ECONOMIC THEORY,

APPLICATIONS AND ISSUES

Working Paper No. 23

**Outbound Business Travel Depends on
Business Returns: Australian Evidence**

by

Darrian Collins and Clem Tisdell

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THE UNIVERSITY OF QUEENSLAND

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ABSTRACT

In an earlier note, Collins and Tisdell (2002b) explored the possibility of a long-run relationship between Australian business returns and international business travel. Using annual data they found that such a relationship exists. The purpose of this study is to further examine this relationship using quarterly data for the time frame 1974:1 to 1999:4. In addition, previous studies on international business travel have offered some but not strong evidence for the existence of a positive relationship between the level of international business travel and real GDP of the origin country. This study suggests that the aggregate return on business investments is a superior predictor of international business travel than GDP. The Engle-Granger and Johansen's maximum-likelihood cointegration procedures are used to show a long-term relationship exists between Australian outbound business travel and Australian business returns, but not with Real Australian GDP. Reasons for this relationship are discussed.

Outbound Business Travel Depends on Business Returns:
Australian Evidence

1. Introduction

In 1999, close to 600,000 overseas visitors arrived in Australia for business and work-related travel, about 13.3 percent of the total overseas visitors. In contrast, and more specifically, nearly 750,000 or 23.3 percent of Australian departures were for the same purpose. While there has been some research into economic factors that may influence this international business travel, this area has been neglected relative to the demand for leisure travel (Crouch 1994a, 1994b, Lim 1997a, 1997b, Sinclair 1998, Sinclair and Stabler 1997, Tisdell 2000). In addition, business travel is expected 'to grow more rapidly than other sectors of the outbound market' (Tourism Forecasting Council 1998). In the five-year period from 1995–99 for instance, outbound Australian business and related travel grew at an average rate of 7.6 percent per year while holiday travel grew by 5.2 percent per year. In the 1998–99 period alone, Australian outbound business and related travel grew by 6.7 percent compared to holiday travel which declined by 1.8 percent.

When determining the economic factors that influence international business travel, it is important to keep in mind that there are a wide variety of Australian sectors that engage in business travel. These include privately run firms or industries, researchers from both universities and other government or private funded research units, public servants from government organizations and even sports persons travelling abroad for professional competitions. The motivation however behind business trips in each of these sectors is liable to differ. For instance, the majority of business firms are motivated by economic gain. They may wish to promote and therefore increase exports, purchase goods unavailable in Australia, develop and nurture foreign investments or simply increase their knowledge of overseas competitors and their businesses. Consequently, the firm is hoping to improve its future profits. Alternatively, the ownership and management of the firm may be separated resulting in utility - rather than profit-maximising behaviour. The intent of this study is to concentrate on privately run businesses where the general goal is to maximise the firm's profits, but ownership and management separation will also be considered, as a small number of larger private firms (listed companies) may operate this way.

Hollander (1982), Kulendran and Wilson (2000b), Morley and Sutikno (1991), Poole (1988), Sakai (1988) and Smith and Toms (1978) have modelled the demand for business travel. Sakai (1988) developed a business travel demand model based on Williamson's (1963) managerial theory of the firm. In this model, separation of ownership and management in public companies gives scope for managers to forgo company profits to provide benefits for themselves, for instance by engaging in unproductive business travel for personal reasons. However, most other international business travel studies have developed demand models using the traditional profit-maximising theory of the firm. A business trip in this instance is an investment decision, where current company funds are sacrificed in anticipation of an increase in future profits. Hollander (1982), Kulendran and Wilson (2000b), Morley and Sutikno (1991), Poole (1988) and Smith and Toms (1978) take this approach. In these studies, it was found that variables such as airfares and travel costs have little influence on the extent of international business travel. Morley and Sutikno (1991) suggest that this is because the cost of such travel is small relative to the value of the business deals involved.

Macroeconomic variables have also been thought to significantly influence international business travel. In the relevant literature, particular attention has been given to the level of international trade and its influence on international business travel (Kulendran and Wilson 2000a; 2000b) and also the influence of GDP (Hollander 1982; Kulendran and Wilson 2000b; Morley and Sutikno 1991; Poole 1988). While these authors provide some support for the existence of a positive relationship between the level of international trade and changes in GDP with levels of international business travel, they fail to show a close relationship. This suggests that perhaps there is a superior model of demand for business travel than the ones used in the past.

In an earlier note, Collins and Tisdell (2002b) explored the possibility of a long-run relationship between Australian business returns and international business travel using annual Australian outbound business travel data for the period 1980–99 employing a residual based cointegration procedure. They find that there is a long-run relationship between outbound international business travel and the return on business investments but not with real GDP. The objective of this paper is to further investigate this relationship using a larger data set based on quarterly information. In addition, the long-run relationship between real GDP and business travel is reinvestigated with this larger data set.

The paper is developed as follows. First, the postulated relationship between international business travel and business returns is described by using various microeconomic theories of the firm. Next, the data will be described, including a close examination of the trend and seasonality in the data. The empirical sections proceed as follows: the stationarity of each variable is tested using the ADF test and the HEGY test is used to test the possibility of seasonal unit roots in the data. Once the order of integration of each variable is determined, cointegration procedures including the Engle-Granger and Johansen maximum likelihood procedures are applied to test whether long-run relationships exist between Australian outbound business travel and Australian business returns and real GDP. Once a long-run relationship is established a vector error correction model is developed to examine the short-run dynamics of the relationship. Finally the results are discussed.

2.   Theories of the Firm

The existence of a relationship between international business travel and Australian business returns can be explained by examining a number of microeconomic theories of the firm. The theories provide theoretical support for the hypothesis being tested in the empirical section.

First, the managerial theory of the firm developed by Williamson (1963) suggests that rises in business returns leave the managers of larger companies with a greater amount of funds to use at their own discretion. Since some managers may consider overseas travel to be a fringe benefit or perquisite, the increased discretionary funds may in part cause an increase in their overseas travel.

