Financial centers in the Asia-Pacific region: an empirical study on Australia, Hong Kong, Japan and Singapore *

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1. Introduction

In the last few decades the pattern of international financial activity has undergone major changes. Beginning with a high concentration in a very small number of financial centers, activity then spilt over to more locations. But now with globalisation revolutionizing the financial services industry, and expanding the worldwide network of financial markets and activities, paradoxically the trend again seems to be towards concentration, with fewer mega financial centers, complemented by smaller centers with more specialized focuses showing hierachical tendencies (Poon 2003; Poon, Eldredge and Yeung 2004). The globalisation of finance has also increased the competition between financial centers in a vigorous search for competitive advantage. Thus, location still matters even in the globalised financial landscape of the New Economy. Physical proximity to potential clients is still imperative, especially in capital markets, merger and acquisition business or private banking, where personal services and physical interactions are essential (Lee 2001). It is also important to recognize the fact that besides a stable and resilient financial industry within the center,

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market participants have always placed a premium on a wide range of socio-economic factors, and the tendency has been for this premium to increase. The factors include sound and responsive regulatory systems with minimal regulatory cost and impediment to innovation, and a conducive business environment including reliable market infrastructure, favourable tax treatment and stable economic and political conditions, as well as attractive living conditions (Walter 1998, Lee 2001, Fock and Wong 2001). Apparently, financial centers tend to prosper when their hinterlands are buoyant. Recent evidence in Asia, for example, proves that when the hinterland is in difficulty, the financial center will be adversely affected (Lee 2001). However, a strong and growing hinterland generates confidence and investor interest, and the center becomes an important conduit for funds and financial services.

The importance of financial centers in the Asia-Pacific region is likely to continue, especially with the rehabilitation and growth of several Asian economies. However, it is not easy to predict which specific factors will emerge as crucial for each center, nor indeed which specific center will emerge in a leading position. This will depend not only on the static comparative advantage of the different cities, but also on the dynamic competitive advantages created by their policies and strategies (Lee 2001). Incumbents (such as Australia, Hong Kong, Japan and Singapore) will always have their own comparative advantage, but no lead is totally unassailable, as London found to its dismay in 1998 when – in the space of just a few months – Frankfurt snatched away the trading of German Bund futures (Lee 2001).

Most studies on financial centers are descriptive, some recent examples being Tschoegl (2000) and Schenk (2002). The only exceptions are Poon (2003) and Poon, Eldredge and Yeung (2004), which make an attempt to reconcile the literature on world cities (geographical perspective) with that on the international financial centers (financial perspective). Moreover, there seems to be a total dearth of more recent empirical studies exploring the comparative advantage of the financial centers of the four Asia-Pacific countries, namely Australia, Hong Kong, Japan and Singapore.

In contrast to the recent studies mentioned above, our empirical study takes a purely financial and economic perspective. The principal aim of this paper is an empirical investigation into the factors endowing Australia, Hong Kong, Japan and Singapore with the status of financial centers and, moreover, sustaining this status.

This paper is structured as follows. Section 2 provides a preliminary perspective on the four financial centers while section 3 is devoted to a selective review of the literature pinpointing the factors contributing to financial center status. Model formulation along with description of the data is given in section 4, while the empirical results are analysed in section 5. The final section of paper sets out our concluding remarks.

2. The four financial centers: Australia, Hong Kong, Japan and Singapore

We begin our discussion with Australia. The finance and insurance sector is the third largest industry in Australia with 7.4% of GDP in 2001-02. This represents an increase of 102% since the mid-1980s (Australian Bureau of Statistics 2002, Axiss Australia 2002f, p. 3). The biggest attraction of Australia probably lies in the fact that its financial markets are showing rather swifter growth than its competitors'.

Furthermore, although the number of foreign banks in Australia is lower (36) than that of Hong Kong, Singapore and Japan, recent years have seen the rate of foreign banks setting up operations in Australia exceeding that of the other three centers. Considering the significant part played by bank assets in Australia's status as a financial center, the fact that the country's banks controlled around A$ 958.1 billion (US$ 527 billion) as of 30 June 2002 is a highly encouraging sign (Australian Prudential Regulatory Authority 2002).

Australia's fund management industry has the largest pool of funds under management in the Asia-Pacific region (ex Japan) – about A$ 700 billion – which is enticing international firms into the market, either by partnering with existing participants or on their own (Axiss Australia 2002d, p. 12). The opportunities available in the managed funds industry remain the primary inducement for those seeking to establish investment management operations here.

The foreign exchange market in Australia is large, open and liquid. There is also an improving trend in the number of global players focusing their Asian foreign exchange operations in Australia, as well as the growing domestic economy and dollar-denominated assets

which are important parts of global investment portfolios. Australia's daily average foreign exchange turnover grew by 11% in 2002 while the global market declined by 19% (Reserve Bank of Australia 2002; Axiss Australia 2002d, p. 16).

The Australian Stock Exchange (ASX) is, by market capitalization, one of the biggest in Asia outside Japan. Australia has the world's highest rate of household direct and indirect share ownership according to the latest available share-ownership survey by the ASX in 2004.

The turbulent events of the last couple of years have had a dramatic impact on global markets, but the resilience of the Australian market has been remarkable, with financial services companies accounting for about 37% of the market as compared with 18% in 1991 (Axiss Australia 2002b, p. 19). As of December 2001, there were 1,410 companies, including 76 foreign companies listed on the ASX. This 15% increase since 1998 and the 20% increase in the value of share trading represents the highest growth rate in the region (Australian Stock Exchange 2002, Axiss Australia 2002b, p. 19).

The Australian securitised debt and corporate bonds market is expanding rapidly, bolstered by efficient clearing and settlement arrangements as well as a diversity of products being offered in the Asia-Pacific. Trends in this market compare well with the trends seen in the world's major debt markets. As of 2002, the total volume of debt on issue in the Australian bond market was A$ 235 billion – an increase of 40% from 1998 (Axiss Australia 2002e, p. 22). Turnover in the physical and derivatives market grew at an average annual rate of 13% between 1998 and 2002 (Axiss Australia 2002a, p. 22).

The growth of Australia as a financial center has seen a wide array of derivative products made available for trading, including futures, options and warrants. The Sydney Futures Exchange (SFE) is the biggest financial futures market in the Asia Pacific region according to Axis Australia.

Thus all the financial markets in Australia can be seen to be growing at a pace that finds no comparison in the region. Once again we must recognize the fact that the Japanese market is indeed a large market, but in terms of growth potential and current attractiveness Australia is clearly in the lead.

When considering Hong Kong as a financial center we cannot but note its strong comparative advantage in catering to China's international financial needs (Montes 1999). In the Asian region, Hong

Kong has held the lead in personal finance (management of assets of individuals). It was expected that as China's economy grew and income rose, savers there would be looking for more sophisticated investment instruments, and that Hong Kong should be able to service this demand (Montes 1999). However, things have not turned out quite like this given the rise of Shanghai as a regional financial center. Hong Kong's northern rival is rapidly making itself a better place to do business according to a survey of 204 chief executive officers and senior managers in 2003. Shanghai is gaining ground over Hong Kong in terms of economic structure – the factor, which makes it a good place to do business. This means that it is highly likely that instead of contributing towards Hong Kong's status and sustainability as a financial center, Shanghai is now a direct competitor. Furthermore, now that China has joined the World Trade Organisation (WTO), Shanghai is the obvious focus for companies hoping to benefit from the opening of China's markets. Thus, Hong Kong's once-unique role as an intermediary in China trade faces the prospect of being eroded by Shanghai. Hong Kong is also troubled by a struggling domestic economy with high redundancies, and is politically less stable than Australia and Singapore.

Japan has been and is still seen by many scholars as the main financial center in the Asia-Pacific region. However some macroeconomic trends such as negative and sluggish economic growth combined with a high level of unemployment (compared with historically low unemployment) in Japan since the early 1990s have not augured well for Tokyo as predominant financial center.

These developments are serious, as a shrinking capital pool in Japan would mean that the present scale of overseas operations of the country's financial institution could no longer be supported, and its markets would become somewhat less attractive to borrowers. Japan has undoubtedly lost its position as leading financial center in the region, mainly on account of the heavy regulation of its financial markets, persisting even after it attained its international standing. Japan's domestic financial system has been characterized by excessive restrictions on financial transactions, brokers' fees and commissions set by regulation making for relatively high transaction costs. Restrictions on interest rates have created rigidities in the kinds of projects that could be financed by the banking system. Taxes and transaction costs on foreign exchange transactions, discouraging foreigners from

holding Japanese bonds, together with restrictions on which banks were enabled to engage in exchange transactions also raised the cost of transformation into and out of yen-denominated financial assets (Montes 1999).

