Moroccan tourist portfolio efficiency with the mean-variance approach

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Abstract

Nowadays, the major objective of all destinations is the development. Develop their attractions, their management strategy to cope with the competition and attract the maximum number of tourists, satisfy and retain them. This paper analyses the Moroccan destination performance with the use of the *mean-variance shortage function* approach. This method permits to help destination decision-makers to minimize the instability and maximize the return of inbound tourism. Accordingly, to optimize its tourism strategy, the Moroccan tourism authority can choose a combination of tourist origins according to its preference in terms of risk. The Results allow us to say that Moroccan Destination Management Organisations (DMOs) have ways for adjustment to achieve best performing strategy. The main contribution of this paper is both empirical and managerial.

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Introduction

With 12% of global GDP and 8% of global employment, tourism has certainly become, as confirmed by the UNWTO, the leading industry in the world. One of the first economic pillars in some countries, it is also a major player in development and the fight against poverty. In Morocco, tourism is considered as a national priority. In addition to its Mediterranean climate, the country is characterized by a wide variety of landscapes that satisfy all tastes. Its cultural wealth, its gastronomy and its various

traditions, symbolizing its history of more than 2500 years.

In the fact of the crisis that has been rocking the global economy since 2008 the Moroccan tourism industry had its best years. The importance of this sector is reflected by major projects that keep coming for a decade already. Since the royal speech of January 10, 2001 edifying for a new policy that draws tourism a national priority, the Moroccan tourism policy has taken an unprecedented twist with the

launch of "Vision 2010" and "Vision 2020" (Peypoch and Sbai, 2011) which implements the guidelines of HM king. After that date, the country has set targets tourism, and since, it only earns ranks in several sectors. On the other hand, the tourism sector shows considerable instability in demand. Decreased or increasing tourist arrivals affect positively or negatively the national economy. So each country must hold firm the flows of tourism demand. It should be noted also that the change in demand is often linked to political, social and economic variables; the Arab spring is a recent example.

In a recent paper, Botti, Goncalves and Ratsimbanierana (2012) used a mean-variance approach to help French DMO to minimize the instability and maximize the return of inbound tourism. In this paper, we will use a similar approach to gauge the less efficient Moroccan DMO to improve their tourism inbound by investing in marketing policy.

Contextual setting

Indeed, the results recorded in 2010, 10 million of tourists were almost reached and the accommodation capacity has reached about 175,000 beds and nearly 57 billion dirhams (1 Euro=11 Dhs approximately) foreign exchange earnings. The role played by private and public institutions in the conduct of this strategy is major, what encouraged more international players in the tourism sector, hospitality in particular, which is a complex sector and it's constantly changing.

This sector of hospitality is considered one of the main foundations of the tourism industry in Morocco; it addresses two types of actors, international and local who share the tourism areas. These actors are classified in categories so aiming at their customers. Thanks to the efforts of the various actors engaged in this new strategy. Today, Morocco counts many international references in the hotel business as the Ritz Carlton, or, major tourism destinations as Marrakech and Tangier. Distribution in general is rather appropriate to the tourism strategy; the country has more than 1600 tourism establishments with 16% of hotels from 1 to 3 stars, 25% of 4 stars hotels, 24% of five stars hotels within 3% of Luxury.

The international chains are present in all the main cities of the Kingdom (Peypoch and Sbai, 2011). What lends credibility to the image of Morocco as a destination is the influx of international brands renowned; they helped to strengthen the national capacity of accommodation and its quality. In 2012, the bed capacity of hotels should to grow more. More than 13 new hotel projects and tourist residences of category 5* divided between the cities of Marrakesh, Tangier, Casablanca and Agadir will emerge with 4500 beds more.

