VARYING ELASTICITIES AND FORECASTING PERFORMANCE

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ABSTRACT

This study assumes that tourists' demand reactions to income and price changes are asymmetric in different phases of the business cycle. In order to test the validity of such a hypothesis, we analysed the demand for international tourism in five source markets using a modified growth rate (MGR) model that allows the income and price elasticities to vary across the business cycle. The empirical evidence clearly demonstrates that income elasticity is indeed asymmetric across the business cycle. In addition, asymmetric price effects were found for Japan. To compare forecasting performance, we also estimated a time varying parameter (TVP) model. The results show that the MGR model generally outperforms the TVP model in out-of-sample forecasting.

INTRODUCTION

Tourism demand studies generally assume that the effects of income and price on the demand for tourism remain stable across the business cycle (Crouch, 1995; Li *et al.*, 2005; Lim, 1997; Schiff and Becken, 2011; Song *et al.*, 2010; Song and Li, 2008). In contrast to these studies, the modified growth rate (MGR) model and the time varying parameter (TVP) model relax the assumption of parameter constancy (Harvey, 1990; Smeral, 2009, 2010, 2011, 2012; Song *et al.* 2009; Song and Wong, 2003). Moreover, the application of the recursive ordinary least square (OLS) method shows that the assumption of constant parameters is too restrictive (Song and Witt, 2000).

Some recent studies have demonstrated that the assumption of constant tourism demand elasticities is an invalid one (e.g. Song and Witt, 2003), but no information about the degree of their variability has been provided. As a solution to this problem, some other studies have suggested estimating demand elasticity intervals using the bootstrapping method (Song *et al.*, 2010; Song *et al.*, 2011). Another study (Nicolau, 2011) questioned the neoclassical view that tourists react symmetrically to price increases and decreases; the results of this study are consistent with the work of Kahneman and Tversky (1979), which demonstrated that human behaviour violates the axioms of the classical utility theory.

The objective of this study was to go one step further by studying the anomalies in tourist behaviour and behavioural changes in relation to the stages of the business cycle. Similar to the macroeconomic studies of business cycles, we show that the demand reactions are asymmetric in the sense that tourist behaviour in one phase of the cycle is not the mirror image of its opposite phase (Bjellerup and Holgerson, 2009; Cook, 2000; Cook and Speight, 2007; Sichel, 1993). Carruth and Dickerson (2003) also raised the possibility of asymmetric consumer spending behaviour, claiming that when aggregate spending is above its long-run equilibrium value, consumers behave differently to when it is below its long-run equilibrium value.

In order to test for the existence of asymmetric income and price effects, we analysed the demand for international tourism in the USA, Canada, Australia, Japan, and the European Union 15 (EU-15, excluding Austria due to the unavailability of data) in terms of tourism imports. To achieve this, we estimated the growth rate models, allowing the magnitudes of the income and price effects to vary depending on the phases of the business cycle. Quarterly data were used to estimate the different models in this study. The reason for using this type of data was to demonstrate the existence of different income and price elasticities across the business cycle. The use of annual data may not have allowed us to achieve this goal because using such a data set might have averaged out the short-term effects of asymmetric tourist behaviour.

In this study, we compared the ex-ante forecasting performance of the MGR model with that of the TVP model for the period 2009-2010. In analysing future tourism demand trends, it is important to use appropriate models that incorporate the time varying elasticities for the forecasting period. Otherwise, the performance of the models will be negatively affected. This would be particularly true for 2009 and 2010, years which were characterized by a painful economic slump followed by a strong recovery. On the other hand, however, more accurate forecasts than those produced by the MGR model may be generated by putting more weight on the most recent data when estimating tourism demand models using the TVP method that considers the structural changes in the model.

METHODOLOGY

Modified Growth Rate Model and Varying Demand Elasticities

The tourism demand model chosen for this study is a partial demand model based on a multistage budgeting process at a given point of time (Deaton and Muellbauer, 1980). The assumption of several stages in the budgeting process requires that various commodities can be aggregated to broad bundles of consumer goods and that the decision process is separable (Hicks, 1934; Stone, 1954). In the applied model, after the temporal allocation of the budget (savings),

goods are separated into leisure goods and other consumer goods; then, the consumers further divide the budget allocated to leisure goods into three groups: international travel (tourism imports), domestic travel, and other leisure goods.

After following the multistage budgeting process described above, the demand for tourism in this study was measured by outbound tourist expenditure on international travel within the framework of a partial demand model (Artus, 1972; Gray, 1970; Leamer and Stern, 2008; Loeb, 1982; Song and Witt, 2000; Stabler *et al.*, 2010): real tourism imports (M_t) are influenced by the real income (Y_t) of tourists and the prices of outbound travel (MP_t) in relation to the prices for domestic travel and other goods measured in the same currency (DP_t).

Normally, in order to model tourism imports, transportation costs, marketing expenditure and consumer tastes (Kulendran and Divisekera, 2007; Lim, 1997, 2006) should also be considered in the model. However, data on these variables are very difficult to obtain (especially when the modelling requires long and consistent time series). Therefore, this study only examined the major explanatory variables, such as incomes and relative prices. These variables are also the most frequently used explanatory factors in tourism demand studies (Lim, 1997; Song and Li, 2008). Special events and data irregularities were captured by dummy variables.

