−0.01	−0.06***	1.00
Singapore												
ROA (1)	1.00											
ROA_{t-1} (2)	0.54***	1.00										
ROE (3)	0.76***	0.53***	1.00									
ROE $_{t-1}$ (4)	0.21***	0.22***	0.27***	1.00								
Tobinq (5)	−0.17***	−0.16***	−0.11***	−0.08***	1.00							
Tobinq $_{t-1}$ (6)	−0.09***	−0.08***	−0.09***	−0.10***	0.38***	1.00						
firmsize (7)	0.21***	0.20***	0.22***	0.16***	0.14***	0.08***	1.00					
leverage (8)	−0.21***	−0.18***	−0.2***	−0.10***	−0.04***	−0.02	0.26***	1.00				
liquidity (9)	0.08***	0.09***	0.06***	0.01	0.01	−0.01	−0.16***	−0.36***	1.00			
salesgrowth (10)	0.11***	−0.02	0.13***	−0.02*	0.08***	0.05***	0.04***	−0.02	−0.02	1.00		
GGDP (11)	0.04***	0.06***	0.04***	0.01	0.01	0.01	0.00	0.01	−0.02**	0.07***	1.00	
Inf (12)	0.01	0.06***	0.03***	−0.01	−0.05***	−0.01	0.02	−0.04***	0.02**	−0.05***	−0.10***	1.00

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively

Table 4. Pooled result

	ROA		ROE		Tobinq	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
Hong Kong						
ROAt-1	**0.70*** **	9.77				
ROE t-1			**0.42***	1.83		
Tobinq t-1					**0.67*** **	17.69
Firmsize	**0.91*** **	2.96	4.12	1.43	**0.02** **	2.45
Leverage	**−2.73***	−1.78	**−20.12***	−1.86	−0.18	−1.46
Liquidity	0.06	0.90	0.74	1.18	−0.00	−0.16
Salesgrowth	0.14	0.53	1.66	1.04	0.01	0.41
GGDP	126.49	0.92	−753.06	−1.07	1.04	1.45
Inf	−0.54	−0.28	−11.48	−0.77	**−0.03*** **	−3.83
AR(2) test	1.92	1.92	−1.56	−1.56	0.05	0.05
Hansen J-test	18.62	18.62	11.33	11.33	22.04	22.04
Singapore						
ROA t-1	**0.58*** **	7.11				
ROE t-1			**0.69** **	2.57		
Tobinq t-1					0.36	1.00
Firmsize	**1.06*** **	5.17	**2.65*** **	2.60	**0.08*** **	3.28
Leverage	**−12.92*** **	−4.79	**−37.75*** **	−3.37	**−0.33** **	−2.52
Liquidity	0.14	1.42	0.28	1.03	−0.00	−0.28
Salesgrowth	**2.78*** **	5.86	**6.49*** **	4.47	**0.06** **	2.04
GGDP	−0.68	−0.16	15.03	1.32	0.16	0.64
Inf	−0.10	−1.30	0.50	1.57	**−0.02** **	−2.16
AR(2) test	1.56	1.56	1.18	1.18	−1.46	−1.46
Hansen J-test	26.73	26.73	21.43	21.43	18.60	18.60

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively. Next to Hansen J-test's coefficient is Chi-square statistic.

For the macroeconomic variables, GGDP has a positive relationship with all three measures during the crisis period. Such relationship reveals the vital role of economic activities and the "size" of the economy during times of economic hardship. Rising GGDP also drives profit upward after the crisis (ROA) and raises market expectations about firm performance before the crisis (Tobinq). This finding is consistent with the studies of Egbunike and Okerekeoti (2018), Killins (2020), and Pattitoni et al. (2014) An inverse impact of inflation is found during the crisis as Inf is negatively related to ROA and Tobinq, while it is not statistically meaningful in other periods. This finding suggests that rising inflations during the crisis period reduce the aggregate demand and amplifies operational and borrowing costs, and consequently causes Hong Kong firms to experience a decline in earnings. This finding supports the finding of Broyles et al. (1983) but contradicted the results of the study by Perry (1992).