Generally, the results of the tourism sector in 2011 remain satisfactory in view of the current situation in the major source market for tourist; these major markets of the kingdom recorded a positive trend: 10% for Belgium, 9% for Germany, 6% for the UK and 6% for Holland. However, the French and Spanish tourist arrivals have declined by -1% and -4% respectively. Altogether, a light evolution with 9.4 million arrivals (1%); 59 billion dirhams incoming. These results confirm the correctness of the strategic choices and the maturity of the Moroccan destination which demonstrated its capacities of resistance through the fundamental strengths of the sector.

Otherwise, while the results become more successful, the overnights stay in classified hotels establishment is still down (-6%), thus, the occupation rate loses 3 points compared to 2010. This paradox is related in large part to the development of other forms of accommodation, of whom unregulated tourism residences, new forms of accommodation thanks to the vision 2010. According to our study with a sample of tourists in Marrakech (Sbai, 2012), the results argue that the guesthouses extract more and more tourists to hotels, they attract more than 30% of tourists in Marrakech (with 2 % evolution per year). This is why we can't rely only on statistics of classified establishment.

Otherwise, and after the good results recorded in general, Morocco has nowadays a real challenge to keep its tourists and win their loyalty. Up to now, the priority source markets of Morocco are: France, Spain, United Kingdom, Germany and Italy. Tourists from

Figure 1. The Mean-Variance Space

these countries are more receptive to the Moroccan offers and have a better return in terms of average expenditure. But with the new offer on the market, including new accommodations not classified, and global competition, the government must put in place a specific marketing to attract tourists, maximize their return and minimize the risk of 'no return'.

The Markowitz Model and Shortage Function

The Markowitz Model

The mean-variance model was introduced by Markowitz (1952, 1959) for gauging portfolio efficiency in order to make a choice into several portfolios (tourism target). We use segments tourist by origins.

We segment the Moroccan tourism inbound demand into sub-markets represented by origins. In this line, DMOs have to find the optimal combination of origin i.e. the combination which minimize the instability and maximize the return of their inbound tourism demand. Each origin may be identified with different levels of risk and return. Set of optimal portfolios are on the efficient frontier, which specifies on the one hand the maximum return for any risk level and on the other hand the minimum risk level for any return level.

Let $E(R_M) = X_A E(R_A) + X_B E(R_B)$ (1)
for the global inbound tourism demand.

With A and B representing countries of origin of tourists and (X_A, X_B) are weights of origins A and B in the global inbound tourism demand of the destination M .

The fluctuation of this virtual inbound tourism demand (its risk) depends on the variance-covariance matrix of origins that can be calculated as follow:

$$V(R_M) = X_A^2 V(R_A) + X_B^2 V(R_B) + 2X_A X_B COV(R_A, R_B) \quad (2)$$

The market utility is used to measure investor satisfaction as far as higher is utility, better is satisfaction. Following the mean-variance model, the market utility is formally given by:

$$U(R_M) = E(R_M) - \Phi V(R_M) \quad (3)$$

$$= X_A E(R_A) + X_B E(R_B) - \Phi (X_A^2 V(R_A) + X_B^2 V(R_B) + 2X_A X_B COV(R_A, R_B))$$

where Φ stands for investor's risk aversion. For our case study, and accordingly to other authors like Brier (1997,2004) and Morey and Morey (1999), we use $\Phi=0,5$. This standard

value of risk aversion represents cautious investors or the neutrality of risk aversion.

The expected return of a portfolio x is defined by:

$$E[R(x)] = \sum_{i=1}^n x_i E(R_i) \quad (4)$$

Where x_i is the proportion of the asset i in the portfolio, $E(R_i)$ the expected return of the same asset i and n the number of assets in the market. Along the same line, the variance of the return of the portfolio x is defined by:

$$V[R(x)] = \sum_{i=1}^n \sum_{j=1}^n x_i x_j \text{cov}(R_i, R_j) \quad (5)$$

Following the mean-variance model of Markowitz, the representation set of portfolios is defined by:

$$\mathfrak{S} = \left\{ \left(\text{Var}[R(x)], E[R(x)] \right) : x \in \mathfrak{X} \right\} \quad (6)$$

For a given degree of risk aversion, Markowitz defined the following utility function to compute the corresponding efficient portfolio:

$$U_{(\rho, \mu)}(x) = \mu E[R(x)] - \rho \text{Var}[R(x)] \quad (7)$$

where $\mu > 0$ and $\rho > 0$.