Standard tourism demand studies based on econometric techniques assume that the effects of income and price on the demand for tourism remain stable across the business cycle. In this study, this assumption was modified to allow for the parameters of the tourism demand model to vary across the business cycle depending on the state of the economy. The growth rate model was specified based on Song *et al.* (2009); the advantage of using such a growth rate model in tourism demand analysis is that it allows researchers to consider tourism imports in the context of the overall economic fluctuations along the business cycle.

We constructed two different growth periods: a fast-growth period and a slow-growth period. In the fast-growth period, the business cycle stages of expansion, peak, and slowdown are combined. The slow-growth period consists of the recession, trough, and recovery stages.

The terms POS and MIN are used to indicate whether the economic growth is faster or slower than a flexible trend. POS has a value of one in the quarter when the economic growth is faster than the trend and a value of zero in all of the other quarters, and MIN expresses the opposite state of the economy.

The application of the *Hodrick-Prescott (HP) filter* method allows for approximating a flexible trend in real gross domestic products (GDPs) and defining the phases of the economy based on the difference between the actual GDP growth and the growth rate of the corresponding flexible trend (Hodrick and Prescott, 1997; Smeral, 2012). The HP filter method is widely used and has become a standard tool in economic research; it is especially used to define the state of the

economy in terms of the business cycle (Cook, 1999, 2000, 2004; Kaiser and Maravall, 2001; Maroto-Sanchez, 2010). The major advantage of the HP filter approach is that it removes all influences that are not relevant in describing the flexible trend. It uses a two-sided linear filter to separate the trend and the stationary component in a time series.

The MGR model is given in Equation (1):

$$\Delta \ln M_t = \alpha_1 + \alpha_2 \Delta \ln Y_t * POS + \alpha_3 \Delta \ln Y_t * MIN + \alpha_4 \Delta(\ln MP_t / \ln DP_t) * POS + \alpha_5 \Delta(\ln MP_t / \ln DP_t) * MIN + \epsilon_t, \quad (1)$$

where ϵ_t is the error term and α's are the parameters to be estimated.

Reasons for unstable demand elasticities

Loss aversion

The main reasons for varying income and price effects are "loss aversion" in consumption level and liquidity constraints. Explanatory factors also include (a) the existence of precautionary saving and changing household behaviour to avoid debts and (b) financial innovations. Furthermore, the intensity and time structure of substitutions among expenditure on outbound travel, domestic stays, and other goods may also play a role.

The loss aversion concept predicts that income elasticity will be greater in slow-growth periods than in fast-growth periods as long as individuals have access to information on the state of the economy (Hamilton, 1989; Holly and Stannet, 1995).

The prospect theory explains that consumer behaviour regarding the trade-offs between gains and losses is asymmetric because consumers attach much higher importance to losing a product than to the prospect of the monetary gain to be obtained from selling it (Kahneman and Tversky, 1979; Nicolau, 2011; Schmidt and Zank, 2005; Tversky and Kahnemann, 1991). In other words, if consumers value a product that is worth one dollar and are willing to pay that price for it, they will ask for a much higher price when selling the same product.

Tversky and Kahneman (1979) showed that among three choices (a guaranteed gain of 240 monetary units, a 25% chance of gaining 1000 monetary units, and a 75% chance of winning nothing), the majority of their sample chose the assured gain. The participants made this selection even though the more risky choice had a higher expected value of 250 monetary units, which demonstrates the fact that consumers are generally risk averse.

During a slowdown period, consumers' expectation of a future negative income shock and a looming recession may have little or no effect on their current consumption and travel behaviour. This is in line with the concept of loss aversion because consumers may place a heavier weight on utility losses than on potential utility gains (Bowman *et al*., 1999; Kahneman *et al*., 1990, 1991; Kahneman and Tversky, 1979; Tversky and Kahneman, 1991). In other words, if the status

of consumers depends on conspicuous consumption, they will not reduce their consumption (Gali, 1994; Treeck, 2008, 2010): Consumers like to maintain their usual consumption level because giving up their consumption status, which would be seen by friends, relatives, work colleagues, and their neighbourhood, would result in a severe loss of satisfaction.

However, consumption will decline significantly during the following recession, when the expected negative income effect is realized. In line with the consumption of luxury goods, expenditure on international travel may decline more than expenditure on general consumer goods because of the fear of future uncertainties. In this situation, consumers tend to be more financially prudent and to allocate more of their resources to savings, domestic travel, or necessities.

During economic recessions, tourists prefer to have holidays in nearby places that can be accessed by car or low-cost carriers. For example, in time of economic uncertainties, tourists tend to travel domestically or to neighbouring countries instead of travelling long haul because of travel costs and quality concerns. Furthermore, individuals who are hit by short-term income losses, and hence are on reduced budgets and have increasingly pessimistic expectations, would rather spend on indispensables such as food, heating, electricity, rent, and mobility while avoiding spending on non-necessities such as leisure and luxury goods or delaying expenditure on durable consumer goods.

In the recovery period, individuals are likely to expect faster income gains because of economic expansion and, as a result, they may immediately increase their consumption and travel standards to pre-recession levels without waiting for the realization of the expected income gains (Dwyer *et al.*, 2006). Because of their great loss of satisfaction, individuals cannot wait to close the consumption gap and to return to former consumption levels as soon as possible. This leads to a much stronger and speedy budget reallocation from other spending items and savings, which, in turn, leads to a higher income elasticity.

