On the Causal Links between the Stock Market and the Economy of Hong Kong

Sin-Yu Ho and Bernard Njindan Iyke

ERSA working paper 591

March 2016

Economic Research Southern Africa (ERSA) is a research programme funded by the National Treasury of South Africa.

On the Causal Links between the Stock Market and the Economy of Hong Kong*

Sin-Yu Ho[†] and Bernard Njindan Iyke[‡§]

March 29, 2016

Abstract

There is a bulk of literature that identifies the major economic drivers of Hong Kong's rapid and steady economic performance over the last three decades. Of these major economic drivers identified, the performance of the stock market has received less attention. This paper examines the causal links between stock market performance and economic performance of Hong Kong in an augmented VAR setting. Using an extended quarterly dataset which covers the period 1986Q2-2014Q4 and the Toda-Yamamoto causality test, we find that stock market performance, as proxied by market capitalisation ratio, and economic performance stimulates each other. Also, the stock market performance, as proxied by total value traded ratio, and economic performance influences each other. However, the causal links between stock market performance and economic performance dissipate, if stock market performance is proxied by turnover ratio. This suggests that the causal links between stock market performance and economic performance are highly dependent on the proxy of stock market performance in the case of Hong Kong.

JEL CODE: C32,E44

KEYWORDS: Causality, Economic Performance, Stock Market Performance, Toda-Yamamoto

1 INTRODUCTION

The growing importance of stock markets around the world has generated various researches in the finance and economic literature, most of which have iden-

*The authors thank, without implicating, the editor of ERSA Working Papers, Professor Jan van Heerden, and an anonymous referee for their helpful comments and suggestions on an earlier version. The authors also thank participants at the Western Economic Association International's 12th International Conference (7–10 January, 2016; Nayang Technological University, Singapore), for their useful suggestions. All remaining shortcomings are regretfully the authors'.

†Department of Economics, University of South Africa, P. O. Box 392, UNISA, 0003, Pretoria, South Africa. Email: hosy@unisa.co.za / alicehosinyu@gmail.com

‡Department of Economics, University of South Africa, P. O. Box 392, UNISA, 0003, Pretoria, South Africa. Email: benitoflex@gmail.com / nykeb@unisa.ac.za

§Corresponding Author [Economics Department, University of South Africa, Pretoria]

tified a strong positive association between the performance of stock markets and the performance of economies. The theoretical contributions suggest that the stock market is an important component of financial sector development in promoting economic growth in different ways. By reducing the cost of mobilising savings, the stock market may facilitate investment into most productive technologies, thereby leading to economic growth (see Greenwood and Smith, 1997). As the stock market develops, it may improve corporate governance by addressing the principal-agent problem, which is beneficial to economic growth (see Jensen and Murphy, 1990). Well-developed stock markets also allow world portfolios to shift from safer low-return capital to riskier high-return capital, which can have substantial welfare gain through the effects on expected consumption growth (see Obstfeld, 1994). In addition, the stock market provides market liquidity which allows investors to trade financial assets in a less risky manner. Such increase in liquidity also provides companies with easy access to capital; therefore contributing to long-term growth (see Bencivenga *et al.*, 1996; Levine, 1991).

There are equally opposing theoretical views about the association between stock market performance and the performance of an economy. In terms of the stock market liquidity, Demirgüc-Kunt and Levine (1996) identify various channels through which stock market development hurts economic performance. First, greater stock market liquidity may reduce the savings rate by increasing the returns on investment. Second, by reducing the uncertainty associated with investment, it may make investment more attractive to risk-averse agents and also decrease the demand for precautionary savings. Third, a highly liquid stock market encourages dissatisfied investors to sell quickly, which can lead to disincentive to exert corporate control, and therefore compromising the quality of corporate governance (see Jensen and Murphy, 1990). In addition, the excessive price volatility in stock markets may lead to an inefficient allocation of resources and upward pressure on interest rates to compensate for higher uncertainty. Therefore, the quantity and productivity of investment may be compromised, which will hinder growth (see Arestis *et al.*, 2001; DeLong *et al.*, 1989).

Indeed, the role of stock market development in the performance of economies is an inconclusive subject. In this paper, we attempt to answer an important country-specific question which has received less attention in the literature: Is the performance of the stock market crucial to Hong Kong's rapid and dominant economic performance over the last three decades? There are existing papers that investigate this question in panel and cross-country data settings but the worry is that country-specific information is lost due to the "lumping" of countries. Panel data analysis usually entails a single dataset composed of several countries which may not share the same economic fundamentals. This means that the ability of panel data to isolate the effects of country-specific information or more general policies depends on making appropriate assumptions and selecting the "right models" (see Hsiao, 2005). Thus, we cannot be sure that these previous studies made the appropriate assumptions and selected the right models in their empirical analysis convincingly. In addition, cross-country data is limited in that it usually has one historical context and, therefore, does not allow the researcher to examine economic relationships over time (see Kramer, 1983). To eliminate these uncertainties, time series techniques may be very useful.

To the question at hand, there are existing studies which provide different answers. For example, Atje and Jovanovic (1993), using 40 countries for the period 1980-1988, conclude that there is a large effect of stock market development on the level and growth rate of economic activities. Levine and Zervos (1996), in their study of 41 countries, including Hong Kong, over the period 1976-1993, find that stock market development is positively associated with economic growth. In another study, Levine and Zervos (1998), utilise cross-country regressions for 47 countries, including Hong Kong, covering the period 1976-1993. They demonstrate stock market liquidity is correlated with economic growth positively. Rousseau and Wachtel (2000) examine the relationship between stock markets, banks and growth for a set of 47 countries from 1980-1995. Their study shows that stock market development and banking sector development explain subsequent growth. A similar result is supported by Beck and Levine (2004), who study a panel of 40 countries for the period 1976-1998. Minier (2003), using the data of Levine and Zervos (1998), claims that there is a positive correlation between stock market development and economic growth in countries with high levels of market capitalisation such as Hong Kong. A similar view is also held by Rioja and Valev (2004), who conclude that the nexus differs at various stages of economic development. In direct contrast, Singh (1997) studying the role of stock markets on economic growth of developing countries during the 1980s and 1990s, concludes that stock market development does not promote faster long-term economic growth. This view is also supported by Harris (1997) who study 49 countries from the year of 1980-1991. In the whole sample, and in the sub-sample of developing countries, the study finds no hard evidence that the level of stock market activity can explain economic growth.

