Exchange rate volatility and tourism – revisiting the nature of the relationship

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Abstract

Tourism literature mainly argues that exchange rate volatility signals risk associated with a destination, which may cause tourists to refrain from visiting the destination and/or cancel their trips. This is especially true if the cause of volatility is seen as a result of political unrest or instability. However, not all volatility is due to country-specific factors and the volatility of the South African rand (ZAR) is an example of this phenomenon. Because of the floating nature of the currency, sharp depreciations in the value of the ZAR have been felt during crises times. Since the ZAR volatility is not always associated with adverse political conditions, it is postulated that volatility may influence spending in South Africa, and not only arrivals. This paper therefore investigates the relationship between exchange rate volatility and international tourism to South Africa. Volatility is modelled using GARCH models, while the influence thereof on tourism is modelled using an autoregressive distributed lag model (ADL) and a bounds test approach. Results support the notion that spending is more consistently influenced by volatility than arrivals.

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Keywords: Tourism demand; exchange rates; South Africa; GARCH-models; ADL-models; cointegration

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Introduction

Tourism has been accepted by the South African government in its key economic policy document, the New Growth Path, as one of the key drivers for the creation of wealth and economic empowerment. This is supported by the fact that, internationally, tourism is acknowledged as one of the world's fastest-growing industries, which, if managed

responsibly, can stimulate economic and social change in countries that is dependent on primary product exports (WTTC, 2012). Du Preez and Witt (2003) state that tourism demand of countries located in the same general area and operating under similar economic, political and social conditions is likely to be affected in a similar manner by economic and environmental factors. One

factor that is often identified as having an influence on tourism to a specific destination is the relative price competitiveness of the destination. In this regard not only the relative price indices are normally considered, but also the exchange rate (Santana-Gallego, Ledesma-Rodriguez & Perez-Rodrigues, 2010).

Since the fall of the Bretton Woods system, exchange rates have become increasingly volatile, making it difficult to predict the cost of international trade in products and services. Park and Jei (2010) concur that exchange rate volatility can have a significant effect on both public and private sectors of the economy. Research by Schnabl (2009) suggests that emerging markets with fixed exchange rates grow faster, since fixed exchange rates have a positive impact on international trade, interest rates and macroeconomic stability. In the case of South African, the local currency (the South African rand – ZAR) is allowed to float freely. This has caused the ZAR to experience substantial volatility over the past two decades, ranging from sharp depreciations during the Russian and Argentine crises, to appreciations between 2003 and 2006, followed again by a spell of depreciation exacerbated by the financial crisis.

The tourism literature mainly argues that exchange rate volatility signals risk associated with a destination, which may cause tourists to

refrain from visiting the destination and/or cancel their trips (Webber, 2001). This is especially true if the cause of volatility is seen as a result of political unrest or instability – which is not always the case in South Africa. The question that can be raised is: what impact does this exchange rate volatility have on South Africa's tourism?

When the ZAR experienced a sharp appreciation, the Tourism Update (2005) in South Africa reported that major tour operators have indicated a drop in sales as a result of the strong exchange rate and many feared the adverse impact that the strong ZAR may have on the blooming South African tourism industry. Yet, despite the strength of the ZAR during from 2003 to 2006, South Africa reported an average growth rate of 9% per year in the number of tourist arrivals.

Since the ZAR volatility is not always associated with adverse political conditions, it is postulated that volatility may influence not only arrivals to South Africa, but also spending in the country. This paper therefore investigates the relationship between exchange rate volatility and international tourism arrivals to and spending in South Africa. Volatility is modelled using GARCH models, while the influence thereof on tourism is modelled using an autoregressive distributed lag specification with an error-correction term.

Figure 1. The growth of international tourism arrivals in South Africa 1994-2010
(Source of data: Statistics South Africa)

Figure 2. *Spending in South Africa (2003-2008)* Source of data: South African Tourism

Background to South Africa's tourism industry and the exchange rate regimes

The tourism industry

On the African continent, South Africa attracts the second most international tourists, only slightly less popular than Morocco, which makes tourism one of the largest industries in South Africa. The WTTC (2012b) indicated that the travel and tourism economy in South Africa contributed approximately 8.7% to the Gross Domestic Product (GDP) during 2011 and that it is expected to grow by an average rate of almost 4% per year. This increase in tourism's contribution to the economy is motivated by the strong recovery in arrivals after the country experienced the first significant decline in arrivals in 20 years during the 1998 world recession (see Figure 1).

South Africa's primary intercontinental markets remain the UK, USA, Germany, the Netherlands, France, and Australia. If one looks at African markets, the important markets remain Southern African Development Community (SADC) countries and specifically Zimbabwe, Lesotho, Mozambique, Swaziland, Botswana, and Namibia. From Figure 1 it is clear that international arrivals to South Africa increased from less than 4 million in 1994, to almost 10 million in 2007. During 2010, arrivals again exceeded 8 million – more than double the number received during 1994. It is also evident that although there has been years

when arrivals stagnated (i.e. 1997 and 2001), the only major fall in arrivals was activated by the world recession of 2008.