The application of the loss aversion concept suggests that most negative as well as positive adjustments in expenditure on tourism imports are realized during the slow-growth period. In contrast, adjustment activities in the fast-growth period are limited. Thus, income elasticity is smaller in a fast-growth period than in a slow-growth period.

Based on the loss aversion concept, price elasticity during periods of slow economic growth is higher than it is in fast-growth periods. At the beginning of an economic slowdown, individuals are likely to keep up their consumption level. This indicates that price elasticity would stay low because (a) consumers hardly respond to increases in relative prices for outbound travel and other luxury goods and (b) consumer income levels have not yet been affected (Nicolau, 2008, 2011; Treeck, 2008; Tversky and Kahneman, 1991). Price elasticity is significantly higher in a recession than in a slowdown period because consumers/tourists react more strongly to price changes in

times of great uncertainty about their economic future. Compensating for real income losses by seeking price advantages is another reason for increased price sensitivity.

As income gains are not yet being realized at the beginning of the recovery period, adjustment to former consumption and travel standards is still on its way. Therefore, price elasticity remains relatively high because consumers are trying to benefit from each price advantage to increase the real purchasing power of their still limited budget. In the expansion period, however, the realized positive income effects and the improvements in general economic conditions reduce price elasticity.

Liquidity constraints

Liquidity constraints could also explain the relatively higher (lower) price elasticity in the slow-growth (fast-growth) period. In the recovery period, although individuals expect an improvement in their income level, liquidity constraints due to tight credit situations result in relatively high price sensitivity to compensate for the limited real-spending budget.

In a period of economic expansion, price elasticity decreases because of positive income effects and disappearing liquidity constraints. In a slowdown period, consumers expect their income to decline and hence reduce their consumption level in order to prepare for recession. In such a case, price elasticity increases, although it will still be lower than in the slow-growth period. The increasing price elasticity is a reaction to tighter loan conditions and higher interest rates. This also indicates that consumers will seek price advantages to compensate for expected real income losses (Hatzinikolaou, 1999; Sarantis and Stewart, 2003). Generally, it is expected that price elasticity will be lower in a fast-growth period than in a slow-growth period.

Contrary to the case above, it is likely that income elasticities will be higher in fast-growth periods than in slow-growth periods. Again, liquidity constraints are the main reasons for this asymmetry in consumption behaviour in terms of income effects.

Although individual consumers may expect income gains in the expansion phase, they may not be able to increase their expenditure on consumption and travel in the recovery period because of liquidity constraints. This is because consumer expenditure relates mainly to current income level as a tight money market situation makes it difficult to get a loan (Campbell and Mankiw, 1989; Hatzinikolaou, 1999; Sarantis and Stewart, 2003; Stabler *et al.*, 2010). Therefore, income elasticity remains low. Even without liquidity constraints, income elasticity would still remain low because of uncertainties due to high unemployment rates, which would result in consumers postponing consumption during the expansion period. In other words, this precautionary saving may generate a major consumption gap in the recovery period (Cook and Speight, 2007; Sarantis and Stewart, 2003).

After income gains are realized and liquidity constraints are reduced or eliminated in the expansion period, consumption is likely to increase. Income elasticity will therefore increase. In contrast to the slow-growth period, the adjustment in consumption resulting from realized income gains could be significant and strong. Another reason for the increased income elasticity is that consumers will modify their consumption habit through rising household indebtedness as a result of easier credit access during the expansion period and/or financial innovations (Messinis *et al*., 2002). In the expansion period, precautionary saving is reduced while consumption budgets and income elasticity increases.

Immediately after an economic cycle reaches its peak, consumers will expect their income to decline with a recession looming in future. In such a situation, consumers will also perceive a gradual tightening of credit conditions and rising interest rates. Facing liquidity constraints, consumers will reduce their spending level and modify their international travel budgets and their consumption of other luxury goods so that the future negative income shock in the upcoming recession will not hurt their consumption too much. This will happen because consumers do not want to suffer from liquidity constraints during the recession; they therefore prepare themselves well in advance in anticipation of the economic slowdown to avoid future negative effects on their purchasing power as a result of declining stock and asset prices and worsening credit facilities (Shirvani and Wilbratte, 2000). Precautionary saving may also play an important role during this phase.

Most of the spending adjustments appear in the fast-growth period (in contrast to the application of the loss aversion concept) primarily because of liquidity constraints, although precautionary saving and habit formation are also important reasons. Consequently, income elasticity is higher in fast-growth periods than it is in slow-growth periods.

Relatively higher price elasticity of consumer goods and tourism imports in periods of fast economic growth compared to relatively lower price elasticity in periods of slow growth are conceivable when individuals expect a deep recession in the slowdown period and are extremely price sensitive, especially since loan conditions are very tight because of a possible global financial crisis. If consumers overestimate the economic slump, price sensitivity in the slow-growth period will be relatively low. However, it should be noted that this situation should be regarded as an exception and cannot be taken as the norm.

Based on Equation (1), the following is a summary of the different reasons that explain why demand elasticities remain stable or vary across the business cycle:

a) Symmetric income and price effects: $\alpha_2 = \alpha_3$; $\alpha_2, \alpha_3 > 0$; $\alpha_4 = \alpha_5$; $\alpha_4, \alpha_5 < 0$.

b) Loss aversion: $\alpha_2 < \alpha_3$; $\alpha_2, \alpha_3 > 0$; $|\alpha_4| < |\alpha_5|$; $\alpha_4, \alpha_5 < 0$.

c) Liquidity constraints: $\alpha_2 > \alpha_3$; $\alpha_2, \alpha_3 > 0$; $|\alpha_4| < |\alpha_5|$;
[theoretically possible:$|\alpha_4| > |\alpha_5|$]; $\alpha_4, \alpha_5 < 0$.

