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Analysis of the Causal Relationships Between Measures of Financial and Customer Aspects in Balanced Scorecard

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Abstract

As is well known, the strategy dictates how an organization creates value for the stakeholders, customers and citizens. In fact, the strategy is the very factor that guides the organization in its journey towards realizing its vision. In this regard, four perspectives of Balanced Scorecard (BSC) articulate the strategic goals of organization in all respects. The cause-and-effect relationships, outlined in the form of a strategy map, are deemed as the formula for the organization's achievement. Causal relationships map the precise route for the strategy realization. Without such relationships, the organization has only to a set of individual financial and non-financial measures. For the first time in the banking industry of Iran, introduced key indicators of the banking industry and has been investigated the cause and effect relationship between to them. In addition, in the research the author's experiences in the banking industry have been considered so based on this research key variables were extracted from the system and converted to quantitative indicators. Finally, to ensure the validity of the data, the cause and effect relationship has been studied using granger causality method.

Taking the above into account, the present study attempts to explore the cause-and-effect relationships between the financial and customer perspectives of BSC in order to clarify how the measures across the customer perspective of the BSC are correlated with organizational vision.

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1. Introduction

Managers are increasingly aware that strategic judgments need to be made in the context of risk assessments. It has been proposed that strategic performance management systems, such as the balanced scorecard (BSC), offer a useful framework for integrating strategic risk and performance information to provide managers with a more comprehensive overview of their strategy.As numerous articles and books published on the performance evaluation as well as the practitioners in this field have argued, the objectives and their respective measures are advised to be defined based on four perspectives of BSC. To put it differently, they suggest that the cause-and-effect relationships should be formulated at the stage of defining the objectives and measures. Theoretically, this approach sounds to be rapid and logical. Nevertheless, practically, it suffers from some limitations. The notable point is that although this recommendation has been frequently repeated in the extant literature on the balanced evaluation, there is very limited information on the procedures for the successful implementation of this process. The reason behind is that it is a is a very challenging process to sit around a conference table and explain and define the organization's strategies logically through a set of objectives and interrelated measures [1].
The major inadequacy of this approach is that it restricts the creativity of the group in designing powerful performance measures that can effectively transform the procedures of strategy implementation in organizations. To put it more exactly, most often, the first performance driver springing up spontaneously in the individuals' mind for a given objective or measure is selected without paying due attention to the available alternative options. Simply speaking, strategy is a hypothesis articulated by the senior authorities of an organization. This hypothesis reflects the existing standpoint on the appropriate performance as well as the knowledge and awareness required for achievement in a competitive environment. Through defining the value creation processes and the critical role of intangible assets, the BSC can overcome the limitations of merely relying on financial evaluation systems. This method allows managers to identify weaknesses of the organization to improve the performance for each perspective in balanced scorecard. BSC is a multidimensional method that moves from traditional financial indices towards a balanced structure (financial and non-financial, short-term and long-term objectives) [2].
The organization's strategy clarifies how an organization creates value for the shareholders, customers and citizens. Without having a comprehensive description of strategy, the managers will not be able to execute it among themselves and their employees successfully. Indeed, the strategy balances opposite forces within an organization. The starting point for defining a strategic plan is balancing and clarifying the short-term objectives to lower the costs and increase the productivity, targeting the long-term objectives of revenue profitability growth. Hence, the strategy map is aligned with the specific strategy adopted by the organization. The strategy map reveals how the intangible assets that place the greatest impact on value delivery to customers, shareholders and society can strengthen the performance of internal processes of an organization [3].

2. Literature Review

BSC is, by definition, is a series of measures meticulously selected from the strategy adopted by the organization. BSC assesses the organizational performance in terms of four different but interrelated

perspectives driven from one organization's mission, vision and strategy (see Fig. 1) [4]. In other words, strategy is a factor that guides the organization toward the realization of its vision. Thus, four perspectives of BSC articulate the organizational strategic objectives in all respects. If precisely and properly selected, the realization of these measures can be construed as the realization of organizational vision. The following figure illustrates a general picture of the foregoing points:

