



Economic impacts of ecotourism: Madagascar case

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Abstract: Tourism activities have become a great economic activity that brings about an improvement than 10% of the world GDP. The number of tourists does not stop increasing whatever field; it is at the level of natural milieu and upgrade tourism as well or luxurious tourism, urban tourism, industrial tourism, etc... This increase is significantly marked by the increase of world population, and also by technology development thanks to improvement in the field of air transport, land transport, maritime transport and river transport existing in Madagascar. So it is very probable that there is a very wide correlation between economic activities of MADAGASCAR, notably tourist activities. Thus, we used the Auto regression Variance model which would approve this correlation. So the variations between the variables on the tourists number have similar effects in short, medium and long terms the other economic variables, noticeably the tourist revenue or the tax for the State to the people living near national parks. The variance of the forecast error of the revenue represents a strong innovation of the impulse shocks compared to that of visitors' number, but in the long run these shocks persist. Anyway, the international tourism, the national tourism is dependent on the economic, political, and social and health state, international and national situation.

Keywords: Activity, VAR, Correlation, Tourism, Natural.

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1 Introduction

Tourism is a major economic activity on a world scale, for developing countries as well as and for industrialized countries. The World Tourism Organization (UNWTO) backs that tourism is the industry that represents the strongest growth and this trend does not seem to be fading along twenty-first century. Moreover, it esteems that international tourism and domestically tourism represents more to percent GDP and generates some 100 million of jobs that are growing one and a half more rapidly than any other industrial sector.

According to the specialized agency of the United States, the revenues coming from international tourism increased on the average of 9% per year since these 16 years, to reach 423 billion US\$ in 1996. During the same

period, international arrivals grew of 4.6% per year to reach 594 million in 1996. According to United Nations estimates, the number of international arrivals could reach 700 million in 2000 and 1 billion in 2010, and revenues are probably about 621 billion US\$. And as Lanfant understates in 1994 it seems almost true that the tourism industry is called to play the role of "locomotive" of global development.

Parallel to this trend, it is a noted growing sensitization public of the population of these environmental related problems. The public is more aware bad effects of tourism on environment. According to many authors, who are Butler (1993), Chalker (1994), D'Amore (1992), Gauthier (1993), Lindberg and Huber (1993), the environmental protection is today well known as essential to qualified touristic development. The dilemma is that the constant growth of tourism risks destroys its proper development by threatening the environment where it progresses.

So the financing on the environment protection is difficult especially for the developing country, but fortunately we have to hold an international convention for environment protection that is traditionally started by national and international parks, like the Vth World Congress on Parks (in Durban, September 2003) and the 7th Conference the Parts of Convention on Biological Diversity (in Kuala Lumpur, February 2004), the insufficiency of traditional funding for protected areas has been released, this fact give its place to many initiatives, whatever continent it is (Asia, Africa...) or the concerned ecosystem (marine or wild) (EMERTON et al., 2006)

The financing of Malagasy protected areas by ecotourism would set up a concessional diet near private operators. The year 2006 illustrates the beginning thinks on jurisdictional conditions the putting into concession, according to different forms, of on part of the protected areas, translating a general tendency to the concession market (KARSENTY and WEBER, 2004). This putting in concession concerns essentially ecotourism activities in natural parks. It is about concede to a private entity the care to achieve economic activities (the right to explode lodging for tourists, shops, restaurants, etc...) as well as the right to set up visit services or paying excursions his later paying in its turn tax for ANGAP according to the nature the nature of the contract and its duration (bail emphatic, rent-management, management contract ...). The logical of financing below rise from management delegation of the touristic activity so as to participation in global the financing of the protected area by ANGAP.

2 Materials and methods

2.1 Materials

Madagascar is among the four biggest isles in the world and the seven countries that benefiting from the ecological richness qualified as exceptional. Ecotourism constitutes thus one of the first assets of this isle¹. Madagascar fauna differ from that of the African continent by its strong rate in endemism. The invertebrates are numbered by more than 100,000 species. For reptiles and amphibians, 95% of species are endemic. Frogs may have unexpected colors ranging at the whole uniform with red scarlet.

Among the 285 species of birds recorded, many families are endemic. Carnivores numbered by seven wild species, all endemic (ibid.). The flora owns a very great number of endemic species because 75% of the 12,000 vegetal species in Madagascar. There are seven species of baobab tree (but there is only one which exist in Africa), 200 orchids species, 150 palm-tree species of trees and thousands of medicinal plants (ibid.).

