Modelling the Volatility in Country Risk for Small Island Tourism Economies

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Abstract: Small Island Tourism Economies (SITEs) differ significantly in their size, location, political systems, historical experience, economic prospects, ecological fragility, and vulnerability to ethnic conflicts, crime, and the threat of global terrorism. Given these differences, a careful analysis of country risk and its components for the SITEs is of great interest to private tourism operators and foreign direct investors in the tourism and hospitality industry, tourism commissions and governments. This paper provides a comparison of country risk ratings, risk returns and associated volatilities for six SITEs for which monthly data compiled by the International Country Risk Guide are available. Monthly economic, financial, political and composite country risk returns are used to estimate symmetric and asymmetric models of univariate conditional volatility. The empirical results provide a comparative assessment of the conditional means and volatilities associated with country risk returns across the six SITEs.

Keywords: *Island economies, small size, vulnerability, volatility, GARCH, GJR, asymmetry, shocks, regularity conditions, risk ratings, risk returns.*

1. INTRODUCTION

Country risk refers broadly to the likelihood that a sovereign state or borrower from a particular country may be unable and/or unwilling to fulfil their obligations towards one or more foreign lenders and/or investors (Krayenbuehl, 1985). The Third World debt crisis in the early 1980s, political changes resulting from the end of the Cold War, the implementation of market-oriented economic and financial reforms in Eastern Europe, the East Asian and Latin American crises that have occurred since 1997, and the tumultuous events flowing from 11 September 2001 indicate that the risks associated with engaging in international relations have increased substantially. Such risks have become more difficult to analyse and predict for decision makers in the economic, financial and political sectors.

A primary function of country risk assessment is to anticipate the possibility of debt repudiation, default or delays in payment by sovereign borrowers (Burton and Inoue, 1985). There are three major components of country risk, namely economic, financial and political risk. The country risk literature holds that economic, financial and political risks affect each other. Country risk assessment evaluates economic, financial, and political factors, and their interactions in determining the risk associated with a particular country. Perceptions of the determinants of country risk are important because they affect both the supply and cost of international capital flows (Brewer and Rivoli, 1990).

The importance of country risk analysis is underscored by the existence of several prominent country risk rating agencies. Over the last two decades, commercial agencies such as Moody's, Standard and Poor's, Fitch IBCA, Euromoney, Institutional Investor, Economist Intelligence Unit, International Country Risk Guide, and Political Risk Services, have compiled country risk indexes or ratings as measures of credit risk associated with lending and/or investing in a country (for a critical survey of the country risk rating systems, see Hoti and McAleer (2003)). Country risk ratings are crucial for countries seeking foreign investment and selling government bonds on the international financial market, and for lending and investment decisions by large corporations and international financial institutions. These agencies provide qualitative and quantitative country risk ratings, combining information about arbitrary measures of economic, financial and political risk ratings to obtain a composite risk rating.

The country risk literature has recently been reviewed in Hoti and McAleer (2003), in which 50 empirical papers published in the last two decades were evaluated according to established statistical and econometric criteria used in estimation, evaluation and forecasting. Such an evaluation permitted a critical assessment of the relevance and practicality of the economic, financial and political theories pertaining to country risk in general. However, to date there has been no discussion of country risk in Small Island Tourism Economies (SITEs). As SITEs share a number of common characteristics, it is important to examine risk ratings and risk returns for such countries.

Risk ratings and risk returns of six SITEs are examined in this paper, these being the only SITEs for which monthly International Country Risk Guide (ICRG) risk ratings and risk returns are available.

Following the ICRG classification, the six SITEs represent two geographic regions, namely North and Central America (the Bahamas, Dominican Republic, Haiti and Jamaica) and West Europe (Cyprus and Malta). These island economies have delicate ecosystems, and are consistently threatened by natural disasters as well as the effects of environmental damage. Careful planning is required to maintain sustainability of tourism and to limit its environmental damage. Although tourism has contributed significantly to economic development in many SITEs, they need to be managed responsibly to secure long-term sustainability.

Tourism forms the economic foundation of SITEs, with tourism earnings accounting for a significant proportion of the value added in the national product. The fundamental aim of tourism development is to increase foreign exchange earnings relative to finance imports. These SITEs rely heavily on service industries, with tourism accounting for the highest proportion in export earnings. A large proportion of tourism earnings is exported to finance imports to sustain the tourism industry. Labour is also imported for employment in tourism, which results in substantial foreign exchange outflows.