Figure 1 illustrates this point. The indifference curves I_1I_1 and I_2I_2 represent the company managers' preferences for declared profits and managerial emoluments. The budget lines ABC and DEF describe all combinations of profit and managerial emoluments available to the managers. The managers' initial utility maximising bundle of profits and emoluments is at B, the intersection of the indifference curve $I_1 I_1$ and line ABC. This point is preferred as the managers are deriving satisfaction from company profits and their emoluments. If potential profit rises and both profit and managerial emoluments are normal commodities, the budget line similar to DEF is achieved. The new utility maximising bundle of profits and emoluments is at E. Thus if higher actual profits are realised by the manager, both the level of the managerial emolument and the actual reported profits will rise. Finally, if business travel

is positively related to the managerial emolument, a rise in business profitability will cause a rise in business travel.
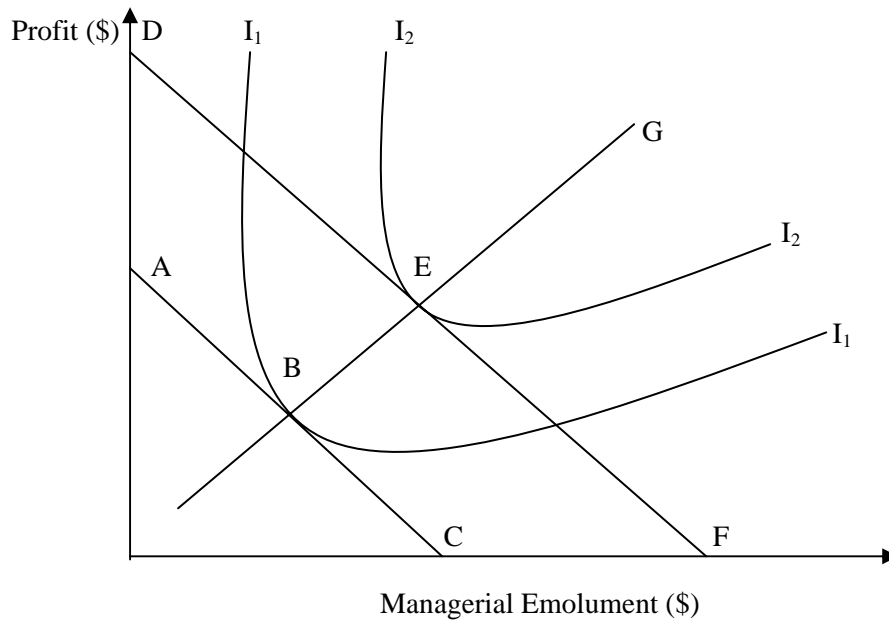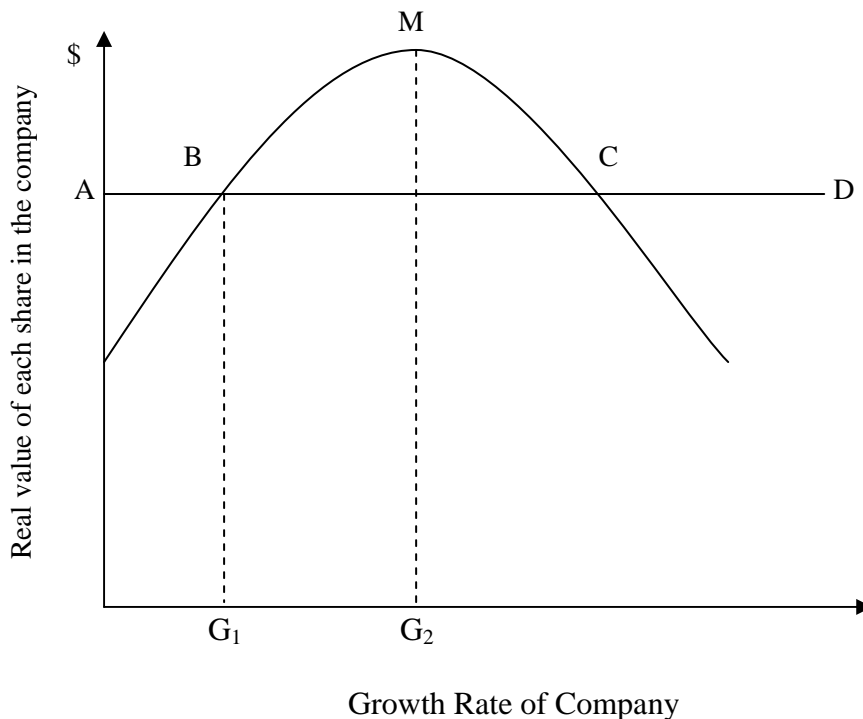
Figure 1

Figure 1: Possible expansion path for profit and managerial emolument given managerial discretion.

The separation of ownership and management is not limited to Williamson's (1963) theory. Quite often the competition that exists in many markets limits the amount of discretion a manager can partake in even if separation does exists. Marris (1964) and Penrose (1959) both suggest that if the management of a firm seeks to maximise the firm's profit (rather than their own utility), more funds are available for company growth. In turn company growth can ensure the management is securing personal gratification through more prestige and higher salary.

The main difference between the two theories is how company growth is achieved. Penrose (1959) simply suggests that growth is possible as long as internal funds are available. Marris (1964) on the other hand, suggests that the firm's management desire is for their company to grow as fast as possible. The growth is constrained however, by the possibility of a takeover. This point is illustrated in Figure 2. As the company profits increase, the management encourage greater growth. This growth causes the value of the company shares to increase (point B). This growth will continue until company profits and the value of the shares reach a maximum at M. The takeover constraint is indicated by the line AD. A takeover will occur if

the company continues to grow to a point where the cost of growth increases so much, it causes the share price to decline. Thus the fear of a takeover at point C ensures the management maximises the firm's profits. In both Marris (1963) and Penrose (1959) theories, the increased funds can be used to promote growth. One way to achieve this growth is to take an overseas business trip to advertise existing products, purchase new products or enter new international markets.