In addition to the ecotourism richness, the different cultural activities and balnear (seaside sites) sites attract tourists in Madagascar well. For balnear (seaside sites), with its 5000 km of coastline, exoticism is well evidently at its appointment. The numerous coves, bays, lagoons and beaches invite people to learn about initiation and practice of many activities like fishing, sailing, scuba diving, surfing and windsurfing.

¹ Madagascar Tourisme: Bilan et perspectives, WWW.madagate.com, 2013.

But Madagascar environment is currently on its way to degrade due to human activities. Consequently, the massive arrival of tourism might be a source of environmental degradation because of several tourism practices building, logistic infrastructures of tourist receptions, ecological tourism and industrial tourism owing to field extraction to explode mining resources. Despite of environmental Malagasy situation in 2013 the Ministry of Tourism foresees good prospective through visitors increases by census. Effectively, the foreseeing for this year is estimated between +12% and +15% compared to 2012. For its part, the Malagasy National Tourist Office (ONTM) plans to arrive at the same number of visitors as in 2008. This is by playing the card of sustainable tourism, with the desire to highlight the destination Madagascar in the world directory of this sustainable tourism.

2.2 Methods

Specificity of the VAR model for the survey, to model our work, we are just lit going to inspired ourselves from the VAR model². This model will allow us to analyze the shocks identification, to verify how the foreign currency revenue for RT tourism reacts in front of to the arrivals of non-resident visitor's arrivals at the frontier for short or medium term? As well as is the existence of a long-term correlation between ecology and green tourism, that it to say ecotourism. That is way; we will adopt in the frame of this work the two following variables:

Be $Y_t = (LRT_t, LAT_t)$ the vector of dimensions (2×1) , composed of stationary variables. The modeling of this vector in the form of an unrestricted VAR process can be represented for each of the variables as follows:

$$\begin{pmatrix} LRT_t \\ LAT_t \end{pmatrix} = \begin{pmatrix} C_{10} \\ C_{20} \end{pmatrix} + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} LRT_{t-i} \\ LAT_{t-i} \end{pmatrix} + \begin{pmatrix} \varepsilon_t^1 \\ \varepsilon_t^2 \end{pmatrix}$$

With $Y_t = \begin{pmatrix} LRT_t \\ LAT_t \end{pmatrix}$, $\Gamma_0 = \begin{pmatrix} C_{10} \\ C_{20} \end{pmatrix}$ is a vector of constancy dimension

$$E(\varepsilon_t) = 0, \quad E(\varepsilon_t, \varepsilon_t) = \Sigma$$

$\varepsilon_t = (\varepsilon_t^1, \varepsilon_t^2)$ the vector structural shocks or perturbation of dimension

(2×1) , $\varepsilon_t \approx iidN(0, \Sigma)$ were Σ is a diagonal matrices. These disturbances which are sources of variation, constituting the contemporary shocks affecting the ecosystem and the Malagasy economy. The first, known as exogenous shocks, represent variations between variables. The second, on the other hand, refer to the internal shocks affecting the total productivity of the factors.

The expression (1) of the standard VAR gives: $Y_t = \Gamma_0 + \Gamma_1 Y_{t-1} + \varepsilon_t$

The use of the operator delay L characterized by $L^k Y_t = Y_{t-k}$ makes it possible to write the equation:

$$Y_t - \Gamma_1 L Y_t = \Gamma_0 + \varepsilon_t \Leftrightarrow \Gamma(L) Y_t = \Gamma_0 + \varepsilon_t \quad (2) \quad \text{were } \Gamma(L) = (I - \Gamma_1 L)$$

The VAR model is written in this form $\Gamma(L) Y_t = \Gamma_0 + \varepsilon_t$ and its reduced form becomes $\Gamma(L) Y_t = \varepsilon_t$, assuming that all the variables are centered. Assuming that any stationary time series has a moving average representation. This is obtained by inverting equation (2) as follows:

$$Y_t = \Gamma^{-1}(L) \Gamma_0 + \Gamma^{-1}(L) \varepsilon_t \Leftrightarrow Y_t = \theta + \psi(L) \varepsilon_t \Leftrightarrow Y_t = \theta + \sum_{s=0}^{\infty} \psi_s \varepsilon_{t-s}$$

with $\psi(L) = \Gamma^{-1}(L) = \sum_{s=0}^{\infty} \psi_s L^s$ et $\theta = \psi(L) \Gamma_0$

² Cheikh Tidiane NDIAYE, Analyse de l'efficacité relative des politiques monétaire et budgétaire au Sénégal, p32

Equation (3) represents an infinite moving average form and the term serves as an impact multiplier in other words, it is through this term that a shock is relayed throughout the process.