A series of financial crises have undermined Japan's banking system, and a number of important banks such as Yamaichi Securities (fourth largest securities firm in Japan), Sanyo Securities (middle level securities firm) and Hokkaido Takushoku (a large commercial bank) (Ito 1997) have gone bankrupt. The main problem lies in the mounting bad debts resulting from the depressed economy. Thus, even if Japan has the largest financial market in the region, its institutional and structural rigidities along with weak economic fundamentals of late may render its size largely immaterial, and it will no longer be able to sustain any advantage it has at present (in the form of its stock market capitalization and massive domestic savings). However, if the economy recovers (as is happening now) and it is able to overcome its structural and institutional woes, the financial institutions may again begin to show the same unruffled confidence in Japan as in the past.

Singapore has recorded impressive growth in the financial services industry over the years. For example, according the Monetary Authority of Singapore (2002), assets under management grew by 11% in 2001-02. Singapore has also been driving much of the merger and acquisition (M&A) business in the region. Its financial center is dominated by a large offshore banking sector known as the Asian dollar market (ADM), with neither exchange control nor restrictions on foreign direct investment flows (Ho 1991, Lessard 1993 and Montes 1999). The government has outlined future directions in its strategy with regard to the industry as part of the on-going work of the Singapore government's financial sector review group (Monetary Authority of Singapore 2002). The recent changes include easing restrictions on how publicly accumulated funds, especially pension funds, can be invested (Montes 1999, Monetary Authority of Singapore 2002). With the reforms, private individuals and companies will have greater ability to decide how their savings can be invested and the type of risks to take. It is expected that this will serve as a spur to the expansion of the range of financial products that will also be of interest to investors from outside Singapore (Montes 1999). With government support and tax incentives, Singapore has been able to stand as a major attraction for the establishment of a wide range of financial markets and services.

These include commodity trading, futures contracts on goods and financial indices, and derivatives (Montes 1999). Singapore also has the largest bond market, foreign exchange market and derivatives market in the region (ex Japan) (Axiss Australia 2002d), as well as enjoying better infrastructure, efficiency and critical mass in the area of equity, foreign exchange and fund management dealing than Hong Kong. Moreover, Singapore surpasses Hong Kong and Japan in political and economic stability, and indeed in its rate of growth within the financial services industry. Singapore can also boast the most open competitive economy in the region – the hallmark of a strong financial center (World Competitiveness Yearbook 2003).

As the above discussion shows, the four financial centers appear to have comparative advantage in different areas of the financial services industry.

3. The existing empirical evidence

The existing literature shows a number of factors that give rise to the establishment of financial centers. The following sections categorize them as applicable to this study.

3.1. *Level of economic activity*

As the literature demonstrates, economic activity has been considered paramount in generating confidence within the business community and financial center. Economic instability might threaten the smooth and efficient flow of international capital within a financial center. Dufey and Giddy (1978) stress that the requirement of strong economic fundamentals is essential for financial centers. When little economic activity takes place within a center, the institutions and businesses located there solely for taxation purposes will soon move on to other centers that have more economic activity going on (Kindleberger 1974, IMF 2000). The simple reason is that a center which is complemented with a strong economic base will have the advantage of economies of agglomeration (Davis 1990), with more efficient economic resources at its disposal, thus making it more efficient and

conducive also as a financial center in the long run. Choi, Tschoegl and Yu (1986) rightly argue that when there is little or no substantive economic activity taking place in the financial center, the only attraction of these centers is their tax haven status. Choi, Tschoegl and Yu (1986, 1996) stress that without a solid, well-founded economic base, the growth and sustainability of these "legal fiction" centers would be in doubt. On similar lines, the close link between finance, entrepreneurial activity and economic growth has also been well documented (see Patrick 1966 and Levine 2004).[1]

According to Montes (1999) for these centers to be able to reinvent themselves through market and product innovation, economic stability is imperative. Montes (1999) stresses that market and product innovation is derived from a high level of economic activity within the center. A center, which is economically active and strong, will be well placed to introduce new financial products and services as well as conduct research on financial instruments.

3.2. *Level of taxation*

McGahey *et al*. (1990) show that financial services firms do in fact gauge the relative tax burdens of different localities once a decision to relocate or expand operations has been made. Their study, like those by Dufey and Giddy (1978) and Scholey (1987), showed that in addition to evaluating effective corporate income tax burdens, firms are also concerned with personal income taxes, property taxes, withholding taxes, etc. Goldberg (1991) stresses that the tax environment is vital to the cost structure of firms. Goldberg's survey of financial institutions revealed that tax incentives and favorable tax treatment within the financial center are seen as critical factors in deciding on location. Montes (1999) argues that financial services firms will seek to locate at centers with the lowest cost and highest productivity, and stresses the point that the lowest cost depends significantly on tax rates and incentives.

[1] We are thankful to an anonymous referee for this point.

3.3. *Financial variables*

Reed (1983) uses a data set of sixteen variables and concludes that the organizational structure of a financial center is determined primarily by the amount of international currency clearings, international content of financial liabilities and the international content of financial assets, among other things. Reed (1983) states that the characteristics of these factors in particular suggest that a financial center's financial infrastructure (mainly the large commercial banks) are developed and largely dependent on the extent of intermediation and management of the world's foreign financial assets and liabilities. Also Reed (1980) stresses that the center must have an international focus and attitude in order to be considered a full-fledged financial center.

Davis (1990) argues that the higher the degree of asset turnover, the greater will be the efficiency and liquidity of a financial center, and indeed its capacity to grow in size. Issuers and investors in capital markets are placing a growing premium on liquidity. According to Walter (1998, p. 38), there were approximately US$ 27.4 trillion worth of assets under management globally towards the end of the 1990s. This contributed significantly towards the functional activities within the financial centers (Walter 1998, Hodjera 1999). Thus, these demand requirements of both issuers and investors are dependent on the efficiency and extent of financial intermediation that takes place within a financial center.

Poon (2003) used a number of financial variables such as stock market capitalization, number of shares traded, value of shares traded and dividend yield. Using cluster analysis for 43 capital cities, Poon (2003) investigated the spatial organization of world financial and capital centers and found they have hierarchical tendencies. Poon, Eldredge and Yeung (2004) found spatial organization of international finance centers evolves into regional centers growing relative to global centers.

3.4. *Regulatory regime*

The regulatory climate within which the financial center operates often commands a premium. Dufey and Giddy (1978) argue that controls must be sufficiently moderate to allow the unconstrained

transfer of capital among non-residents and to limit the cost of these transactions by minimizing taxation and reserve requirements. Regulations need to be administered with adequate flexibility to adjust quickly to changing conditions (Dufey and Giddy 1978, Reed 1983).

McGahey *et al.* (1990, p. 22) stress that favorable regulation and taxation policies are crucial "dimensions of competition" that both developing and developed financial centers can implement in order to enhance their attractiveness. As tempting as it may be to conclude that localities with the least number of regulations are the most attractive for financial services firms, it is also evident that total deregulation is not desirable (McGahey *et al.* 1990, Lee 2001). The speed with which authorities approve new products also has become an important aspect of the regulatory climate. Competition among financial services firms has led to a dramatic increase in the volume of new products they are making available (Schenk 2002). Thus, it is clear that financial services firms will be attracted to those locations in which the regulatory apparatus is most responsive to industry changes and innovation (Dufey and Giddy 1978, McGahey *et al.* 1990, Goldberg 1991, Lee 2001).

3.5. *Socio-economic features*

Socio-economic factors such as living conditions and the availability of talent are crucial factors as well (Lee 2001). A location which has poor living conditions and a small talent pool would for obvious reasons be an unattractive destination for firms. When a location is unattractive not only do fewer firms and institutions choose to locate there, but also existing firms and institutions tend to emigrate elsewhere.