The following program maximizes the mean-variance utility function:

$$\text{Max } Z = \Phi E[R(x)] - \text{Var}[R(x)] \quad (8)$$

$$\text{s. c. } Ax \geq 0$$

$$\sum_{i=1}^n x_i = 1$$

$$x \geq 0 \quad (4)$$

where the ratio $\phi = \frac{\rho}{\mu} \in [0, +\infty[$ stands for risk aversion

According to our data, this example permits us to determine that, for the next period (2011),

$$E(R_A) = -0.994166\%$$

$$E(R_B) = -2.940457\% \text{ and}$$

$$X_A = 0.61619961 \quad (5)$$

$$X_B = 0.38380039 +$$

$$\begin{aligned} * X_A &= 4775662 / (4775662 + 3119347) = 0.61619961 \\ + X_B &= 3119347 / (4775662 + 3119347) = 0.38380039 \end{aligned}$$

$$V(R_A) = 0.00204388$$

$$V(R_B) = 0.00227799$$

$$\text{COV}(R_A, R_B) = 0.00092276$$

$$U(R_M) = E(R_M) - \Phi V(R_M)$$

$$= X_A E(R_A) + X_B E(R_B) -$$

$$- \Phi (X_A^2 V(R_A) + X_B^2 V(R_B) + 2 X_A X_B \text{COV}(R_A, R_B))$$

$$U(R_A) = -1.096\% \text{ (utility of a market exclusively composed of Austrian tourists) and}$$

$$U(R_B) = -3.054\% \text{ (utility of a market exclusively composed of Finnish tourists).}$$

Table 1. Periodic overnight stays data

Year	A: Germany	B: Belgium	X_A	X_B	R_A	R_B
2006	985685	688878	0,58862223	0,41137777		
2007	988958	667906	0,59688544	0,40311456	0,00332053	-0,03044371
2008	959079	590868	0,6187818	0,3812182	-0,03021261	-0,11534258
2009	895617	582277	0,60600896	0,39399104	-0,06616973	-0,01453963
2010	946323	589418	0,61619961	0,38380039	0,05661572	0,01226392
Total	4775662	3119347	0,60489633	0,39510367		
				$E(R)$	-0,00994166	-0,02940457
				var	0,00204388	0,00227799
				cov	0,00092276	0,00092276

The major problem of this model is the choice of way to reach the efficient frontier. It shows why we will use the *shortage function*. With a pre-assigned direction, this tool determines the shortcut which permits to reach the efficient frontier.

Shortage Function

The major problem of this model lies in the choice of a direction to reach the efficient frontier. To overcome this difficulty, we use in our paper the *shortage function* which is an useful tool for efficiency measurement. This concept was introduced by Luenberger (1984,1992) and used several times in a lot of sectors. It determines then the shortcut which permits to reach the efficient frontier. DMOs have indeed to find the optimal combination of origins, i.e. portfolio of origins which minimize the risk and maximize the return of their inbound tourism market.