4.3. Results for the sub-periods—Singapore

Tables 8, 9 and 10 present the results of the Singapore firms divided into the three sub-periods: pre-crisis (1998–2006), crisis (2007–2009), post-crisis (2008–2010). Lagged profitability does not affect current profitability during the crisis across all three measures. Specifically, lagged profitability only positively affects ROA before and after the crisis, and Tobinq after the crisis. Lee et al. (2017), when examining the impact of lagged profitability during the GFC in a sample of Chinese firms, find that two out of three accounting-based measures of profitability are uncorrelated with their lagged terms.

Table 5. ROA—Hong Kong

ROA	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
ROA_{t-1}	0.11	0.27	**0.64*** **	4.20	**0.76*** **	14.95
Firmsize	**1.89*** **	2.82	**0.77*** **	2.96	**0.68*** **	7.47
Leverage	**−10.00** **	−2.01	**−5.77** **	−2.21	−1.26	−1.59
Liquidity	0.39	1.63	0.1	0.51	−0.03	−0.56
Salesgrowth	0.52	0.97	−0.22	−0.50	**0.50** **	2.42
GGDP	29.28	1.45	**43.21*** **	3.49	**69.01*** **	5.58
Inf	0.30	0.58	**−0.98** **	−2.46	−0.08	−0.66
AR(2) test	−0.52	−0.52	1.25	1.25	1.42	1.42
Hansen J-test	5.83	5.83	6.74	6.74	18.90	18.90

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.
Next to Hansen J-test's coefficient is Chi-square statistic.

Similar to Hong Kong firms, the Singapore firms' profitability is hugely influenced by their size and the amount of their borrowings. Except for ROE in the crisis period, firm size is positively associated with ROA, ROE and Tobinq. This result affirms the findings of prior literature (Asimakopoulos et al., 2009). On the other hand, leverage inversely impacts firm accounting profitability but shows no relationship with the market-based measure during and after the crisis period.

Regarding liquidity, its positive impact is found scattered in the pre-crisis period (Tobinq) and the post-crisis period (ROA and ROE). There is no impact of liquidity on profitability in the crisis period. It therefore suggests that, raising cash and cash equivalents during the crisis period does not improve firms' survival chances during a period of economic hardship. The effect of sales growth also varies as salesgrowth strongly and positively affects ROE over all three periods, while influences ROA in pre- and post-crisis and Tobinq in only the first timeframe. Although the evidence of sales growth is not conclusive, it does suggest to the Singapore firms that maintaining a positive sales growth rate is important during times of recession.

Table 6. ROE—Hong Kong

ROE	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
ROE_{t-1}	−0.30	−0.82	0.27	0.62	0.40	1.39
Firmsize	**5.23*** **	3.23	**2.87** **	2.01	**3.12*** **	3.26
Leverage	**−33.58** **	−2.22	**−20.76*** **	−2.82	**−12.53** **	−2.11
Liquidity	0.72	1.31	−0.27	−0.72	**0.60** **	2.38
Salesgrowth	**1.88***	1.83	−0.73	−0.60	1.30	0.61
GGDP	27.00	0.69	**72.84*** **	2.63	−590.78	−0.42
Inf	0.06	0.10	−0.41	−0.74	3.89	0.22
AR(2) test	0.33	0.33	−0.41	−0.41	−0.66	−0.66
Hansen J-test	7.56	7.56	13.68	13.68	11.66	11.66

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.
Next to Hansen J-test's coefficient is Chi-square statistic.