Given the increasing challenges facing financial services firms to secure a well-trained and sophisticated workforce as well as the growing complexity and multi-faceted nature of finance, localities whose labor supply is skilled, educated and stable will be at a great advantage as locations for financial services firms (McGahey *et al.* 1990, Lee 2001). The quality of basic education in a country along with vocational programs and training and development programs greatly contribute to competitiveness in human resources in the financial center of that country. The implementation of financial deals requires a combination of top talent not only in finance and business, but also in law, accounting, project management and information technology

(Goldberg 1991, Kaufman 2001, Lee 2001). According to Lee (2001) few centers have the full spread of necessary skills, and fewer still reach the critical mass with them. Lee (2001) argues that despite the wonders of telecommunications and the internet, there as yet is no substitute for face to face interaction between two parties making a complex deal. The responsiveness of the educational system to the needs of the financial services industry in most instances weighs unwaveringly decisively when firms make location decisions for their operations (McGahey *et al*. 1990).

The ensuing section incorporates the above factors in the formulated empirical models.

4. Model formulation and data

Based on the literature reviewed in the previous section, empirical models are formulated so as to examine the relationship between the identified factors and the status and sustainability of Australia, Hong Kong, Singapore and Japan as financial centers. The first two modeling approaches incorporate the basic model given below.

$$FB_t = \alpha + \beta_1 GDP_t + \beta_2 TAX_t + \beta_3 EXA_t + \beta_4 EXL_t + \beta_5 FALR_t + \varepsilon_t, \quad (1)$$

where FB_t = the number of foreign banks, GDP_t = gross domestic product in real terms, TAX_t = the tax rates of corporations, EXA_t = value external assets of banks in real terms, EXL_t = value of external liabilities of banks in real terms, α = constant term and ε_t = random error term.

The expected signs for the model parameters are:

$$\beta_1 > 0; \beta_2 < 0; \beta_3 > 0; \beta_4 < \text{ or } > 0, \beta_5 > 0.$$

In the above model, four proxy measures (dependent variables) of financial centers will be used: *the number of foreign banks in the center (FB), stock market capitalization (SMC), foreign exchange market average daily turnover (FMT) and securities market turnover (SMT).* These variables have been included in previous studies (Goldberg 1991, Walter 1998, Hodjera 1999) while the more recent are those of Poon (2003) and Poon, Eldredge and Yeung (2004).

It is evident from the literature reviewed in section 2.1 that domestic economic activity (GDP) should have a positive impact on financial centers, since (among other things) a center complemented with a strong economic base will have the advantage of economies of agglomeration (Davis 1990), with more efficient economic resources at its disposal. Hence, the hypothesized sign of β_1 is positive in equation 1.

As shown in section 2.2, a high tax regime is expected to have a negative impact on the financial center since taxation is a strain on the financial institution's cost structure (Goldberg 1991). Special tax treatment for corporations is a strong pull factor in a financial center. Hence, the expected sign of β_2 is negative in equation 1.

Earlier on, section 2.3 emphasized the importance of financial variables as significant determinants of financial centers. In equation 1, the impact of external position of all banks on the financial center is measured by the coefficient values β_3 and β_4 of external assets and of external liabilities respectively. Similarly, the coefficient of the ratio of foreign assets to foreign liability β_5 is a measure of foreign assets and liabilities alone, excluding the domestic component. Companies raising funds seek markets that are liquid and have a ready access to capital. Thus, an increase turnover of assets would mean increased revenue for the banks and more business opportunities within the financial center (Fock and Wong 2001). The impact of bank assets (reflected in β_3 and β_5) also reflects the importance of the financial center as an international clearing market for inter-bank transactions and a major source of funds in the region for business investments as well as government borrowing (Walter 1998). It also means that there is greater opportunity for revenue generating activities such as asset management and securitisation (Davis 1990, Walter 1998). Hence the expected signs for β_3 and β_5 are positive. However, without a surplus of funds in the center (i.e. liabilities), there can be no sufficient supply for those requiring funds. Thus, adequate bank liabilities are required for the intermediation process to be efficient (Scholey 1987, Hodjera 1999). Similarly, a rate of increase in bank liabilities exceeding that of bank assets reflects a lesser propensity for revenue generating activities such as asset management and securitisation, as well as the inefficiency of the intermediation process in the financial center (Walter 1998, Hodjera 1999, Fock and Wong 2001). Therefore, the expected signs for β_4 can be either positive or negative.

The basic model (Equation 1) can be transformed into an unrestricted error correction model (UECM). The UECM provides more robust results for small sample size (Banerjee *et al*. 1986), as is the case in this study. Furthermore, the UECM may indicate the presence of cointegration[2] between variables.

Under our first approach, the methodology adopted is analogous to that of Mehra (1991) and Arize (1994), who employed an UECM in modeling money demand in the US. According to Phillips and Loretan (1991), a number of error correction formulations can be adopted in model specification. Banerjee *et al*. (1986) observe that the UECM approach allows for testing of cointegration of the variables in the model. This approach based on an autoregressive distributed lag (ARDL) model has the advantage of avoiding the classification of variables into $I(1)$ or $I(0)$ and, unlike standard cointegration tests, there is no need for unit root pre-testing. Moreover, Hendry and Ericsson (1991) argue that valid error correction models are obtainable even when cointegration tests do not reject the null hypothesis of no cointegration. In addition, the Granger representation theorem (Granger 1983) states that, if statistically significant error correction adjustment exists in a model, it implies cointegration of variables in that model. Moreover, according to Hall (1986), Phillips and Loretan (1991), Boswijk and Franses (1992) and Kremers, Ericson and Dolado (1992), the coefficient values of the lagged level dependent variable of an ECM can provide a robust check on the presence of a long-run cointegrating relationship.

The UECM specification based on equation 1 takes the following form:

$$\Delta \ln FB_t = \sum_{i=1}^{n1} b_{1i} \Delta \ln FB_{t-i} + \sum_{i=0}^{n2} b_{2i} \Delta \ln GDP_{t-i} + \sum_{i=0}^{n3} b_{3i} \Delta \ln TAX_{t-i} + \sum_{i=0}^{n4} b_{4i} \Delta \ln EXA_{t-i}$$

$$+ \sum_{i=0}^{n5} b_{5i} \Delta \ln EXL_{t-i} + \sum_{i=0}^{n6} b_{6i} \Delta \ln FALR_{t-i} + \gamma_1 \ln FB_{t-1} + \gamma_2 \ln GDP_{t-1} \qquad (2)$$

$$+ \gamma_3 \ln TAX_{t-1} + \gamma_4 \ln EXA_{t-1} + \gamma_5 \ln EXL_{t-1} + \gamma_6 \ln FALR_{t-1} + \xi + \varepsilon_t$$

[2] Cointegration describes the long-run equilibrium relationship between variables. The UECM can be used implicitly in cointegration analysis (Granger 1983).

where $i = 0, 1, 2, 3 \ldots$ are the number of lags while ξ and ε_t are the constant and random error terms respectively. The first difference operator is denoted by Δ while *ln* represents the natural log of respective variables in equation 1. We can write similar equations with SMC, FMT and SMT as dependent variables.

The above UECM (equation 2) is based on the main empirical model (equation 1). It captures both the short-run dynamics and long-run relationships. The differenced explanatory variables account for short-run behaviour, while the long-run parameters are given by the lagged independent variables. The number of lag lengths (*k*) taken by the variables in the process of estimating the UECM (equation 2) will be limited by the sample size.

The ordinary least squares (OLS) method can be used to estimate the UECM model. The usual 'general-to-specific' procedure for narrowing down independent variables can be used once modeling commences. This process, advocated by Davidson *et al.* (1978) and Hendry (1979), involves systematic modification of independent variables in the 'general' (broad) model until they develop into significance, eventually arriving at the 'specific' parsimonious model. Based on the coefficients of the lagged level variables, the long-run elasticities of the variables can be derived. Banerjee, Dolado and Mestre (1998) provide critical values for identifying the existence of cointegration (long-run relationship) in the estimated equation by examining the t-statistics of the error-correction term ($y_k lnFB_{t-k}$) in equation 2. If the t-statistics (in absolute terms) of the error correction term in the estimated equation exceeds the critical values specified by the Banerjee, Dolado and Mestre (1998) series, there is adequate evidence to reject the null hypothesis of no cointegration.

An additional model can be used to further substantiate the results of our basic model. We pool time-series (annual observations) and cross-sectional (four countries) observations in using this additional model, as shown in equation 3 below. The pooled regression model (panel data analysis – Gujarati 2003) can indicate the combined effects of the interaction and influence of variables for the four countries under study as a whole, as opposed to country-specific analysis.