3 Results and discussions

3.1 Results

3.1.1 Madagascar ecotourism

The below figures show the evolution national parks visitors evolution and the right to enter fee parks.

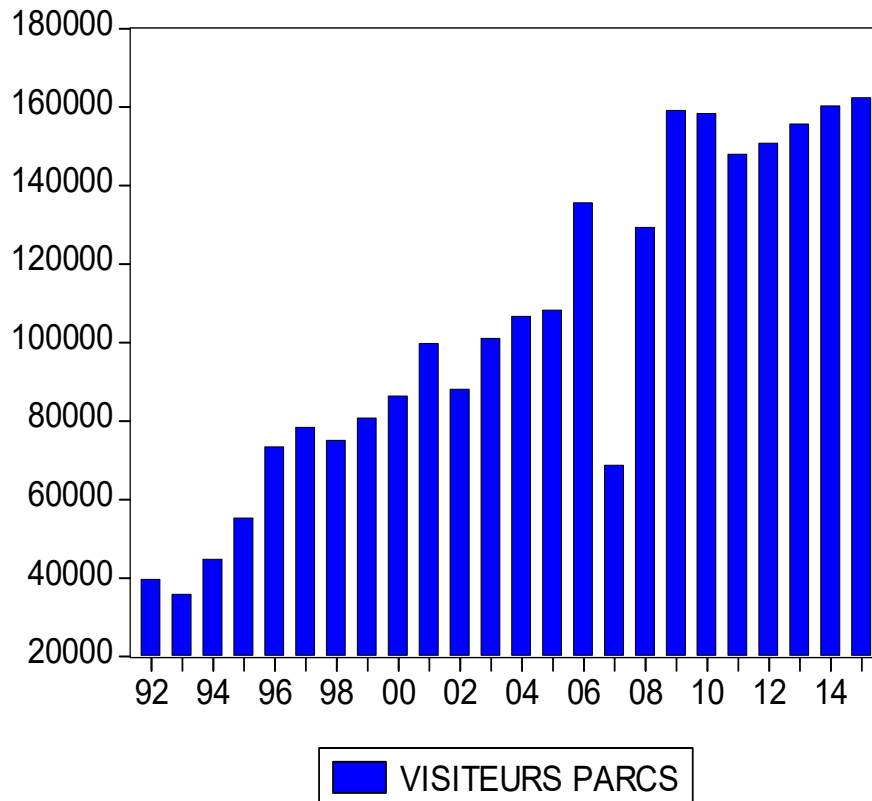


Figure 1. Number of national parks visitors, Madagascar National Parks, 2020

Therefore, the new concept is born "Vanilla Islands" to reinforce the ecotourism item, and to incite the non-residents to visit the big island owing of our richness by green production very necessary at the world level. Rather intended to the South African markets Russian, Australian and Chinese. In the frame work of this project, a series of initiatives were taken as a meeting of tour operators of the Vanilla Islands in September 2010 and joint presentation of the destinations Mauritius-Reunion-Seychelles-Madagascar at the saloon of Tourism ITB in Berlin (in Germany March 2011). Comparing to other Indian Ocean Islands such as Mauritius, Seychelles, Sri Lanka ... in terms of tourism is still not competitive at the level of international standards. But the advantage of the Big Island that it is strong in endemic species.

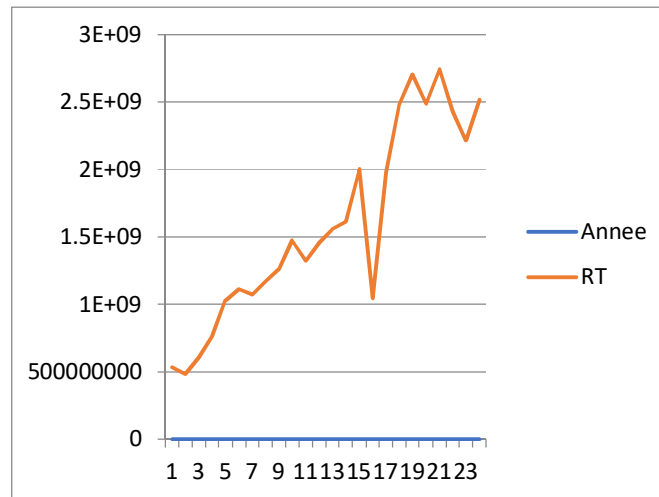


Figure 2. The tax to parks at the national level RT, Madagascar National Parks, 2022

3.1.2 Result of simulation Analysis at national level

Shock simulation is a powerful method for analyzing the dynamics between on group of variables. By identifying a VAR model, impulse analysis allow to explain the structural shocks influences of one of variable on the other variables system. So, it will be useful to examine the real effects of shocks identified to discover eventual contradictions between structural shocks effects. The answer Impulsions stay one the most indicated instruments to explain sources of impulsion. They reflect the reaction in the moment of the variables to identified contemporary shocks.