However, the average spending by tourists in South Africa does not reveal the same pattern. During the years of the appreciation, average spending by tourists in South Africa stagnated, and it only started to increase again during 2008. Figure 2 illustrates the average spending of a typical tourist in South Africa from various source markets, from 2003 to 2008.

Exchange rate regimes in South Africa

Since the termination of the Bretton Woods System in the 1970s, which saw the end of a long era of fixed and stable exchange rates, currencies worldwide have experienced more turbulence and changes. In South Africa, Van der Merwe (2003) identifies four distinct phases or decades of exchange rate regimes and monetary arrangements since the fall of the Bretton Woods system, namely:

- The 1970s – Direct monetary controls and the desire to maintain stability in the exchange rate.
- The 1980s – The transition to more market-oriented measures and money supply targets.
- The 1990s – Informal inflation targeting and a managed floating exchange rate regime.
- From 2000 – Formal inflation targeting and a floating exchange rate regime.

The policy applied in the first period led to unsuccessful results in terms of price stability, balance of payments outcomes and economic and employment growth. This instigated an investigation into the monetary system and lead to the subsequent findings by “The Commission of Inquiry into the Monetary System and Monetary Policy in South Africa” (the de Kock Commission).

The second period saw the implementation of the findings of the de Kock Commission, with a more market-orientated approach and less capital control restrictions. However, the deepening of sanctions against the country in 1985 led to the reinstatement of a dual exchange rate system – the commercial rand and financial rand. Political changes in the 1990s led to South Africa’s reintroduction in the world financial system. In 1995 the financial rand was abolished and exchange controls on residents were gradually relaxed (van der Merwe, 2003). This left South Africa with one exchange rate, which proved to be increasingly volatile in a volatile global environment.

After a period of initial stability, the ZAR started to show weakness in February 1996 and between the end of March 1996 and April 1996,

the effective exchange rate of the ZAR plummeted by approximately 8%. In the first 6 months of 1996 the ZAR lost 15.7% to a basket of currencies. The introduction of a new economic policy plan for South Africa saw a change in sentiment towards the ZAR and the currency kept its ground throughout the early days of the Asian crisis in 1997. But the first couple of months in 1998 saw the ZAR shedding approximately 8% of its value. The Russian crisis, coupled with the end of term of the Reserve Bank governor (often referred to as the Mboweni bump), sucked South Africa backed into the vortex with the ZAR shedding 23.2% of its value against the dollar from May to July 1998 (see Figure 3) (Steyn, 2004).

More emerging market crises (for example Brazil in 1999 and Argentina in 2001/2) lead to greater world financial instability and affected the value of the ZAR (see Figure 3). Steyn (2004) states that one lesson learned from all these crises is that it does not succeed to try and manage the value of the exchange rate if there is pressure on it to weaken. This led the Reserve Bank to implement a formal inflation targeting approach and a flexible exchange rate in February 2000.

Figure 3. Rand/dollar monthly exchange rate movements (ZAR for US\$1)
(Source of data: South African Reserve Bank)

It was generally expected that the ZAR would depreciate gradually against developed country currencies (such as the dollar and the euro), but since the end of 2002 the ZAR has recovered strongly against both the dollar and the euro and it has kept its ground until the start of the financial crisis. This has obviously led to various concerns regarding the level of the exchange rate and the competitiveness of South African exports and also the tourism industry's competitiveness during that time. The Reserve Bank and government has been under pressure from, amongst others, labour unions and the mining houses, to intervene in market and devalue the currency in order to stimulate export and job creation. The financial crisis saw a sharp depreciation again, although the over-reaction soon cleared and the currency returned to its pre-crisis levels.

The influence of exchange rates on tourism demand

Tourism demand may be defined as the number of persons who travel, or wish to travel, to use tourist facilities and services at places away from their places of work and residence (Page, 2003). In contrast, more economic-focused definitions of demand is primarily concerned with the schedule of the amount of any product or service which people are willing and able to buy at each specific price in a set of possible prices during a specific period of time (Cooper, Fletcher, Gillbert & Wanhill, 1998). Demand for tourism forms a part of private household consumption. To be more specific Lim (1996, 1997) indicated that tourism demand refers to the demand for tourism-orientated products which include accommodation, entertainment, transport and other services. The demand is therefore influenced by the cost factors associated with the destination.

To this effect Divisekera (2003) indicated that because tourism services are bought at the point of supply (destination) transport cost form a large proportion of the expenditure. Coupled with this are the costs associated with the consumption of tourism goods and services at a given destination (country costs). Hence prices (costs) associated with demand are two-fold – country cost and travel cost. Webber (2001) mentions two components of country

cost whilst at the destination, also known as cost of living, namely exchange rates and destination country prices. Lim (1997) confirms that exchange rates are often introduced into tourism demand models in addition to, and separately from, the relative price available.