Table 7. Tobin's Q—Hong Kong

Tobinq	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
$Tobinq_{t-1}$	0.26	1.16	**0.59****	2.18	**0.70*****	17.94
Firmsize	**0.83****	2.49	−0.33	−0.70	**0.02***	1.83
Leverage	−2.43	−0.54	−2.03	−0.16	−0.15	−1.13
Liquidity	0.31	0.49	0.21	0.29	−0.00	−0.31
Salesgrowth	−0.31	−0.60	0.50	1.03	0.00	0.05
GGDP	**6.30***	1.87	**6.97****	2.43	−0.26	−0.16
Inf	−0.09	−1.48	**−0.38*****	−3.17	−0.01	−0.47
AR(2) test	0.05	0.05	0.39	0.39	−1.04	−1.04
Hansen J-test	5.68	5.68	5.02	5.02	23.25	23.25

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

Next to Hansen J-test's coefficient is Chi-square statistic.

Real GDP growth does not affect Singapore firms' profitability much since GGDP only positively influences Tobinq before the GFC, whereas having no significant impact in other periods and with ROA and ROE. The other macroeconomic indicator is inflation, whose coefficients present contradicting findings. First, inflation is found to be positively correlated with ROA and ROE after the crisis. Although inflation is insignificant with the aggregate profitability of all firms as shown in Table 4, it motivates the rise of profit in the service sector (Chaudhry et al., 2013). Since Singapore is a service-based market and is effectively orchestrated by the government (Chin & Strand, 2008; TheHeritageFoundation, 2019), inflation is under control and boosts Singapore firms' profitability. Simultaneously, inflation also negatively associates with Tobinq in the pre-crisis timeframe. This is supported by Faria and Mollick (2010) as they find that there exists a negatively strong relationship between Tobin's Q and inflation in the U.S from 1953 to 2000.

Overall, our regressions in Hong Kong and Singapore suggest that the effect of each factor varies with alternative firm performance measures and economic phases. The variation in the results could be the consequence of the different nature of the firm measures. The investigated factors show the strongest correlations when ROA (which indicates the managerial efficiency in translating their assets into profit) is the dependent variable. This is the most common proxy for firm performance as it reflects corporate profitability through the utilization of the resources a firm possesses. The regressions of ROE on firm-specific and macroeconomic factors bring on relatively less significant estimates, as ROE does not correlate with its lag in any tests. We feel that these weak correlations partially shows that ROE is not a comprehensive metric of firm performance as it disregards the contribution of debt to profit generated (Deloitte, 2013). Tobin's Q, on the other hand, is a market-based measure of performance that reflects market expectation on firms' prospect; and it explains why investigated factors may affect Tobin's Q differently from the other two accounting-based measures.

We noticed that the macroeconomic factors are more influential during the crisis period in Hong Kong, but have no effect on Singapore firms in the same period. Notwithstanding the above observation, the estimation results across three measures in the pre-crisis and post-crisis periods give support to the existing literature on firm performance, although the general effects of both firm-specific and macroeconomic factors on accounting measures of firm performance are slightly more prominent in the latter. This implies both corporate capacity and the resilience of the economy substantially contribute to the recovery of businesses after the 2008 GFC.

Table 8. ROA—Singapore

ROA	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
ROA_{t-1}	**0.44****	2.35	0.30	1.39	**0.58*****	5.40
Firmsize	**1.57*****	3.50	**1.47****	2.11	**1.07*****	3.48
Leverage	**−15.39*****	−3.38	**−19.14****	−2.08	**−14.22*****	−3.95
Liquidity	0.25	0.84	0.10	0.36	**0.15***	1.67
Salesgrowth	**2.45*****	3.03	−0.49	−0.07	**2.50*****	4.28
GGDP	0.89	0.10	−56.33	−0.22	−0.19	−0.03
Inf	0.28	0.64	−1.13	−0.47	**0.16***	1.89
AR(2) test	0.89	0.89	−0.32	−0.32	1.35	1.35
Hansen J-test	1.82	1.82	8.98	8.98	22.13	22.13

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

Next to Hansen J-test's coefficient is Chi-square statistic.