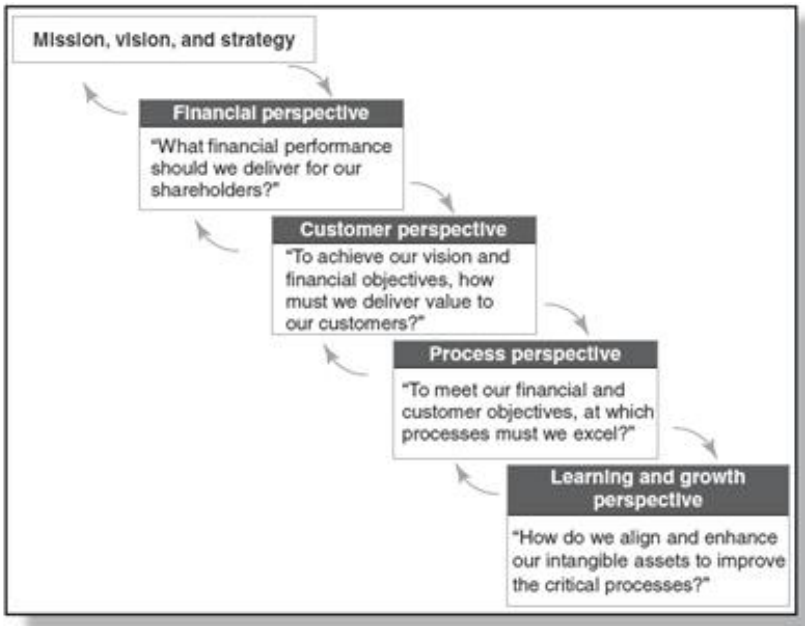

Figure 1: Relational Model of Organization's Objectives and Strategy[4]

For the documentation and testing of the hypotheses that formulate the strategy, organizations commonly require a method. Balanced evaluation system exactly provides the organizations with such a method. This system should explicate the organization's strategy through the objectives and measures. All the measures adopted in the BSC from learning and growth perspective to financial performance perspective should be related to one other through cause-and-effect linkages. Clearly defined, these linkages will allow monitoring the validation and management of the measures. Upon the completion of the foregoing stages of the process of designing a balanced evaluation system, a series of objectives and measures are identified for each of four perspectives. Notwithstanding, the developed system is not complete and it is necessary to move ahead to the next significant stage. This stage involves finding the association between the measures using a series of cause-and-effect relationships. In this way, not only it is possible to assess the organization performance regarding the strategy execution but also the methods of value creation are fully illustrated. Balanced Scorecard is one of the modern business management concepts, which provides a methodology for organization's strategy definition. BSC is the basis for strategic controlling in enterprises [5]. This method allows translating the strategy, mission and vision of the company into operational activities by defining the objectives and measures in the business four perspectives [6]: financial perspective, customer perspective, internal processes perspective, and growth and development perspective [7].
The cause-and-effect relationships delineated in the form of strategy map are regarded as the guideline for the organization achievement. These relationships clarify the precise route for the strategy realization. Without having such relationships, the organization have only a set of individual and separate financial and non-financial measures. If the cause-and-effect linkages among the measures are not defined, it will remain ambiguous how to execute the strategy. This is only can be made

clear through outlining the foregoing relationships as a strategy map. The strategy map relates the seemingly independent components of organization's strategy to one another. The causal associations involved in the balanced evaluation system in fact narrates the "story" behind the organization's strategy. It has been advised that the performance measure to be determined at the first stage. Then, the strategy map consisting of some series of cause-and-effect associations among the measures can be drawn [8].

Thus, a brief literature review in this research area is provided. Following this, based on the general model, for example in some study "The balanced scorecard of a new destination product: Implications for lodging and skiing firms", by Sainaghi and et.al [9], tried to examine the New product development (NPD) is a counter-seasonal strategy able to reduce demand fluctuations, especially during the seasonal tails. No previous study has analysed this field through the lens of balanced scorecard (BSC). This explorative paper contributes to this gap and considers two research questions: i) how is a destination NPD process operationalized using the four BSC perspectives? ii) What is the relevance and content of each perspective in this particular field? In thishe study deploys a longitudinal analysis of the Skipassfree product, launched by Livigno (Italy) in 2007. Over a decade, this product generated a significant uplift both in terms of hotel guests (+108%) and ski company clients (+248%). The proposed framework is built around 22 codes and incorporates a fifth BSC perspective (the destination context). "Learning and growth" is the most significant perspective with "alignment" being a key attribute, which suggests the relevance of innovation and stakeholders' involvement [9].