In terms of the influence of exchange rates on tourism demand, Santa-Gallego *et al.* (2010) mention that a more fixed exchange rate regime reduces uncertainty and is therefore expected to increase international trade and therefore also international tourism. Their research results support this notion, with a less flexible exchange rate promoting tourism. Lim (2004) found that a depreciation of the South Korean Won against the Australian dollar had significant adverse effects on travel to Australia. This has led to Koreans travelling closer to home. Although most studies that introduce exchange rates in tourism demand analysis, the volatility component is not included (see for example Kulendran and King, 1997; du Preez and Witt, 2003; Song, Witt and Jansen, 2003; Lim and McAleer, 2002; Lim, 2004; Kulendran and Witt, 2001; Smeral and Weber, 2000; Oh and Ditton, 2006).

Webber (2001) rightfully states that the impact of the exchange rate volatility on tourism demand has not been investigated fully. Ten years later Chang, McAleer, Lim (2012) confirm this statement. The evidence on the influence of exchange rate volatility on international trade is more readily available, although Santa-Gallego *et al.* (2010) note that empirical results of the effect of exchange rate volatility on trade are inconclusive.

In the tourism literature, only a limited number of studies analyses volatility. Amongst these, the volatility of tourism arrivals is prominent, with research by Park and Jei (2010), Chang and McAleer (2010) and Chang *et al.* (2012). Park and Jei (2010) indicated that determinants of volatility of tourism demand are country specific.

Two prominent papers focussing on the influence of exchange rate volatility on tourism is that by Webber (2001) and Chang and McAleer (2010). Webber (2001) sees the influence of volatility on tourism as follows: A

risk-averse tourist prefers a stable exchange rate and prices and may cancel his/her trip if there is too much volatility or substitute one destination for another. Conversely a risk-seeking tourist may see the exchange rate volatility as an opportunity if luck runs his/her way. Volatility in the exchange rate as a result of political unrest and instability may also lead to cancellations. He notes that this aspect is especially true for many developing countries.

The research by Webber (2001) indicated amongst other, the following results for Australian outbound tourism:

- Exchange rate volatility is likely to cause tourists to abandon holidaying in a particular country in 40% of the case.
- Changes in the exchange rate are likely to have a similar impact on tourist destination choice as relative price changes.
- Tourists do look at other markets and products and exchange rate volatility could lead to cancellations.
- Prices at the destination relative to prices at home are an important determinant of tourism choices.

Chang and McAleer (2010) finds that volatility in the exchange rate can be interpreted as risk associated with shocks to the world, and that it leads to negative volatility effects in tourist arrivals in Taiwan. It is evident from literature, that volatility of the exchange rate can be seen as a risk which, according to Chang *et al.* (2012) is under-researched and is seen as relatively new to tourism research. These authors also state that knowledge on understanding volatility is important for tourism management and informed policy decision-making. From the above it can be concluded that little research has been done on exchange rate volatility and its effect on tourism, with the focus thus far on the influence of volatility on arrivals.

Method

Model specification and variables

This research focuses on the influence of exchange rate volatility on tourism demand, as measured by (i) tourist expenditure and (ii) tourist arrivals. To this means, tourism demand

is defined in terms of real income ($\frac{Y_i}{P_i}$) and

relative prices ($\frac{P_j}{P_i}$ and $\frac{P_j^s}{P_i}$), where the latter refers to the relative price of substitute destinations, with exchange rate volatility included (V_j) (adapted from Bonham et al., 2009: 533):

$$D_{ij} = F\left(\frac{Y_i}{P_i}, \frac{P_j}{P_i}, \frac{P_j^s}{P_i}, V_j\right) \quad (1)$$

where D_{ij} indicates the demand for destination country j (in this case, South Africa) by origin country i . Demand is measured two-fold: firstly in terms of spending per day on South African products and services within the country by international tourists. Average spending data is divided by the average number of days spent in the country (both available from South African Tourism). The data ranges from January 2003 to December 2010 and is converted into quarterly average spending in order to be compatible with income data. Secondly, tourism arrivals are used as demand for South Africa. The data was obtained from Statistics South Africa and measured in total arrivals from origin country per quarter.

Real gross domestic product (GDP) of the origin country is used as a measure of real income. The data series were obtained from the IMF's International Financial Statistics (IFS) database and the real GDP index (2005=100) series of all the origin countries were used. The relative price of tourism demand is measured as the cost of consumption at the destination. As a proxy, we use the real exchange rate (i.e. the nominal exchange rate adjusted for price differences) in order to capture the true cost differences between the origin and destination country, since high inflation may be offset by currency devaluations. All series is obtained from the IFS database. The relative price variable (P_t) was therefore compiled as follows:

$$P_t = (CPI_{it} / CPI_{jt}) * e_t, \quad (2)$$

where CPI_i is the consumer price index of the origin country, CPI_j the consumer price index of South Africa and e_t the nominal exchange rate, defined as South African rand (ZAR) for foreign currency.