Mixed forms, such as symmetric price effects and asymmetric income effects or vice versa, are also possible.

The initial data analysis in this study showed that dummy variables (DUMMIES) to account for special events and data irregularities were required. The reasons for introducing these dummies into the models are explained below.

DUM2001 is the September 11 dummy to account for the strong decrease in outbound travel in both the Australian and USA models; DUM2004 is the Summer Olympics dummy in the Australian model; and DUM2008 captures the strong appreciation of the Australian dollar that fuelled a strong growth in outbound travel from Australia.

For Canada, DUM1983 captures an extreme strong increase in the demand for outbound travel as a result of the economic recovery; DUM1990 captures the surge in tourism imports before the economic downturn in the following years; and DUM1994 is designed to account for the data irregularities that occurred in 1994.

In the EU-15 model, DUM1986 is used to capture Glasnost and the soccer world championship in Mexico and DUM1991 and DUM1992 are the German reunification dummies.

In the Japanese model, DUM1991 is the year just before the burst in asset prices in Japan (in that year, outbound tourism from Japan rose significantly); DUM2004 is the year when Japan recovered from a decade-long economic recession, which caused an extremely strong recovery in outbound tourism in Japan; and DUM2006 is the Winter Olympics and world basketball championship dummy.

Time varying parameter model

One of the possible ways in which time varying demand elasticities may be tested is to use the TVP modelling procedure to estimate the demand model specified in a state space (SS) form:

$$\Delta \ln M_t = \alpha_{1t} + \alpha_{2t}\Delta \ln Y_t + \alpha_{3t}\Delta(\ln MP_t/\ln DP_t) + \epsilon_t \quad (2)$$

$$\alpha_{it} = \alpha_{it-1} + \omega_t, \quad (3)$$

where α_{1t}, α_{2t}, and α_{3t} are the TVPs in Equation (2) and the latter two represent income and price elasticities respectively, and ω_t symbolizes the white noise.

Equations (2) and (3) are respectively termed the measurement and transition equations. A transition equation is assumed to follow a random walk (RW) process. Previous studies have

confirmed that in most cases, a RW process can best represent the transition process (see, for example, Song *et al.*, 2009; Song and Wong, 2003). The TVP approach uses a recursive estimation process in which information that is more recent is weighted more heavily than distant information. Once the SS model is formulated, a convenience algorithm known as the *Kalman filter (KF)* can be used to estimate the SS model (Kalman, 1960). The KF is a recursive procedure for calculating the optimal estimator of the state vector given all of the information available at time *t*.

Normally, experimentation determines the structure of the transition equation. The criteria used to determine the structure of a transition equation are the goodness of fit and the predictive power of the model. Greenslade and Hall (1996), Kim (1993), and Song and Witt (2000) concluded that in most cases, the RW process sufficiently captures the structural change in various economic models (including tourism demand models).

The KF procedure is not presented here, but for a detailed exposition of the KF estimator, see Harvey (1990). Over the last two decades, the co-integration and error correction models have been widely implemented, and sometimes even overused, in areas of tourism demand modelling and forecasting. Although these modelling methods differ in terms of the ways in which they construct the models, they are all derivatives of the traditional OLS method.

According to Bomhoff (1994), if time series are stationary, their first and second moments are well defined and there is no conceptual problem in computing the unconditional means, variances, and co-variances based on observations over the same period. However, if time series are non-stationary, as is the case with most tourism time series, OLS is invalid since the properties of the time series depend on the length of the sample period. Therefore, unconditional means, variances, and co-variances cannot be calculated using OLS. To overcome this problem, the data need to be differenced; this often results in the loss of the long-run characteristics of the model.

The TVP approach, on the other hand, estimates the parameters of the model sequentially using the forward KF and the backward Kalman smoother and produces conditional distributions for the means and variances. It is therefore more useful in analysing both stationary and non-stationary series. Moreover, the TVP approach does not require the data to be stationary before model estimation, thus dramatically simplifying the model specification and estimation procedure since one does not have to worry about unit root testing and data differencing. In this study, the differenced data are used in the model estimation. The use of the TVP model is appropriate without going through the co-integration and error correction treatment of the data.

EMPIRICAL RESULTS

Estimates of the Modified Growth Rate Model

In order to test the stability of demand elasticities across the business cycle in a given observation period, we used the MGR model (Equation (1)) and the TVP model (Equations (2) and (3)) in terms of log differences to analyse the tourism imports of the USA, Canada, Australia, Japan, and the EU-15.

Real income Y_t was expressed through real GDP. GDP and the tourism imports M_t were measured at the constant prices and exchange rates of 2000. The prices for tourism imports (MP_t) were captured by the average import price index of the five source markets. These different import price indices (base year 2000) were measured by the weighted sum of the consumer price indices of the country-specific destinations. The GDP deflator (base year 2000) was chosen to indicate the prices for domestic stays and other consumer goods (DP_t). All model variables were expressed in US dollars. The estimation periods of the different models extend from the mid-1980s to 2008.

The quarterly data were obtained from the balance of payments statistics developed by the International Monetary Fund (IMF, 2011), the national accounts of the Organization for Economic Co-ordination and Development (OECD, 2011), and the tourism statistics of the World Tourism Organization (UNWTO, 2011).