In another research Hamamura [10], investigates the optimal level of transfer prices chosen by managers in a divisionalized firm when they are evaluated based on a balanced scorecard. A unique assumption of our model is that transfer prices are unobservable to a competing firm's managers. In contrast to the findings in several studies that examine strategic transfer pricing, this research shows that a manager who is evaluated using a balanced scorecard chooses a transfer price that exceeds marginal cost given a market competitor in a specific economic environment. This result is caused mainly by our model's assumption that a manager considers the competitor's profit in his/her in decision-making when the objective is to maximize long-term profit. This study makes a significant contribution to the strategic transfer pricing literature by showing that even if the transfer price is unobservable to rivals, the optimal transfer price exceeds marginal cost when the final product market is characterized by price competition, something not shown in previous analytical accounting research.

Considering these, in one study titled "The possibility of using the Balanced Evaluation System in Mehr Eghtesad Bank", Valipour & Keshavarznia [11] tried to examine the possibilities, infrastructures and systems available in the banking industry for the execution of a balanced evaluation system. The findings of this study revealed that the bank in question has access to all the systems, infrastructures and information tools required for executing the balanced evaluation; however, it lacks an explicit and understandable strategy to be used by its employees.

In the same vein, Wilson et al. [12] in their study titled "Results Using the Balanced Scorecard in the Public Sector" examined the effects of using BSC. They found that the BSC approach that has been implemented by the National Directorate of British Columbia in Canada renamed the "financial perspective" as the "Stakeholder View" and put this system of balance assessment at the same level as the customer perspective. They also argued that the financial perspective was at the leading edge of the three national agencies that all followed a balanced approach to strategic planning.

However, the approach aims in this research is to integrate this performance evaluation of sustainable development and use qualitative and quantitative information with the sustainability-balanced scorecard[11]. So we can investigate for the first time in iran the cause and effect relationship by

using the Granger causality method.

3. Methodology Granger causality

In time series analysis, inference about cause-effect relationships is commonly based on the concept of Granger causality Granger [8]. Unlike the two previous approaches, this probabilistic concept of causality does not rely on the specification of a scientific model and thus is particularly suited for empirical investigations of cause-effect relationships. For his general definition of causality, Granger [8] evokes the following two fundamental principles [13]:

1. The effect does not precede its cause in time;
2. The causal series contains unique information about the series being caused that is not available otherwise.

Taking these studies into account, by using Granger causality test method, the present study was designed to examine the cause-and-effect relationships between the measures of customer perspective and those of financial perspective that have been derived from organizational vision.
Granger causality test was firstly introduced in Granger's study. In this test, causality, more appropriately, means precedence regarding explanatory power. For instance, if the time series X at t-p time can forecast the time series behavior of Y at t time, then, X is said to Granger-causes Y. It is notable that this test has been designed for the time series. The simple and general form of Granger test is based on VAR equation that can be applied to the stationary time series. G-causality is normally tested in the context of linear regression models. It is formulated in the following way [13]:

$$X_1(t) = \sum_{j=1}^{p} A_{11j} X_1(t-j) + \sum_{j=1}^{p} A_{12j} X_2(t-j) + E_{1(t)} \tag{3.1}$$

$$X_2(t) = \sum_{j=1}^{p} A_{21j} X_1(t-j) + \sum_{j=1}^{p} A_{22j} X_2(t-j) + E_{2(t)} \tag{3.2}$$

Where p is the maximum number of lagged observations included in the model (the model order), the matrix A contains the coefficients of the model (i.e., the contributions of each lagged observation to the predicted values of X_1(t) and X_2(t), and E_1 and E_2 are residuals (prediction errors) for each time series. If the variance of E_1 (or E_2) is reduced by the inclusion of the X_2 (or X_1) terms in the first (or second) equation, then it is said that X_2 (or X_1) Granger-(G)-causes X_1 (or X_2). In other words, X_2 G-causes X_1 if the coefficients in A_{12} are jointly significantly different from zero. This can be tested by performing an F-test of the null hypothesis that $A_{12} = 0$, given assumptions of covariance stationarity on X_1 and X_2. The magnitude of a G-causality interaction can be estimated by the logarithm of the corresponding F-statistic. Note that model selection criteria, such as the Bayesian Information Criterion (BIC), or the Akaike Information Criterion (AIC), can be used to determine the appropriate model order p [13].
As Granger has argued, this test is only valid when the variables are not cointegrated. In consequence, at first, the stationary or non-stationary nature of the variables should be checked. Then, the cointegration relationship between the variables should be examined. If the variables are found to be stationary and 1^{st}-order but non-integrated, a YAR model can be developed by taking 1^{st}-order difference for the variables and then the test can be performed [8]. It is also noteworthy that in Granger causality test, the stationary degree of the variables should be known. As a result, it is necessary to assess the stationary degree of the variables by using Augmented Dickey-Fuller test.