The model used in the panel regression takes the following form:

$$FB_{it} = \alpha + \beta_1 GDP_{it} + \beta_2 TAX_{it} + \beta_3 EXA_{it} + \beta_4 EXL_{it} + \\ + \beta_5 FALR_{it} + \varepsilon_{it} \qquad (3)$$

The variables are as defined for equation 1 given earlier. It is similar to that of equation 1, although, in this case, *i* stands for the *i*-th country and *t* for the *t*-th time period. In this study we have a balanced panel i=4 (four countries) and t=26 (1977-2002) for each of the four countries, thus giving us a total of 104 observations. Baltagi (1995) supports the use of panel regression model, as it provides an aggregate comparison of results as opposed to the analysis of the individual regression such as the one based on equation 1. Since we are using pooled data (a good sample of 104 observations), it was decided not to use error correction modeling.

The third model is employed to capture the effects of socio-economic variables, level of regulation and taxes on each of the four financial centers separately as described earlier in section 2. The dependent variable in this model is denoted by *FV* in equation 4 given below. The pooled dependent variable (*FV*) includes the stock market capitalization, derivatives market turnover, securities market turnover and mutual funds under management for each country. The independent variables take the form of ranks assigned for each country.

$$FV_t = \alpha + \beta_1 EDU_t + \beta_2 GOVT_t + \beta_3 QLTY_t + \beta_4 REG_t + \\ + \beta_5 TAX_t + \varepsilon_t \qquad (4)$$

where FV_t = financial variables as a percentage of GDP, EDU_t = education system in the form of ranks, $GOVT_t$ = government economic policies in the form of ranks, $QLTY_t$ = quality of life in the form of ranks, REG_t = regulatory environment in the form of ranks, TAX_t = tax treatment of foreign corporations in the form of ranks, α = constant term and ε_t = random error term.

The expected signs are $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 < 0$; $\beta_5 < 0$.

Section 2 discussed the rationale for the hypothesized signs.

Annual data for the period 1977-2002 were collected from Axis Australia (2002, various issues) and Bank for International Settlements (2002) for use in the UECM (equation 2) and pooled regression model (equation 3). Data (ranks) for the explanatory variables excepting TAX variable in equation 4 were obtained mainly from Institute of Management Development (Switzerland) (IMD 2003a, 2003b). In addition, we used data from The World Competitiveness Yearbook (2003) and the Economic Intelligence Unit (2002b) Worldwide Business Cost Rankings. As for TAX, we assigned ranks based on the tax legislations, which are available from the individual tax authorities of

the four countries. On the above basis, the sample used in estimating equation 4 consists of monthly data for the 1995-2002 period.

5. Analysis of the results

Annual data from 1977 to 2002 were employed in the estimation of the two models (equations 2 and 3). Tables 1 through to 3 show the results of four equations for the four financial centers using the UECM (equation 2). Table 1 provides results of all four models for Australia using four dependent variables: *the number of foreign banks in the center (FB), stock market capitalization (SMC), foreign exchange market average daily turnover (FMT) and securities market turnover (SMT).* Table 2 shows the results of model 4 for Hong Kong and models 2-4 for Singapore since the other estimated models were not meaningful. This is the case with Japan also, as shown in Table 3; only the results for models 1-3 are given.

The diagnostics reported in Tables 1 through to 3 indicate that the estimated UECM equation for all four financial centers are well fitted and conform to the conditions of normality of residuals, model stability, homoscedasticity, absence of serial correlation, and stationarity of residuals. Consequently, the estimated equations are capable of affording reliable inferences in relation to the determinants of a financial center in Australia, Hong Kong, Singapore and Japan. Based on the test results for cointegration shown in all three tables, the variables included in the estimated model show long-run equilibrium relationships.

When investigating the interaction between variables the long-run elasticity coefficients are of particular interest, that is, the impact of GDP, TAX, EXA (banks' external assets), EXL (banks' external liabilities), FALR (ratio of banks' foreign assets to foreign liabilities) influence FB (number of foreign banks), SMC (stock market capitalization), FMT (foreign exchange market average daily turnover) and SMT (securities market turnover), which are proxy measures used in this study for a financial center.

Examination of the elasticity coefficients as shown in table 4 for the four financial centers reveals that GDP has a substantial positive influence on all four proxy variables, and especially on SMC (Model

2). This reflects the overwhelming importance of the level of economic activity on the status of the four countries as financial centers.

Table 4 shows a negative impact of TAX only for Model 3 for Australia, but the elasticity coefficient (–0.467) is statistically insignificant. Although the insignificance of TAX may seem intuitively unappealing, it provides an explanation as to why there still has been an influx of foreign banks into Australia and a highly stable stock market as well as significant growth in the foreign exchange market and respectable growth in the securities market. A plausible explanation for this may be that Australia's offshore investments have been in countries with tax rates equal to or higher than Australia's (Richardson 2002). Australia's top three trading partners (US 43%, United Kingdom 14%, Japan 7% of Australian foreign trade) all have far higher tax rates than Australia (*ibid*.). It would thus appear that Australia's high tax rates have not deterred investments into Australia by these countries, which are major financial centers themselves.

But for Singapore two of the three models generated statistically significant high elasticity coefficients. Thus for Singapore taxation seems to be the most important determinants of its financial center status. The rest of the results shown in Table 4 are for financial variables. The substantial (statistically significant) impact of EXA (banks' external assets) on the four financial center proxies is clearly evident for all the four. All the elasticity coefficients of EXL (banks' external liabilities) have a negative impact on only three financial centers: Australia, Singapore and Japan. But it is notable that not all the EXL coefficients are statistically significant, and they have slightly lower values (in absolute terms) than the EXA coefficients for the three countries.

Finally, FALR (ratio of banks' foreign assets to foreign liabilities) has a substantial positive influence on all four proxy variables for the four financial centers, but some of its coefficients are not statistically significant. Notably, the substantially high elasticity coefficients for these three financial variables (for Australia compared to those of the other three countries) demonstrate the importance of the bank asset base for Australia. According to Battelino (2002), Australia has become a much more important exporter of capital since the removal of exchange controls and other financial deregulation in the 1980s, and this has significantly increased its status as a financial center.

TABLE 1

ESTIMATES OF THE UNRESTRICTED ERROR CORRECTION MODEL: AUSTRALIA

Estimated model	1	2	3	4
Sample period	1977-2002	1977-2002	1977-2002	1977-2002
Dependent variable	ΔFB_t	ΔSMC_t	ΔFMT_t	ΔSMT_t
CONSTANT	−7.43 (3.48)***	5.228 (1.91)*	3.155 (1.53)	2.34 (5.32)***
ΔFB_{t-1}	1.130 (2.45)*	–	–	–
ΔSMC_{t-1}	–	−1.119 (2.65)**	–	–
ΔFMT_{t-1}	–	–	−0.943 (1.19)	–
ΔSMT_{t-1}	–	–	–	0.219 (1.53)
ΔTAX_{t-1}	–	–	−0.211 (0.521)	–
ΔGDP_{t-1}	1.602 (5.88)***	2.195 (2.53)**	−0.468 (1.66)	−0.404 (1.39)
ΔEXA_{t-1}	0.404 (1.82)*	1.072 (2.74)**	0.673 (2.18)**	−0.112 (1.37)
ΔEXL_{t-1}	–	2.091 (2.43)*	–	–
$\Delta FALR_{t-1}$	−0.667 (2.88)***	−1.71 (2.54)*	−0.384 (1.33)	−1.05 (3.13)***
FB_{t-1}	−1.656 (4.23)***ϕ	–		–
SMC_{t-1}	–	−1.92 (4.86)*** ϕ		–
FMT_{t-1}	–	–	−1.93 (4.35)*** ϕ	–
SMT_{t-1}	–	–	–	−1.69 (5.82)*** ϕ
TAX_{t-1}	–	–	−0.773 (0.902)	–
GDP_{t-1}	1.521 (3.81)***	2.084 (2.72)***	1.704 (2.71)**	1.678 (2.13)**
EXA_{t-1}	1.255 (1.91)*	2.991 (4.36)***	1.614 (2.14)**	1.28 (5.19)***
EXL_{t-1}	–	−1.319 (3.95)***	–	–
$FALR_{t-1}$	1.241 (1.89)*	2.201 (3.55)***	1.377 (1.72)*	1.531 (2.43)**
Diagnostics				
Adjusted R^2	0.760	0.805	0.765	0.842
F-Statistics	5.966	7.783	7.081	8.82
Normality (Jarque-Bera)	0.648	1.293	0.236	0.779
First order serial correlation (Godfrey)	1.896	2.480	1.216	1.020
Heteroscedasticity (White)	0.954	1.185	1.081	0.642
Autoregressive conditional hetero-scedasticity (Engle)	0.548	1.518	0.889	0.189
RESET (Ramsey)	0.855	1.497	1.530	0.021
Predictive failure (Chow)	1.420	0.887	0.921	1.085
Unit root (Aug-mented Dickey-Fuller)	−4.003	−4.084	−3.606	−4.185

* Significant t-statistics at 10% level.
** Significant t-statistics at 5% level.
*** Significant t-statistics at 1 % level.
ϕ Passes the cointegration test. For 26 observations, the critical values for cointegration tests for five level variables incorporated in the error correction terms in equations 1, 2, 3 and 4 are −5.53, -4.46 and −3.82 at the 1%, 5% and 10% level of statistical significance respectively (Banerjee *et al*. 1998). All the diagnostic tests shown above, except the Normality (Jarque-Bera) (NJB) test, use the F-Distribution. The NJB test uses the χ^2 (2) distribution.