The estimation results of the MGR model based on Equation 1 suggest that income and price elasticities differed across the states of the economy (economic growth below or above the trend). In three cases (Canada, EU-15, and Japan), we found that the residuals were correlated with their own lagged values; thus, corrections were necessary to obtain unbiased estimation results. To address serial correlation, we introduced an autoregressive error (AR) term of the order p = 1 (AR (1)) into the estimation equation.

With regard to the constant term, the estimations in the cases of Canada and Japan delivered insignificant coefficients and/or parameters with unrealistic magnitudes; therefore, these equations were estimated without intercept.

In the next step, we applied the Wald test to check whether the measured differences in elasticity values were significant (Hill *et al.*, 2008). The Wald test tested whether we could accept the coefficient restrictions $\alpha_2 = \alpha_3$ and $\alpha_4 = \alpha_5$ for Australia, EU-15, and the USA and the restrictions $\alpha_1 = \alpha_2$ and $\alpha_3 = \alpha_4$ for Japan and Canada or whether we would have to reject the null hypothesis and accept that the elasticities are variable across the business cycles.

The results of the Wald test suggest that the income elasticities for all source markets were significantly different. In the case of the price elasticities, the values were significantly different only for Japan. Based on the results of this first test, we re-estimated the equations for Australia,

Canada, EU-15, and the USA. However, we did not separate the price data by the two phases of the business cycle, as we assumed that (according to the given data set) the price elasticities remain stable across the business cycles (for a summary of the results see Table 1).

[please insert Table 1 here]

To evaluate the results, we had to consider that even when the aggregate price elasticities of the different business cycles were equal, the elasticity values in each individual business cycle might be asymmetric. Furthermore, it was necessary to note that the asymmetric price effects might be biased because only ex post data were available.

The results of the Wald test suggest that the income elasticities were unstable across the business cycles. In the case of Japan, this was also true the for price elasticity. According to the F- and Chi-Square statistics, we could reject the null hypothesis at 90% probability for Australia and Canada, 95% for EU-15 and the USA, and 99.9% for Japan and we could accept varying elasticities across the business cycles. Diagnostic tests of normality, serial correlation (Lagrange Multiplier Test according to Breusch-Godfrey), heteroskedasticity (Breusch-Pagan-Godfrey-Test), and structural breaks (Chow-Test) delivered satisfying results.

The estimation results showed that the income elasticities for Australia (1.64/2.64), Japan (2.13/3.10), and the USA (1.62/2.44) were greater in situations when the economy was in a slow-growth period whereas the opposite was true for Canada (1.44/0.87) and the EU-15 (2.14/1.39; see Table 2 for a summary). In the case of Japan, the different price elasticities (–0.30/–1.04) had the same pattern as the income elasticities.

[please insert Table 2 here]

For Australia, Japan, and the USA, the loss aversion concept provides the reason why consumer behaviour differs depending on the state of the economy. That is consumers will not reduce their consumption and travel plans in a slowdown period when they expect a recession and that price elasticity in Japan will remain very low in a slowdown period. Consumers hardly respond to increases in relative prices for travelling abroad and other luxury goods; this is most likely due to their incomes remaining high at the beginning of the slowdown period.

Consumption in these three source markets, especially expenditure on luxury goods, which includes travelling abroad, is reduced during a recession because economic conditions inevitably lead to such behaviour. In the recovery period, individuals expect income gains in the expansion period and instead of planning a possible increase in future travelling and consumption in the expansion period, they will immediately adjust their consumption level to its former level without waiting for the realized improvements.

In Japan, price elasticity is significantly higher during a recession than during a slowdown period because consumers/tourists tend to react more strongly to price changes in times of great

uncertainty about their economic future. Balancing out real income losses by seeking price advantages is another reason for increased price sensitivity. In the recovery period, price elasticity in Japan remains relatively high as income gains are not expected before the expansion period. During this economic stage, the realized positive income effects and improvements in credit facilities and labour market conditions lead to a decrease in price elasticity, which reaches a relatively low level.

In the cases of Canada and the EU-15, income elasticity in the fast-growth period is higher than it is in the slow-growth period. Individuals postpone a significant part of their positive consumption level adjustments from the recovery to the expansion period. Similarly, consumers have already reduced their consumption level in the slowdown period and do not wait until the recession starts. The reasons for this are primarily liquidity constraints and/or precautionary saving in the recovery and slowdown periods. It would be interesting to calculate the different magnitudes of the influence of liquidity constraints and the saving factor, but the separation of these two effects is very difficult as they seem to interfere with each other.

Estimates of the TVP Model

The estimation results of the TVP model are summarized in Figure 1 and Figure 2. The figures report the estimated income and price elasticities of the five source markets studied. Based on the results below, it is easy to recognize that the income elasticities of the five source markets (α_{2t}; see Equation (2) and Figure 1) are clearly time varying, although their development is different from the estimated elasticities according to Equation (1). In other words, the estimated income elasticities of the TVP model follow no pattern, which indicates cyclical fluctuations; this could be because the TVP approach may not be the best method to use to identify the cyclical feature of elasticities, although it can reflect long-term structural changes such as policy regime changes or changes in the demand structure of tourists.