4.4. Robustness

There are two important assumptions of sys-GMM model that need to be considered; the absence of second-order serial correlation and the over-identification issue of the estimator. To address the former issue, we apply the Arellano-Bond test and observe if the second-order serial correlation is present in the model (Goddard et al., 2005; Pervan et al., 2019). If the test statistics is significant, it means that the second-order serial correlation is present in the model and the sys-GMM is not robust. The result from the second last row of Tables 4–10 reveals that all the AR(2) tests are statistically insignificant. Therefore, this indicates second-order serial correlation problems did not occur across all the regressions.

We then conduct the Hansen J-test, as suggested by Hansen (1982), to test for the over-identification problem. A significant test statistics indicates that the model is over-identified, thus it casts doubt on the

Table 9. ROE—Singapore

ROE	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
ROE_{t-1}	0.31	0.71	0.55	1.12	0.56	1.62
Firmsize	**4.22*****	2.95	2.37	1.19	**3.47*****	2.91
Leverage	**−51.40*****	−2.87	**−26.63***	−1.76	**−43.20*****	−3.57
Liquidity	−0.13	−0.27	0.21	0.50	**0.80****	2.07
Salesgrowth	**6.39*****	3.13	**6.11*****	3.16	**5.44*****	3.47
GGDP	33.03	1.61	22.16	1.02	17.46	0.82
Inf	−0.39	−0.40	0.33	0.73	**1.19****	2.12
AR(2) test	0.70	0.70	−0.86	−0.86	1.62	1.62
Hansen J-test	3.26	3.26	9.18	9.18	22.69	22.69

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

Next to Hansen J-test's coefficient is Chi-square statistic.

Table 10. Tobin's Q—Singapore

Tobinq	Column 1 Pre-crisis period (1990–2006)		Column 2 Crisis period (2007–2009)		Column 3 Post-crisis period (2010–2018)	
	Coefficient	**t-stat**	**Coefficient**	**t-stat**	**Coefficient**	**t-stat**
$Tobinq_{t-1}$	0.32	1.02	0.39	1.41	**0.89****	2.34
Firmsize	**0.11*****	6.16	**0.08****	2.01	**0.07***	1.71
Leverage	**−0.50*****	−2.83	−0.09	−0.24	0.67	0.89
Liquidity	**0.03***	1.65	−0.01	−0.62	0.16	1.05
Salesgrowth	**0.11****	1.98	−0.04	−0.20	−0.40	−0.36
GGDP	**1.28*****	2.92	6.50	0.25	0.03	0.01
Inf	**−0.11*****	−3.24	0.03	0.29	0.01	0.99
AR(2) test	−0.18	−0.18	−0.44	−0.44	−0.33	−0.24
Hansen J-test	3.63	3.63	11.17	11.17	14.28	11.47

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

Next to Hansen J-test's coefficient is Chi-square statistic.

robustness of the estimator. As seen from the last row of Tables 4–10, all the test statistics are insignificant. Therefore we can safely conclude that all the sys-GMM models are correctly identified.

The outcome from the two robustness tests denotes that all the results from the sys-GMM method are reliable. To further add credibility to the results, the tests were re-run with the industry sector fixed effects included in the model. The results for the pooled sample, Hong Kong and Singapore are reflected in Tables 11, 12 and 13 respectively. The results of the re-run tests show that the coefficients in the pooled, Hong Kong and Singapore samples are not significantly different from the original results, and therefore, further validate our results.

