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Economic crises and tourism competitiveness: A Markov swtiching regression approach.

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Abstract

Authors discuss the effects that economic crises generate on the global market shares of tourism destinations, through a series of potential transmission mechanisms based on the main economic competitiveness determinants identified in the previous literature using a non-linear approach. Specifically a Markov Switching Regression approach is used to estimate the effect of two basic transmission mechanisms: reductions of internal and external tourism demands and falling investment.

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1. Introducction

Relationship between economic crises and tourism competitiveness is a very promising field of research. Perles, Ramón, Rubia & Moreno (2013) analyzed the long-term implications of economic crises for Spain's tourism performance, using market share as a proxy for competitiveness and the unit root test to determine the persistence of the effects of economic crises on tourism destinations. The authors concluded that studies undertaken from a competitiveness perspective enrich analysis based solely on a demand interpretation. Perles & Ramón (2013) explored, using vector autoregression (VAR) techniques and Granger causality approach, the differential effects that economic crises generated in tourism destinations, depending of the destinations' mature or emerging status. Krstic, Milic and Jovanovic (2014) explore the impact of the last economic crisis on the tourism sector and competitiveness of European countries. Finally, Perles, Ramón, Sevilla & Rubia (2014) propose an integrated model that describes the relationships among economic crises, tourism competitiveness and destinations' market performances and by presenting the economic mechanisms operating in this context using a non-linear Hansen's threshold regression approach (Hansen, 2000).

This article tries an alternative approach by estimating this model using a Markov Switching regression techniques confirming the validity of previous findings for the Spanish case during the period 1970-2013.

The paper proceeds as follows. Section two reviews the Markov Switching regression literature. Section three deals with the econometric estimation of the model. Finally, section four states the conclusions, as well as the limitations of the model.

2.-Switching Regression Methodology.

Threshold Regressions and Markov Switching Regressions (both belonging to a broader family of Switching Regression Models) have been applied by several authors to different tourism issues (see Fernando (2010) and Kun-Huang et al. (2011)). They have been used for applications in demand forecasting by Beaman et al. (2001) or Taplin (2003); by Uysal et al. (1995) for modeling destination or trip type choice; by Moore and Whitehall (2005) to explain destinations lifecycle; by Chia-Lin et al. (2012) for establishing links among tourism specialization and economic development and by Ming-Hsiang (2014) for analyzing the effects of monetary policy in the tourism industry stock performance. In this article we apply these kinds of specifications to the field of destination competitiveness.

Following Teräsvita et al. (2010), the standard switching regression (SR) model is piecewise linear, can be generally defined as follows:

$$y_t = \sum_{j=1}^{r} (\emptyset_j' z_t + \varepsilon_{jt}) I(c_{j-1} < s_t \leq c_j) \qquad (1)$$

where $z_t=(w_t', x_t')'$ is a vector of explanatory variables, with $w_t=(y_{t-1},\ldots,y_{t-p})'$ and $x_t=(x_{1t},\ldots,x_{kt})'$, s_t is an observable switch-variable, usually assumed to be a continuous stationary random variable, $c_0, c_1, \ldots, c_{r+1}$, are switch or threshold parameters, $c_0=-\infty$, $c_r=\infty$.

If r=1, the model is linear. Furthermore, $Ø_j=(Ø_{0j}, Ø_{1j},…, Ø_{mj})$' such that $Ø_i≠Ø_j$ for i≠j, where m=p+k+1, $ε_{jt}= σ_jε_t$ with $\{ε_t\}$~iid(0,1), and $σ_j>0$, *j=1,...,r*. It is seen that (1) is a piecewise linear model whose switch-points, however, are generally unknown.