We add to this burgeoning literature by arguing that the performance of the Hong Kong stock market has contributed greatly to the rapid and steady performance of its economy over the last three decades. To provide firm support for our argument, we regress the indices of stock market performance on economic performance in an augmented VAR setting. Using the Toda-Yamamoto test for causality, we find that the performance of the Hong Kong stock market, as proxied by market capitalisation ratio, and the performance of the Hong Kong's economy influences each other. In addition, we find that, if proxied by total value traded ratio, the stock market and the economy of Hong Kong influences each other. However, the causal links between stock market performance and economic performance vanish if stock market performance is proxied by turnover ratio. This suggests that the causal links between stock market performance and economic performance are highly dependent on the proxy of stock market performance in the case of Hong Kong

In the next section, we briefly discuss the stock market development in Hong Kong. Section 3 presents the methodology and the data. Section 4 reports our main empirical results. Section 5 provides the conclusion.

2 STOCK MARKET DEVELOPMENT IN HONG KONG

Hong Kong has experienced more than a hundred years of stock market development. The first formal stock exchange, the Association of Stockbrokers in Hong Kong, was established early in 1891. It was later, in 1914, renamed the Hong Kong Stock Exchange. However, the activities of the Exchange were generally regarded as insignificant until the 1970s. During the 1970s, Hong Kong was regarded as the Euro-Dollar market in a different time zone, and the flows of international capital into Asia boosted its financial activities (Jao, 2003). There was an influx of foreign banking and non-bank financial institutions that contributed to the rapid growth of the stock market. As a result, three other stock exchanges were established in the late 1960s and early 1970s (Tsang, 2004).

The global market crash in 1987 revealed various flaws that led to major reforms in the stock market of Hong Kong. One of them was the unification of four stock exchanges to become the Hong Kong Stock Exchange in 1986, in order to avoid destructive competition among them (Hong Kong Exchanges and Clearing Limited (HKEx), 2011). In 1999, the Stock Exchange, the Futures Exchange and its associated clearing houses, were merged to form the Hong Kong Stock Exchange and Clearing Limited (HKEx) in order to reduce operation costs through achieving economies of scale. In the same year, a second board known as the Growth Enterprise Market was launched to provide start-up companies with a capital formation platform and an alternative market to the Main Board (HKEx, 1999). In 2000, the HKEx was demutualised to become one of the first stock exchanges in the world to go public (Ghosh, 2006; HKEx, 2011). In 2012, a joint venture known as the China Exchange Service Company Limited was formed between the HKEx, the Shanghai Stock Exchange and the Shenzhen Stock Exchange to strengthen the linkage of stock market activities between Hong Kong and Mainland China. In the same year, the London Metal Exchange was acquired as the HKEx's first overseas member, with a vision of developing the HKEx into a global vertically integrated multi-asset class exchange (see HKEx, 2015a).

The Hong Kong stock market responded positively to the reforms and became one of the most highly developed markets as indicated by the size and the liquidity of the market. The size of the stock market, as measured by the stock market capitalisation, increased significantly from US$608 billion in 1999 to US$3101 billion in 2013. In 2013, it was ranked as the fifth largest stock market in the world, and the second largest in Asia (World Federation of Exchanges, 2015). The major reason for the phenomenal growth in the market capitalisation is that Hong Kong has been established as a preferred centre for initial public offering (IPOs) internationally. The amount raised by IPOs increased significantly from HK$17 billion in 1999 to the highest level of HK$449 billion in 2010. In 2013, HK$169 billion was raised through IPOs; contributing 45% to the total equity fund raised in that year (HKEx, 2013). The growth of Hong Kong as an IPO fund-raising centre has been driven largely by the listing of companies from Mainland China. In 2013, Hong Kong became the second largest IPO fund-raising centre in the world, just behind the New York Stock Exchange (see Ernst and Young, 2013).

The performance of the Hong Kong stock market becomes more impressive when the comparison is based on the market capitalisation as a percentage of GDP. Figures from the World Development Indicators (WDI, 2014) indicate that Hong Kong has been the home of the largest stock market in the world during the period of 1999 to 2012, in terms of the market capitalisation ratio due to the following reasons. First, there has been substantial increase in the number of listed enterprises from Mainland China on the Exchange. In 2013 alone, Mainland Chinese enterprises accounted for 41% of the total market capitalisation (HKEx, 2013). Second, there has been an expansion in the activities of Hong Kong companies in overseas territories. Many listed companies in Hong Kong have substantial investment in countries overseas. Their sources of earning are outside Hong Kong, which do not necessarily have a direct relationship with the GDP in Hong Kong (see Lee and Poon, 2005).

The stock market in Hong Kong has also recorded impressive growth in terms of liquidity as indicated by the total value traded ratio and the turnover ratio. The HKEx had the most liquid stock market in the world during the period of 2007 to 2012, as measured by the total value traded ratio (WDI, 2014). It was also the seventh most liquid market globally in 2012 by turnover ratio, according to figures from the WDI (2014). On these accounts, we could argue that Hong Kong has an extremely liquid stock market with low transaction costs.

The magnificent growth in the stock market is also accompanied by the rapid growth of economic activities in Hong Kong. Hong Kong has achieved an "economic miracle" over the past few decades. The real GDP has increased more than threefold from HK$ 157,823 million in 1986Q2 to HK$ 573,280 million in 2014Q4, comparable to the advanced market economies. Figure 1 shows the economic performance and stock market development in Hong Kong during 1986Q2 to 2014Q4.