[please insert Figure 1 and 2 here]

With respect to income elasticity, for Australia, Canada, and Japan, the values of the TVP model measured at the end of the estimation period were lower than the values obtained from the MGR models (for each of the two identified growth periods). For the EU-15, the income elasticity of the TVP model was located close to the value for the slow-growth period. In the case of the USA, the income elasticity of the TVP model was higher compared to the value obtained from the MGR model.

In terms of price elasticity, according to the TVP approach, Australia, Canada, EU-15, and the USA exhibited negative price elasticity while Japan's price elasticity was positive over the estimation period (Figure 2). However, the Japanese price elasticity was statistically insignificant,

which is consistent with the results obtained by Song *et al.* (2003) when examining the demand for Hong Kong tourism among residents of Japan.

The magnitudes of the price elasticities of the TVP and MGR models were similar in the cases of Canada (TVP model: –1.43; MGR model: –1.32) and the USA (TVP model: –1.09; MGR model: –0.95). For the EU-15 (–0.99; –0.59) and Australia (–0.93; –0.79), the values of the TVP model were greater than those of the MGR model. In the case of Japan, the MGR model showed significantly different and negative price elasticities for the different growth periods.

FORECASTING PERFORMANCE OF THE ESTIMATED MODELS

To evaluate the quality of the forecasting performance of the two chosen model types, we carried out an out-of-sample forecast for 2009 and 2010 using the model estimations only (with data up to the 4th quarter of 2008) and measured the forecasting performance separated by years; the latter aimed to assess the different performance patterns for the recession and recovery periods. In line with the MGR approach for each source market, different elasticities were used for the crisis year 2009 ("below the flexible trend") and the upturn year 2010 ("above the flexible trend"). Table 2 shows that incorporating different income elasticities depending on the state of the economy is an important factor when it comes to calculating forecast values in situations of strong economic fluctuations.

Forecasting performance was measured in terms of the mean absolute percentage error (MAPE). According to the MAPE results of the growth rate models, the forecasting performance was generally very good as 50% of the MAPEs were between 5% and 10% and 50% were below 5%. In general, the MAPE results were better for 2010 than for 2009. Analysed by country, the best results were found for the EU-15, the USA, and Canada.

[please insert Table 3 here]

The short-term forecasting performance of the TVP model was very poor, which contrasts with many other studies in which its forecasting performance generally outperformed other prominent forecasting approaches (see, for example, Li *et al.*, 2006; Song and Wong, 2003). The TVP approach delivered rather satisfying results with respect to the forecasting performance for 2010 only in the case of Australia. This MAPE result was also better than the result obtained from the MGR model.

The reason for the poor forecasting performance of the TVP approach for the years 2009 and 2010 might be that the structure of the TVP model, especially the supposed RW process of the parameters, is only good for capturing structural changes and not the strong cyclical fluctuations that we faced in the years 2009 and 2010. Therefore, further studies on alternative specifications

of the transition equations should attempt to improve the forecasting performance of the TVP model.

CONCLUSION

Based on the available dataset, the empirical evidence indicates that according to the MGR model, the income elasticity of each source market is not stable across the business cycle. With regard to price elasticity, the values were significantly different depending on the state of the economy only in the case of Japan. When evaluating the results on price elasticity, we have to consider that even when the aggregate price elasticities of the different business cycles are equal, the elasticity values may be asymmetric in each individual business cycle. Furthermore, it is also important to note that the asymmetric price effects might be clouded by the fact that only ex post data were available.

The main reasons why income elasticity may vary across the business cycle include loss aversion, liquidity constraints, and precautionary saving as well as the intensity and time structure of the substitution effects between expenditure on tourism imports, domestic tourism, and other goods and services. The estimation results show that the income elasticities for Australia, Japan, and the USA are greater when the economy is in a slow-growth period, whereas the opposite is true for Canada and the EU-15. In the case of Japan, the different price elasticities have the same pattern as the income elasticities.

For Australia, Japan, and the USA, the loss aversion concept delivers the main arguments for the fact that the consumer behaviour differs depending on the state of the economy. In the cases of Canada and the EU-15, the reasons for the varying elasticity across the business cycle are primarily liquidity constraints and precautionary saving in the recovery and slowdown periods.

The TVP approach clearly demonstrated that the income elasticities of the five source markets were time varying and were not stable in the estimation period, but they did not follow patterns that indicate cyclical fluctuations. The latter finding might be due to the fact that although the TVP approach can reflect long-term structural changes such as policy regime changes or changes in the demand structure of tourists, it may not be the best method to use to identify the cyclical feature of elasticities.

The forecasting performance of the MGR model using different elasticities depending on the state of the economy was very good: 50% of the MAPEs were between 5% and 10% and 50% were below 5%. In contrast to the MGR model applied here, the short-term forecasting performance of the TVP model was very poor.

The non-satisfying forecasting performance of the TVP model might have been due to the fact that the structure of the TVP model is only good for capturing structural changes and not the strong cyclical fluctuations that occurred in the crisis years of 2009 and 2010, which were characterized by a strong economic upturn. It is clearly demonstrated that in periods with strong fluctuations in economic activities, the MGR model provides an efficient approach to modelling the elasticity asymmetry across different stages of the business cycle. In order to improve the forecasting performance of the TVP model, further research that defines the transition equations of the TVP model in alternative manners would be desirable.