The squared deviation from the mean GDP growth rate is known as the volatility of GDP growth. In SITEs, the volatility of GDP growth rate tends to be very high. According to the Commonwealth Secretariat/World Bank Joint Task Force on Small States (2000), the high volatility in the GDP growth rate of SITEs is due to the openness to world markets, limited resource bases, susceptibility to changes in international market conditions, a small range of uncompetitive exports, and affliction to natural disasters which affect every activity within the economy. Armstrong and Read (1998) state that the most prominent features of SITEs are their narrow productive base and small domestic market. There is less incentive to diversify industry when the domestic market is small. During the last decade, tourism-related exports among SITEs have soared.

Vulnerability involves exposure to exogenous shocks and low resilience to recover from such shocks. SITEs are less likely to be resilient to these shocks. Given the narrow economic structures and limited resources, SITEs are less likely to be resilient to these shocks. Vulnerability can exist in the form of economic, financial and political factors. Economic and financial vulnerability examines the narrow productive base, the susceptibility of the economy to external shocks, and the high incidence of natural disasters, and depend on, among others, GDP per capita, real GDP growth rate, inflation rate, budget balance as a percentage of GDP, current account as a percentage of GDP, foreign debt as a percentage of the GDP, foreign debt service as a percentage of exports of goods and services, current account as a percentage of exports, net international liquidity import cover, and exchange rate stability. Strategic vulnerability accounts for the political vulnerability to their colonial history, as well as their larger neighbours, and depends on a wide variety of political factors.

The range of production of goods and services in SITEs is narrow, a wide range of goods and services is consumed for international trade, and the proportion of trade to GDP is high. Terms of trade for SITEs do not exhibit irregular changes when compared with larger developing countries. The reliance of SITEs on their import tariff receipts as a major source of government revenue can be hampered in any trade liberalisation measure, which can also result in unsustainable government debt.

A common feature of SITEs is that they depend heavily on foreign aid to finance development. Aid flows have dropped sharply during the last decade of the 20^{th} Century, due to the collapse of communism in Europe. Moreover, SITEs have limited access to commercial borrowings because they are perceived to suffer from frequent natural disasters or for other reasons considered to be high risk. For these reasons, it is essential to analyse the risk ratings and risk returns of SITEs.

Even with relatively low levels of indebtedness, SITEs generally face difficulties in borrowing on commercial terms. The costs of obtaining information on the economy and high country risk issues are major impediments to borrowing. Difficulties in prosecuting illegal activities in SITEs make contract enforcement costly for investors, contribute to the high costs of borrowing for SITEs, and prevent a smooth integration of SITEs into international financial capital markets.

The plan of the paper is as follows. Section 2 discusses aspects of country risk assessment, with particular emphasis on the ICRG rating system regarding economic, financial, political and composite risk ratings. Section 3 provides a detailed analysis and comparison of the risk ratings, risk returns and associated volatility for six SITEs for which monthly ICRG data are available. Symmetric and asymmetric models of univariate conditional volatility for country risk returns are presented in Section 4. The empirical results are discussed in Section 5, and some concluding remarks are given in Section 6.

2. COUNTRY RISK ASSESSMENT

In the finance and financial econometrics literature, conditional volatility has been used to evaluate risk, asymmetric shocks, and leverage effects. The volatility present in risk ratings also reflects risk considerations in risk ratings. As risk ratings are effectively indexes, their rate of change (or returns) merits attention in the same manner as financial returns (for further details, see Chan, Hoti and

McAleer (2002)). This paper provides a comparison of country risk ratings, risk returns and associated volatilities for the six SITEs. The ratings were compiled by the ICRG, which is the only risk rating agency to provide detailed and consistent monthly data over an extended period for a large number of countries.

As of December 2003, the ICRG has been providing economic, financial, political and composite risk ratings for a total of 140 countries. The ICRG rating system comprises 22 variables representing the three major components of country risk, namely economic, financial and political. These variables essentially represent risk-free measures. There are 5 variables representing each of the economic and financial components of risk, while the political component is based on 12 variables.

Economic risk rating measures a country's current economic strengths and weaknesses. This permits an assessment of the ability to finance its official, commercial, and trade debt obligations. Financial risk rating is another measure of a country's ability to service its financial obligations. Political risk rating measures the political stability of a country, which affects the country's ability and willingness to service its financial obligations.