3 METHODOLOGY AND DATA

In this section, we present the preliminary tests employed, the models and the data used to examine the relationship between the stock market performance and the performance of the Hong Kong economy. To examine the stationary properties of the stock market and the economic performance series, we use two sets of stationarity tests: (i) stationarity tests without structural breaks, i.e. the Augmented Dickey-Fuller (ADF), and the Dickey-Fuller generalised least squares (DF-GLS) tests; and (ii) stationarity tests with structural breaks, i.e. the Perron, and the Zivot-Andrews tests. We then examine whether the series are causally linked using the Toda-Yamamoto test developed by Toda and Yamamoto (1995).

3.1 Stationarity Tests without Structural Breaks

As a preliminary analysis, prior to examining the nature of the relationship between stock market performance and the performance of the economy, we examine their stationary properties. We utilise the ADF and DF-GLS tests. The DF-GLS test is proposed by Elliot *et al.* (1996). We use this test to cater for the drawback of the ADF test. The ADF test has been found to over-reject the null hypothesis of unit root, when the time series under consideration has a large and negative moving average (MA) component, even when there is a unit root (see Schwert, 1986; Caner and Killian, 2001). Elliot *et al.* (1996) demonstrate that the DF-GLS test has substantially higher power, even when the root of the time series is closer to unity. To estimate results which are based on parsimonious regressions, we determine the optimal lags for both tests using the Modified Akaike Information Criterion (MAIC). The regressions and test statistics underlying DF-GLS test have been discussed thoroughly in various studies. Thus, we preserve space by not discussing them here.

3.2 Stationarity Tests with Structural Breaks

Macroeconomic time series, such as the ones we use in this paper, are found to be characterised by structural breaks. The presence of structural breaks has been found to distort the statistical power of the stationarity tests we have discussed so far. Perron (1989), for example, has found these tests to accept the null hypothesis of unit roots in time series, even when there are clear indications of no unit roots. Since this discovery, various stationarity tests have been developed to take into account structural breaks in time series. In this paper, we utilise the Perron (1997) test and the Zivot and Andrews (1992) test as robust alternatives for examining the stationary properties of the series considered in this paper.

The Perron test, which is originally derived by Perron (1989) and later modified by Perron (1997), proceeds by fitting the following Augmented Dickey-Fuller (ADF) regression with shifts in mean and trend

$$\Delta y_t = \alpha + \beta y_{t-1} + \sum_{i=1}^{k} p_i \Delta y_{t-1} + \mu_t + \epsilon_t \tag{1}$$

where $\mu_t = \mu_o + \mu_o^s d_{tT_B} + \mu_1 t + \mu_1^s (t - T_B) d_{tT_B}$ are potential deterministic terms, and T_B is the break date. The test has three null hypotheses: (i) y_t is non-stationary with a structural break in the intercept; (ii) y_t is non-stationary with a structural break in the trend; and (iii) y_t is non-stationary with a structural break in the intercept and trend.

Zivot and Andrews (1992) argue that the Perron test suffers because the break date is determined exogenously. They argue that the identification of a break date may be unassociated with the data. Thus, if the critical values computed under the null hypothesis are computed on the basis that the break date is determined *ex ante*, then there could be substantial size distortions. Under this kind of situation, the Perron test will frequently reject the null hypothesis of unit root. The Zivot-Andrews test differs from the Perron test by explicitly modelling the break date endogenously. The Zivot-Andrews test also uses the ADF regression in *Eq.* (1). The test applies the Perron (1989) procedure for each break date in the dataset, and selects the break date for which the support for the null hypothesis is the strongest (see Zivot and Andrews, 1992). The null hypotheses under the Zivot-Andrews test are the same as those under the Perron test.

3.3 Specification for Testing Granger Causality

The traditional test for causality proposed by Granger (1969) in the vector autoregressive (VAR) setting requires the researcher to first establish the integration properties of the time series. In cases where the series are I(1), the researcher will need to test whether there is any co-integrating relationships, before carrying out the test for causality. However, most of the diagnostic tests for unit roots and co-integration are known to have low power against the alternative hypotheses of stationarity and cointegration. Toda and Yamamoto (1995), in particular, stress that the traditional way of testing for causality by first testing for unit root and co-integration exposes this approach to pretesting bias. This view is supported by He and Maekawa (1999), who argue that testing for causality using F-statistics when one or both time series are non-stationary can lead to spurious causality.

Thus, according to Toda and Yamamoto (1995), the problems inherent in the traditional testing for Granger causality can be avoided by fitting an augmented VAR model which adds the highest order of integration to the optimal lag of the VAR model. This technique ensures that the test statistic for the causality test has a standard asymptotic distribution. We specify a modified vector autoregressive model, $VAR(m + d_{\max})$, following Yamada (1998) of the form

$$y_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1i} y_{t-i} + \sum_{i=m+1}^{m+d_{\max}} \gamma_{2i} y_{t-i} + \sum_{i=1}^{m} \varphi_{1i} x_{t-i} + \sum_{i=m+1}^{m+d_{\max}} \varphi_{2i} x_{t-i} + u_{1t} \quad (2)$$

$$x_t = \Theta_0 + \sum_{i=1}^{m} \Theta_{1i} x_{t-i} + \sum_{i=m+1}^{m+d_{\max}} \Theta_{2i} x_{t-i} + \sum_{i=1}^{m} \delta_{1i} y_{t-i} + \sum_{i=m+1}^{m+d_{\max}} \delta_{2i} y_{t-i} + u_{2t} \quad (3)$$

where y_t and x_t are the series under consideration; δ, γ, Θ and φ are the parameters of the model; u_1 and u_2 are the white-noise innovations.