Formally spoken, the disposal representation set is defined as:

$$DR = \left\{ \mathbb{N} + (R_+ \times (-R_+)) \right\} \cap R_+^2 \quad (9)$$

This subset may be rewritten as follow:

$$DR = \left\{ \begin{array}{l} (V', E') \in R_+^2; \exists x \in \mathfrak{I}, (V', E') \leq \\ (-Var[R(x)], E[R(x)]) \end{array} \right\} \quad (10)$$

The above subset represents the weakly efficient frontier, i.e. the set of all mean-variance points that are not strictly dominated:

$$\partial^M(\mathfrak{I}) = \left\{ \begin{array}{l} (Var[R(x)], E[R(x)]) ; \\ x \in \mathfrak{I}, (-Var[R(x)], E[R(x)]) < \\ < (-V', E') \Rightarrow (-V', E') \notin DR \end{array} \right\} \quad (11)$$

According to properties exposed by Bricc *et al.* (2004), we can use the shortage function to gauge markets efficiency. This function is defined by:

$$S_g(x) = \sup \left\{ \delta; (Var[R(x)] - \delta g_V, E[R(x)] + \delta g_E) \in DR \right\} \quad (12)$$

which is the shortage function for the portfolio x in the direction of the vector $g = (-g_V, g_E)$.

Figure 2. The shortage function

It measures the shortcut in the direction of g that looks simultaneously improvements in variance reduction and in mean expansion. Note that if $S_g(x) = 0$ no improvement is needed as the portfolio x is an efficient point.

Note that the shortage function generalizes Morey and Morey distance function which gauge portfolio efficiency either in risk contraction or in mean expansion (Morey and Morey, 1999). In the risk reduction orientation, we have $g_E=0$ and $g=g_V$. For a given level of expected return, the function looks at the risk reduction possibilities. The shortage function then becomes:

$$S_{g_V}(x) = \sup \left\{ \delta_V; \begin{pmatrix} Var[R(x)] - \\ \delta_V g_V, E[R(x)] \end{pmatrix} \in DR \right\} \quad (13)$$

Otherwise, the Morey and Morey risk contraction function is defined as follows:

$$D_{RC}(x) = \inf \left\{ \lambda ; \left(\lambda Var[R(x)], E[R(x)] \right) \in DR \right\} \quad (14)$$

Note that Chambers *et al.* (1998) show that $\delta_V = 1 - \lambda$.

In the overnight stays expansion orientation,

we have $g_V=0$ and $g=g_E$ i.e. for a given level of risk, the function computes the possible expansion of the expected number of overnight stays.

$$S_{g_E}(x) = \sup \left\{ \delta_E; \begin{pmatrix} Var[R(x)] \\ E[R(x)] + \delta_E g_E \end{pmatrix} \in DR \right\} \quad (15)$$

In the same way, the expected overnight stay expansion function is defined as follows:

$$D_{NSE}(x) = \sup \left\{ \theta; \begin{pmatrix} Var[R(x)] \\ \theta E[R(x)] \end{pmatrix} \in DR \right\} \quad (16)$$

And as previously, it can be stated that we have: $\delta_E = 1 - \theta$.

Results and discussion

For each origin, they present, on the one hand, return and risk level and, on the other hand, relative efficiency. The relative efficiency is measured by the distance between a given tourist origin and the efficient frontier (14). This distance represents possible improvements and can be measured in three directions: (i) vertically in maximizing overnight stays expectancy, (ii) horizontally in reducing volatility