As relative substitute prices we use the relative price of South Africa's closest substitute destinations that provide tourism products similar to that of the destination. Three African destinations are combined to derive the substitute price, namely Kenya, Tanzania and Botswana. The substitute price is determined as follows:

$$P_t^s = (P_{Bot,t} + P_{Ken,t} + P_{Tan,t})/3, \quad (3)$$

where $P_{Bot,t}$ indicates the cost of living in Botswana calculated as in (2), $P_{Ken,t}$ is the cost of living in Kenya, calculated as in (2) and $P_{Tan,t}$ is the cost of living in Tanzania, calculated according to equation (2). Data was again obtained from the IMF's International Financial Statistics database.

While Webber (2001) measure exchange rate volatility using a random walk specification, we follow Chang and McAleer (2010) by modelling volatility using an autoregressive conditional heteroskedasticity (ARCH) specification, introduced by Engel (1982). Variants of the original ARCH model include the generalised ARCH model (or GARCH (p, q) model), which is more parsimonious than a high-order ARCH model, as well as GARCH models that take information asymmetry into account (i.e. EGARCH and TARCH models). A typical AR(1)-GARCH(1,1) model takes the following mean and conditional volatility equations (Asteriou & Hall, 2011):

$$y_t = \alpha + \beta y_{t-1} + u_t \quad (4)$$

$$u_t | \Omega_t \sim \text{i.i.d } N(0, h_t) \quad (5)$$

$$h_t = \gamma_0 + \gamma_1 u_{t-1}^2 + \delta_1 h_{t-1} \quad (6)$$

Where equation (4) is the mean equation with a first order autoregressive term, equation (5) indicates that the distribution of the error term conditional on the current information set (Ω) and equation (6) indicate the conditional variance equation. Weekly ZAR-US\$ data, obtained from Reuters, is used in modelling the exchange rate volatility.

Models are estimated for the following countries: the UK, the USA, Germany, France, Australia, Brazil and China. European arrivals to South Africa form the majority of the country's intercontinental arrivals, with the UK as the country's main source market, while Germany and France and are also part of the top five intercontinental tourist markets for South Africa. The USA is the second most important source of intercontinental tourists for South Africa, and the main market from the North-American continent. From South America, Brazilian tourists are the main source of tourists to South Africa and Australia fulfils this role from Australasia. China (including Hong Kong) is the main source of tourists from Asia to South Africa. Data for China is limited and the Hong Kong data of the independent variables is therefore used in the estimations. While arrivals from Africa are the main source of international tourists to South Africa, data limitations and fixed currency agreements make it difficult to model these markets.

Econometric method

A linearised demand function forms the basis of the estimation, with expenditure in South Africa as the dependent variable:

$$\ln D_{it} = \beta_0 + \beta_1 \ln Y_{it} + \beta_2 \ln P_{it} + \beta_3 \ln P_t^s + \beta_4 V_t + u_{it} \quad (7)$$

where D_t is expenditure, Y_t is income, P_t is relative prices, P_t^s is substitute prices, V_t is exchange rate volatility, and u_t is an i.i.d. white noise error term. All variables, except volatility, are in natural logs in order to ensure measurement consistency and easy interpretation of the β coefficients. Plots of the variables are included in the appendix (Figure A3).

Since it is not only expected that current variables may influence current demand, an autoregressive distributed lag (ADL) specification is employed, which includes both current and lagged values of the dependent and independent variables (Song and Witt, 2000: 74). A typical ADL specification takes the following form (Enders, 2010: 286):

$$y_t = \alpha_0 + \sum_{i=1}^p \alpha_i y_{t-i} + \sum_{j=0}^n \beta_j x_{t-j} + u_t \quad (8)$$

where y_t is the dependent variable, x_t a vector of independent variables and u_t as defined above.

Kulendran and Divisekera (2006:193-194) indicate that the specification can be expanded to include an error correction term that take both the long-run and short-run relationships between the variables into account. In order to estimate the long-run relationship, a two-step approach is followed. Firstly, the existence of a long-run relationship between the variables should be examined; and secondly, when cointegration is found, the long-run and short-run coefficients of the model are estimated using an ADL specification (Sultan, 2010:92).

The bound test approach to cointegration is followed, since it allows for cointegration between variables that are not integrated of the same order (see Wang, 2009). The bound test is based on an ADL specification with an error correction component (Pesaran, Shin & Smith, 2001; Wang, 2009):

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta y_{t-1} + \sum_{j=0}^n \beta_j x_{t-j} + \lambda z_{t-1} + u_t \quad (9)$$

where z_t is a (kx1)-vector of all the variables in the model and λ a (1xk)-vector of coefficients.