TABLE 2

ESTIMATES OF THE UNRESTRICTED ERROR CORRECTION MODEL: HONG KONG AND SINGAPORE

Estimated model /Country	4 Hong Kong	2 Singapore	3 Singapore	4 Singapore
Sample period	1977-2002	1977-2002	1977-2002	1977-2002
Dependent variable	ΔSMT_t	ΔSMC_t	ΔFMT_t	ΔSMT_t
CONSTANT	–3.305 (3.314)***	4.667 (2.212)**	12.136 (2.032)**	1.306 (1.926)*
ΔFB_{t-1}	-	-	-	-
ΔSMC_{t-1}	-	1.720 (3.77)***	-	-
ΔFMT_{t-1}	-	-	1.035 (2.123)**	-
ΔSMT_{t-1}	1.688 (2.753)**	-	-	–2.357 (2.107)**
ΔTAX_{t-1}	-	–1.203 (3.428)***	–0.949 (3.806)***	–0.510 (1.72)*
ΔGDP_{t-1}	–0.8273 (1.193)	0.816 (1.874)*	0.492 (4.75)***	–0.774 (1.213)
ΔEXA_{t-1}	–0.471 (1.713)*	-	–0.486 (2.768)**	1.272 (1.702)
ΔEXL_{t-1}	-	-	-	-
$\Delta FALR_{t-1}$	–1.191 (2.12)**	–1.54 (1.02)	0.489 (2.82)***	–0.674 (1.84)*
FB_{t-1}	-	-	-	-
SMC_{t-1}	-	–2.74 (5.111)*** ϕ	-	-
FMT_{t-1}	-	-	–2.07 (4.47)*** ϕ	-
SMT_{t-1}	–1.84 (4.32)*** ϕ	-	-	–1.45 (4.89)*** ϕ
TAX_{t-1}	-	–2.895 (2.24)**	–1.926 (1.755)*	–0.410 (0.71)
GDP_{t-1}	1.615 (3.336)***	2.16 (1.377)	1.560 (2.476)**	1.401 (1.72)*
EXA_{t-1}	0.621 (2.936)***	-	1.444 (1.776)*	0.924 (2.159)**
EXL_{t-1}	-	–1.01 (1.03)	-	–1.0 (0.103)
$FALR_{t-1}$	1.31 (1.304)	1.65 (1.48)	1.240 (1.571)	1.397 (2.107)**
Diagnostics				
Adjusted R^2	0.697	0.699	0.769	0.650
F-Statistics	6.711	7.35	6.49	6.983
Normality (Jarque-Bera)	1.98	2.87	0.159	0.581
First Order Serial Correlation (Godfrey)	1.59	1.68	0.394	2.401
Heteroscedasticity (White)	0.323	0.512	1.752	1.884
Autoregressive conditional hetero-scedasticity (Engle)	0.119	0.429	0.730	0.965
RESET (Ramsey)	0.984	1.911	0.640	0.427
Predictive failure (Chow)	1.094	1.034	0.996	0.742
Unit root (Aug-mented Dickey-Fuller)	–3.667	–4.762	–4.017	–4.886

* Significant t-statistics at 10% level.
** Significant t-statistics at 5% level.
*** Significant t-statistics at 1% level.
ϕ Passes the cointegration test. For 26 observations, the critical values for cointegration tests for five level variables incorporated in the error correction terms in equations 1, 2, 3 and 4 are –5.53, -4.46 and –3.82 at the 1%, 5% and 10% level of statistical significance respectively (Banerjee *et al*. 1998). All the diagnostic tests shown above, except the Normality (Jarque-Bera) (NJB) test, use the F-Distribution. The NJB test uses the χ^2 (2) distribution.

TABLE 3

ESTIMATES OF THE UNRESTRICTED ERROR CORRECTION MODEL: JAPAN

Estimated model	1	2	3
Sample period	1977-2002	1977-2002	1977-2002
Dependent variable	ΔFB_t	ΔSMC_t	ΔFMT_t
CONSTANT	1.515 (1.204)	1.316 (1.243)	2.523 (1.473)
ΔFB_{t-1}	1.444 (2.237)*	-	-
ΔSMC_{t-1}	-	1.100 (1.532)	-
ΔFMT_{t-1}	-	-	1.105 (1.558)
ΔSMT_{t-1}	-	-	-
ΔTAX_{t-1}	-	-	-
ΔGDP_{t-1}	–3.872 (2.009)**	–0.121 (1.635)	
ΔEXA_{t-1}	–0.158 (2.86)***	–0.176 (1.006)	–0.193 (1.737)*
ΔEXL_{t-1}	0.079 (3.352)***	-	1.996 (2.128)**
$\Delta FALR_{t-1}$	–2.21 (1.09)	–1.176 (2.154)**	1.645 (1.06)
FB_{t-1}	–2.574 (4.798)*** ϕ	-	-
SMC_{t-1}	-	–2.360 (4.310)*** ϕ	-
FMT_{t-1}	-	-	–2.28 (5.618)*** ϕ
SMT_{t-1}	-	-	-
TAX_{t-1}	-	-	-
GDP_{t-1}	2.47 (3.198)***	2.432 (2.86)***	-
EXA_{t-1}	1.912 (1.97)*	2.197 (2.89)***	1.872 (1.912)*
EXL_{t-1}		–0.487 (2.488)**	–1.091 (1.12)
$FALR_{t-1}$	2.185 (3.62)***	1.622 (1.74)*	0.61 (0.812)
Diagnostics			
Adjusted R^2	0.753	0.671	0.7055
F-Statistics	5.47	7.76	6.49
Normality (Jarque-Bera)	0.169	0.230	0.428
First order serial correlation (Godfrey)	0.537	1.162	0.787
Heteroscedasticity (White)	0.784	0.543	1.491
Autoregressive conditional heteroscedasticity (Engle)	0.362	0.166	0.353
RESET (Ramsey)	0.055	0.099	0.176
Predictive failure (Chow)	1.091	1.219	1.661
Unit root (Augmented Dickey-Fuller)	–4.024	–4.172	–4.976

* Significant t-statistics at 10% level.
** Significant t-statistics at 5% level.
*** Significant t-statistics at 1% level.
ϕ Passes the cointegration test. For 26 observations, the critical values for cointegration tests for five level variables incorporated in the error correction terms in equations 1, 2, 3 and 4 are –5.53, -4.46 and –3.82 at the 1%, 5% and 10% level of statistical significance respectively (Banerjee *et al*. 1998). All the diagnostic tests shown above, except the Normality (Jarque-Bera) (NJB) test, use the F-Distribution. The NJB test uses the χ^2 (2) distribution.