From *Eq.* (2), x_t causes y_t if $\varphi_{1i} \neq 0, \forall i = 1, 2, \ldots, m$. Similarly, in *Eq.* (3), y_t causes x_t if $\delta_{1i} \neq 0, \forall i = 1, 2, \ldots, m$.The test statistic for these hypotheses follows a *chi-squared* distribution. Take the hypothesis $\delta_{1i} = 0, \forall i = 1, 2, \ldots, m$, for example, and let $\delta = vec(\delta_1, \delta_2, \ldots, \delta_m)$ be a vector of m VAR parameters. Toda and Yamamoto (1995) demonstrate that for a suitably selected Z, the modified *Wald*-statistic for testing this hypothesis is of the form

$$W = T(\hat{\delta}' Z'(Z\hat{\Sigma}_u' Z')^{-1} Z\hat{\delta}$$

where $\hat{\delta}$ is the OLS estimate of $\hat{\delta}$; $\hat{\Sigma}_u'$is a consistent estimate of the variance-covariance matrix of $\sqrt{T}(\hat{\delta} - \delta); T$ is the sample size. W, the test statistic, is *chi-squared* distributed with m degrees of freedom.

3.4 Data

The period covered in this paper is from the second quarter of 1986 to the fourth quarter of 2014. The data are obtained from the World Federation of Exchanges (2015), HKEx (2015b), and the Census and Statistics Department of Hong Kong (2015). These data sources are preferred to other sources because they provide the original data on each of the variables employed in this paper. The variables employed in this paper are: (i) economic performance, measured by the real GDP; and (ii) stock market performance, measured by three proxies, namely the stock market capitalisation ratio ($LNMCR$), the total value traded ratio ($LNTVR$) and the turnover ratio ($LNTOR$).

4 THE EMPIRICAL RESULTS

4.1 Results of the Tests for Stationarity

To examine the effect of stock market performance on the performance of the Hong Kong economy, we first test whether the proxies for stock market performance and economic performance are stationary. We employ the ADF and DF-GLS tests and perform our stationarity analysis by considering the drift and trend options. The tests for stationarity of the series in their levels are presented in Tables 1 and 2. The evidence in favour of stationarity or no unit roots in the series using the ADF and DF-GLS is weak at the conventional levels of significance. The drawback here is that the ADF and the DF-GLS have substantial size distortion when these series contain structural breaks. In practice, there are various reasons why we should expect breaks in the stock market and economic performance variables we utilise in this paper. The oil price shocks of the 1973 and 1979, the Gulf war in 1990, the Asian financial crisis of the 1997, and the recent global financial and economic crisis could have caused substantial shocks to the path of these variables. The ADF and the DF-GLS test are unable to detect these breaks. To present robust stationarity evidence, we employ two alternative stationarity tests which can cater for structural breaks in our series. These are the Perron and the Zivot-Andrews tests. The results of these tests presented in Table 1 also indicate that all the variables, except $LNTOR$ contain unit roots. So we difference the non-stationary variables once and again examine their stationary status. The results, presented in Table 2, show that the variables are first-difference stationary at the conventional levels of significance.

4.2 Lag Selection and Model Diagnostics

To perform the Toda-Yamamoto test, the appropriate lag length needs to be selected. In this paper, we select the lag length using the Akaike Information Criterion (AIC), the Hannan-Quinn Criterion (HQC), the Schwartz Information Criterion (SIC), and the Final Prediction Error (FPE). For all three VAR models, the optimal lag selected is 5. Thus, we fit the three VAR models by including 5 lags. In addition to selecting the lags, our models must be stable structurally and free of serial correlation. The inverses of the roots of the characteristic equations are greater than unity (i.e. for *LNGDP* and *LNMCR* equations, the inverse of the root is 1.0077; *LNGDP* and *LNTVR* is 1.0099; and *LNGDP* and *LNTOR* is 1.0113) indicating the models are stable structurally. Figures A.1, A.2 and A.3 in the appendix are the cumulative sum of recursive residual plots which also support this evidence. The models are also free of serial correlation. For example, the *chi-squared statistic* is 35.635 with a *p-value* of 0.8114 for the *LNGDP* and *LNMCR* model; 44.496 and 0.4507 for the *LNGDP* and *LNTVR* model; and 57.027 and 0.143 for the *LNGDP* and *LNTOR* model, respectively.

4.3 Results of the Tests for Causality

Having satisfied the necessary requirements for the Toda-Yamamoto test, we fitted a $VAR(6)$ for each of the three models (i.e. $m = 5$ and $d_{\max} = 1$). The results of the tests for Granger causality between *LNGDP* and *LNMCR* are reported in Table 3. The results show that there is bidirectional causal relationship between *LNMCR* and *LNGDP* at 1% level of significance. This is indicated by the *chi-squared statistics* of 35.60 and 24.10, with corresponding *p-values* of 0.00 and 0.00, for the *LNGDP* and *LNMCR* equations, respectively. The implication is that the performance of the stock market, as proxied by market capitalisation ratio, can stimulate the performance of the Hong Kong economy. In a similar fashion, economic performance can also influence the performance of the stock market. This finding is consistent with the existing findings (see Atje and Jovanovic, 1993; Levine and Zervos, 1996 and 1998; Beck and Levine, 2004).

Next, we analyse the causal relationship between *LNGDP* and *LNTVR*. The results for this are reported in Table 3. Similar to the first model, we find bidirectional causality between *LNGDP* and *LNTVR* at 5% level of significance. This is indicated by the *chi-squared statistics* of 12.80 and 13.40, with corresponding *p-values* of 0.025 and 0.02, for the *LNGDP* and *LNTVR* equations, respectively. Thus, stock market performance, defined in terms of total value traded ratio, and economic performance influences each other. This finding is also documented in the literature (see Rousseau and Wachtel, 2000; Minier, 2003; Beck and Levine, 2004)

Finally, we analyse the causal relationship between *LNGDP* and *LNTOR*. This is reported in Table 3 as well. The causality test reveals no causal flow between *LNGDP* and *LNTOR*. This is indicated by the *chi-squared statistics* of 3.00 and 6.00, with corresponding *p-values* of 0.70 and 0.31, for the *LNGDP* and

LNTOR equations, respectively. Thus, the performance of the stock market, as proxied by turnover ratio, does not influence the performance of the Hong Kong economy at the conventional level of significance. This conclusion holds, conversely, and is consistent with some previous findings (see Harris, 1997; Singh, 1997).