In this Unrestricted Error Correction Model (UECM), the null hypothesis is that of no cointegration and the F-values to evaluate the hypothesis are derived from the Wald test results. The Wald test is used to test whether the long-run coefficients are equal to 0 ($\lambda_1 = \lambda_2 = \lambda_3 = 0$). However, the F-critical values are different than the normal F-test and can be found in Pesaran *et al.* (2001). F-statistics greater than the upper bound of the test for the number of regressors result in a rejection of the null hypothesis, while values less than the lower bound mean that the null hypothesis cannot be rejected. F-statistics between the two bounds fall in the zone of indecision. The lower bound for $k=3$ and $\alpha=0.1$ is 2.72 and the upper bound 3.77. For $k=4$ and $\alpha=0.1$, the lower bound is 2.45 and the upper bound 3.52, and for $k=5$ and $\alpha=0.1$ the bounds are 2.26 and 3.35 (Case III, unrestricted intercept and no trend) (see Pesaran *et al.*, 2001).

Results and discussion

To obtain stationarity, log-differences were taken of ZAR-USD exchange rate, denominated as South African rand for 1 US\$ (see Figure A1 in the Appendix for the graph). An inspection of the correlogram indicated that one autoregressive term should suffice. After estimating an AR(1) model of the series, the ARCH LM test was used to determine whether the errors exhibit signs of heteroskedasticity. Table 1 indicates the results of the test and shows that the errors do not exhibit equal variance. Furthermore the test indicated that two ARCH terms may be considered in the specification of the variance equation.

An AR(1)-ARCH(2) model were estimated as well as an AR(1)-GARCH(1,1), and AR(1)-EGARCH(1,1) and an AR(1)-TGARCH(1,1). The results are summarised in Table 2 below.

Table 1. Results of the ARCH LM test

F-statistic	10.70415	Prob. F(5,404)	<0.0001
Obs*R-squared	47.96176	Prob. Chi-Square(5)	<0.0001

Table 2. Results of the GARCH estimations

	ARCH(2)	GARCH(1,1)	EGARCH(1,1)	TGARCH(1,1)
Mean equation				
A	-0.0009 (0.338)	-0.0006 (0.513)	-0.0004 (0.656)	-0.0004 (0.677)
B	0.2118 (<0.001)	0.2053 (<0.001)	0.2135 (<0.001)	0.2125 (<0.001)
Variance equation				
Y₀	0.0002 (<0.001)	<0.0001 (0.109)	-0.728 (0.040)	<0.0001 (0.071)
Y₁	0.1484 (0.004)	0.1012 (<0.001)	0.2148 (<0.001)	0.1248 (<0.001)
Y₂	0.1435 (0.012)			
δ₁		0.8459 (<0.001)	0.9288 (<0.001)	0.8263 (<0.001)
EGARCH			0.0538 (0.075)	
TGARCH				-0.0567 (0.252)
Model diagnostics				
R-squared	0.0363	0.0368	0.0365	0.0365
AIC	-4.9752	-4.9991	-5.0027	-4.9963
SBC	-4.9266	-4.9506	-4.9445	-4.9380
Log likelihood	1037.35	1042.33	1044.07	1042.74

Notes: p-values in round brackets

Table 3. Unrestricted error correction model for tourist spending

	UK	France	Germany	USA	China	Brazil	Australia
constant	-7.207 (-3.729)	-12.434 (-1.339)	8.433 (3.046)	8.394 (3.605)	-8.062 (-2.955)	4.856 (1.660)	-10.364 (-5.072)
lspend(-1)	-1.473 (-10.59)	-1.182 (-8.595)	-0.987 (-8.230)	-1.129 (-15.23)	-0.748 (-6.300)	-0.592 (-6.579)	-1.085 (-6.578)
lgdp(-1)	3.846 (7.350)	3.545 (1.625)	-0.861 (-1.366)	-0.098 (-0.224)	2.813 (4.457)	-0.173 (-0.257)	3.612 (6.191)
vol(-1)	0.029 (0.336)	0.086 (0.373)	0.068 (0.691)	0.164 (2.257)	-0.528 (-1.765)	1.076 (4.234)	-0.446 (-2.510)
lprice (-1)	-0.672 (-5.183)	1.812 (2.352)	1.016 (3.170)	-0.347 (-1.621)	1.623 (1.889)	0.310 (1.180)	-0.082 (-0.254)
lsubprice(-1)	1.866 (4.848)	-1.012 (-0.603)	-1.052 (-1.698)	0.108 (0.246)	1.697 (1.090)	-3.507 (-3.301)	2.994 (4.650)
R-squared	0.921	0.942	0.923	0.965	0.869	0.953	0.873
Adj R-squared	0.874	0.911	0.87	0.945	0.784	0.913	0.796
Akaike	-2.624	-0.543	-2.18	-2.693	-0.661	-1.236	-1.960
Schwarz	-2.063	-0.029	-1.573	-2.138	-0.095	-0.612	-1.399