Figure 2

Source: Tisdell, 1982

Figure 2:   Business returns and company growth

An alternate theory to explain the relationship between international business travel and business returns is Baumol's (1959) model of sales maximisation. Baumol (1959) suggests the incentive of a firm is to maximise the firm's sales subject to a minimum profit constraint. To increase the firm's sales, the firm may use part of their current profit to direct a representative from the firm overseas to sell their product. The incentive for the management in this instance is the likelihood that the increased sales will increase their future salary.

However not all businesses operate in this way and not all have a separation of ownership and management. In many instances, rising business returns are a signal to nearly all firms to engage in business expansion and increased investment. This may be reflected by a greater number of staff being sent abroad to secure or expand foreign markets or to purchase inputs required for business expansion. In addition, high profitability in a firm can make it easier for the firm to obtain funds through external sources. These external funds can be used for investment and growth attainable through overseas business trips. The firm may also wish to make a human capital investment. One method of improving staff's work-related human capital is by directing them to conventions and conferences to learn about the recent international business innovations. Such travel decisions may merely be based on anticipated profitability in the future.

Finally, even in the case of businesses involving a single proprietor, partnership or private company in which ownership and control are not separated, owner-managers or joint-managers may be more inclined to travel at the expense of the business as the profits of their business rise. This is because such a rise implies a rise in the real income of the owners involved and in Australia (and most countries), expenses for business travel are fully tax-deductible. In this case, two effects are present: an income effect and a taxation effect.

This income or wealth effect tends to increase the demand for travel. Indeed, available evidence (see Crouch 1992, 1994, Sinclair 1998 and Sinclair and Stabler 1997 for summaries) indicates that the demand for travel is income elastic. In addition, since business travel is income tax deductible but private travel is not, it is always economically advantageous for owners of businesses to undertake personal travel as business travel rather than private travel, where the tax deduction can be claimed. Because information is asymmetric, many claims for business travel may indeed 'disguise' a considerable amount of travel for private purposes.

Thus, a wide range of microeconomic theories of the firm suggest that when business returns rise the frequency of overseas business travel can be expected to increase. This is the case for managerial theories as well as profit or wealth maximisation theories of the firm.

3. Data

A major investment for most businesses, irrespective of the size, is in capital goods. If business confidence is high, firms will invest surplus funds into improved capital goods. Thus the net return on this capital investment may be an appropriate proxy for business returns. The net rate of return on private capital (NRR) is the ratio of net operating surplus to net capital stock (NKS). Net operating surplus is gross operating surplus (GOS) after the deduction of the consumption of fixed capital (CC), that is, after allowing for depreciation of such capital. This data are available quarterly (seasonally unadjusted) through Austats released by the Australian Bureau of Statistics (ABS).

Unfortunately only annual data for NKS at June of each year is available. To obtain a quarterly series, the ABS definition of NKS, given by (1), is used, where GFCF is gross fixed capital formation (also released as a quarterly series) with all variables deflated to period t. To obtain the value of NKS at the September quarter, the June value (namely NKS_{t-1}) is deflated to the September quarter, and the September quarter values for GFCF and CC are added and subtracted to obtain the NKS for September. This value is then deflated to December and (1) is used to obtain NKS for this period. This process is repeated to obtain the final quarter, and then the whole procedure starts again using the next annual observation for NKS.

$$NKS_t = NKS_{t-1} + GFCF_t - CC_t \qquad (1)$$

Another limitation problem with the data is the difficulty in only isolating the private segment of the market. GFCF and CC are segmented into values for public and private corporations. On the other hand, annual NKS and GOS are split into general government corporations and households as well as financial and non-financial corporations. However only non-financial corporations are further divided into public and private. Therefore, to derive a proxy for private NKS and GOS, the public part of non-financial corporations, general government corporations and households are excluded.

Real GDP (y_t) is the seasonally adjusted chain volume measure derived by the ABS in 1999/2000 dollars. Business departures (b_t) are measured by short-term departures of Australian residents for business, to attend a convention or conference and for employment purposes. In this article, overseas travel to attend a convention or conference and for employment purposes are combined with business travel for a number of reasons. First the

data available on outbound travel from Australia according to the travel purpose combines these three categories in some years; hence to obtain a long time series the categories need to be combined over the whole period. Furthermore, travelling for business, to attend a convention/conference and for employment purposes display similar travel life cycles (Collins and Tisdell 2002a). The authors show that travel for these purposes peak for individuals in their late thirties or early forties. In terms of Wells and Gubar's (1966) family life cycle theory, this peak occurs around the full nest stage of the life cycle.

Combining outbound travel for business, to attend a convention or conference and employment purposes may also be a limitation of the model. In many instances, academics/researchers and government servants are likely to travel abroad to attend conventions and conferences. Hence are not likely to be motivated by the potential fiscal gain to themselves or their place of work. The former group will tend to treat a business trip either as a platform for presenting their own research techniques and findings or to investigate current international research. Alternatively, the incentive for government bodies[1] may be to expand and develop foreign relations in anticipation of an improved current account balance, or to observe international innovations in technology, education, tourism and so on, that will assist the development of the Australian economy.

Up to 1994, short-term departure data are available from the ABS publication 'Overseas Arrivals and Departures'. After 1994, the data must be acquired directly from the ABS. The data are seasonally unadjusted and are available for the period 1974:1 to 1999:4 giving a total of 104 observations. All data are in logarithmic form because logs capture the multiplicative effect of the level variables (Lim and McAleer 1999), and the coefficients can easily be interpreted as elasticities.