5 CONCLUSION

The arguments surrounding the role of stock markets in the performance of economies have remained inconclusive. Today there are a number of studies which find a strong positive association between the stock market and economic performance (see for example, Jensen and Murphy, 1990; Levine, 1991; Obstfeld, 1994; Bencivenga *et al.*, 1996; Greenwood and Smith, 1997). Yet, there are studies which find that strong stock market performance hurts the performance of the economy in some ways (see DeLong *et al.*, 1989; Demirgüc-Kunt and Levine, 1996; Arestis *et al.*, 2001). Hong Kong is among the countries whose stock market and economy have experienced tremendous advancements in the last three decades. The question that we ask is: Is the strong performance of the stock market in Hong Kong essential to the performance of its economy? This question has received less attention in the literature, perhaps due to the inconclusive nature of the links between stock markets and real economic activities. We explore this question in this paper in an augmented VAR setting by making use of the Toda-Yamamoto test for causality. Using an extended quarterly dataset which covers the period 1986Q2-2014Q4, we find bidirectional causal linkages between stock market performance, as proxied by market capitalisation ratio, and the performance of the Hong Kong economy. In addition, we find bidirectional causal flow between stock market performance, as proxied by total value traded ratio, and the performance of the Hong Kong economy. However, the causal links between stock market performance and economic performance vanish, if stock market performance is proxied by turnover ratio. This suggests that the causal links between stock market performance and economic performance are highly dependent on the proxy of stock market performance in the case of Hong Kong.

References

[1] Arestis, P., Demetriades, P. O. and Luintel, K. B. (2001). Financial Development and Economic Growth: The Role of Stock Markets. *Journal of Money, Credit and Banking* 33(1): 16–41.

[2] Atje, R. and Jovanovic, B. (1993). Stock Market and Development. *European Economic Review* 37: 623-640.

[3] Beck, T. and Levine, R. (2004). Stock Markets, Banks and Growth: Panel Evidence. *Journal of Banking and Finance* 28(3): 423-442.

[4] Bencivenga, V. R., Smith, B. D. and Starr R. M. (1996). Equity Markets, Transactions Costs, and Capital Accumulation: An Illustration. *World Bank Economic Review* 10 (May): 241-65.

[5] Caner, M. and Kilian, L. (2001). Size Distortion of Tests of the Null Hypothesis of Stationarity: Evidence and Implication for the PPP Debate. *Journal of International Money and Finance* 20: 639-657.

[6] Census and Statistics Department of Hong Kong, [Online] Available from <http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables /index.jsp?tableID=030> accessed on 4 March 2015.

[7] DeLong, J. B., Schleifer, A., Summers, L. H. and Waldmann, R. J. (1989). The Size and Incidence of the Losses from Noise Trading. *Journal of Finance* 44 (September): 681-96.

[8] Demirgüc-Kunt, A. and Levine, R. (1996). Stock Markets, Corporate Finance, and Economic Growth: An Overview. *World Bank Economic Review* 10 (May): 223-39.

[9] Elliot, G., Rothenberg, T. J. and Stock, H. (1996). Efficient Tests for an Autoregressive Unit Root. *Econometrica* 64: 813-836.

[10] Ernst and Young, Strategic Growth Markets. (2013). *EY global IPO trends*. Available from <http://www.ey.com/GL/en/Services/Strategic-Growth-Markets/Initial-public-offering/EYglobal-ipo-trends-2014-q3-1-report#.VQmOMmwcTcs>, accessed on 5 May 2014.

[11] Ghosh, S.R. (2006). *East Asian Finance: The Road to Robust Markets*. World Bank, Washington, DC.

[12] Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica* 37 (3): 424–438.

[13] Greenwood, J. and Smith, B. (1997). Financial Markets in Development and the Development of Financial Markets. *Journal of Economic Dynamics and Control* 21 (January):145-82.

[14] Harris, R. (1997). Stock Market and Development: A Re-assessment. *European Economic Review*, 41:139-146.

[15] He, Z. and Maekawa, K. (1999). On Spurious Granger Causality. *Economic Letters*, 73(3), 307–313.

[16] Hong Kong Exchanges and Clearing Limited (HKEx). (1999). *Hong Kong Exchange Fact Book*, Hong Kong.

[17] ——. (2011). *A Glimpse of the Past*.

[18] ——. (2013). *Hong Kong Exchange Fact Book*.

[19] ——. (2015a). Available at <http://www.hkexgroup.com/eng/abouthkexgroup/history.htm>, accessed 11 June 2015.

[20] ——. (2015b). Available at <http://www.hkex.com.hk/eng/stat/smstat/statarch/statarchive.htm>, accessed 11 June 2015.

[21] Hsiao, C. (2005). Why Panel Data? *Singapore Economic Revie*w, 50(2):1–12

[22] Jao, Y.C. (2003). Financial Reform in Hong Kong, Chapter 6 in Maximilian J.B. Hall (ed.), *The International Handbook on Financial Reform*, Edward Elgar Publishing, Cheltenham.

[23] Jensen, M. C. and Murphy, K. J. (1990). Performance Pay and Top Management Incentives. *Journal of Political Economy* April: 225-64.

[24] Kramer, G. H. (1983). The Ecological Fallacy Revisited: Aggregate versus Individual-Level Findings on Economics and Elections and Sociotropic Voting. *American Political Science Review* 77, 92-111.

[25] Lee, J. and Poon, J. (2005). Alternative Measures of the Size of the Stock Market, *Securities and Futures Commission Research Paper* No. 27, Hong Kong.