TABLE 4

LONG-RUN ELASTICITY COEFFICIENTS[a]

Variables	Australia Table 1	Hong Kong Table 2	Singapore Table 2	Japan Table 3	Model	Expected signs
GDP_t	0.918	-	-	0.969	(1)	$\beta_2 > 0$
	1.085	-	0.788	1.031	(2)	$\beta_2 > 0$
	0.883	-	0.754[b]	-	(3)	$\beta_2 > 0$
	0.993	0.877	0.966	-	(4)	$\beta_2 > 0$
TAX_t	-	-	-	-	(1)	$\beta_1 < 0$
	-	-	–1.056	-	(2)	$\beta_1 < 0$
	–0.467[b]	-	–0.930	-	(3)	$\beta_1 < 0$
	-	-	–0.282[b]	-	(4)	$\beta_1 < 0$
EXA_t	0.758	-	-	0.743	(1)	$\beta_3 > 0$
	1.560	-	-	0.931	(2)	$\beta_3 > 0$
	0.836	-	0.695	0.821	(3)	$\beta_3 > 0$
	0.767	0.337	1.320	-	(4)	$\beta_3 > 0$
EXL_t	-	-	-	-	(1)	$\beta_4 <$ or > 0
	–0.686	-	–0.368[b]	–0.206	(2)	$\beta_4 <$ or > 0
	-	-	-	–0.478[b]	(3)	$\beta_4 <$ or > 0
	-	-	–0.680[b]	-	(4)	$\beta_4 <$ or > 0
$FALR_t$	0.749	-	-	0.848	(1)	$\beta_5 > 0$
	1.146	-	0.602[b]	0.687	(2)	$\beta_5 > 0$
	1.402	-	0.600[b]	0.710[b]	(3)	$\beta_5 > 0$
	0.916	0.712**	0.963	-	(4)	$\beta_5 > 0$

[a] Long-run elasticity coefficients are calculated by dividing the coefficient of the variable (at the level lagged) by the coefficient of the error correction term (at the level lagged) and reversing the sign.
[b] Not significant statistically.

We now move on to analyse the results of the pooled time-series (panel) regression based on equation 3. This model allows for the identification of vital variables that have a significant effect on all four financial centers as a whole. Thus, although certain variables in the individual country regression analysis may show an insignificant value, the same variables may show a significant value in the panel model.

The estimates in Table 5 were generated using the seemingly unrelated regression (SUR) method (Zellner 1962). The diagnostics reported there for all the four models are satisfactory. It is quite clear from Table 5 that the majority of the five explanatory variables have a statistically significant influence on Australia, Hong Kong, Singapore

TABLE 5

POOLED TIME-SERIES (PANEL) REGRESSION FOR AUSTRALIA, HONG KONG, SINGAPORE AND JAPAN

Model	1	2	3	4
Sample period	1977-2002	1977-2002	1977-2002	1977-2002
Dependent variable	FB	SMC	FMT	SMT
GDP	1.205 (8.289)***	1.378 (9.944)***	1.323 (8.150)***	1.804 (5.704)***
TAX	−1.389 (1.773)*	−1.253 (1.146)	−0.755 (0.984)	−0.994 (1.035)
EXA	1.174 (6.114)***	0.139 (2.917)*	0.105 (2.509)**	0.945 (5.263)***
EXL	−0.987 (0.991)	−0.141 (1.036)	−0.160 (0.967)	−0.867 (0.983)
FALR	1.131 (4.382)***	1.302 (3.276)***	0.123 (3.541)***	0.312 (2.784)**
DIAGNOSTICS				
Adjusted R^2	0.980	0.951	0.953	0.936
Heteroscedasticity (LM1)	1.005	1.933	1.091	0.991
Fixed effects[a]				
Australia	1.407	3.913	4.533	7.28
Hong Kong	2.535	5.663	4.533	9.69
Singapore	2.020	5.578	5.431	9.136
Japan	1.806	4.068	3.972	8.052

* Significant t-statistics at 10% level.
** Significant t-statistics at 5% level.
*** Significant t-statistics at 1% level.
[a] Fixed effects refers to the constant term for each country.

and Japan as financial centers. Firstly, the significant positive effect of GDP is clearly evident there. This is similar to the individual (UECM) regression analysis. The results here prove that countries with a high level of economic activity have the tendency to become home to important financial centers.

Table 5 also shows that TAX is negative and significant for one of the four proxy financial center measures. This result is in line with the results of the individual country regression analysis since Singapore only reported statistically significant elasticity values (see Table 4). The result relating to TAX in Table 5 indicates that, although taxes may not be as consequential, they may still be a vital ingredient for the growth and sustainability of a financial center. Walter (1998) states that "encouraging" taxes are crucial for the competitive performance of financial centers. Taxes, we may conclude, are indeed important and, although possibly insignificant in some centers, there is no doubt

that favorable taxes will provide a competitive advantage to financial centers.

As before, the next three (financial) variables can be analysed together. The primary reason for including EXA and FALR is in accordance with Reed (1980, 1983) as well as Montes (1999), Walter (1998) and Fock and Wong (2001), who argue that a center with a strong asset base is likely to be very attractive as a financial center. The results in Table 5 (consistent with results of individual regression analysis shown in Table 4) accord well with this theory and it clearly indicates that EXA and FALR have a significant positive effect on Australia, Hong Kong, Singapore and Japan as a whole. An increase in turnover of assets (EXA and FALR) would connote increased revenue for the banks (in the form of assets turnover as well as securitisation) and more business opportunities within the financial center (Fock and Wong 2001). An increase in bank assets (EXA and FALR) similarly reflects the importance of the financial center as an international clearing market for inter-bank transactions and a major source of funds in the region for business investments as well as government borrowing. It also shows that the financial center can efficiently source and allocate funds (an efficient financial intermediation process) (Walter 1998, Hodjera 1999).

The results also prove that the EXL variable has a negative impact on all four financial centers, but the variable is not statistically significant for all four financial center proxy (dependent) variables. This result seems to be consistent with the results in Table 4, where only two of the five coefficients of this variable are statistically significant.

We now move on to analyse the empirical results of the model equation 4 using OLS method. This model enables identification of crucial socio-economic and government intervention variables that have a significant effect on Australia, Hong Kong, Singapore and Japan as financial centers. It is clear from table 6 that education (EDU) is a positive and significant factor for Australia, Hong Kong and Singapore, while it is not a statistically significant variable for Japan. Sound and justly acclaimed educational systems turn out skilled and well-trained individuals. Table 6 proves that a center with a sound education system is highly attractive. This is due to the fact that the critical mass of talent has become more important as the world of

TABLE 6

IMPACT OF SOCIO-ECONOMIC AND GOVERNMENT INTERVENTION VARIABLES ON FINANCIAL CENTERS

Equation	1	2	3	4
Sample period	1995:1-2002:12	1995:1-2002:12	1995:1-2002:12	1995:1-2002:12
Country	Australia	Hong Kong	Singapore	Japan
Dependent variable				
CONSTANT	6.791 (2.718)**	–8.527 (1.549)	2.303 (2.707)***	10.060 (3.210)***
EDU	1.887 (2.450)**	2.842 (3.175)*	1.04 (2.055)**	1.363 (1.383)
QLTY	1.134 (2.370)**	0.243 (1.506)	1.591 (1.864)*	0.527 (1.161)**
GOVT	0.599 (1.296)	0.475 (2.180)**	1.450 (1.890)*	–0.808 (1.797)*
REG	–0.468 (3.088)*	–1.423 (3.506)***	–0.925 (3.535)**	–1.472 (1.948)*
TAX	–0.450 (1.600)	–0.872 (3.095)***	–1.221 (3.670)***	–0.484 (1.636)
Diagnostics				
Adjusted R^2	0.893	0.829	0.834	0.815
F-Statistics	12.752	7.608	8.122	7.668
First order serial correlation (Godfrey)	1.001	1.312	1.432	1.54
Heteroscedasticity (White)	0.872	0.334	0.4773	0.412
Autoregressive conditional heteroscedasticity (Engle)	0.914	0.773	1.017	0.398
Normality (Jarque-Bera)	1.981	2.662	2.121	3.091

* Significant t-statistics at 10% level.
** Significant t-statistics at 5% level.
*** Significant t-statistics at 1% level.

finance has grown increasingly multi-faceted. Talented and enterprising investment bankers, fund mangers and currency traders work best when they can interact with other equally bright and capable people, to strike deals, develop new products, exploit investment and business opportunities and service clients (Lee 2001). Next, the quality of life (QLTY) variable is positive and significant for Australia, Singapore and Japan, while for Hong Kong it is not statistically significant. Overall these results confirm that the less tangible aspects of the quality of life seem to be an important, determinant variable of financial centers. Thus, if the quality of life within the financial centers, in terms of a good, wholesome living environment is high, talented

individuals are more likely to be attracted to the center and companies will have more confidence that they can set up business in the center and that their expatriate staff will have a conducive environment to work in. Thirdly, government polices (GOVT) are positive but statistically insignificant for Australia, positive and significant for Hong Kong and Singapore and negative and significant for Japan. This shows that in the case of Hong Kong and Singapore, and to a lesser extent Australia, the policies implemented by their respective governments have been conducive towards to growth of the centers. As for Japan, the statistically significant sign is negative. This seems to be a reflection of mediocre Japanese government policies, which may have dampened its financial center growth and sustainability. The country has seen a high turnover of government leaders, which may well account for the poor consistency of its policies. Fourthly, the regulatory environment (REG) is negative and significant for all four centers. A highly regulated center is therefore a huge impediment. With the globalisation of finance, institutions seek a well-regulated environment with as few barriers as possible. It is proven here that the regulator's touch has to be sufficiently flexible and light, to let market forces work, innovation thrive and the industry develop. A lighter touch, however, does not mean a laxer approach, and maintaining high standards of integrity, transparency and enforcement is quintessential. Lastly, the tax treatment of foreign corporations (TAX) is negative and significant for Hong Kong and Singapore, while it is negative and insignificant for Australia and Japan. This again proves that unfavorable tax treatment acts as a hindrance to corporations, rendering the center unattractive. As for Australia and Japan, providing more favourable tax treatment is likely to endow their financial services industry with added value. Although it is not as significant, providing a more conducive tax environment can only act as a competitive advantage for these two centers, and even more so for Australia since it is growing much faster than Japan as a financial center.