3. RISK RATINGS, RISK RETURNS AND VOLATILITIES FOR SIX SITES

Risk returns are defined as the monthly percentage change in the respective risk ratings. Volatility is defined as the squared deviation of each observation from the respective sample mean risk ratings or risk returns. [Risk ratings, risk returns and the associated volatilities for the six SITEs are available on request.]

As there are significant differences among the economic, financial, political and composite risk ratings, risk returns and their associated volatility across different SITEs, a careful analysis of each of these components of country risk is of great interest to private tourism operators and foreign direct investors in the tourism and hospitality industry, tourism commissions and governments.

Information regarding the economic, financial and political environments for the six selected SITEs has been collected and extended from four widely-used international sources, namely the US Department of State: Countries and Regions [http://www.state.gov/countries/], BBC News: Country Profiles and Timeline [http://news.bbc.co.uk/1/shared/bsp/hi/country_profiles/html/default.stm], The Economist: Country Briefings [http://www.economist.com/countries/], and The World Factbook 2002, prepared by the Central Intelligence Agency [http://www.odci.gov/cia/publications/factbook/index.html].

4. UNIVARIATE MODELS OF CONDITIONAL VOLATILITY FOR COUNTRY RISK RETURNS

This section discusses alternative models of the volatility of the logarithmic difference in country risk ratings, that is, risk returns, using the Autoregressive Conditional Heteroscedasticity (ARCH) model proposed by Engle (1982), as well as subsequent developments in Bollersllev (1986), Bollerslev et al. (1992), Bollerslev et al. (1994), and Li et al. (2002), among others. The most widely used variation for symmetric shocks is the generalised ARCH (GARCH) model of Bollerslev (1986). In the presence of asymmetric behaviour between positive and negative shocks, the GJR model of Glosten et al. (1992) is also widely used. Ling and McAleer (2002a, 2002b, 2003) have made further theoretical advances in both the univariate and multivariate frameworks.

Consider the following AR(1)-GARCH(1,1) model for risk returns, Y_t :

$$Y_t = \theta_0 + \theta_1 Y_{t-1} + \varepsilon_t , \qquad |\theta_1| < 1 \qquad (1)$$

where the unconditional shocks, ε_t, are given by:

$$\varepsilon_t = \eta_t \sqrt{h_t} , \qquad \eta_t \sim iid(0,1) \qquad (2)$$

$$h_t = \omega + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1}$$

and $\omega > 0$, $\alpha \geq 0$ and $\beta \geq 0$ are sufficient conditions to ensure that the conditional variance $h_t > 0$. The ARCH (or α) effect captures the short-run persistence of shocks, while the GARCH (or β) effect measures the contribution of shocks to long-run persistence, $\alpha + \beta$. In equations (5) and (6), the parameters are typically estimated by maximum likelihood to obtain Quasi-Maximum Likelihood Estimators (QMLE) in the absence of normality of η_t .

The conditional log-likelihood function is given as follows:

$$\sum_t \ell = -\frac{1}{2}\sum_t \left(\log h_t + \frac{\varepsilon_t^2}{h_t} \right). \qquad (3)$$

It has been shown by Ling and McAleer (2003) that QMLE of GARCH (*p*,*q*) is consistent if the second moment is finite. The well known necessary and sufficient condition for the existence of the second moment of ε_t for GARCH(1,1) is:

$$\alpha + \beta < 1, \qquad (4)$$

which is also sufficient for consistency of the QMLE. Jeantheau (1998) showed that the weaker log-moment condition is sufficient for consistency of the QMLE for the univariate GARCH *(p,q)* model. Hence, a sufficient condition for the QMLE of GARCH(1,1) to be consistent and asymptotically normal is given by:

$$E[\log(\alpha\eta_t^2 + \beta)] < 0 . \quad (5)$$

McAleer et al. (2002) argue that this conclusion is not straightforward to check in practice as it involves the expectation of an unknown random variable and unknown parameters. Moreover, the second moment condition is far more straightforward to check in practice, although it is a stronger condition.