Their examination provides information the consequences in the moment of shocks. It seems interesting to analyze the functions of impulse answers and the decomposition of the variance error of the forecast in order to interpret the shocks impact on the dynamics of studied variables.

Therefore, the following figures reveal the answers to shocks on the residues of studied variables. The pointed represent the interval of trust. The amplitude of the shock is equal to the standard deviation of the errors of the variable and we are interested in the effects of the shock over ten periods. The moment horizon of the answers is fixed on these ten periods and it represents the necessary deadline so that the variables find again their levels of long-term. The variables that we held chosen to stimulate shocks are: foreign currency revenue under the name RT tourism and arrivals of non-resident visitors at the AT frontiers.

Shock on the currency revenue for RT tourism, the figure points out the simulation of a shock impact on the revenue in foreign currency for RT tourism. This shock can be change into either dynamism to impulsions resulting from interior or that from the exterior part. Let's analyze the repercussions of this shock of revenue foreign currency for RT tourism, the arrivals of non-resident visitors at the AT frontiers, DF deforestation, RB reforestation.

- On answer of impulsion shock on an interval of 10 periods on the revenue in foreign currency goes down at of the period [1-2], and increases at the period of [1-4] and it remains static between [5-10].
- The positive shock of revenue in foreign currency for RT tourism at the beginning of the period results in a positive effect of arrivals of non-resident visitors at the AT frontier at the beginning of the period [1-2], then increases from [2-4] and remains steady [5-10]. This going down, decrease can be translated by decrease of non-resident visitors arrivals at the AT frontiers at the beginning of the period, represents a decrease in number of foreign tourists entering into our country so an immediate drop of the revenue in foreign currency for RT tourism. These two variables are strongly correlated by a similar effect which is most stressed compared to the other variables. It is also confirmed itself to the result of causality tests in the sense of Granger.

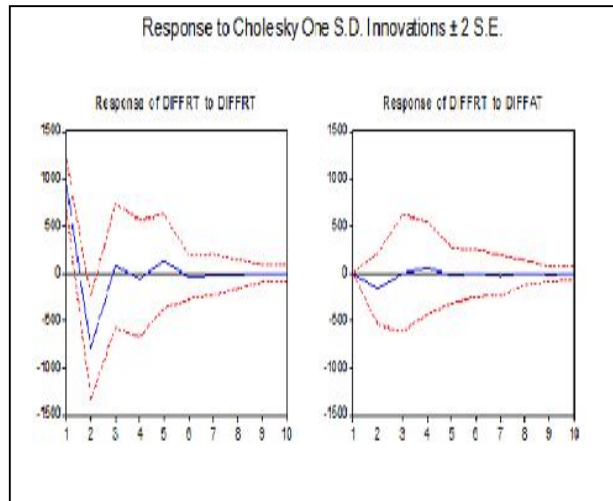


Figure 3. Answer to Impulsion shock function on the revenue in foreign currency for RT tourism

Shock of non-resident visitors arrivals at AT frontiers, the figure below show again simulates of a shock impact on non-resident visitors at the AT frontiers. This shock may be imputable either impulse' dynamism coming from the internal part or that from external part. Let's analyze this shock repercussions between non-resident visitors arrivals at the AT frontiers and the revenue in foreign currency for RT tourism,

A shock on an interval of 10 periods on the non-resident visitors arrivals at the AT frontiers, can be translated as negative results in a negative effect at the period beginning [1-2] and after it improves in the [2-3] period, and remains steady [6-10];

- A negative shock at the period beginning of non-resident visitors arrivals at the AT frontiers, can be translated as a negative effect to the in foreign currency in respect for non-resident visitors RT at beginning period, that is to stay go down at beginning period [1-2], negative in ([2-3] [3-4]), and improves in [4-5] and then remains stable between [5-10]. This decrease means that the number of non-resident visitor's arrivals coming to Madagascar has diminished. These two variables have similar effects at a medium and long term. And they have their very strong correlations that prove their links and the uniqueness that illustrates the obtained result by causality tests in the Granger way.