Notes: t-values in round brackets; the “l” prefix indicates that natural logs was taken

It is evident that the asymmetry terms are in none of the specifications significant and the EGARCH and TGARCH specifications were therefore disregarded. Between the AR(1)-ARCH(1) and AR(1)-GARCH(1,1) there seems to be very little difference. An inspection of the

conditional variance graphs (included in the appendix – Figure A2), lead to the choice of the AR(1)-ARCH(2) model for presenting volatility of the currency. Exchange rate volatility is therefore determined by the following conditional variance specification:

Table 4. Unrestricted error correction model for tourist arrivals

	UK	France	Germany	USA	China	Brazil	Australia
constant	12.194 (5.940)	6.193 (2.547)	26.182 (11.832)	-7.089 (-6.031)	0.361 (-0.243)	1.889 (1.018)	1.472 (1.840)
larrive(-1)	-2.088 (-9.044)	-0.736 (-6.648)	-1.225 (-26.936)	-1.119 (-10.97)	-0.283 (-2.743)	-1.071 (-7.545)	-0.708 (-5.922)
lgdp(-1)	2.502 (6.026)	0.228 (0.412)	-2.762 (-5.774)	4.263 (9.936)	0.546 (2.782)	1.792 (2.774)	1.242 (4.883)
vol(-1)	-0.086 (-1.450)	-0.241 (-3.185)	-0.786 (-4.644)	-0.073 (-1.917)	0.753 (3.902)	0.362 (1.396)	-0.342 (-4.220)
lprice(-1)	0.160 (1.714)	0.181 (0.776)	0.321 (1.305)	-0.211 (-1.965)	0.170 (0.515)	0.447 (2.735)	-0.003 (-0.016)
lsubprice(-1)	0.620 (2.127)	0.719 (1.422)	0.456 (0.918)	0.533 (2.382)	0.019 (0.026)	-1.833 (-3.500)	0.193 (0.534)
R-squared	0.992	0.963	0.993	0.986	0.933	0.972	0.944
Adj R-squared	0.986	0.944	0.989	0.976	0.871	0.928	0.906
Akaike	-3.346	-2.498	-2.676	-4.048	-2.111	-2.496	-2.930
Schwarz	-2.739	-1.989	-2.022	-3.447	-1.41	-1.609	-2.323

Notes: t-values in round brackets; the "l" prefix indicates that natural logs was taken

$$h_t = \gamma_0 + \gamma_1 u_{t-1}^2 + \gamma_2 u_{t-2}^2 \quad (10)$$

The volatility series was changed to the sum of quarterly volatility in order to be comparable to the other data used in the analysis. An Unrestricted Error Correction Model (UECM) was estimated (as indicated in equation 9) with quarterly seasonal dummies to account for seasonality in the time series and a structural dummy to account for outliers, where applicable. A maximum lag structure of 2 lags is used and following Hendry et al. (1984), insignificant lagged variables are eliminated from the estimation. The results of the UECM are presented in Tables 3 and 4 for spending and arrivals respectively. Only the long-term variables are presented in the tables to save space (since up to two lagged dependent and independent variables are used).

The errors of the UECM's were scrutinised for

normality, autocorrelation as well as heteroskedasticity. Tables A1 and A2 in the appendix indicate the results of these tests. It is evident that all the errors are normally distributed, according to the Jarque-Berra statistic; that there are no autocorrelation, according to the Breusch-Godfrey LM test; that there are no heteroskedasticity present, as indicated by the ARCH LM-statistic.

The above parsimonious UECM was used to test for cointegration using the Bounds Test. The results of the Bounds Test for both spending of tourists per day in South Africa and arrivals are indicated in Table 5. From Table 5 it is evident that the *F*-statistics exceed the upper bound, as specified by Pesaran *et al.* (2001), and that the null hypothesis of no cointegration can therefore be rejected in all instances. Therefore the cointegrating relationship can be estimated. The influence of volatility on arrivals and spending are

Table 5. F-statistics of the Bounds Test

	UK	France	Germany	USA	China	Brazil	Australia
Spending	23.614	15.715	16.242	62.011	12.561	10.033	12.759
Arrivals	17.105	10.143	155.8	27.039	9.514	20.976	8.824

Table 6: Long-run elasticities with spending as dependent variable

	UK	France	Germany	USA	China	Brazil	Australia
Lag structure	(0,1,1,1,1)	(0,0,0,1,1)	(1,0,1,0,1)	(0,1,1,1,1)	(0,0,0,0,1)	OLS	(0,1,1,0,1)
gdp	2.198**	2.672**	3.448**	0.116	3.270**	-1.666	3.507**
volatility	-0.039	-0.074	0.577**	0.273**	0.580**	0.847**	-0.432**
price	-0.546**	1.107**	-1.484**	-0.071	-1.629**	1.042**	0.777
sub. price	1.593**	1.067	-5.122**	1.337**	5.741**	-4.150**	1.604**
ECM(-1)	-1.376**	-0.982**	-1.192*	-0.763**	-0.784**	-1.038**	-1.449**

Notes: ** indicates significance at $\alpha = 1\%$; * indicates significance at $\alpha < 10\%$

investigated using ordinary least squares (OLS) and the ADL model.