The observable regime indicator s_t in (1) may be replaced by an unobservable discrete stochastic variable $Ø_t$ that obtains *r* different values $\{v_1,…,v_r\}$, and is independent of $ε_t$. When it is also assumed that $σ_j=σ>0$ for *j=1,...,r*, one obtains another switching regression model. The sequence $\{Ø_t\}$ may be assumed to be a sequence of iid variables or to follow a Markov chain, typically of order one, with transition (or staying) probabilities

$p_{ij}=Pr\{ Ø_t=v_j| Ø_{t-1}=v_i\}$, *i,j=1,...,r*. (2)

In the latter case the model, then called Markov-switching (MS) or hidden Markov regression model, may be written as follows:

$$yt = \sum_{j=1}^{r}(Ø'_j z_t + \varepsilon_{jt}) I(\theta_t = v_j) \quad (3)$$

where $ε_{jt}=σ_jε_t$ with $\{ε_t\}$~iid N(0,1). It is often assumed, however, that $σ_j=σ>0$ for *j=1,...r*, so the error variance of (3) remains constant. Lindgren (1978) considered this model and properties of the maximum likelihood estimators of its parameters. The idea of (3) with (2), however, can be traced at least back to Baum, Petrie, Soules and Weiss (1970). In economics, the model has been applied, for example, to characterizing business cycles (Hamilton, 1989, 1990), in which case the latent variable represents the phase of the cycle. Other applications include interest rate behavior where the set $\{v_1,...,v_r\}$ of values for $Ø_t$ indicates economic policy regimes. In economic applications, generally r=2, on some occasion r=3, whereas r>3 very rarely, if ever. The number of regimes is typically chosen a priori and not determined from the data. In economic application this is often the case when economic theory behind the model is not specific about the number of regimes (Teräsvita et al., 2010).

In this paper we consider a model with the variation of Spain's market share as dependent variable (CMERLIBTEN), and values of the variation of the Spanish Gross Domestic Product (PIBSPA05), the variation of international price competitiveness adjusted by exchange rates (TCERCLUES), the variation Tourism Receipts of Spain *per capita* (ITRESPPC), the variation of beds capacity (representing tourism investment), the variation of inward and outward Foreign Direct Investment (FDIINFESPU and FDIOUTESPU) are used as explanatory variables.

The equations representing the performed model, where the sub index "ri" is an indicator of the corresponding regime, are as follows:

$$dln(CMERLIBTEN) = \alpha_{ri} + \beta_{1ri}dln(PIBSPA05) + \beta_{2ri}dln(TCERLCUES) + \beta_{3ri}dln(ITRESPPEC) + \beta_{4ri}dln(FDIINFESPU) + \beta_{5ri}dln(FDIOUTESPU) + \mu$$

The central hypothesis is that different economic scenarios, as captured by two regimes, may define heterogeneous characteristic responses in Spain's market share which may show sheer differences across regimes. Consistent with previous literature, we consider a two-regime model (*r=1*) aiming to capture difference between expansive and contractive cycles in the economy. The two-regime approach is parsimonious representation suffices to capture the most salient nonlinearities in practice (Teräsvita et al, 2010:33). Also, for comparison purposes, a classical linear regression model without regimes is estimated. All variables are determined as logarithmic differences. The estimations are performed using Eviews© 8.

3.-Results.

Table 1 reflects the result of the classical regression linear estimated model which determines a positive association of the evolution of GDP (statistically significant at 95% confidence level) and market share for the whole period. Also positive associations are observed among market share and beds capacity and inward foreign direct investment. Negative associations among market share, exchange rate and tourism receipts and outward foreign direct investment are observed. R^2 values are low as usual in a model estimated in log-differences.

Table 1: Ordinary Least Square estimation.

Dependent Variable: LD_CMERLIBTEN
Method: Least Squares
Date: 03/13/15 Time: 12:21
Sample (adjusted): 1971 2011
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.023876	0.016600	-1.438259	0.1595
LD_PIBSPA05	1.120440	0.527669	2.123376	0.0411
LD_TCERCLUES	-0.356421	0.230283	-1.547754	0.1309
LD_ITRESPPC	-0.094211	0.115493	-0.815726	0.4203
LD_CAMASESPANA	0.029739	0.205143	0.144968	0.8856
LD_FDIINFESPU	0.011366	0.025984	0.437420	0.6646
LD_FDIOUTESPU	-0.036476	0.022820	-1.598436	0.1192

R-squared	0.214906	Mean dependent var	-0.005658
Adjusted R-squared	0.076360	S.D. dependent var	0.064049
S.E. of regression	0.061555	Akaike info criterion	-2.583531
Sum squared resid	0.128825	Schwarz criterion	-2.290969
Log likelihood	59.96238	Hannan-Quinn criter.	-2.476996
F-statistic	1.551150	Durbin-Watson stat	2.049624
Prob(F-statistic)	0.191684		

Source: Authors own elaboration.