The correlation coefficient between NRR in Australia and real Australian GDP is 0.96, suggestive of a strong, positive significant relationship. Multicollinearity problems would therefore be encountered if both variables were included in a business travel demand model. This relationship between NRR and real GDP is twofold. There is an artificially induced connection because GDP is a function of GOS suggesting NRR is indirectly a function of GDP. In addition, there is a natural connection, as a rise in the total flow of all goods and services produced in Australia may induce a positive return on capital investment in private businesses.

The question is, which variable is more suitable for explaining business travel demand? As with GDP, NRR is associated with business confidence in an economy. The main difference between the two variables is that NRR only relates to return on the physical capital in the economy, while GDP includes all goods used for final consumption as well as investment.

Stochastic and deterministic trend and seasonality

From Figure 3, it is evident that all series are increasing over time. The trend in a series could be due to either deterministic or stochastic trend. Practically if a series can be made stationary by including a time trend in the model it is said to contain a deterministic trend. Alternatively if a series can be made stationary by first differencing, the trend is known as stochastic trend. A series can of course have both stochastic and deterministic trends.

Figure 3

Levels | First Differences

Logarithm of Short-term Business Departures from Australia

Logarithm of the Net Rate of Return on Capital in Australia
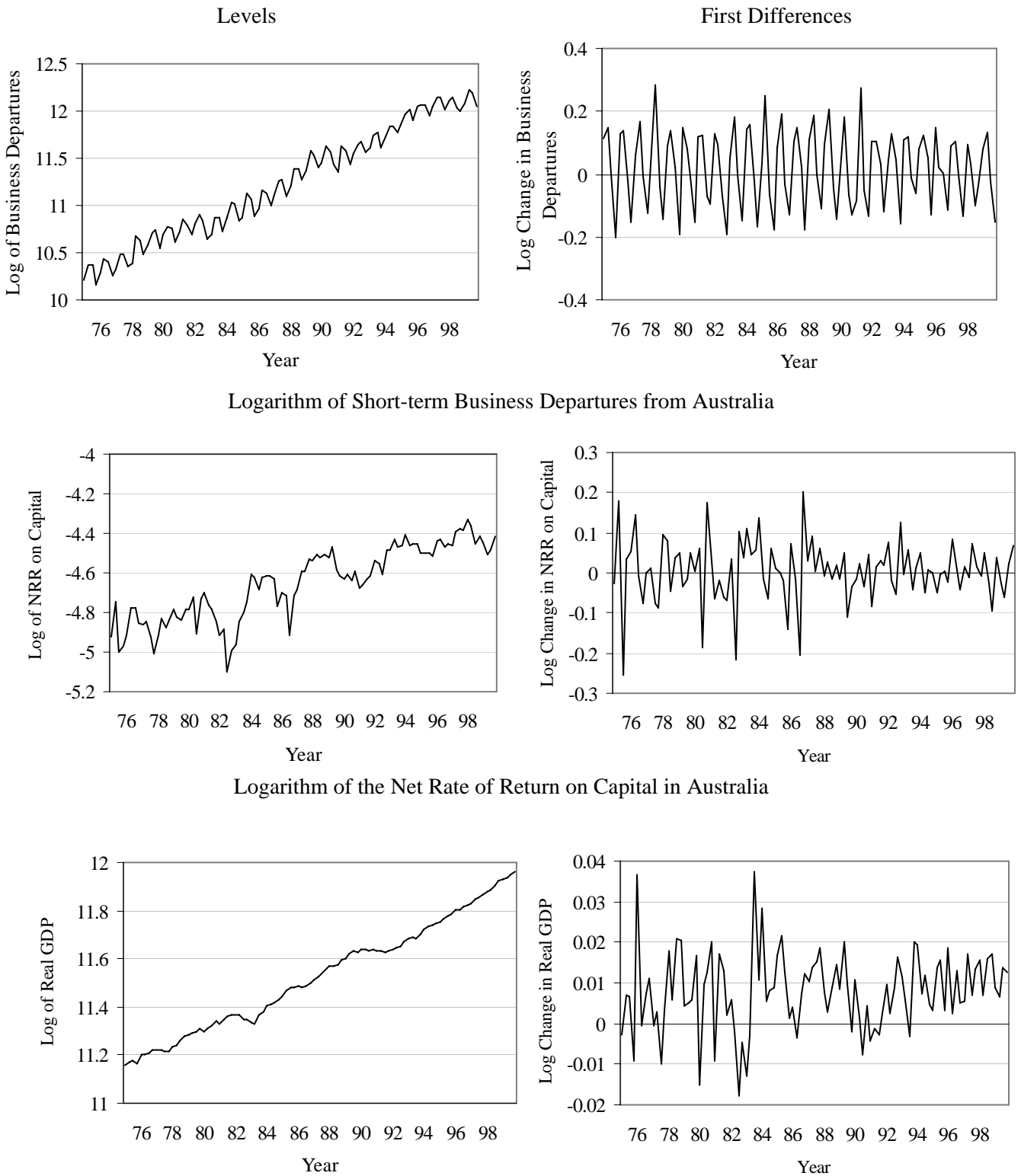

Figure 3:   Time series plots of levels and first differences

The data for short-term business departures and NRR are both seasonally unadjusted, so it is important to examine whether seasonal patterns are evident in the series'. From Figure 3,

only the logarithm of business departures displays obvious seasonal patterns[2]. If the seasonal pattern is purely due to the fact that the demand for business travel changes each quarter due to seasonal events like Christmas and holidays, seasonal dummy variables can be incorporated into the model. This is known as the deterministic definition of seasonality. If the seasonality on the other hand is due to unpredictable occurrences seasonal differences are required.