[26] Levine, R. (1991). Stock Markets, Growth, and Tax Policy. *Journal of Finance* 46 (September) 1991, 1445-65.

[27] Levine, R. and Zervos, S. (1996). Stock Market Development and Long Run Growth. *World Bank Economic Review* 10 (2).

[28] Levine, R. and Zervos, S. (1998). Stock Markets, Banks and Economic Growth. *American Economic Review* June: 537-58.

[29] Minier, J. (2003). Are Small Stock Markets Different? *Journal of Monetary Economics* 50:1593-1602.

[30] Obstfeld, M. (1994). Risk-taking, Global Diversification, and Growth. *American Economic Review* 84:1310-1329.

[31] Perron, P. (1989). The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis *Econometrica* 57(6): 1361-1401

[32] Perron, P. (1997). Further Evidence on Breaking Trend Functions in Macroeconomic Variables. *Journal of Econometrics* 80(2): 355-385.

[33] Rioja, F. and Valev, N. (2004). Finance and the Sources of Growth at Various Stages of Economic Development. *Economic Enquiry* 42 (1): 127-40.

[34] Rousseau, P.L. and Wachtel, P. (2000). Equity Markets and Growth: Cross-Country Evidence on Timing and Outcomes, 1980-1995. *Journal of Business and Finance* 24 (November): 1933-57.

[35] Schwert, W. (1986). Test for Unit Roots: A Monte Carlo Investigation. *Journal of Business and Economic Statistics* 7: 147-159.

[36] Singh, A. (1997). Financial liberalization, Stock markets and economic development. *The Economic Journal* 107:771-782.

[37] Toda, H. Y. and Yamamoto T. (1995). Statistical Inference in Vector Autoregressions with Possibly Integrated Processes. *Journal of Econometrics*, 66, 225–250.

[38] Tsang, S. (2004). *A Modern History of Hong Kong*, I.B. Tauris & Co Ltd, London.

[39] World Federation of Exchanges, [Online] Available from <http://www.world-exchanges.org> accessed on 4 March 2015.

[40] World Development Indicators. (2014). World Bank, Washington, D.C.

[41] Yamada, H. (1998). A Note on the Causality between Exports and Productivity: an Empirical Reexamination. *Economics Letters*, 61: 111-4.

[42] Zivot, E., and Andrews, D. W. K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics* 10(3): 251-270.

Table 1: Tests for Unit Roots for Variables in Levels

Test	Level Variables			
	LNGDP	LNMCR	LNTOR	LNTVR
ADF[Drift]	-1.156	-0.702	-2.061	-1.225
ADF[Trend]	-2.399	-3.220*	-3.032	-3.908**
DF-GLS[Drift]	1.893	0.229	-1.116	-0.044
DF-GLS[Trend]	-1.0588	-3.152**	-3.051**	-3.866***
Perron[Drift]	-3.668	-4.778	-5.501**	-4.672
	[1997Q2]	[2005Q4]	[2005Q2]	[2005Q4]
Perron[Trend]	-2.187	-4.199	-5.281**	-4.196
	[2001Q4]	[1990Q3]	[2010Q2]	[1990Q3]
Zivot-Andrews[Drift]	-3.721	-4.778	-5.544***	-4.729*
	[1997Q4]	[2006Q1]	[2006Q1]	[2006Q1]
Zivot-Andrews[Trend]	-2.474	-3.286	-5.223	NA
	[2002Q2]	[2006Q1]	[2009Q3]	NA

Note: *, ** and *** denote significance at 10%, 5% and 1% levels, respectively. NA denotes non-applicable. Items in block parentheses are break dates.

Table 2: Tests for Unit Roots for Variables in First-Difference

	First-difference Variables			
	ΔLNGDP	ΔLNMCR	ΔLNTOR	ΔLNTVR
ADF[Drift]	-10.808***	-12.049***	-13.177***	-12.180***
ADF[Trend]	-10.753***	-11.997***	-13.122***	NA
DF-GLS[Drift]	-0.140	-4.333***	-4.287***	-5.545***
DF-GLS[Trend]	-1.282	-11.85675***	NA	NA
Perron[Drift]	-5.323**	-12.889***	NA	-12.429***
	[2003Q2]	[2008Q4]	NA	[1990Q4]
Perron[Trend]	-4.928**	-12.176***	NA	-9.277***
	[1997Q1]	[2006Q4]	NA	[2007Q1]
Zivot-Andrews[Drift]	-5.412***	-9.499***	NA	-6.610***
	[2003Q3]	[2008Q1]	NA	[2008Q2]
Zivot-Andrews[Trend]	-4.653**	-9.278***	NA	-6.301***
	[2007Q1]	[2007Q1]	NA	[2007Q1]