3.1. Spectral G-causality

By using Fourier methods, it is possible to examine G-causality in the spectral domain. This can be very useful for neurophysiological signals, where frequency decompositions are often of interest. Intuitively, spectral G-causality from X_1 to X_2 measures the fraction of the total power at frequency f of X1 that is contributed by X_2. For completeness, we give below the mathematical details of spectral G-causality. The Fourier transform of (1 and 2) gives:

$$\begin{pmatrix} A_{11}(f) & A_{12}(f) \\ A_{21}(f) & A_{22}(f) \end{pmatrix} \begin{pmatrix} X_1(f) \\ X_2(f) \end{pmatrix} = \begin{pmatrix} E_1(f) \\ E_2(f) \end{pmatrix} \tag{3.3}$$

In which the components of A are:

$$A_{lm}(f) = \delta_{lm} - \sum_{j=1}^{p} A_{lm}(j) e^{-i2\pi fj} \tag{3.4}$$

$$\delta_{\mathrm{lm}} = 0(\mathrm{l} = \mathrm{m})$$

$$\delta_{\mathrm{lm}} = 1 \quad (\mathrm{l} \neq \mathrm{m})$$

Rewriting Equation (3.2) as:

$$\begin{pmatrix} H_{11}(f) & H_{12}(f) \\ H_{21}(f) & H_{22}(f) \end{pmatrix} = \begin{pmatrix} A_{11}(f) & A_{12}(f) \\ A_{21}(f) & A_{22}(f) \end{pmatrix}^{-1} \tag{3.5}$$

Where H is the transfer matrix. The spectral matrix S can now be derived as:

$$S(f) = \langle X(f) X^*(f) \rangle = \left\langle H(f) \sum H^*(f) \right\rangle \tag{3.6}$$

In which the asterisk denotes matrix transposition and complex conjugation, Σ is the covariance matrix of the residuals E(t) , and H is the transfer matrix. The spectral G-causality from j to i is then:

$$I_{j \to i}(f) = -\ln \left(1 - \frac{\left(\Sigma_{jj} - \frac{\Sigma_{ij}^2}{\Sigma_{ii}} \right) |H_{ij}(f)|^2}{S_{ii(f)}} \right) \tag{3.7}$$

In which S_{ii}(f) is the power spectrum of variable i at frequency f [13].

For the purpose of this study, the objectives and measures for the financial perspective of the BSC are as follows:

In the same vein, the objectives and measures of the customer perspective can be defined as in Table2.

4. Data analysis

To assess the cause-and-effect relationships between the measures under study, firstly, the variables should be checked for stationary or non-stationary. One of the tests widely used for assessing the stationary degree of the variables is Augmented Dickey-Fuller test that has been used in this study as well.

As is evident from the findings of the foregoing table, the absolute values of Dickey-Fuller statistic obtained for the variables of “revenue to cost ratio of resources supply” and “number of outstanding claims files” at the desired level are greater than the critical values; hence, it can be deducted that the foregoing variables are stationary. Nonetheless, for other measures, the variables became stationary after calculating the 1^{st} -order differencing.

Table 1: Objectives and performance measures of the financial perspective

Objectives	**Measures**
Equity (stocks') value increase (shareholder's wealth)	Economic value added (EVA) (revenue to capital costs ratio)
Improved structure of total cost	Revenue to resources supply cost ratio
Increased assets consumption	Revenue to loans ratio
Improved customer value	Outstanding claims percentage (Outstanding claims to loans ratio)

Table 2: Objectives and performance measures of customer perspective

Objectives	**Measures**
Acquisition of new customers	Net sales (loans to outstanding claims ratio)
Improved market share	Total costs of resources
	Bad debts amount
Increased customer profitability	Number of outstanding claims files
	Future interest (Profitability of previous customers)

Table 3: Results of Stationary Test Using Augmented Dickey-Fuller Test at Variables Level