6. Conclusion

Given the lack of empirical research carried out on financial centers and the overwhelming importance of financial services within the

Asia-Pacific region, this study has addressed investigation of the important factors and influential variables for the status and sustainability of Australia, Hong Kong, Singapore and Japan as financial centers.

The remarkable evolution of global finance has given rise to extraordinary competition among the world's financial centers in vigorous pursuit of competitive advantage. It can be asserted that a number of variables do indeed contribute towards gaining this competitive advantage. Naturally, each country has its own responses towards the contributing variables which seem to show their comparative advantage in different areas of the financial services industry, as indicated in section 2.

With regard to the status and sustainability of the financial centers under investigation in this study, a number of variables seem to be critical. Firstly, economic activity and stability within the center are seen as imperative. The reason for this is that a center complemented with a strong economic base will have the advantage of economies of agglomeration, with more efficient economic resources at its disposal. The second variable is taxation. The results of this study support the view that financial services firms do in fact weigh up the relative tax burdens of different localities in choosing the most cost effective center. Thirdly, there are the assets and liabilities of banks. With the global orientation of finance being the order of the day, it is imperative to look at the international aspects of these assets and liabilities. Based on this, the external assets and liabilities as well as the ratio of foreign assets to foreign liabilities of all the banks within the four financial centers were used in this study. Lastly, socio-economic variables such as level of education, quality of life and government regulatory and tax environment are seen as important. It is observed that these socio-economic factors provide a competitive advantage for the centers as well as added value to the functional aspects of the financial center.

As discussed in section 2 earlier on, it is evident that the Singapore, Hong Kong and Australian markets, while smaller than their Japanese counterpart in terms of transaction volume, will be the keenest competitors as leading financial centers of the future. Hong Kong's biggest advantage is the huge need for financial services in China. Singapore's advantage seems to derive mainly from government support and solid economic fundamentals. Australia has seen its financial services industry expanding consistently and swiftly over the

past decade. Japan seems to be a stable source of funds and it has the largest capital pool and the largest funds under management. In terms of size, at every level within the industry Japan still surpasses the other three centers. However, due to rigidities and the recent difficulties within the economy, it is uncertain whether the advantages Japan enjoys are sustainable. It is clear that the ultimate basis of competition will be centered on the international focus of the financial center and the strength of its economic fundamentals, as well as socio-economic factors conducive to smooth functioning of the center in carrying out business.

REFERENCES

ARIZE, A.C. (1994), "Modelling the demand for broad money in the United States", *Atlantic Economic Journal*, vol. 22, no. 3, pp. 37-51.

AUSTRALIAN BUREAU OF STATISTICS (2002), *The Australian Economy*; http://www.abs.gov.au/, December 18.

AUSTRALIAN FINANCIAL MARKETS ASSOCIATION (2002), *Australian Derivatives Market Turnover Profile*; http://www.afma.com.au/, December.

AUSTRALIAN PRUDENTIAL REGULATORY AUTHORITY (2002), *Annual Report: 2002*, Sydney.

AUSTRALIAN STOCK EXCHANGE (2002), *Stock Market Capitalistion*, November; http://www.asx.gov.au.

AUSTRALIAN TAX OFFICE (2002), *Time Series Tax Rates,* 18 October; http://www.ato.gov.au/

AXISS AUSTRALIA (2002a), *Derivatives Trading in Australia* (Data File), December; http://www.axiss.com.au.

AXISS AUSTRALIA (2002b), *The Australian Equity Market* (Data File), December; http://www.axiss.com.au.

AXISS AUSTRALIA (2002c), *The Australian Foreign Exchange Market* (Data File), December; http://www.axiss.com.au.

AXISS AUSTRALIA (2002d), *Investment Management in Australia* (Data File), December; http://www.axiss.com.au.

AXISS AUSTRALIA (2002e), *The Australian Debt Securities Markets* (Data File), December; http://www.axiss.com.au.

AXISS AUSTRALIA (2002f), *Axiss Markets Perspective*, December; http://www.axiss.com.au.

BALTAGI, B.H. (1995), *Econometric Analysis of Panel Data*, John Wiley and Sons, New York.

BANERJEE, A., J.J. DOLADO and R. MESTRE (1998), "Error-correction mechanism tests for cointegration in a single-equation framework", *Journal of Time Series Analysis,* vol. 19, no. 3, pp. 267-83.

BANERJEE, A., J.J. DOLADO, D.H. HENDRY and G.W. SMITH (1986), "Exploring equilibrium relationships in econometrics through state models: some Monte Carlo evidence", *Oxford Bulletin of Economics and Statistics*, vol. 48, no. 3, pp. 253-77.

BANK FOR INTERNATIONAL SETTLEMENTS (2002), *BIS Quarterly Review*, September; http://bis.org/publ/regpubl.htm.

BATTELINO, R. (2002), "Australia as a capital exporter", *Reserve Bank of Australia Bulletin,* August 29, pp. 18-23.

BOSWIJK, P. and P.H. FRANSES (1992), "Dynamic specification and cointegration", *Oxford Bulletin of Economics and Statistics*, vol. 54, no. 3, pp. 369-81.

CHOI, S.-R., A. TSCHOEGL and C.-M. YU (1986), "Banks and the world's major financial centres", *Weltwirtschaftliches Archiv*, Bd 122, Nr 1, pp. 48-64.

CHOI, S.-R., A. TSCHOEGL and C.-M. YU (1996), "Banks and the world's major banking centres", *Weltwirtschaftliches Archiv*, Bd 132, Nr 4, pp. 774-93.

CHOW, G.C. (1960), "Tests for equality between sets of coefficients in two linear regressions", *Econometrica*, vol. 28, no. 3, pp. 591-605.

DAVIDSON, J., D.F. HENDRY, F. SRBA and S. YEO (1978), "Econometric modeling of the aggregate time-series relationships between consumers' expenditure and income in the United Kingdom", *Economic Journal*, vol. 88, no. 352, pp. 661-92.

DAVIS, E.P. (1990), "International financial centers – An industrial analysis", *Bank of England Discussion Paper*, no. 51, September, pp. 1-23.

DICKEY, D. and W. FULLER (1981), "Likelihood ratio statistics for autoregressive time series with a unit root", *Econometrica*, vol. 49, no. 4, pp. 1057-72.

DUFEY, G. and I.H. GIDDY (1978), "Financial centers and external financial markets", in *The International Money Market,* Prentice-Hall, Englewood Cliffs, pp. 35-47.

ENGLE, R.F. (1982), "Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation", *Econometrica*, vol. 50, no. 1, pp. 987-1007.

FOCK, S.T. and A.C. WONG (2001), "Post-East Asian financial crisis: challenges and opportunities for banking and financial services sector in Singapore", *Review of Pacific Basin Financial Markets and Policies*, vol. 4, no. 4, pp. 495-521.

FUJITA, Y. and S. OSAKI (1995), "Asia's securities markets in the 21st century", *Nomura Research Institute Quarterly*, April, pp. 23-36.

GODFREY, L.G (1978), "Testing for higher order serial correlation in regression equations when the regressors include lagged dependent variables", *Econometrica*, vol. 46, no. 6, pp. 103-10.

GOLDBERG, M. (1991), "Asia Pacific international financial centres", *The International Journal of Bank Marketing*, vol. 9, no. 5, pp. 4-10.