Of particular interest are the elasticities of the cointegrating equation, i.e. the long-run elasticities, which is derived by dividing the relevant coefficient by that of the lagged dependent variable (in levels) when an ADL model is used. Up to two lags were considered, given the limited timeframe of the data, and quarterly dummies were included to account for seasonality. Where applicable, a structural dummy was also included to account for structural changes in the data. The resulting long-run elasticities for both the model specifications are indicated in Tables 6 and 7 respectively, with the first row indicating the model estimated.

Table 6 reveals that volatility does not always have a significant influence on spending, with volatility not influencing spending by French and UK tourists. For tourists from Germany, the USA, Brazil and China, an increase in volatility is associated with an increase in spending and it is evident that tourists from Brazil are much more sensitive to volatility than any other market. These markets can therefore be seen as risk-takers. This confirms the notion that volatility is country specific (see Park & Jei, 2010; Chang & McAleer, 2010; Chang *et al.*, 2010). Increased volatility is associated with decreased spending in South Africa by tourists from Australia, indicating risk adverse behaviour.

Concerning the remaining elasticities; the income elasticities are all positive, indicating that an increase in income leads to an increase in spending. Tourist consumption in South Africa is therefore a normal good. The only

exception is for tourists from Brazil, where the elasticity is negative albeit not significant. It is also evident that the income elasticity is quite high, confirming that tourist consumption is a luxury and not a necessity.

The price elasticities are mainly negative, indicating that an increase in the price cause a decrease in spending. Tourists from Germany and China seem to be more price sensitive than any of the other markets with elasticities significantly greater than unity. The substitute price results indicate that Kenya, Botswana and Tanzania can be seen as substitute destinations for South Africa for tourists from UK, France, USA, China and Australia, while they can be viewed as complimentary destinations for tourists from the Brazil and Germany. With cross-price elasticities greater than unity, substantial substitution effects in spending are present when South African prices increase.

The last row of Table 6 indicates the speed of adjustment. The error terms from the long-run equation is included in an ECM-ADL specification to determine the significance of the long-run estimation as well as the speed of adjustment from disequilibrium. In all cases, the error-correction term is negative (as it should be), indicating convergence to a long-run solution. In addition, the speed of adjustment is quite quick, indicating that it spending adjusts quickly (mostly within one quarter) to changes in the independent variables.

Table 7 shows the elasticities for arrivals and it can be seen that the volatility coefficient is again not always significant as a determinant of tourist arrivals. For the more established markets, i.e. the UK, Germany and the USA,

Table 7. Long-run elasticities with arrivals as dependent variable

	UK	France	Germany	USA	China	Brazil	Australia
Lag structure	(0,1,1,1,1)	(1,1,1,1,1)	(0,1,1,1,0)	(0,0,0,1,0)	(0,1,1,0,1)	(0,1,1,1,0)	(0,0,1,1,0)
gdp	8.056**	2.802**	4.822*	3.714**	3.981**	2.945**	1.999*
volatility	0.080	-0.713**	-0.154	-0.018	0.384**	-0.197*	-0.218**
price	-0.290	0.039	0.918**	-0.236**	-0.887**	0.077	-0.229*
sub. price	0.413	2.156**	-0.048	0.610**	1.538	-0.977**	0.363*
ECM(-1)	-0.964**	-0.638*	-0.585**	-1.057**	-0.413**	-1.266**	-0.742*

Notes: ** indicates significance at $\alpha = 1\%$; * indicates significance at $\alpha < 10\%$

volatility does not influence arrivals to South Africa. An increase in volatility is a deterrent for tourism to South Africa from countries such as France, Brazil and Australia. This indicates risk adverse behaviour of tourists from these markets. For China, an increase in volatility is associated with an increase in arrivals, indicating risk-taking behaviour.

The income elasticities are all positive and significant, indicating that an increase in income leads to an increase in tourism to South Africa. The elasticities are again quite high, indicating that tourism to South Africa is a luxury good. The price elasticities are again mainly negative, indicating that an increase in price is associated with a decline in arrivals. In all the instances, the elasticities are quite low, indicating a relative price inelastic demand, which might be an indication that South Africa is still seen as a relatively inexpensive destination.