Variable	ADF Statistic	Critical values		
		1%	5%	10%
Economic value added (EVA)	-2.225	-3.519	-2.900	-2.587
Revenue to resources supply costs ratio	-4.340	-3.519	-2.900	-2.587
Revenue to loans ratio	-2.188	-3.519	-2.900	-2.587
Outstanding claims percentage	-2.003	-3.519	-2.900	-2.587
Net sales	-0.264	-3.520	-2.901	-2.588
Resources total costs	-2.115	-3.519	-2.900	-2.587
Bad debts amount	0.327	-3.519	-2.900	-2.587
Number of outstanding claims files	5.577	-4.297	-3.213	-2.748
Future interest	-0.751	-3.520	-2.901	-2.588

Table 4: Results of Stationary Test Using Augmented Dickey-Fuller Method at variables level (1^{st}-order differencing

Variable	ADF Statistic	Critical values		
		1%	5%	10%
Economic value added (EVA)	-9.170	-3.520	-2.901	-2.588
Revenue to loans ratio	-9.149	-3.520	-2.901	-2.588
Outstanding claims percentage	-8.166	-3.520	-2.901	-2.588
Net sales	-4.413	-3.520	-2.901	-2.588
Resources total cost	-8.781	-3.520	-2.901	-2.588
Bad debt amount	-7.035	-3.520	-2.901	-2.588
Future interest	-4.062	-3.520	-2.901	-2.588

5. Conclusion

Doubtlessly, the customers are the main factor of companies' achievement. Consequently, the measures of the customer perspective within the BSC are of particular significance. Furthermore, the measures of financial perspective are in fact a translation of organizational vision that have been transformed into quantitative measures via a process. Considering these, in this study, the cause-and-effect relationships of the financial and customer measures in the banking industry have been examined. The results of the study have been summarized in the following table:

Table 5: Results of Granger Causality Test

Measures	Hypothesis	F- Statistic	Probability	Result
Granger Causality Test for Economic Added Value (EDV) & Measures of Customer Perspective	Net sales Granger-causes EVA.	0.34831	0.5569	Rejected
	EVD Granger-causes net sales.			Accepted
	Resources total cost Granger-causes EVA.	3.21544	0.0461	Accepted
	EVA Granger-causes resources total cost.	2.27211	0.1106	Rejected
	Bad debts amount Granger-causes EVA.	1.00162	0.3202	Rejected
	EVA Granger-causes bad debts amount.	6.60368	0.0122	Accepted
	Number of outstanding claims files Granger-causes EVA.	0.00498	0.9457	Rejected
	EVA Granger-causes number of outstanding claims files.	9.87982	0.0163	Accepted
	Future interest Granger-causes EVA.	1.78382	0.1858	Rejected
	EVA Granger-causes future interest.	48.9577	1.00E-09	Accepted
Granger Causality Test for Revenue-Cost Ratio of Resources Supply & Measures of Customer Perspective	Net sales Granger-causes revenue-cost ratio of resources supply.	42.6436	8.00E-09	Accepted
	Revenue-cost ratio of resources supply Granger-causes net sales.	1.2263	0.2718	Rejected
	Resources total cost Granger-causes revenue-cost ratio of resources supply.	9.34206	1.00E-06	Accepted
	Revenue-cost ratio of resources supply Granger-causes resources total cost.	0.08373	0.9945	Rejected
	Bad debts amount Granger-causes revenue-cost ratio of resources supply.	42.5225	8.00E-09	Accepted
	Revenue-cost ratio of resources supply Granger-causes bad debts amount.	0.74183	0.3919	Rejected
	Number of outstanding claims files Granger-causes revenue-cost ratio of resources supply.	42.6436	8.00E-09	Accepted
	Revenue-cost ratio of resources supply Granger-causes number of outstanding claims files	1.2263	0.2718	Rejected
	Future interest Granger-causes revenue-cost ratio of resources supply.	2.27614	0.1102	Rejected
	Revenue-cost ratio of resources supply Granger-causes future interest .	3.64644	0.0312	Accepted