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Table 1. Econometric explanation of the changes of real tourism imports considering the different states of country-specific business cycles

$\Delta \ln M_t$	Australia	Canada	EU–15[a]	Japan	U.S.A.
Intercept	–0.92 (–0.51)		–1.35 (–1,90)		–0.73 (–0.74)
$\Delta \ln Y_t POS$	1.74 (3.59)	1.44 (5.10)	2.14 (8.14)	2.13 (4.77)	1.62 (5.25)
$\Delta \ln Y_t MIN$	2.64 (3.71)	0.87 (1.82)	1.39 (4.37)	3.10 (4.57)	2.44 (5.81)
$\Delta \ln(MP/DP)_t$	–0.79 –9.98)	–1.32 (–10.65)	–0.59 –2.69)		–0.95 (–16.67)
$\Delta \ln(MP/DP)_t POS$				–0.30 (–1.91)	
$\Delta \ln(MP/DP)_t MIN$				–1.04 (–6.52)	
AR (1)		0.53 (6.21)	0.59 (6.57)	0.21 (1.92)	
DUM1983		11.04 (3.04)			
DUM1986			7.52 (3.97)		
DUM1990		25.16 (6.94)			
DUM1991			–4.86 (–1.89)	29.61 (5.06)	
DUM1992			9.87 (5.46)		
DUM1994		–9.21 (–2.71)			
DUM2001	–12.84 (–4.47)				–12.46 (–5.02)
DUM2004	17.09 (4.90)			41.00 (5.39)	
DUM2006				–30.15 (–5.16)	
DUM2008	19.68 (5.51)				
	R^2 adj.= 0.74 D.W.= 1.58	R^2 adj.= 0.82	R^2 adj. = 0.75	R^2 adj. = 0.72	R^2 adj. = 0.77 D.W.= 1.58

POS: the dummy variables have a value of one in every quarter in which the economy grows faster than the flexible trend and a value of zero in every other quarter.

MIN: the dummy variables have a value of one in every quarter in which the economy grows slower than the flexible trend and a value of zero in every other quarter.

t = time index; t-statistics are in parentheses.

[a.] Excluding Austria.

Sources: IMF, OECD, UNWTO, estimations (generated by EViews 7.2).

Table 2. Income and price elasticities in the different growth periods

	Slow growth periods		Fast growth periods	
	Income elasticity	Price elasticity	Income elasticity	Price elasticity
Australia	2.64		1.64	
Canada	0.87		1.44	
EU-15	1.39		2.14	
Japan	3.10	–1.04	2.13	–0.30
USA	2.44		1.62	

Source: Author's calculations generated by EViews 7.2.

Table 3. Forecasting performance of the MGR model in terms of the MAPE

	Out-of-sample forecasting performance			
	2009		2010	
	GRM	TVP	GRM	TVP
Australia	6.45	21.86	10.16	5.98
Canada	6.35	33.24	2.71	21.01
EU-15	3.41	20.51	3.15	143.3
Japan	7.33	158.16	5.79	52.75
USA	3.34	27.40	2.55	80.75

Source: Authors' calculations generated by EViews 7.2.