4.5. Overall implications

We found three important observations from examining the results of the tests. Firstly, we found that the impact of the various determinants is not identical across the three measures, especially between accounting-based measures and the market-based measure. The investigated determinants are more statistically related to the accounting-based measures than to the market-based measure. This observation highlights an ongoing debate on whether the three measures of firm performance can be treated as if they are identical i.e. they capture the same aspects of firm performance and therefore, could be used interchangeably as an indicator of firm performance. Dietrich and Wanzenried (2011) are of the opinion that ROA is a better measure of firm performance compared to ROE as ROE does not take into account the risk associated with leverage. Gentry and Shen (2010) mention that the market-based measure is a reflection of the future value of the firm while the accounting-based measure is a reflection of past performance, and they are, therefore, distinct dimensions of firm performance. On the other hand, Rowe and Morrow (1999) contend although the accounting and market measures are distinct, they do provide insights into a firm's fundamental performance and could therefore be treated as a single underlying construct of firm performance.

Secondly, results from the pooled sample showed that firm's profitability in both countries are similarly affected by past profitability, firm size and leverage. Past profitability and firm size positively affected firm profitability while leverage negatively affected firm profitability in both samples. In addition, the Singapore firms depended on sales growth to generate earnings for the firm.

Table 11. Pooled sample with sector fixed effects

	Hong Kong			Singapore		
	ROA	**ROE**	**Tobinq**	**ROA**	**ROE**	**Tobinq**
ROA_{t-1}	**0.702*** **			**0.571*** **		
	(11.00)			(6.793)		
ROE_{t-1}		**0.410***			**0.651** **	
		(1.821)			(2.377)	
$Tobinq_{t-1}$			**0.666*** **			0.293
			(17.75)			(0.813)
Firmsize	**0.911*** **	4.082	**0.0253** **	**1.085*** **	**2.850*** **	**0.0790*** **
	(3.057)	(1.402)	(2.509)	(4.939)	(2.787)	(3.603)
Leverage	**−2.672***	**−19.32***	−0.158	**−12.79*** **	**−39.50*** **	**−0.352** **
	(−1.854)	(−1.840)	(−1.245)	(−4.639)	(−3.537)	(−2.546)
Liquidity	0.0675	0.728	−0.000348	0.145	0.270	−0.00478
	(0.976)	(1.196)	(−0.0565)	(1.447)	(0.967)	(−0.516)
Salesgrowth	0.107	1.811	0.00695	**2.822*** **	**6.479*** **	**0.0654** **
	(0.396)	(1.136)	(0.328)	(5.959)	(4.597)	(2.067)
GGDP	166.4	−792.6	1.033	−0.640	15.41	0.211
	(1.187)	(−1.131)	(1.433)	(−0.149)	(1.393)	(0.834)
Inf	−0.288	−10.40	**−0.02*** **	−0.0876	0.479	**−0.0160** **
	(−0.160)	(−0.740)	(−3.842)	(−1.185)	(1.579)	(−2.387)
Industry effects	Included	Included	Included	Included	Included	Included
AR(2) test	1.82	−1.59	0.02	1.54	1.16	−1.41
Hansen J-test	19.94	11.34	20.59	27.35	21.32	18.24

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

Lastly, the firm-specific variables-firm performance relationship of Hong Kong firms during the GFC period is relatively more significant than that of the Singapore firms. The profitability of Hong Kong firms are also more affected by macroeconomic elements during the crisis period as compared with Singapore firms. Therefore, we can conclude that during the 2008 financial crisis, Hong Kong firms' profitability is not only driven by their internal factors but also affected by changes in macroeconomic conditions. Oppositely, the profitability of Singapore firms does not depend on macroeconomic factors, while firm-specific factors only have limited influence. The findings of the Hong Kong sample supported the suggestion of Issah et al. (2017) that macro-economic factors should be considered in the prediction of firm performance.

5. Conclusion

This study investigates the impact of firm and macroeconomic factors on firm profitability before, during and after the global financial crisis in Hong Kong and Singapore. In addition to the four firm factors and two macroeconomic factors, we have also considered a prior year profitability variable in the sys-GMM model. ROA, ROE and Tobinq were used as the proxies for firm performance. Two samples (pooled sample and the pre/during/post crisis sub-period sample) were analysed and results separately discussed.