Table 2 reflects the coefficient estimates of our Markov model. Table 3 reflects the probability transition matrix and Figures 1 and 2 show filtered and smoothed regime probabilities, reflecting that models clearly captures the economic crises of 70s and 80s (regime 1), but not the other crisis like recent economic crisis.

Table 2: Markov Switching regression.

Dependent Variable: LD_CMERLIBTEN
Method: Switching Regression (Markov Switching)
Date: 09/27/13 Time: 18:20
Sample (adjusted): 1971 2011
Included observations: 41 after adjustments
Number of states: 2
Initial probabilities obtained from ergodic solution
Ordinary standard errors & covariance using numeric Hessian
Random search: 25 starting values with 10 iterations using 1 standard deviation (rng=kn, seed=1300306041)
Convergence achieved after 19 iterations

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	-0.016858	0.030648	-0.550041	0.5823
LD_PIBSPA05	0.936044	0.797470	1.173768	0.2405
LD_TCERCLUES	-0.807741	0.238980	-3.379958	0.0007
LD_ITRESPPC	-0.073287	0.136408	-0.537262	0.5911
LD_CAMASESPANA	-0.987281	0.772126	-1.278653	0.2010
LD_FDIINFESPU	0.161185	0.056598	2.847886	0.0044
LD_FDIOUTESPU	-0.088811	0.042750	-2.077448	0.0378
Regime 2				
C	-0.021716	0.016562	-1.311187	0.1898
LD_PIBSPA05	1.346975	0.525917	2.561192	0.0104
LD_TCERCLUES	0.283517	0.271637	1.043737	0.2966
LD_ITRESPPC	-0.278311	0.141377	-1.968583	0.0490
LD_CAMASESPANA	0.018581	0.162025	0.114682	0.9087
LD_FDIINFESPU	-0.035702	0.023070	-1.547525	0.1217
LD_FDIOUTESPU	0.004419	0.020558	0.214944	0.8298
Common				
LOG(SIGMA)	-3.359093	0.153219	-21.92345	0.0000
Transition Matrix Parameters				
P11-C	1.495614	0.959020	1.559523	0.1189
P21-C	-2.453957	1.040217	-2.359082	0.0183

Mean dependent var	-0.005658	S.D. dependent var	0.064049
S.E. of regression	0.069511	Sum squared resid	0.125626
Durbin-Watson stat	2.008258	Log likelihood	68.91453
Akaike info criterion	-2.532416	Schwarz criterion	-1.821910
Hannan-Quinn criter.	-2.273689		

Source: Authors own elaboration.

During crisis times (see Table 2, regime 1) the relevant variables determinant market share are price competitiveness adjusted by exchange rates, inward and outward foreign direct investment. All with the expected signs. Meanwhile, during growth times (see Table 2, regime 2), a normal functioning of tourism market is observed as reflected that economic cycles (GDP) and tourism receipts (tourism demand) are the most relevant determinants. So, according with the previous result of Perles, Ramón, Sevilla & Rubia (2014), a different behavior of market share is observed among crisis and growth times.

Table 3: Transition probability matrix.

Equation: Spain's Tourism Market Share
Markov Model
Date: 03/13/15 Time: 13:04
Transition summary: Constant Markov transition probabilities and expected durations
Sample (adjusted): 1971 2011
Included observations: 41 after adjustments

Constant transition probabilities:
P(i, k) = P(s(t) = k | s(t-1) = i)
(row = i / column = j)