Figure 3. *Morey and Morey distance functions*

Table 2. Return Expansion

Country of origin	Expected number of overnight stays	Standard deviation	Maximum expected overnight stays for the same standard deviation level	Efficiency Θ
France	6025431	340046	6025431	1.0000
Germany	955131	33802	1427175	1.4942
Belgium	623868	45103	1640175	2.6290
Other countries of the World	902390	128628	3058175	3.3890
United States of America	246603	22963	1216175	4.9317
Switzerland	145543	7008	862175	5.9239
United Kingdom	1016516	473700	6025431	5.9275
Netherlands	278409	47622	1687175	6.0601
Other countries of Middle East	141862	14073	1025175	7.2266
Saudi Arabia	173164	28402	1323175	7.6412
Italy	504581	225586	4496175	8.9107
Commonwealth of Independent States	279654	99085	2600175	9.2978
Japan	85032	9330	916175	10.7745
Spain	517424	346726	6025431	11.6451
Tunisia	47291	4366	800175	16.9203
Portugal	87431	41041	1564175	17.8903
Algeria	81851	36583	1480175	18.0837
Sweden	80536	37119	1490175	18.5033
Egypt	33122	1280	719175	21.7127
Canada	54160	26951	1295175	23.9137
Other countries of Africa	70481	49988	1731175	24.5623
Nationals Residing Abroad	30720	2893	763175	24.8426
Finland	37407	16207	1073175	28.6888
Austria	35617	17716	1106175	31.0572
Denmark	27466	9936	930175	33.8659
Libyan Arab Jamahiriya	23329	4078	793175	33.9995
United Arab Emirates	25903	12250	983175	37.9566
Norway	19921	10041	932175	46.7927
Mauritania	12167	8966	907175	74.5603
Syrian Arab Republic	6175	2775	760175	123.1013

and (iii) in the both (Botti *et al.*, 2012).

Table 2 exposes the results of the expected overnight stays expansion (vertical frame). Indeed, for the next period, Morocco may expect from United Kingdom more than 10 16 millions of overnight stays. However, this expectation is associated with a standard deviation of 473 700 overnight stays. Moreover, for the same degree of risk, overnight stays may reached the level 6 025 431 which means that Morocco can improve United Kingdom overnights stay expansion at 59.9275%.

Table 3 exposes the horizontal frame i.e. the risk contraction perspective. As previously,

Morocco may expect from the United Kingdom more than 1016516 of overnight stays with a standard deviation of 473700 overnight stays. But, our frame permits us to say that Morocco should be able to reduce the instability of this origin as, for the same number of overnight stays, the standard deviation of Germany could be 13667. In this line, Morocco may improve United Kingdom market stability by 28.85%.

Table 4 simultaneously incorporates the previous two perspectives. For efficient origins, shortage is equal to 0 %, meaning that regarding these origins, the Morocco DMO maximize return and minimize risk. As previously explained in our interpretation of the

Table 3. Risk contraction

Country of origin	Expected number of overnight stays	standard deviation	Minimum standard deviation for the same expected overnight stays level	Efficiency λ
France	6025431	340046	340046	1.00000
Germany	955131	33802	11028	0.32625
Other countries of the World	902390	128628	8735	0.06791
United Kingdom	1016516	473700	13667	0.02885
Algeria	81851	36583	0	0.00000
Tunisia	47291	4366	0	0.00000
Mauritania	12167	8966	0	0.00000
Other countries of Africa	70481	49988	0	0.00000
Canada	54160	26951	0	0.00000
United States of America	246603	22963	0	0.00000
Japan	85032	9330	0	0.00000
Commonwealth Independent States	279654	99085	0	0.00000
Denmark	27466	9936	0	0.00000
Finland	37407	16207	0	0.00000
Norway	19921	10041	0	0.00000
Sweden	80536	37119	0	0.00000
Italy	504581	225586	0	0.00000
Portugal	87431	41041	0	0.00000
Spain	517424	346726	0	0.00000
Austria	35617	17716	0	0.00000
Belgium	623868	45103	0	0.00000
Netherlands	278409	47622	0	0.00000
Switzerland	145543	7008	0	0.00000
Libyan Arab Jamahiriya	23329	4078	0	0.00000
Saudi Arabia	173164	28402	0	0.00000
Syrian Arab Republic	6175	2775	0	0.00000
United Arab Emirates	25903	12250	0	0.00000
Egypt	33122	1280	0	0.00000
Other countries of Middle East	141862	14073	0	0.00000
Nationals Residing Abroad	30720	2893	0	0.00000