Our results from the pooled sample confirm findings from previous empirical studies that firm size, leverage and past profitability are significant predictors of firm performance. Firm size is also a significant predictor of firm performance in all the three sub-period samples in both countries for ROA. This is in line with the principle that larger firms have more resources to weather the storm of the financial crisis. We also find that Singapore firms are more sheltered from the changes in macroeconomic elements as

Table 12. Hong Kong with sector fixed effects

	ROA			ROE			Tobinq		
	Pre-crisis	**Crisis**	**Post-crisis**	**Pre-crisis**	**Crisis**	**Post-crisis**	**Pre-crisis**	**Crisis**	**Post-crisis**
ROA_{t-1}	0.250	**0.642*****	**0.755*****						
	(0.647)	(4.292)	(15.30)						
ROE_{t-1}				−0.268	0.255	0.414			
				(−0.726)	(0.566)	(1.416)			
$Tobinq_{t-1}$							0.302	**0.565***	**0.702*****
							(1.497)	(1.938)	(17.86)
Firmsize	**1.894*****	**0.786*****	**0.667*****	**5.309*****	**3.069****	**3.069*****	**0.834****	−0.350	**0.0196***
	(2.637)	(2.922)	(7.283)	(3.131)	(2.064)	(3.136)	(2.454)	(−0.856)	(1.809)
Leverage	**−8.449***	**−5.642****	**−1.336***	**−32.48****	**−20.11*****	**−12.42****	−2.059	−0.799	−0.119
	(−1.839)	(−2.255)	(−1.690)	(−2.116)	(−2.632)	(−2.131)	(−0.475)	(−0.0654)	(−0.882)
Liquidity	0.384	0.119	−0.0305	0.756	−0.149	**0.620****	0.375	0.121	−0.00202
	(1.629)	(0.598)	(−0.597)	(1.393)	(−0.396)	(2.445)	(0.696)	(0.184)	(−0.288)
Salesgrowth	0.386	−0.203	**0.533****	**1.805***	−0.794	1.581	−0.435	0.568	−0.000571
	(0.774)	(−0.461)	(2.576)	(1.743)	(−0.639)	(0.741)	(−0.790)	(1.410)	(−0.0222)
GGDP	30.04	**42.48*****	**68.27*****	26.07	**72.11****	−716.6	**7.204****	**6.630****	−0.225
	(1.480)	(3.406)	(5.483)	(0.669)	(2.575)	(−0.513)	(2.077)	(2.306)	(−0.154)
Inf	0.133	**−0.994****	−0.0826	−0.0342	−0.372	3.898	**−0.103***	**−0.371*****	−0.00704
	(0.298)	(−2.474)	(−0.671)	(−0.0543)	(−0.658)	(0.214)	(−1.666)	(−3.059)	(−0.440)
Industry effects	Included	Included	Included	Included	Included	Included	Included	Included	Included
AR(2) test	−0.38	1.22	1.42	0.25	−0.48	−0.73	0.12	0.30	−1.04
Hansen J-test	6.87	6.88	20.07	7.90	14.53	11.53	4.39	4.35	22.16

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

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Table 13. Singapore with sector fixed effects