	1	2
1	0.816919	0.183081
2	0.079150	0.920850

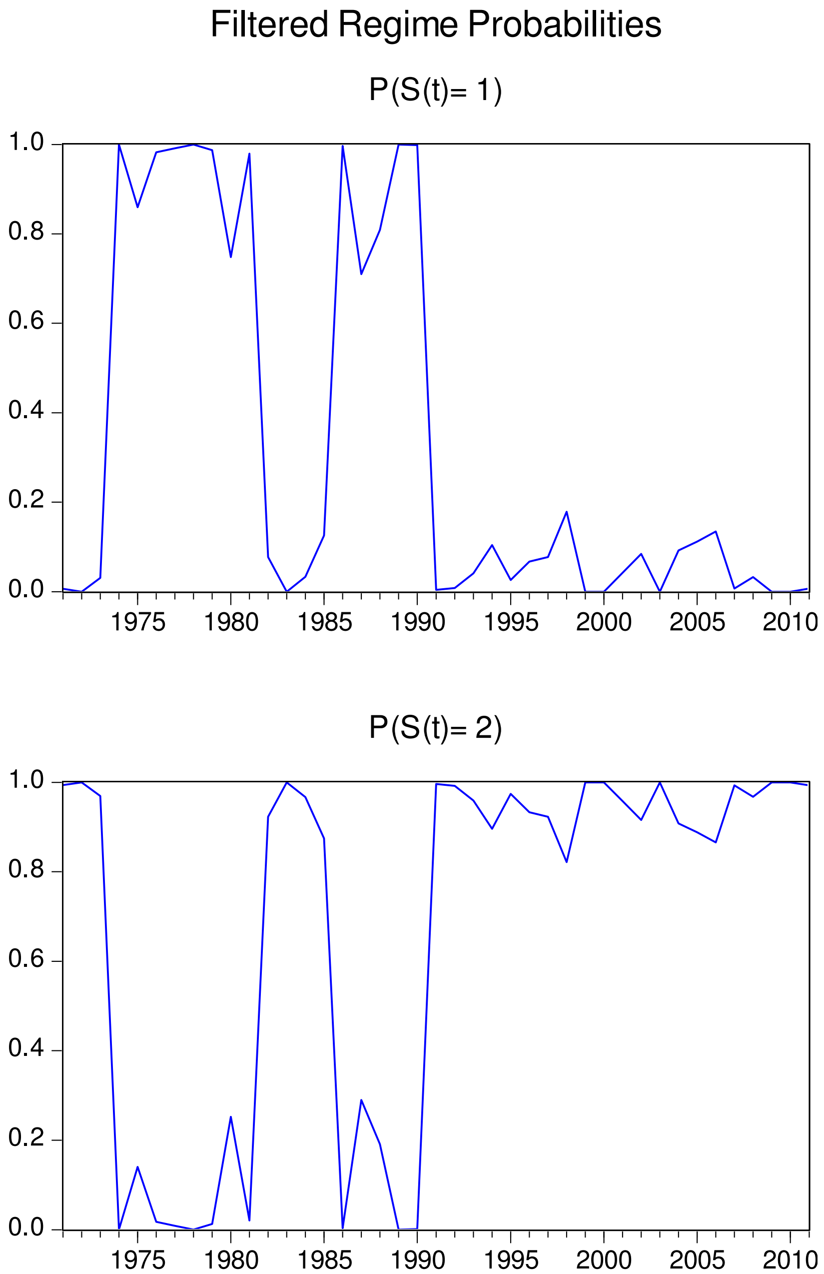
Constant expected durations:

	1	2
	5.462074	12.63429

Source: Authors own elaboration.