The effects of positive shocks on the conditional variance h_t are assumed to be the same as negative shocks in the symmetric GARCH model. Asymmetric behaviour is captured in the GJR model, for which GJR(1,1) is defined as follows:

$$h_t = \omega + (\alpha + \gamma I(\eta_{t-1}))\varepsilon_{t-1}^2 + \beta h_{t-1} \quad (6)$$

where $\omega > 0$, $\alpha + \gamma \geq 0$ and $\beta \geq 0$ are sufficient conditions for $h_t > 0$, and $I(\eta_t)$ is an indicator variable defined by:

$$I(\eta_t) = \begin{cases} 1, & \eta_t < 0 \\ 0, & \eta_t \geq 0 . \end{cases} \quad (7)$$

The indicator variable distinguishes between positive and negative shocks such that asymmetric effects are captured by γ, with $\gamma > 0$. In the GJR model, the asymmetric effect, γ, measures the contribution of shocks to both short run persistence, $\alpha + \gamma/2$, and long run persistence, $\alpha + \beta + \gamma/2$. The necessary and sufficient condition for the existence of the second moment of GJR(1,1) under symmetry of η_t is given in Ling and McAleer (2002b) as:

$$\alpha + \beta + \gamma/2 < 1. \quad (8)$$

The weaker sufficient log-moment condition for GJR(1,1) is as follows:

$$E[(\log((\alpha + \gamma I(\eta_t))\eta_t^2 + \beta)] < 0 , \quad (9)$$

in McAleer et al. (2002), who also demonstrate that the QMLE of the parameters are consistent and asymptotically normal if the log-normal condition is satisfied.

5. EMPIRICAL RESULTS

All the estimates in this paper are derived using EViews 4. The Berndt, Hall, Hall and Hausman (BHHH) (1974) algorithm has been used in most cases, but the Marquardt algorithm is used when the BHHH algorithm does not converge.

Risk returns and volatilities for the six SITEs are estimated using the univariate AR(1)-GARCH(1,1) and AR(1)-GJR(1,1) models. The monthly ICRG data for the Bahamas and Cyprus are available from December 1984 to May 2002, Dominican Republic, Haiti and Jamaica from January 1984 to May 2002, and Malta from April 1986 to May 2002.

The second moment conditions for the AR(1)-GARCH(1,1) and AR(1)-GJR(1,1) models are the empirical versions of (4) and (8), respectively, while the log-moment conditions are the empirical versions of (5) and (9), respectively. Asymptotic and robust t-ratios are reported for the QMLE (see Bollerslev and Wooldridge (1992) for the derivation of the robust standard errors). There is no algebraic relationship between the asymptotic and robust t-ratios, though the robust t-ratios are expected to be generally smaller in absolute value, especially in the presence of extreme observations and outliers.

The short-run persistence (α) and the contribution of the shocks to long-run persistence (β) are positive fractions in 11 and 18 cases, respectively, for the GARCH(1,1) model. There are 6 cases, namely the Bahamas, Cyprus and Haiti for economic risk returns, Jamaica for financial risk returns, Malta for political risk returns, and Haiti for composite risk return, where both the α and β estimates are positive fractions. In these cases, the short-run persistence of previous shocks on risk returns is smaller than the contribution of these shocks to the long-run persistence. The log-moment condition is satisfied in 10 of the 24 cases, while the second moment condition is satisfied 21 times. Only in the case of Jamaica for composite risk returns is the second moment condition not satisfied and the log-moment condition could not be computed. Except for this case, the consistency and asymptotic normality of the QMLE are guaranteed, even in the presence of infinite second moments. Generally, the log-moment condition is satisfied when the second moment condition is not, and the second moment condition is satisfied for all cases when the log-moment condition could not be computed.

For the GJR(1,1) model, only 3 of the 24 γ estimates are significant. The average short-run persistence ($\alpha+\gamma/2$) and the contribution of shocks to long-run persistence (β) estimates are positive fractions in 16 and 20 cases, respectively. Specifically, the $\alpha+\gamma/2$ and β estimates are both positive fractions in 13 cases, namely the Bahamas, Cyprus, Haiti and Jamaica for economic risk returns, the Bahamas, Cyprus, Dominican Republic, Haiti and Jamaica for financial risk returns, the Bahamas for political risk returns, and Cyprus, Haiti and Jamaica for composite risk returns. In general, the short-run persistence of the shocks in these risk returns is lower than the contribution of the shocks to long-run persistence. Of the three significant γ estimates, those for Cyprus and Haiti for economic risk returns are positive, while the estimate for the Dominican Republic for political risk returns is negative. This implies that the short-run and long-run effects of a negative shock in the political risk returns will result in less uncertainty in subsequent periods for the Dominican Republic. While the second moment condition is satisfied 22 times, the log-moment condition is satisfied 9 times. However, the log-moment condition is satisfied when the second moment condition is not, and the second moment condition is satisfied in all cases when the log-moment condition could not be computed. As a result, the consistency and asymptotic normality of the QMLE are guaranteed in all cases, even in the presence of infinite second moments.