	ROA			ROE			Tobinq		
	Pre-crisis	**Crisis**	**Post-crisis**	**Pre-crisis**	**Crisis**	**Post-crisis**	**Pre-crisis**	**Crisis**	**Post-crisis**
ROA_{t-1}	**0.429****	0.322	**0.575*****						
	(2.295)	(1.454)	(5.162)						
ROE_{t-1}				0.244	0.535	0.503			
				(0.656)	(1.148)	(1.454)			
$Tobinq_{t-1}$							0.277	0.440	**0.909****
							(0.811)	(1.445)	(2.223)
Firmsize	**1.673*****	**1.515***	**1.101*****	**4.416*****	2.425	**3.652*****	**0.119*****	0.0607	0.0589
	(3.484)	(1.903)	(3.449)	(3.448)	(1.356)	(2.957)	(6.037)	(1.414)	(1.563)
Leverage	**−16.14*****	**−18.07***	**−14.36*****	**−54.51*****	−21.86	**−44.22*****	**−0.498*****	0.00233	0.521
	(−3.416)	(−1.912)	(−3.828)	(−3.282)	(−1.466)	(−3.742)	(−2.700)	(0.00625)	(0.746)
Liquidity	0.211	0.168	0.140	−0.354	0.292	**0.756****	**0.0323***	−0.00764	0.135
	(0.745)	(0.536)	(1.557)	(−0.708)	(0.676)	(1.981)	(1.868)	(−0.507)	(0.948)
Salesgrowth	**2.478*****	−1.343	**2.563*****	**6.177*****	**5.528*****	**5.552*****	**0.108****	−0.0231	−0.351
	(3.093)	(−0.182)	(4.361)	(3.144)	(2.923)	(3.676)	(2.005)	(−0.136)	(−0.328)
GGDP	1.000	−39.62	−0.100	31.40	19.98	19.18	**1.356*****	4.332	0.0102
	(0.109)	(−0.152)	(−0.0157)	(1.601)	(0.936)	(0.924)	(3.259)	(0.171)	(0.00549)
Inf	0.301	−1.210	**0.166****	−0.481	0.338	**1.143****	**−0.107*****	0.0205	0.0133
	(0.698)	(−0.495)	(1.988)	(−0.540)	(0.752)	(2.114)	(−3.452)	(0.192)	(1.078)
Industry effects	Included	Included	Included	Included	Included	Included	Included	Included	Included
AR(2) test	0.87	−0.29	1.34	0.62	−0.90	1.57	−0.18	−0.40	−0.14
Hansen J-test	1.67	8.96	22.95	3.49	9.31	23.23	3.75	12.12	13.16

(***), (**), (*) indicate the coefficient is significant at 1%, 5% and 10% level respectively.

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compared to Hong Kong firms. This, perhaps, has to do with the different style of managing the economy. The Singapore government is generally more protective over the economy and are therefore likely to take actions whereas the Hong Kong government tend to refrain from interfering in business activities.

The contributions of this study are as follows. Firstly, this study provides recent evidence of the determinants of firm profitability and therefore, extended the existing evidence. Secondly, with an extended period of ten years in our study, the study has captured any changes in both the internal and external environments over the duration of the study. Thirdly, we break down the period of study into three sub-periods: before, during and after the global financial crisis. This allows us to gain an understanding of the impacts of the financial crisis on the predictors of firm performance. Fourthly, we provided further insights into the determinants of firm performance by comparing and contrasting the impacts of firm-specific and macroeconomic factors on firm profitability in two most similar economies in Asia. Lastly, we used both accounting-based measures and market-based measures as a proxy for firm profitability and this provided further insight into the different dimensions of firm profitability. In summary, the findings of this paper assists investors and other interested parties in forecasting the performance of a firm.

Even though our study provided interesting insights into the predictors of firm profitability in two small and open economies in Asia, it has some limitations. Our study is limited in that we considered only four firm factors, two macroeconomic factors and a prior year profitability variable. Further studies may consider including more firm and macroeconomic factors. Also, in using the accounting-based and market-based measures of firm performance, we have only considered the financial aspect of a firm's performance. However, there could be other indicators of firm performance that may enhance the understanding of the predictors of firm performance.

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Author details
Carol Cheong[1]
E-mail: carol.cheong@lincoln.ac.nz
ORCID ID: https://orcid.org/0000-0003-4939-4488
Huy Viet Hoang[1,2]
ORCID ID: https://orcid.org/0000-0001-7264-8226
[1] Department of Financial and Business Systems, Faculty of Agribusiness and Commerce, Lincoln University, Christchurch, New Zealand.
[2] Faculty of Business Management, National Economics University, Hanoi, Vietnam.

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