To test if the seasonality in the departures is relatively constant over time, two methods are used. The first method examines the multivariate vector process of the quarterly observations, sampled annually (Hylleberg 1986). The results are shown in Figure 4. Up to 1996, short-term business departures are relatively stable over time, with the March and December quarters having fewer departures than June and September. This makes sense since the March and December quarters contain the Easter, summer holidays and Christmas period in Australia. Consequently in these quarters one might expect departures for leisure purposes to be up and those for business to be down. After 1996, business departures in the March quarter increased and departures in the September quarter decreased and then increased again in 1999. The latter decrease could in part be caused by the decline in business departures to major Asian destinations like Hong Kong and Singapore in that period due to the Asian economic crisis.
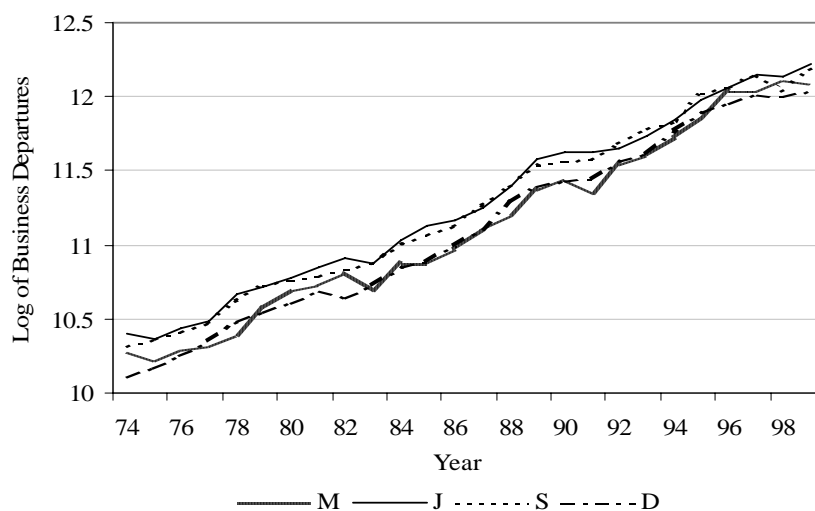
Figure 4

Figure 4: Multivariate vector process of quarterly observations sampled annually for short-term departures for business purposes

Another method tho examine the stability of seasonality over time is proposed by authors such as Barsky and Miron (1989) and Beaulieu and Miron (1990) (summarised in Miron (1994)). They examine the deterministic definition of seasonality where the logarithmic change of business departures is regressed on the seasonal dummy variables[3]. The coefficients of the seasonal dummy variables represent the quarterly growth rate of business departures. If the quarterly growth rates are not constant over time, seasonality is irregular implying the seasonality may be stochastic.[4] The resulting regression equation is specified in (2). All seasonal dummy variables are significant at the 1% level, and 84.12 % of the variation in the growth of business departures is explained by the seasonal dummy variables.

$$\Delta b_t = 0.086 S_{1t} + 0.150 S_{2t} - 0.023 S_{3t} - 0.142 S_{4t} \tag{2}$$

The growth rates are not constant over time, but the variation between quarters is quite small being less than 0.5%[5]. The largest growth rate increase is from quarter 1 to 2 where business departures are increasing again after the lull over the summer holiday period. The largest decrease is from quarter 3 to 4 where departures are slowing down for the summer holiday period.

4. Empirical Method

Testing for stationarity

If non-stationary time series' are used in regression analyses, spurious regressions are obtained. A series is made stationary by determining the order of integration, that is the number of times a series needs to be differenced to achieve stationary. A series order d is denoted I(d) and implies the series needs to be differenced d times. The augmented Dickey-Fuller (ADF) test is an extension of the Dickey-Fuller (DF) test (Dickey and Fuller 1979), where lagged difference terms are added to an AR(1) process as in (3). This ensures the residuals are white noise processors.The ADF test involves estimating (3) where Δ is the difference operator, y_t is the series to be tested, μ_t represents any deterministic components that may be present (drift and/or deterministic trend) k is the lag length to ensure a white noise process and ε_t is the error term.

$$\Delta y_t = \mu_t + \gamma y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta y_{t-1} + \varepsilon_t \tag{3}$$

The coefficient of concern is γ, and the null hypothesis is $\gamma = 0$. If the null hypothesis is rejected, the series y_t is stationary or I(0). If the null hypothesis is not rejected, the series is

non-stationary and needs to be differenced and the test repeated. This procedure is continued until the series is stationary.

If it is suspected that the seasonality in the series is stochastic, the series needs to be tested for seasonal unit roots. However, unlike annual data, seasonal data can contain more than one unit root. Consider the seasonal filter for a non-stationary quarterly series, that is $(1-L^4)$. The filter is actually a fourth-order polynomial with four roots, namely $(1-L)$, $(1+L)$, $(1-iL)$ and $(1+iL)$. If the two complex roots $(1-iL)$ and $(1+iL)$ are equated to $(1+L^2)$, the quarterly series has three possible roots. $(1-L)$ corresponds to a unit root at the zero frequency[6]. This implies the series repeats itself each and every period. $(1+L)$ is equivalent to a unit root at the semi-annual frequency, where the series repeats every six months. Finally $(1+L^2)$ relates to a unit root at the annual frequency where the sequence repeats every four periods.

One procedure that tests for seasonal unit roots at other frequencies is the Hylleberg, Engle, Granger and Yoo (1990) (HEGY) test. This test not only considers the zero frequency case, but also tests for cyclical movements at the semi-annual and annual frequencies. The test is based on the following regression

$$y_{4t} = \mu + \pi_1 y_{1t-1} + \pi_2 y_{2t-1} + \pi_3 y_{3t-2} + \pi_1 y_{3t-1} + \varepsilon_t \qquad (4)$$

where $y_{4t} = y_t - y_{t-4} = (1-L^4)y_t$

$y_{1t} = y_t + y_{t-1} + y_{t-2} + y_{t-3} = (1+L+L^2+L^3)y_t$

$y_{2t} = -y_t + y_{t-1} - y_{t-2} + y_{t-3} = -(1-L+L^2-L^3)y_t$

$y_{3t} = -y_t + y_{t-2} = -(1-L^2)y_t,$

and ε_t is the error term, μ are the deterministic regressors and L is the backward shift operator.