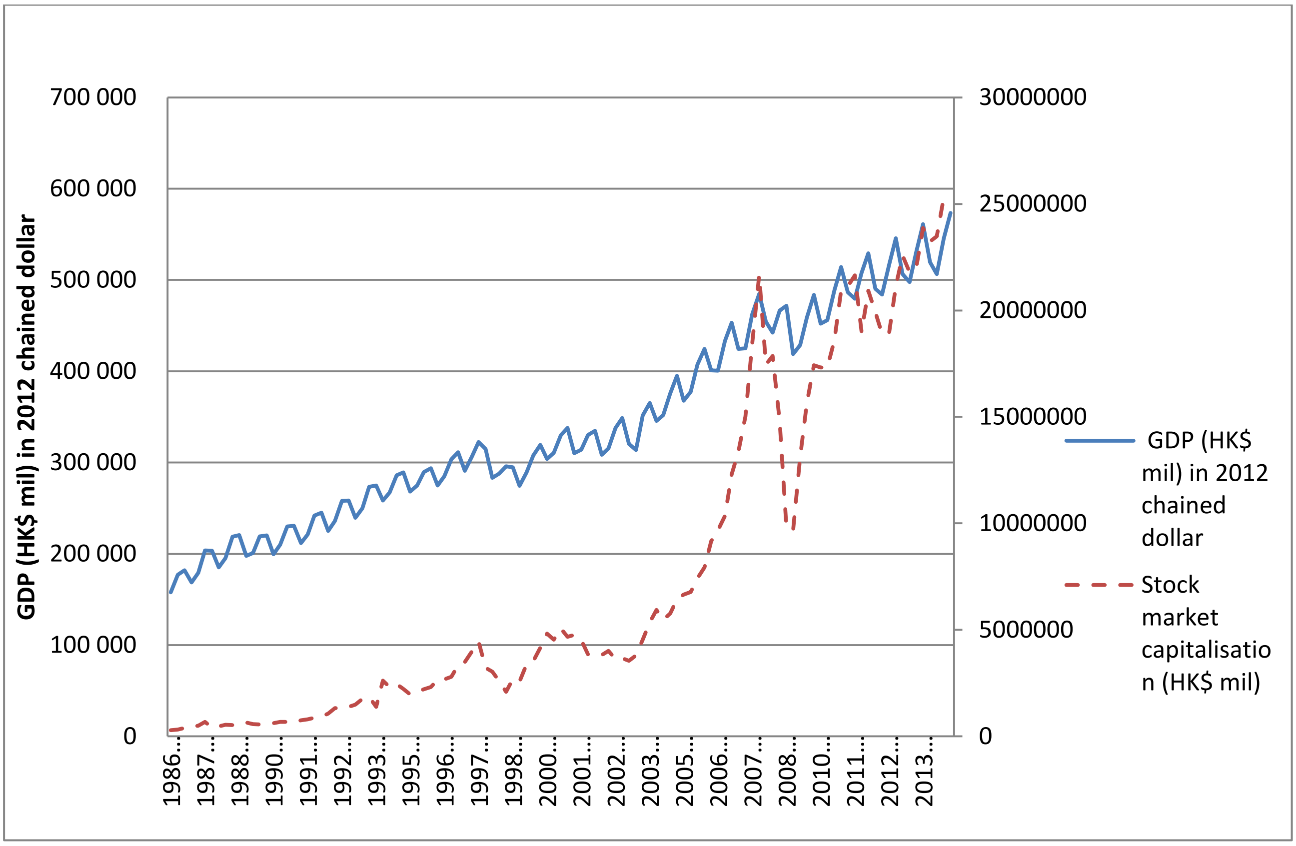
Note: ** and *** denote significance at 5% and 1% levels, respectively. NA denotes non-applicable. Items in block parentheses are break dates. Δ denotes the first-difference operator.

Table 3: Tests for Granger Causality

	Wald-statistic [p-value]			**Inverse Roots**
Variable	LNGDP	LNMCR		
LNGDP	NA	35.60[0.00] ***	1.0077	
LMCR	24.10[0.00]***	NA	1.0077	
Variable	LNGDP	LNTVR		
LNGDP	NA	12.80[0.025]**	1.0099	
LNTVR	13.40[0.02]**	NA	1.0099	
Variable	LNGDP	LNTOR		
LNGDP	NA	3.00[0.70]	1.0113	
LNTOR	6.00[0.31]	NA	1.0113	
Lag Selection	AIC = 5	BIC = 5	HQC = 5	FPE = 5
Serial Correlation	χ^2-statistic	p-value		
	35.635	0.8114		
	44.496	0.4507		
	57.027	0.143		

Note: ** and *** denote significance at 5% and 1%, respectively. NA denotes non-applicable.

Figure 1: The Economic Performance and Stock Market Development in Hong Kong during 1986Q2 to 2014Q4



Source: HKEx (2015b), and the Census and Statistics Department of Hong Kong (2015)