The paper also reports the preferred model for the six SITEs by risk return. For economic risk returns, GJR(1,1) is superior to GARCH(1,1) for Cyprus, Haiti and Jamaica, even though the γ estimate for Jamaica is insignificant. GARCH(1,1) model is preferred only for the Bahamas, while neither model is preferred for the Dominican Republic and Malta.

For financial risk returns, the GARCH(1,1) model is preferred only for Jamaica, and neither model is favoured for Malta. Overall, the GJR(1,1) model is superior to GARCH(1,1) model for the Bahamas, Cyprus, Dominican Republic and Haiti, even thought all the γ estimates are insignificant.

Unlike the case of the economic and financial risk returns, neither model is preferred for political risk returns in four cases, namely Cyprus, Dominican Republic, Haiti and Jamaica. The GARCH(1,1) model is favoured for Malta, while the GJR(1,1) model is superior for the Bahamas, even though the γ estimate for the Bahamas is insignificant.

For composite risk returns, GJR(1,1) is superior to GARCH(1,1) for Cyprus and Jamaica, although the γ estimates for both countries are insignificant. The GARCH(1,1) model is preferred for Haiti, while neither model is suitable for the composite risk returns for three countries, namely the Bahamas, Dominican Republic and Malta.

Overall, for the six SITEs, the GJR(1,1) model is suitable in 10 cases (even though the γ estimates in 8 cases were insignificant), the GARCH(1,1) model is suitable in 4 cases, and neither model is preferred in 10 cases.

In summary, the empirical results show that the univariate GARCH(1,1) and GJR(1,1) estimates are statistically adequate for the six SITEs. The regularity conditions are typically satisfied, with the conditions regarding β (the contribution to long-run persistence) and second moments satisfied in a high proportion of cases. Either GARCH(1,1) or GJR(1,1) is found to be statistically adequate in 14 of 24 cases. One of the two volatility models is determined as being adequate for 5 of 6 SITEs in the case of financial risk returns, in 4 of 6 cases for economic risk returns, in 3 of 6 cases for composite risk returns, and in 2 of 6 cases for political risk returns. The preferred models for each risk return for each country are given in Table 1.

6. CONCLUSION

This paper provided a comparison of country risk ratings, risk returns and associated volatilities for six Small Island Tourism Economies (SITEs) for which monthly ICRG data were available. Aspects of country risk assessment, with particular emphasis on the ICRG rating system regarding economic, financial, political and composite risk ratings, were discussed in detail. For each of the six SITEs, the trends and associated volatility of the four country risk ratings and risk returns were analysed according to economic, financial and political environments in the country. There were substantial differences in the trends of the risk ratings, risk returns and their associated volatilities.

Monthly ICRG risk returns were used to estimate symmetric and asymmetric models of univariate conditional volatility. The empirical results showed that the univariate GARCH(1,1) and GJR(1,1) models are statistically adequate for the six SITEs. The regularity conditions were typically satisfied, with the conditions regarding the contribution to long-run persistence and second moments satisfied in a high proportion of cases. Either GARCH(1,1) or GJR(1,1) was found to be statistically adequate in 14 of 24 cases. This was a particularly strong empirical finding, especially as these models of volatility have not been customized for any particular SITE, but have been applied generically to all six SITEs.

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Table 1: Preferred Model for Six SITEs by Risk Return

Country	Economic	Financial	Political	Composite
The Bahamas	GARCH	GJR*	GJR*	X
Cyprus	GJR	GJR*	X	GJR*
Dominican Republic	X	GJR*	X	X
Haiti	GJR	GJR*	X	GARCH
Jamaica	GJR*	GARCH	X	GJR*
Malta	X	X	GARCH	X

Notes: GJR* refers to cases when the γ estimate for a particular risk return was insignificant, but the GJR(1,1) estimates were superior to their GARCH(1,1) counterparts. X refers to cases where neither model is preferred.