Granger Causality Test for Revenue-Loans Ratio & Measures of Customer Perspective	Net sales Granger-causes revenue-consumption ratio.	0.77481	0.3816	Rejected
	Revenue-consumption ratio Granger-causes net sales.	42.0665	9.00E-09	Accepted
	Resources total cost Granger-causes revenue-loans ratio.	5.91865	0.0012	Accepted
	Revenue-loans ratio Granger-causes resources total cost.	5.73346	0.0015	Accepted
	Bad debts amount Granger-causes revenue-loans ratio.	0.55681	0.4579	Rejected
	Revenue-loans ratio Granger-causes bad debts amount.	6.13281	0.0156	Accepted
	Number of outstanding claims files number Granger-causes revenue-loans ratio.	6.26028	0.0146	Accepted
	Revenue-loans ratio Granger-causes number of outstanding claims files.	0.27836	0.5994	Rejected
	Future interest Granger-causes revenue-loans ratio.	2.65525	0.1075	Rejected
	Revenue-loans ratio Granger-causes future interest.	49.556	9.00E-10	Accepted
Granger Causality Test for Outstanding Claims Percentage & Measures of Customer Perspective	Net sales Granger-causes outstanding claims percentage.	7.39991	0.0012	Accepted
	Outstanding claims percentage Granger-causes net sales.	10.7716	8.00E-05	Accepted
	Resources total cost Granger-causes outstanding claims percentage.	10.7434	0.0016	Accepted
	Outstanding claims percentage Granger-causes resources total cost.	1.82976	0.1803	Rejected
	Bad debts amount Granger-causes outstanding claims percentage.	0.28886	0.5926	Rejected
	Outstanding claims percentage Granger-causes bad debts amount.	9.96832	0.0023	Accepted
	Number of outstanding claims files Granger-causes outstanding claims percentage.	3.07552	0.0525	Accepted
	Outstanding claims percentage Granger-causes number of outstanding claims files.	2.92205	0.0604	Rejected
	Future interest Granger-causes outstanding claims percentage.	8.102	0.0007	Accepted
	Outstanding claims percentage Granger-causes future interest.	6.53176	0.0025	Accepted

References

[1] Cheng, M. M., Humpreys, K. A., & Zhang, Y. Y. (2018). "The Interplay between strategic risk profiles and presentation format on managers strategic judgments using the balance scorecard". Accounting, Organization and Society, 30, 1-14.
[2] Sarraf, F., & Nejad, S. H. (2020). "Improving performance evaluation based on balanced scorecard with grey relational analysis and data envelopment analysis approaches: Case study in water and wastewater companies". Evaluation and Program Planning, 79, 101762.
[3] Kaplan, R.S. & Norton, D.P. (2015). "Strategy Maps: Converting. Intangible Assets into Tangible Outcomes". Translated by Akbari. H., Soltani, M. & Maleki, A.. Tehran: Aryana Ghalam.
[4] Atkinson, A.A., Kaplan,R.S., Matsumura, E. M., & Young. S.M. (2004). "Management Accounting Information for Decision-making and Strategy Execution". Copyright 2012 , 2007, 2004, 2001, 1997 by Pearson Education ,Inc. ,Upper Saddle River , New Jersey , 07458. Sixth edition.
[5] Lesáková, Ľ., & Dubcová, K. (2016)." Knowledge and use of the balanced scorecard method in the businesses in the Slovak Republic". Procedia-Social and Behavioral Sciences, 230, 39-48.
[6] Tubis, A., & Werbińska-Wojciechowska, S. (2017)." Balanced scorecard use in passenger transport companies performing at Polish market". Procedia Engineering, 187, 538-547.
[7] Hamamura, J. (2019). "Unobservable transfer price exceeds marginal cost when the manager is evaluated using a balanced scorecard". Advances in accounting, 44, 22-28.
[8] Granger, C.W.J. (1986). "Development in Study of Cointegrated Economic Variables". Oxford Bulletin of Economics & Statistics, Vol.48, pp.213 & 228.
[9] Sainaghi, R., Phillips, P., & d'Angella, F. (2019). "The balanced scorecard of a new destination product: Implications for lodging and skiing firms". International Journal of Hospitality Management, 76, 216-230.
[10] Hamamura, J. (2019). "Unobservable transfer price exceeds marginal cost when the manager is evaluated using a balanced scorecard". Advances in accounting, 44, 22-28.
[11] Lu, M. T., Hsu, C. C., Liou, J. J., & Lo, H. W. (2018). "A hybrid MCDM and sustainability-balanced scorecard model to establish sustainable performance evaluation for international airports". Journal of Air Transport Management, 71, 9-19.
[12] Eichler, M. (2012). "Causal inference in time series analysis". pp. 327-354, na.
[13] Anil Seth,(2007). "Granger causality". Scholarpedia, Journal Article, 7(2), 20-35