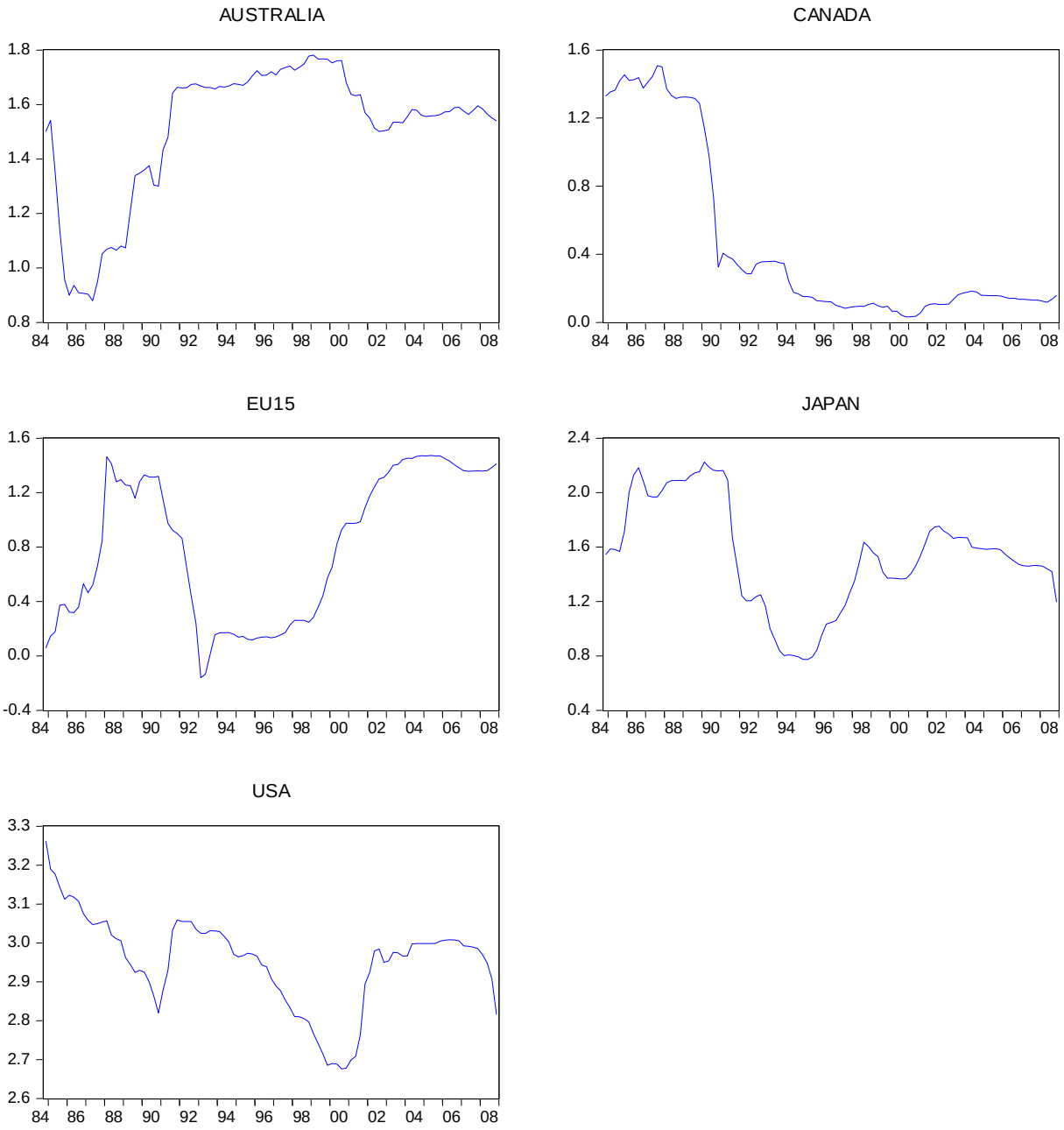

Figure 1. Estimates of TVP Income Elasticities

Source: Authors' calculations.

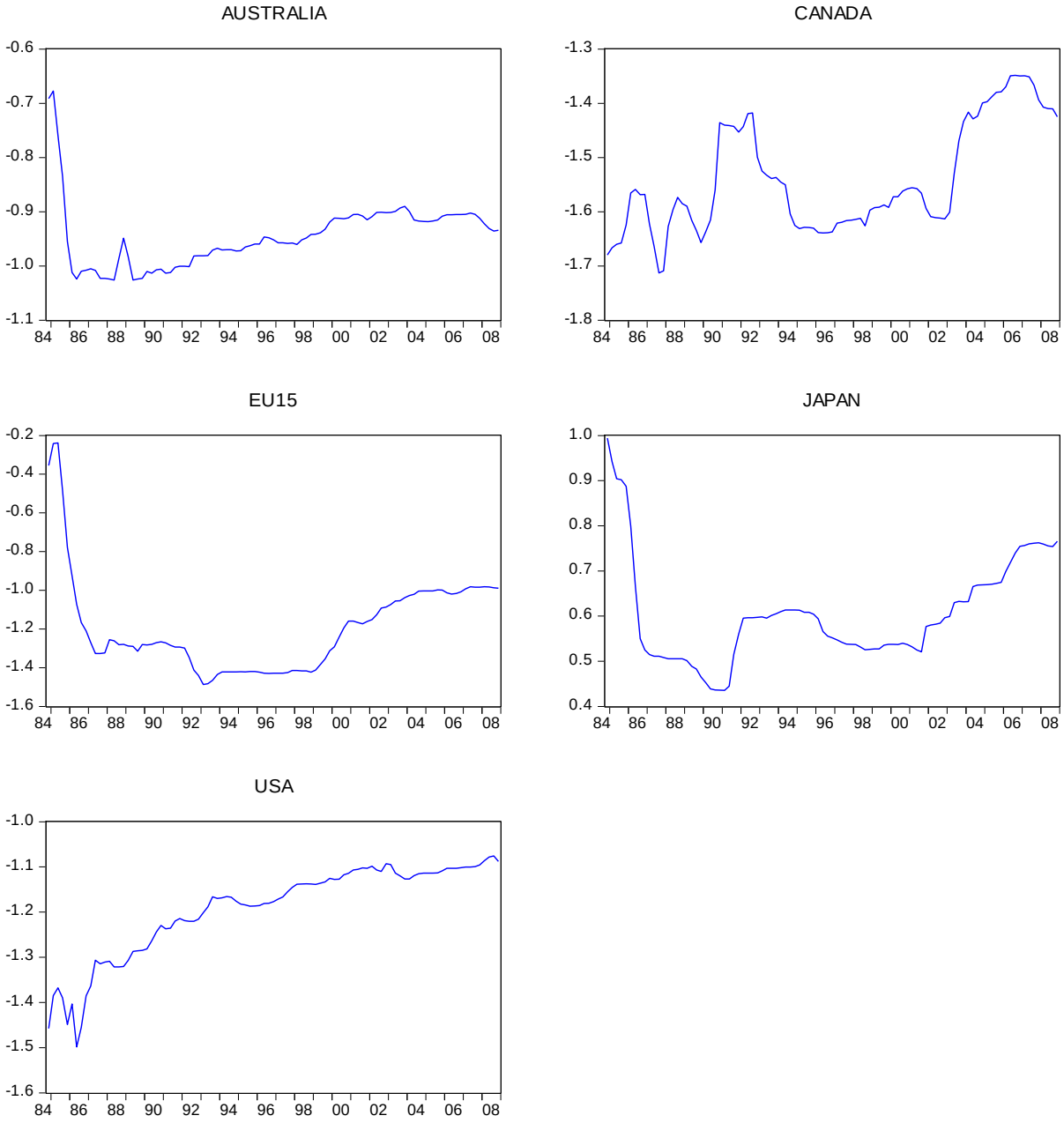

Figure 2. Estimates of TVP Price Elasticities

Source: Authors' calculations.