APPENDIX
Figure A.1: Model Diagnostic Test for Structural Stability

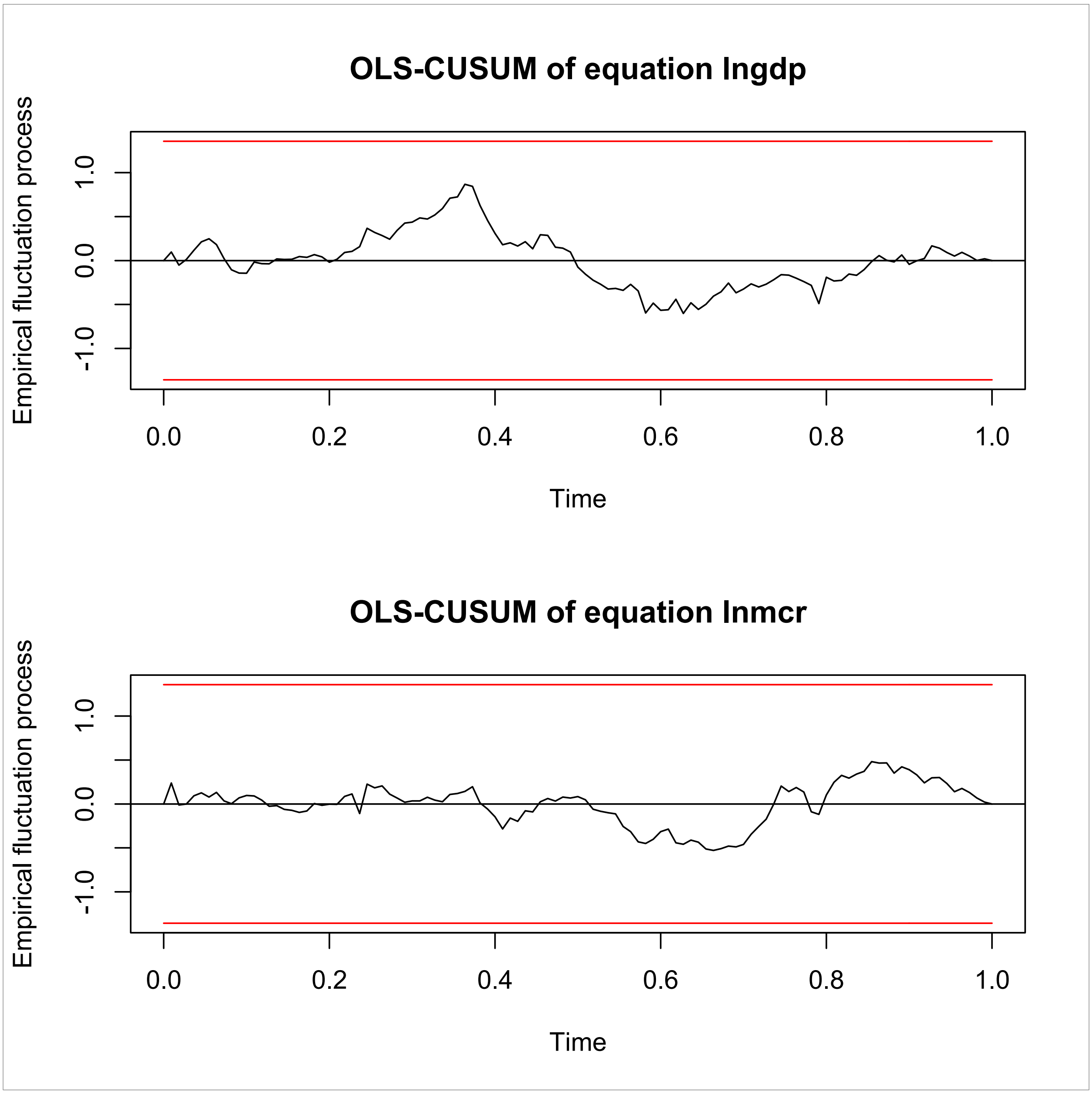


Figure A.2: Model Diagnostic Test for Structural Stability

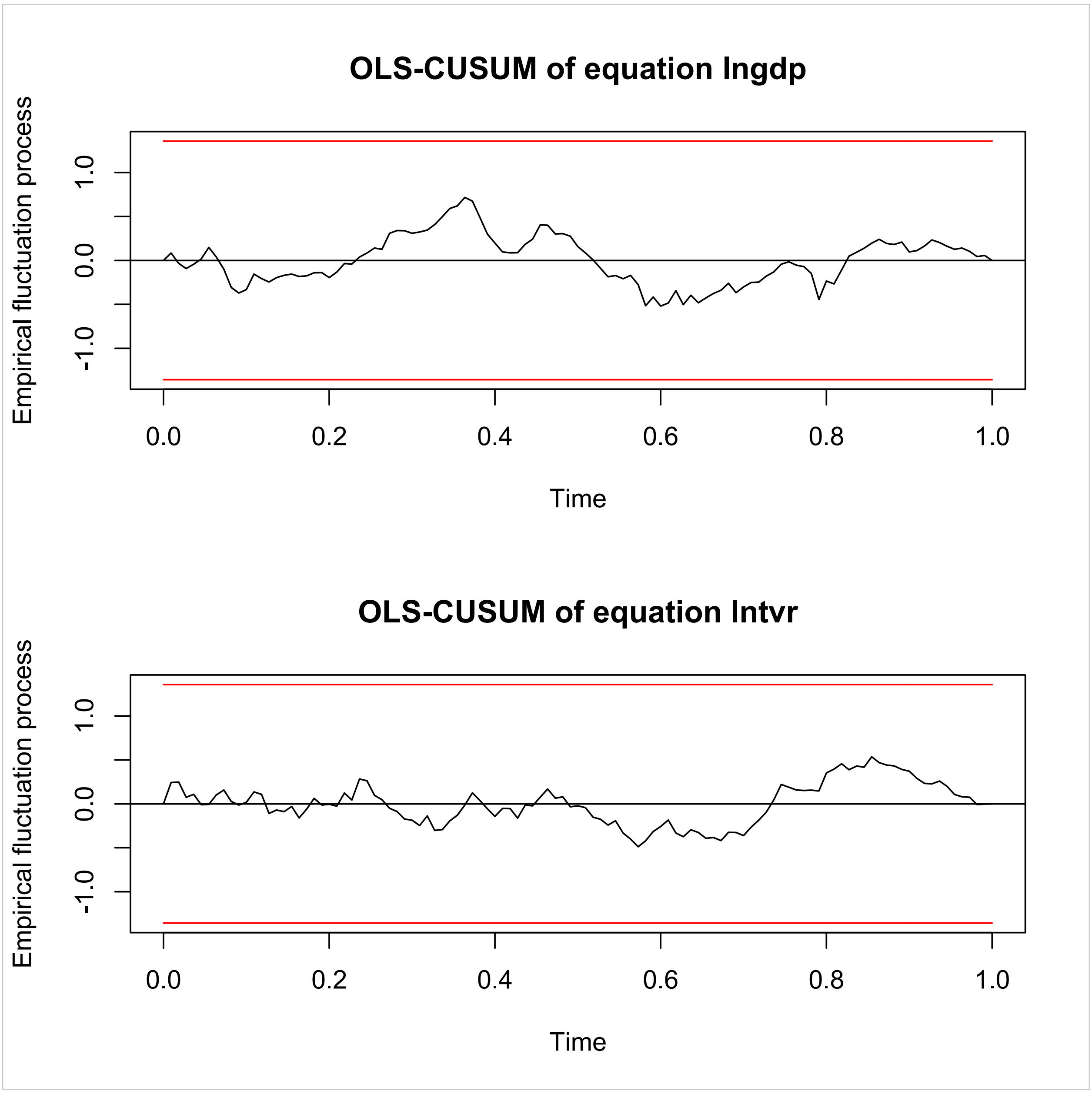


Figure A.3: Model Diagnostic Test for Structural Stability