OLS regressions on (4) are run to test the following hypotheses.

(1) H_0: $\pi_1 = 0$, H_1: $\pi_1 < 0$

(2) H_0: $\pi_2 = 0$, H_1: $\pi_2 < 0$

(3) H_0: $\pi_3 = \pi_4 = 0$, H_1: π_3 and/or $\pi_4 \neq 0$

The first two hypotheses are based on *t* tests and the third an F test. There are no seasonal or non-seasonal unit roots if all three hypotheses are rejected. In this case the series y_t is I(0, 0,

0), or the series is stationary. [7] At the other extreme, if all three hypotheses cannot be rejected, there are three unit roots at the zero, semi-annual and annual frequencies and the series is I(1, 1, 1). If there are no seasonal unit roots, the first hypothesis is not rejected and the other two are rejected. The series is I(1, 0, 0) which is equivalent to an I(1) series. To ensure a white noise process, lags of the dependent variables in (4) can be added to the right hand side of the equation.

Cointegration and ECM testing

Engle and Granger (1987) proposed a two-stage procedure to test for this long-run relationship between two variables. The procedure involves running a simple OLS regression to obtain an estimate for the residuals. These least squares residuals are then tested for stationarity using the ADF procedure. Note since OLS residuals have a zero mean, they are not expected to contain any drift or trend. Thus the deterministic regressor term, μ, is left out of (3). Additionally, the usual ADF critical values cannot be used to test if the residuals are stationary as the test in this instance is based on estimated residuals, rather than the true disequilibrium errors. This results in a downward bias in the estimates of γ. Davidson and MacKinnon (1993) developed a separate set of critical values for cointegration tests.

There are a number of problems associated with the Engle-Granger procedure. First, it lacks power and often fails to detect a long-run relationship when there is one. Second, since it relies on a two step estimation procedure, if there are errors present when the residuals are estimated in the first step, this error will be carried over to the second step resulting in an incorrect specification of γ. This of course can result in not detecting a long-run relationship when there is one. Third, the procedure can only be applied to the two-variable case, as there are numerous unique log-run relationships in the multivariate case.

The most popular of the multivariate cointegration procedures is the Johansen test. Johansen (1988, 1995) suggest a maximum likelihood (ML) approach for testing for more than one cointegrating relationship between a set of I(1) variables. It is based on a vector autoregressive process allowing for all possible relationships between a number of nonstationary I(1) variables to tested.

If a long-run relationship is found between a set of variables, an error correction model (ECM) should be developed. An ECM is a short-term disequilibrium relationship between a set of variables, and represents the dynamic structure controlling their behaviour. An ECM is expressed using first differences with long-run information retained by an error correction term, which is the lag of the residuals from the equilibrium regression. (12) represents an ECM where e_{t-1} are the lag of the cointegrating residuals obtained from either procedure discussed above and is known as the error correction term. It represents the extent of departure from the long-run equilibrium. In addition, λ is the short-run adjustment parameter, μ are the deterministic regressors and ε_t is a white noise process.

$$\Delta y_t = \mu + lagged(\Delta y_t, \Delta x_t) - \lambda e_{t-1} + \varepsilon_t \qquad (5)$$

Reducing (12) using general to specific methodology results in a parsimonious model with consistent short-run parameters that are asymptotically efficient and consistent.

5. Empirical Results

Table 1 displays the results for the Augmented Dickey Fuller (ADF) unit root tests. All unit root regressions are free of serial autocorrelation. The lag length for the ADF test is chosen based on the significance of the lags and model selection tests including the Akaike information criterion (AIC) and Schwarz criterion (SC). In quarterly data with possible seasonal unit roots, a lag length of at least 3 should be chosen otherwise the ADF test could have poor size properties. This is the case with the logarithm of business departures. The critical values are from a Monte Carlo study done by Dickey and Fuller (1979)[8] The results of the unit root tests suggest all variables are non-stationary and I(1) at the 5% significance level.

Table 1

Results of the ADF Unit Root Test

Variable	Level		First Difference	
	ADF Statistic	Lag Length	ADF Statistic	Lag Length
b_t	-2.746[a]	8	-3.612[b]	7
n_t	-1.137[b]	7	-5.922[b]	8
y_t	-2.182[b]	0	-5.157[b]	3

Note: [a] The critical values for the ADF regressions for n = 100 at the 5% level is –3.45 (includes trend and constant). [b] The critical values for the ADF regressions for n = 100 at the 5% level is –2.89 (includes constant only).

From Figure 1, it was suggested that the logarithm of business departures are seasonal. Table 2 displays the result for the HEGY unit root test for testing for seasonal unit roots. The drift, trend and seasonal dummy variables are included in the auxiliary regressions, and a lag length of 6 is chosen to ensure a white noise process. After reducing the model using general to specific methodology, the first hypothesis is not rejected and the other two are rejected at the 5% significance level. Thus the logarithm of short-term outbound business departures from Australia has a unit root at the zero frequency only, with the integration being $SI_4(1, 0, 0)$. Thus no seasonal unit roots exist implying only first differencing is required to achieve a stationary series.

Table 2

Results of the HEGY Unit Root Test for Total Short-term Business Departures

HEGY Tests	
$H_O: \pi_1 = 0$	t = -3.114
$H_O: \pi_2 = 0$	t = -4.998
$H_O: \pi_3 = \pi_4 = 0$	F = 8.284
$F_{AUTO} = 0.224\ (0.924)$	

Note: Drift, trend and seasonal dummy terms are included. The critical values at the 5% level from Hylleberg, Engle, Granger and Yoo (1990) for 100 observations are $t(\pi_1)$ = -3.53, $t(\pi_2)$ = -2.94 and $F(\pi_3, \pi_4)$ = 6.60. F_{AUTO} is the Lagrange multiplier (LM) test for serial correlation at the fourth order, p-value in brackets.