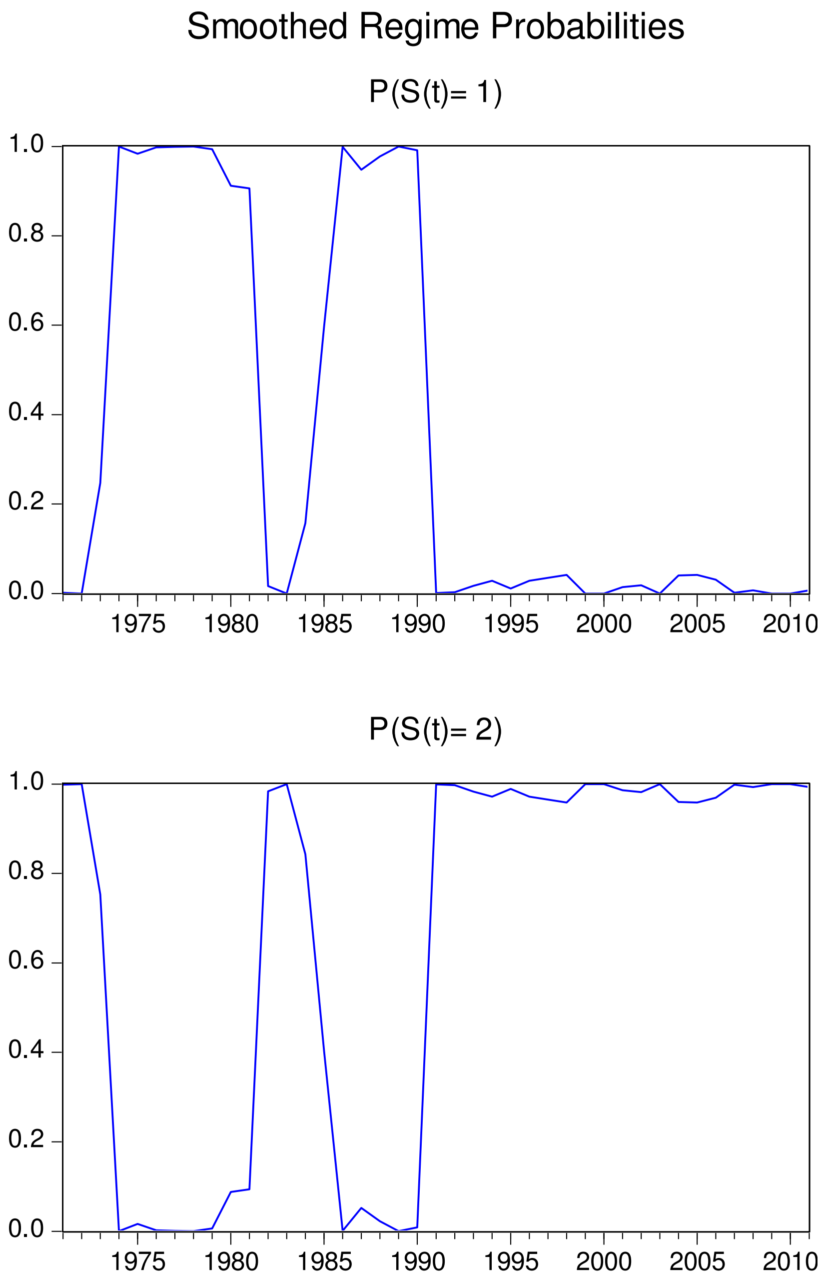
The estimated duration of each crisis period (see Table 3) is 5.5 years. Meanwhile 12.5 years is the estimated duration of growth periods. But the most interesting fact is reflected in Figures 1, 2, 3 and 4 when no tourism crises are detected beyond 90s. A plausible explanation for this fact could be the learning process experienced by the industry after the initial economic crisis of 70s and 80s. But we think the most probably explanation is the geopolitical disturbs experienced by the main tourism competitors of Spain during the 90s (Balkans wars 1991-2001) and during the last Global Economic Crisis (Arab Spring) directly favoring Spanish tourism competitiveness.

Figure 1:



Filtered Regime Probabilities
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
1975
1980
1985
1990
1995
2000
2005
2010
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
1975
1980
1985
1990
1995
2000
2005
2010

Figure 2:


Smoothed Regime Probabilities
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
1975
1980
1985
1990
1995
2000
2005
2010
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
1975
1980
1985
1990
1995
2000
2005
2010

4. -Conclusion

This study has attempted to take an alternative approach to tourism competitiveness by estimating a Markov-Switching model that establishes the relationships that exist among economic crises, competitiveness and the market success of tourism destinations. The empirical analysis performed confirms that the proposed model of Perles, Ramón, Sevilla & Rubia (2014) is not merely a theoretical or conceptual exercise. Applied to the Spanish case, the model explains the different behavior of the competitiveness dynamics between crisis and expansion periods.

While this is an observational study and cause-effect relationships among the dependent and explanatory variables does not follow from the research design, we might suggest some policy measures to be use in neutralizing the negative effects that economic crises might have on destinations. Specifically, the study suggest that to care price competitiveness and to attract foreign direct investment might be adequate measures to recover lost of tourism competitiveness during crisis times.