table 1 and 2 results, Morocco may expect for the next period from Germany more than 955 131 of overnight stays with a standard deviation of 33 802 overnight stays. Our framework indicates that the Moroccan destination manager may expect from German segment 1 234 651 overnight stays with 23 910 overnight stays of variation. The Moroccan DMO needs to improve the number of German overnight stays by 9 886 which is given by δ in equation 11. Efficiency of origins is given by the ratio δ / expected overnight stays. This choice permits us to take into account share market of each origin and accordingly, Germany has 77.4 % of shortage, which represent 9 886 overnight stays and Belgium have 59.9 % of shortage which represent 30 198 overnight stays. We

can see that the French segment is efficient; indeed the shortage is equal to 0. Morocco may not improve the French overnight stays. Therefore, it is more interesting to invest promotional resources on another segment of origin.

Conclusion

Nowadays, research in tourism interest has increased, especially in the western world. In Morocco, the need of research in this area is indisputable. It's a developing market and seeks maturity. Public and private institutions must coordinate more to develop further the sector and stand up to the competition. Our paper, as already mentioned, is a tool to demonstrate how the Moroccan DMOs can be

Table 4. Shortages

Country of origin	Expected overnight stays	Standard deviation	Shorted expected overnight stays	Shorted standard deviation	δ Shortage	Efficiency of each origin
France	6 025 431	340 046	6 025 431	340 046	-	1.00000
Egypt	33 122	1 280	66 221	1	1 278	0.50056
Syrian Arab Republic	6 175	2 775	12 348	1	2 530	0.54824
Nationals Residing Abroad	30 720	2 893	61 435	1	2 880	0.50226
Libyan Arab Jamahiriya	23 329	4 078	46 657	0	4 017	0.50760
Tunisia	47 291	4 366	94 576	1	4 347	0.50216
Switzerland	145 543	7 008	291 079	0	7 000	0.50059
Mauritania	12 167	8 966	24 332	1	7 217	0.62113
Norway	19 921	10 041	39 842	0	8 966	0.55993
Japan	85 032	9 330	170 062	0	9 274	0.50301
Denmark	27 466	9 936	54 932	0	9 343	0.53171
Germany	955 131	33 802	1 234 651	23 910	9 886	0.77394
United Arab Emirates	25 903	12 250	51 804	0	11 074	0.55311
Other countries of Middle East	141 862	14 073	283 718	1	14 004	0.50247
Finland	37 407	16 207	74 813	1	14 871	0.54492
Austria	35 617	17 716	71 234	0	15 862	0.55844
United States of America	246 603	22 963	493 199	1	22 863	0.50217
Canada	54 160	26 951	108 319	1	24 128	0.55850
Saudi Arabia	173 164	28 402	346 323	1	28 027	0.50669
Belgium	623 868	45 103	1 042 663	14 826	30 198	0.59984
Algeria	81 851	36 583	163 701	1	33 398	0.54767
Sweden	80 536	37 119	161 070	1	33 710	0.55056
Portugal	87 431	41 041	174 861	1	37 151	0.55235
Other countries of Africa	70 481	49 988	140 960	1	40 773	0.61300
Netherlands	278 409	47 622	556 811	1	46 939	0.50727
Other countries of the World Commonwealth Independent States	902 390	128 628	1 529 672	39 214	88 519	0.59569
Italy	279 654	99 085	559 305	1	93 395	0.53046
Spain	504 581	225 586	981 882	12 197	194 807	0.56287
United Kingdom	517 424	346 726	1 014 581	13 581	276 754	0.61385
	1 016 516	473 700	1 905 603	59 383	375 543	0.58823

more operative and more efficient. That said, how they can make the Moroccan destination more competitive. It should be noted that the efficiency become among the main points of interest of decision makers and researchers for sure. This work allows us to target countries of origin that present the best capacity of improvement in term of return expansion and risk contraction. Moroccan authority can select a suit of origins according to its preference in terms of risk and choose origins less reliable to target their promotional policy in these countries.

Finally, we can conclude that the tourism in Morocco must be developed more to improve its attractiveness.

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