Engle-Granger procedure

To find a linear combination of the I(1) variables, business departures are regressed separately with NRR and real GDP using ordinary least squares regressions. The resulting equations are (6) and (7). Seasonal dummy terms are included as departures are not seasonally adjusted (Thomas 1997). Time trend terms were originally included in the cointegrating regressions, but in both cases incorrect signs were obtained.[9]

$$b_t = 24.557 + 2.884n_t - 0.021S_1 + 0.089S_2 + 0.232S_3$$
$$R^2 = 0.791$$
(6)

$$b_t = -18.308 + 2.552y_t + 0.075S_1 + 0.210S_2 + 0.165S_3$$
$$R^2 = 0.988$$
(7)

OLS regressions produce superconsistent estimates of the long-run parameters if the sample is large enough. Therefore in some instances, the OLS estimates are biased. Banerjee, Dolado, Hendry and Smith (1986) show this bias is related to $1 - R^2$. Thus a small bias corresponds to a high coefficient of determination. Both R^2 are reasonably large here,

suggesting any bias in the model is quite small. Since the variables are in logs, the coefficients of NRR and real GDP from (6) and (7) represent the long-run elasticities, with a 1% increase in business returns causes a 2.88% increase in business departures and a 1% increase in real GDP causing a 2.55% increase in business departures, suggesting both are highly elastic relative to the explanatory variables.

To find the equilibrium relationships ADF tests are performed on the resulting residuals to see if they are stationary. The lag length is chosen to ensure the residuals are a white noise process. When the ADF test is performed on the estimated residuals resulting from (6), a long-run relationship between business departures and NRR is found with the residuals being stationary ($\tau = -5.106$) at any reasonable significance level. (The 5% critical value for a sample size of 100 from Davidson and MacKinnon (1993) is -3.39). On the other hand it is found a long-run relationship does not exist between business departures and real GDP ($\tau = -3.051$).

The next step of the Engle-Granger two-stage procedure is to estimate an ECM similar to (5) using the residuals from the equilibrium regression between business departures and NRR in (6). A lag length of five is chosen initially, and centred seasonal dummies[10] are used rather than the usual ones due to the large deterministic seasonality detected earlier. Centred seasonal dummy variables are used as they only affect the mean of total business departures and not the trend (Johansen 1995). The equation is then reduced using general to specific methodology with the result being the ECM in (8), with t values in brackets.

$$\Delta b_t = 0.017 - 0.351\Delta b_{t-1} + 0.200\Delta b_{t-4} + 0.222\Delta b_{t-5} \qquad (8)$$

$$(3.194) \quad (-3.668) \qquad (2.062) \qquad (2.218)$$

$$+ 0.164 S_{1tc} + 0.242 S_{2tc} + 0.116 S_{3tc}$$

$$(6.125) \qquad (6.559) \qquad (3.866)$$

$$R^2 = 0.8665 \quad F(6, 98) = 98.459 \ (0.000) \qquad DW = 2.070 \quad F_{AUTO} = 1.393 \ (0.243)^{[11]}$$

From (8) it can be concluded that there is a short-term disequilibrium relationship between the change in short-term business departures with the lagged change in departures at the first, fourth and fifth lag and the seasonal dummy variables. Since the error correction term does not appear in the final model, changes in business departures are not significantly related to movements away from the long-run equilibrium in the previous period.

Johansen's ML procedure

As discussed earlier, there are problems associated with the Engle-Granger procedure often resulting in a Type II error. Thus to validate the results from the Engle-Granger procedure, the Johansen procedure will be used to test for cointegrating relationships between business departures and NRR and business departures and Real GDP. Table 3 displays the results for Johansen's trace and maximum eigenvalue tests. The VAR length was chosen using a likelihood ratio (LR) test statistic that compares two VARs of length p_1 and p_0 where $p_1 > p_0$. The LR statistic is calculated as $-2(\ell_o - \ell_1)$, where ℓ_0 and ℓ_1 are the log likelihood statistics for each respective VAR length. The statistic is a χ^2 distribution with $n^2(p_1 - p_0)$ degrees of freedom, where n is the number of variables in the VAR. The null hypothesis to be tested is the number of restrictions that need to be placed on the model VAR(p_1) model to obtain a VAR(p_2). [12]

Table 3
Results for the Johansen ML Procedure

Variables	H_0	H_1	Maximum Eigenvalue	Trace	VAR
b_t, n_t	$r = 0$	$r = 1$	31.596	31.766	5
	$r \leq 1$	$r = 2$	0.169	0.169	
b_t, y_t	$r = 0$	$r = 1$	2.696	3.031	4
	$r \leq 1$	$r = 2$	0.335	0.335	

Note: The critical values are from Osterwald-Lenum (1992). For the maximum eigenvalue test statistic, the 5% critical value for H_0: $r = 0$ is 14.07 and for H_0: $r \leq 1$ the critical value is 3.76. For the trace statistic, the respective critical values at the 5% level are 15.41 and 3.76.

From Table 3, it can be concluded that there is a single cointegrating relationship between business departures and NRR. The resulting cointegrating vector is given by (9) with the *t* value in brackets. From (16), we can conclude that there is a significant long-run relationship between business departures from Australia and Australian business returns, with the relevant long-run elasticity suggesting a 1% increase in business returns cause a 3.52% increase in business departures. Thus business departures are highly sensitive to changes in business returns as was the case with the Engle-Granger procedure. Conversely, there is no long-run relationship between departures and Real GDP. This is consistent with the conclusion from the Engle-Granger procedure.

$$b_t = 27.621 + 3.523n_t \qquad\qquad (9)$$

$$(19.804)$$

If there is indeed a long-run relationship between business departures and NRR, the cointegrating residuals (specifically e_t) from (9) should be stationary and a dynamic ECM similar to (5) can be developed. Performing the ADF test on the estimated residuals results in a lag length of 4 and an ADF statistic of –5.333. Thus at the 5% critical level, e_t are I(0). The resulting ECM is in Table 4.