In terms of the substitute price, the elasticities are mainly below unity, except for tourists from France. In this instance, there seems to be quite a large substitution effect towards Kenya, Botswana and Tanzania if prices in South Africa increase. For tourists from the USA and Australia, these destinations are also substitutes for South Africa, although the elasticity is well below unity. Only tourists from Brazil and Germany, views South Africa and Tanzania, Botswana and Kenya as complementary destinations, although the effect is not significant for German tourists. Noteworthy is that there is consistency in both spending and arrivals in terms of substitution and complementary effects.

The last row again indicates the significance of the long-run relationship as well as the speed of adjustment in cases of disequilibrium. As was the case with spending, the lagged error-term is negative and significant, indicating convergence to a long-run solution. However, the speed of adjustment seems to be lower for most countries when arrivals are considered, with adjustment taking 2 quarters and longer for some countries (e.g. Germany and China).

Conclusion

This paper investigated the influence of exchange rate volatility on tourism by focusing not only on the influence that volatility has on arrivals, but also its effect on tourist spending in South Africa. It is one of the very few studies where a free floating exchange rate is investigated, therefore making an important contribution to the discourse on the impact of volatility on arrivals and spending. Seven countries' arrivals and spending in South Africa were analysed in a demand framework, with the ZAR-USD exchange rate volatility included in the specification. The South African currency has been allowed to float freely since 2000 and is one of the most volatile currencies in the world. However, the volatility of the currency is more related to international events and political uncertainty than instability and war. Therefore, it was postulated that the currency volatility might have a stronger influence on tourist spending than on arrivals.

The conditional volatility of the ZAR-USD exchange rate was modelled using an ARCH(2) specification and the series included in a typical demand specification. An ADL specification was used with an error-correction extension. The Bounds test was used to test for

cointegration and in all instances the F-statistic revealed that the null hypothesis of no cointegration can be rejected.

The results revealed that volatility has a significant influence on both tourist spending and arrivals in South Africa, but that it is more prone to influence spending than arrivals in the long-run, confirming the notion proposed by the research. The elasticities found are in line with those found by Webber (2001) for Australian outbound tourism.

The results differ between markets which have interesting implications for practitioners. In terms of spending volatility, most tourists to South Africa exhibit risk-taking behaviour in their spending, with tourists from China, Germany, the USA and Brazil increasing spending when volatility increases. Only Australian tourists tend to spend less when volatility increases. In terms of arrivals France, Brazil and Australia exhibit risk aversion behaviour with an increase in volatility associated with a decline in arrivals. Only Chinese tourists show risk-taking behaviour in terms of arrivals. This research thereby confirms the risk averse and not taking behaviour as indicated by Webber (2001).

The results support the hypothesis that exchange rate volatility has a more prominent influence on tourist spending compared to tourist arrivals. Increased volatility is associated with increase spending and given that the South African currency is more prone to depreciate during volatile periods, this result is not that surprising. An increase in volatility is therefore normally associated with a relative price decrease, stimulating tourist spending. Contrary to what is expected, increased volatility is still associated with a decline in spending even seen in the light that volatility is mainly caused by international events (and not local instability). In their choice of destinations, tourist to South Africa is therefore mostly risk-averse and currency volatility is an indicator of riskiness. Given the differing nature of behaviour of markets to volatility, this information can be useful for marketers in order to gain a better insight of where to focus their marketing spend in volatile situations.

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Appendix

Figure A1. Log-differences of the exchange rate
RZARUSD

Figure A2. Conditional volatility graphs
ARCH02

GARCH01

Figure A3. Variables included in the analyses
UK

FRANCE

GERMANY

USA

CHINA

BRAZIL

AUSTRALIA

Table A1. *Diagnostic Test results – Spending as dependent variable*

	JB	BG	ARCH
UK	3.944 [0.139]	4.366 [0.112]	0.850 [0.653]
France	1.313 [0.518]	3.184 [0.203]	1.549 [0.460]
Germany	0.430 [0.806]	3.818 [0.148]	3.595 [0.165]
USA	0.769 [0.680]	3.181 [0.203]	1.287 [0.525]
China	2.917 [0.232]	0.878 [0.644]	2.622 [0.269]
Brazil	0.133 [0.935]	5.432 [0.066]	0.842 [0.656]
Australia	0.176 [0.915]	3.181 [0.203]	2.639 [0.267]

Notes: p-values in square brackets

Table A2. *Diagnostic Test results – Arrivals as dependent variable*

	JB	BG	ARCH
UK	1.745 [0.417]	1.593 [0.450]	0.921 [0.630]
France	0.884 [0.642]	5.143 [0.076]	0.766 [0.681]
Germany	0.911 [0.634]	4.377 [0.112]	0.594 [0.742]
USA	3.163 [0.205]	0.663 [0.717]	1.807 [0.405]
China	2.264 [0.322]	0.678 [0.712]	0.072 [0.964]
Brazil	0.918 [0.631]	3.192 [0.202]	3.386 [0.184]
Australia	1.570 [0.455]	2.335 [0.311]	2.443 [0.294]

Notes: p-values in square brackets