The main limitation of this study is that it is only focused on economic crises and economic determinants of competitiveness. Therefore, in empirical research, it could be difficult to isolate these effects from others (wars, political turmoil, etc.) that could affect tourism destinations. In fact, we have shown that the model does not capture the economic crises beyond 90s which could be attributed to socio-political turmoil's affecting Spanish competitors.

For future research, an empirical application of this model to a broader set of tourism destinations could offer further valuable insight, especially with regard to the symmetrical or asymmetrical character of economic crises in destinations. The increasing recurrence of economic crises and their potential effects on destinations around the world, as well as the significant relevance of the tourism industry in promoting the development of many countries, might justify further efforts to research, improve and debate the proposed model.

REFERENCES:

Baum, L. Petrie, T., Soules, G and Weiss, N. (1970). A Maximization Technique Occurring in the Statistical Analysis of Probabilistic Functions of Markov Chains. *The Annals of Mathematical Statistics*, 41 (1):164-171.

Beaman, J., Huan, T and Kozak M. (2001). Estimating a Markov Model that incorporates First Visit Decisions and Varying Repeat Frequency. *Tourism Analysis*, 6 (2):81-97

Chia-Lin, C., Thanchanok, K and McAleer, M. (2012). IV estimation of a panel threshold model of tourism specialization and economic development. *Tourism economics: the business and finance of tourism recreation*, 18 (1):5-41.

Fernando, E. (2010). Identifying and predicting turning points in Australian inbound tourism demand growth. PhD. Thesis. Victoria University.

Hamilton, J.D. (1989). A new approach to the Economic Analysis of Nonstationary Time Series and the Business Cycle. *Econometrica*, 57:357-384.

Hamilton, J.D. (1990). Analysis of Time Series Subject to Changes in Regime. *Journal of Econometrics*, 45:39-70.

Hansen, B. (2000). Sample splitting and threshold estimation. *Econometrica*, 68: 575-603.

Krstic, B., Milic V.J and Jovanovic, S. (2014). Investigation of the Impact of the Global Economic Crisis on the Tourism Sector and Competitiveness of European Countries. *Themes – Journal for Social Research*, 3/14:1133-1153.

Kun-Huang, H., Hui-Kuang, Tand Solé-Parellada, F (2011). An innovative regime switching model to forecast Taiwan tourism demand. *The Services Industries Journal*, 31 (10):1603-1612.

Lindgren, G. (1978). Markov Regime Models for Mixed Distributions and Switching Regressions. *Scandinavian Journal of Statistics*, 5:81-91.

Ming-Hsiang, C. (2014). Asymmetric Effects of Monetary Policy Changes on Hospitality Stock Performance. *Tourism Economics*, 20 (3):545-566.

Moore, W and Whitehall, P. (2005). The tourism area lifecycle and regime switching models. *Annals of Tourism Research*, 32 (1):112-126.

Perles, J and Ramón, A. (2013). Economic cycles, asymmetric crises and tourism competitiveness: emerging versus mature destinations. *Economics Bulletin*, 33 (3): 2080-2097

Perles, J., Ramón, A., Rubia, A and Moreno, L. (2013). Economic crisis and tourism competitiveness in Spain: permanent effects or transitory shocks? *Current Issues in Tourism*, in press. DOI 10.1080/13683500.2013.849666

Perles J., Ramón, A., Sevilla, M and Rubia, A (2014). The effects of economic crises on tourism success: an integrated model. *Tourism Economics*, in press. DOI 10.5367/te.2014.0428

Teräsvita, T., Tjøstheim, D and Granger, C. (2010). Modelling nonlinear economic time series. Advanced Text in Econometric. Oxford University Press. New York

Taplin, J. (2003) Modelling the choice of second and subsequent trip destinations as a Markov Process: Behavioural Implications. International Congress on Modelling and Simulation. Townsville, Australia.

Uysal, M., Barrett, R and Marsinko, A. (1995). An Examination of Trip Type Switching and Market Share: Markov Chain Model Application. *Journal of Travel and Tourism Marketing*, 4 (1):45-56