GOLDBERG, M., R. HELSEY and M. LEVI (1988), "On the development of international financial centers", *Annals of Regional Sciences*, vol. XXII (special Festschrift issue), February, pp. 81-94.

GRANGER, C.W.J. (1983), "Co-integrated variables and error-correcting models", University of California, San Diego, *Discussion Paper*, no. 83-13a.

GRANGER, C.W.J. and P. NEWBOLD (1974), *Forecasting Economic Time-Series*, Academic Press, New York.

GUJARATI, D.N. (2003), *Basic Econometrics*, 4th ed., McGraw-Hill, New York.

HALL, S.G. (1986), "An application of Granger and Engle two-step procedure to United Kingdom aggregate wage rate", *Oxford Bulletin of Economics and Statistics*, vol. 48, no. 3, pp. 229-39.

HENDRY, D.F. (1979), "Predictive failure and econometric modelling in macroeconomics: the transactions demand for money", in P. Ormerod ed., *Economic Modelling: Current Issues and Problems in the U.K. and the U.S.*, Heineman, London, pp. 217-42.

HENDRY, D.F. and N.S. ERICSSON (1991), "An econometric analysis of the UK money demand in monetary trends in the United States and the United Kingdom", *The American Economic Review*, vol. 81, no. 1, pp. 8-38.

HO, R. (1991), "Hong Kong as and international financial center", in R.Y.-K. Ho, R.H. Scott and M.K. Lewis eds, *The Hong Kong Financial System*, Oxford University Press, Hong Kong, pp. 381-405.

HODJERA, Z. (1999), "The Asian currency market: Singapore as a regional financial centre", in M.K. Lewis ed., *The Globalisation of Financial Services*, Edward Elgar, Northampton, pp. 360-92.

HUAT, T.C. (1982), "Singapore as an international financial center", *East Asia Dimensions of International Business*, Prentice Hall, Sydney, pp. 29-44.

IMD – INSTITUTE OF MANAGEMENT DEVELOPMENT (Switzerland) (2003a); http://www01.imd.ch/documents/wcy/content/Methodology.pdf, accessed in May 2003.

IMD – INSTITUTE OF MANAGEMENT DEVELOPMENT (Switzerland) (2003b); http://www02.imd.ch/documents/wcy/, accessed in May 2003.

IMF (2000), "Offshore financial centres", *International Monetary Fund Background Paper*, May 23, pp. 1-19.

ITO, T. (1997), "Japan's economy needs structural change", *Finance and Development*, June, pp. 16-19.

JARQUE, C.M. and A.K. BERA (1980), "Efficient tests for normality, homoscedasticity and serial independence of regression residuals", *Economics Letters*, vol. 6, no. 3, pp. 255-59.

JIN, N.K. (1996), "Singapore as a financial centre; new developments, challenges and prospects", *NBER-East Asian Seminar on Economics*, vol. 5, pp. 360-92.

JOHANSEN, S. and K. JUSELIUS (1990), "Maximum likelihood estimation and inference on cointegration – With application to the demand for money", *Oxford Bulletin of Economics and Statistics*, vol. 52, no. 2, pp. 169-210.

KAUFMAN, G.G. (2001), "Emerging economies and international financial centres", *Review of Pacific Basin Financial Markets and Policies*, vol. 4, no. 4, pp. 365-77.

KINDLEBERGER, C. (1974), "The formation of financial centers: a study in comparative economic history", *Princeton Studies in International Finance*, no. 36.

KREMERS, J.J.M., N.R. ERICSSON and J.J. DOLADO (1992), "The power of cointegration tests", *Oxford Bulletin of Economics and Statistics*, vol. 54, no. 3, pp. 325-48.

LEE, H.L. (2001), "Financial centers today and tomorrow: a Singapore perspective", *International Monetary Conference*, Singapore, June, pp. 1-6.

LESSARD, D. (1993), *Singapore as an International Financial Center*, Nanyang Technological University, Singapore.

LEVINE, R. (2004), "Finance and growth: theory and evidence", *National Bureau of Economic Research Working Paper*, no. 10766, September.

MCGAHEY, R., M. MALLOY, K. KAZANAS and M. JACOBS (1990), "What makes a financial center?", in *Financial Services, Financial Center: Public Policy and the Competition for Markets, Firms and Jobs*, Westview Press, Boulder, pp. 15-76.

MEHRA, Y.P. (1991), "An error-correction model of the U.S. M2 demand", *Federal Bank of Richmond Economic Review*, vol. 77, no. 3, pp. 3-12.

MONETARY AUTHORITY OF SINGAPORE (2002), *Macroeconomic Review*, vol. 1, no. 2.

MONTES, M.F. (1999), "Tokyo, Hong Kong and Singapore as competing financial centres", *Journal of Asian Business*, vol. 18, no. 1, pp. 153-68.

PATRICK, H.T. (1966), "Financial development and economic growth in underdeveloped countries", *Economic Development and Cultural Change*, vol. 14, no. 2, pp. 174-89.

PHILLIPS, P.C.B and M. LORETAN (1991), "Estimating long-run economic equilibria", *Review of Economic Studies*, vol. 53, pp. 407-36.

POON, J.P.H. (2003), "Hierarchical tendencies of capital markets among international financial centers", *Growth and Change*, vol. 34, no. 2, pp. 135-36.

POON, J.P.H., B. ELDREDGE and D. YEUNG (2004), "Rank size distribution of international financial centers", *International Regional Science Review*, vol. 27, no. 4, pp. 411-30.

RAMSEY, J.B. (1969), "Tests for specification errors in classical linear least squares regression analysis", *Journal of Royal Statistical Society*, Series B, vol. 31, pp. 350-71.

REED, H. (1980), "The ascent of Tokyo as an international financial center", *Journal of International Business Studies*, vol. 11, no. 3, pp. 19-35.

REED, H. (1983), "Appraising corporate investment policy: a financial center theory of Foreign Direct Investment", in C.P. Kindleberger and D.B. Audretsch eds, *The Multinational Corporations in the 1980s*, MIT Press, Cambridge, Mass., pp. 219-44.

REED, H. (1989), "Financial center hegemony, interest rates, and the global political economy", in Y.S. Park and M. Essayyad eds, *International Banking and Financial Centers*, Kluwer, Boston, pp. 43-71.

RESERVE BANK OF AUSTRALIA (2002), *Australia's Foreign Exchange Market Turnover*; http://www.rba.gov.au/, December.

RICHARDSON, J. (2002), *Tax Measures to Promote Offshore Investment*, *Keeping Good Companies* [Professional Updates: Taxation Law], Chartered Institute of Company Secretaries, Sydney.

SCHENK, C.R. (2002), "Banks and the emergence of Hong Kong as an international financial centre", *Journal of International Financial Markets, Institutions and Money*, vol. 12, no. 4-5, pp. 321-40.

SCHOLEY, D. (1987), "Essential features of international financial centers", in *International Financial Centers: Structure, Achievements and Prospects,* proceedings of the 40th International Banking Summer School, Swiss Bankers' Association, Interlaken/Basle, pp. 11-24.

THE ECONOMIST INTELLIGENCE UNIT (2002a), *Country Profile: Australia, Hong Kong, Singapore,* October; http://www.eiu.com.

THE ECONOMIST INTELLIGENCE UNIT (2002b), *Worldwide Business Costs Rankings*, December; http://www.eiu.com.

TSCHOEGL, A.E. (2000), "International banking centers, geography, and foreign banks", *Financial Markets, Institutions & Instruments*, January, vol. 9, no. 1, pp. 1-32.

WALTER, I. (1998), "Globalisation of markets and financial-centre competition", *New York University Solomon Centre Working Paper*, no. S/98/31.

WHITE, H. (1980), "A heteroscedasticity-consistent covariance estimator and a direct test for heteroscedasticity", *Econometrica*, vol. 48, no. 4, pp. 817-38.

WINCKLER, G. (1991), "Vienna as an international financial centre", in A. Wala ed., *Challenges for European Bank Managers in the 1990s,* International Schriftenreihe der Oesterreichische National Bank, Vienna, vol. 3, pp. 165-78.

WORLD COMPETITIVENESS YEARBOOK (2003), *Country Rankings*, IMD (Switzerland), March; www.imd.ch/wcy.

ZELLNER, A. (1962), "An efficient method of estimating seemingly unrelated regression and tests for aggregation bias", *Journal of the American Statistical Association*, vol. 57, no. 298, pp. 348-68.