Table 4

VECM for Total Outbound Australian Business Departures

Independent Variable	Coefficient	t-value
Constant	-0.078	-3.066
Δb_{t-1}	-0.451	-4.141
Δb_{t-2}	-0.212	-1.772
Δb_{t-3}	-0.091	-0.767
Δb_{t-4}	0.093	0.786
Δb_{t-5}	0.157	1.424
Δn_{t-1}	0.069	0.723
Δn_{t-2}	-0.018	-0.203
Δn_{t-3}	-0.009	-0.099
Δn_{t-4}	-0.046	-0.518
Δn_{t-5}	0.078	1.093
S_{1tc}	0.119	3.298
S_{2tc}	0.202	4.363
S_{3tc}	0.103	2.854
e_{t-1}	-0.022	-0.845

Reducing the ECM in Table 4 using general to specific methodology results in removal of the error correction term, giving the same ECM as the Engle-Granger procedure, that is (9). Consequently, changes in business departures are significantly related to lagged changes in business departures at lags 1, 4 and 5 and the seasonal dummy variables.

6. Conclusion

This paper proposes a unique approach to modelling business travel demand based on microeconomic theories of the firm. Whereas previous studies have concentrated on traditional macro specifications of travel demand such as real GDP, this study illustrates the importance of examining non-standard specifications, providing evidence of a long-term positive relationship between Australian outbound business travel and business returns on private capital. It is shown no such significant relationship exists with Australian GDP, contrasting with some earlier studies.

The relationship is a result of several factors. First, a firm's management, if separated from the ownership, may directly use the increased returns for an overseas trip; or in the case of profit-maximising corporations the increased business returns may be used for business expansion and increased investments attainable via an overseas business trip. In the case of smaller businesses, a rise in the net return of the business implies a rise in the real income of the owners who are often managers, so an income effect is present. This combined with the fact the expenses incurred for an overseas business trip are tax deductible, provides a strong incentive for overseas business travel by owners, when the returns from their business rise. Conversely a decline in business returns can be expected to cause a decline in international business travel. This would have a number of implications for the wider economy. Travel abroad for a business trip may be to buy/sell a good or service or to nurture the current international ties of the business. Thus if business returns are low, the amount of international trade flow between Australia and international destinations may be affected. Furthermore, considering the increasing presence of multinational firms around the world, if the business returns of these firms are declining, and international business travel is reduced, it would be hard for such firms to continue operating.

The main limitation that may be foreseen in this paper is the disregard for other possible determinants of international business travel.[13] The exclusion of relevant variables can cause the estimator of the parameter of the independent variable to be biased. In the international business travel demand studies discussed earlier, there was little empirical support for the previously utilised demand determinants suggesting perhaps a superior indicator was available. This study finds that business travel is driven mainly by the level of business returns on capital and suggests economic reasons why this relationship is expected.

END NOTES

[1] Of course discretionary behaviour involving overseas travel is also possible with government officials.

[2] Unlike the log first difference of business departures, examination of the correlogram of the log first difference of NRR showed the autocorrelations decayed quite quickly. This suggests that stochastic seasonality is not present in NRR.

[3] This type of regression may by seasonally heteroscedastic. To overcome the problem, the standard errors are adjusted using the Newey and West (1987) procedure as suggested by Miron (1994).

[4] If a series has seasonal unit roots as may be the case when the seasonality is stochastic, estimation can lead to spurious regressions. This is because the estimated coefficients 'reflect initial conditions plus the accumulation of random shocks' (Miron 1994:217).

[5] Lim and McAleer (1999, 2000a, 2000b) had a similar finding for holiday travel.

[6] This is of course the non-seasonal filter.

[7] The HEGY test implies if one concludes a seasonal series is stationary by rejecting the three hypotheses it is equivalent to testing and rejecting the overall hypothesis $\pi_1 = \pi_2 = \pi_3 = \pi_4$ at the same significance level. Ghysels, Osborn and Rodrigues (2001) perceive a problem with this. Using the same significance level for each of the three mutually exclusive HEGY tests, does not imply the same level of significance for the overall test. For instance if $\alpha = 0.05$ for the individual tests, the probability of correctly not rejecting the null hypothesis for the overall test is $(1-\alpha)^3 \approx 0.86$. This implies the level of significance for the overall test is 0.14.

[8] τ is the appropriate statistic when (3) contains no drift or trend term, τ_μ when there is a drift term and τ_τ when both the drift and time trend terms are included.

[9] Standard errors and t ratios are not recorded, as they are not consistent estimates. This is due to nonstationary nature of the variables.

[10] These are calculated as $S_{itc} = S_{it} - \frac{1}{4}$, where $i = 1,..,4$.

[11] DW is the Durbin Watson statistic and F_{AUTO} is the Lagrange multiplier (LM) test for serial correlation at the fourth order. p-values are in brackets.

[12] Note the LR statistic was used over the AIC and SC criterion as the AIC as a tendency to choose the model with the largest lag length and SC the more parsimonious VAR. In both cases however, they supported the results for the LR test.

[13] A reviewer indicated that it might be useful to test for the relative price variable as an influence on total outbound business travel from Australia. This, however, would be quite complicated because relative prices vary between countries of destination, and using a weighted average of all destinations would potentially result in biases, depending on the weights used. For this reason and our lack of suitable data, we have not been able to test for the importance of this variable. It could be an area for future research.

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