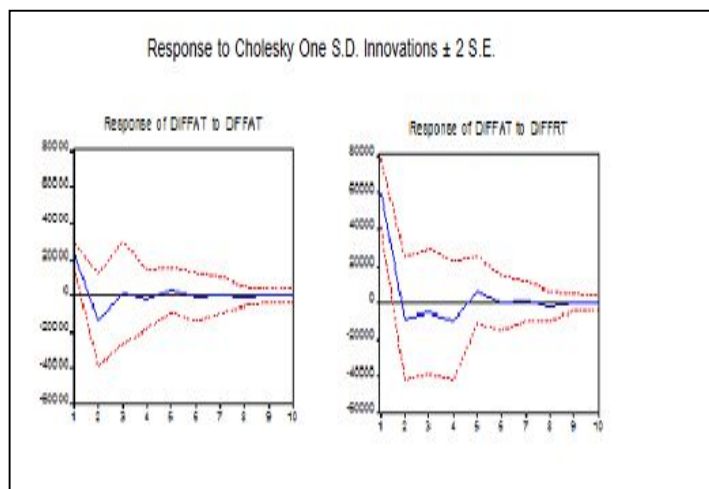


Figure 4: Impulse shock answer function non-resident visitors' arrivals at AT frontiers

3.1.3 Decomposition the error variance of ecotourism forecast at the national level

Discussions on decomposition the error variance of ecotourism forecast at the national level represent is the number of visitors to parks and the revenue in foreign currency for RT tourism, at national level RT tourism. The number of visitors to parks at the national level, the variance forecast error of parks visitors number ecotourism NV, is due at 98.46% at their proper innovations, and at 1.53% for that RT revenue for entry tax into park (RT). This result shows that numbers of visitors shock to NV no impact on the revenue from entry taxes into (RT) parks. This relationship is shows that the activity depend an especially foreign visitor who brings about more contribution for the parks. In the long run, the variance of forecast error on visitor's numbers due to its proper innovations remains stable because of its endogenous character. These results are conforming to those steady owing to its endogenous on answer functions following a shock of visitors number.

Table I. Decomposition of visitors number variance error NV (in %)

Period	S.E.	DIFFNV	DIFFRT
1	21247.17	100.0000	0.000000
2	24695.48	99.65183	0.348166
3	24823.51	98.64004	1.359957
4	25271.33	98.56737	1.432631
5	25479.73	98.46910	1.530904
6	25504.38	98.32977	1.670235
7	25519.10	98.32660	1.673403
8	25538.17	98.31803	1.681975
9	25541.81	98.31029	1.689713
10	25542.38	98.30990	1.690104

The park revenue by entry tax to parks at the national level RT tourism, the variance of forecast error of the park revenue coming from entry tax into the parks at the national level is due to 83.40% for its proper innovations, and 16.59% for park visitors. This result is always conformity with this obtained result on the impulse response function. They show the endogenous character in long-term. The latter therefore strongly influences the number of visitors by revealing that a shock on the recipe therefore has more impact on the number of visitors. The variance of the recipe forecast error due to its own innovations gradually decreases in the medium and long term, due to its endogenous nature.

Table II. Decomposition of the revenue in foreign currency for RT, variance error at national level RT (in %)

Période	S.E.	DIFFNV	DIFFRT
1	3.65E+08	84.09761	15.90239
2	3.98E+08	86.55939	13.44061
3	4.05E+08	83.74512	16.25488
4	4.07E+08	83.42526	16.57474
5	4.09E+08	83.40518	16.59482
6	4.10E+08	83.30670	16.69330
7	4.10E+08	83.30412	16.69588
8	4.11E+08	83.31628	16.68372
9	4.11E+08	83.32121	16.67879
10	4.11E+08	83.32072	16.67928

4 Conclusion

To conclude we found that the tourists number is very variable which is depend on the global economic situation, and political stability. Thus tourism and ecotourism is significantly correlated to the political, economic, and social. After these simulations results are globally significant in their impulse reaction that shows us that between this exogenous variable, it represents their endogenous value from short term, in the medium term, and the long term as well.

And here incites, the State, the public collectivity and the private sectors to concentrate on the synergy in green development by creation of activities nearby National Parks or extension of protected areas system to ensure so the existing resources, but without touching these species to protect their predatory instinct. That is to say, we would have to value these National, natural patrimonies and regional too. Because we don't have cause effect and cause between these variables but there is a dependence of value in terms of contribution on the tax into National Parks that may be represented as exogenous financing.

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