contribuciones

The Influence Of The Net-metric And Biblio-metric Variables On The Top Artists Of The Internacional Art Market

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ABSTRACT

The variable Artist influences the market price of a work of art. Both Biblio-metric and Net-metric variables are built using documental and digital sources of information to quantify or measure the variable Artist. The variable Annual Turnover is explained through the Variable Artist. An original database has been built including all transactions of the most quoted artists in terms of turnover in the international auction houses during the period 1997-2005. The proposed regression models show the Annual Turnovers are explained in a 50% and in a 70% by the Biblio-metric variable and the Net-metric variables respectively, which points out the Net metric variables have more relevance as explanatory variables of the Art Market. Also, Pearson correlation coefficients between both kinds of metric variables and the annual turnovers suggest spacing in the time between both kind of metrics Variables.

Keywords: net-metric variables, biblio-metric variables, ranking of artists, art market, multivariable regression analysis

La Influencia De Las Variables Red-metricas Y Biblio-metricas En El Mercado Del Arte De Los Principales Artistas A Nivel Internacional

RESUMEN

Se han construido variables Biblio-métricas y Red-métricas, utilizando información documental y digital en enero del 2007, para medir o cuantificar el autor y explicar la facturación alcanzada en las casas de subastas en el periodo 1997-2005, con las obras de los primeros artistas del ranking mundial. Los modelos obtenidos por regresión indican un porcentaje de explicación mayor del 50% con la variable Biblio-métrica y de más del 70% con las Red-métricas, lo que indica la mayor oportunidad de estas últimas para explicar el mercado del arte. Asimismo, los coeficientes de correlación de Pearson entre las variables métricas y la facturación anual indican un distanciamiento entre los dos tipos de variables a medida que se aproximan en el tiempo.

Palabras Clave: variables red-métricas, variables biblio-métricas, ranking artistas, mercado del arte, analisis de regresion multivariante

1. INTRODUCTION

The first economic studies about the Art market focused on the relationship between art and investments. Baumol (1986) promoted the research of the financial returns of Art purchases, comparing it to the profit acquired with other kinds of investments. Later studies in line with this topic were carried out by Frey and Pommerehne (1989), Buelens and Ginsburgh (1993), Goetzmann (1994), Chanel (1995), and Mei and Moses (2002).

A few years ago, multivariable regression models began to be used for determining the factors that can explain the art market behaviour. The first papers written about this topic were published in 1997, examples include such papers as the Czujack (1997), Ginsburgh and Penders (1997) and Pommerhne papers (1997).

Czujack examined the market of Picasso paintings sold at auction between 1963 and 1994. She tested where and in which way dimensions, materials used, signature, where and by whom the art work was sold, the catalogue raisonné number, working periods, exhibitions, and provenance play a significant role in the determination of the price.

Second ones, Ginsburgh and Penders focused on the relations of land artists to the art market. Their paper examines whether there is a market for Land Art and if so, whether it shares the same characteristics as markets for Minimal and Conceptual Art, which started at about the same time. For this they used as explanatory variables the size of the work of art, the antiquity, materials and techniques. Data collected on auctions over the period 1972–1992, show that this market is very thin.

Finally, Pommerhne analyzed how the policy museums issues related to works of art purchases influence the works of art prices sold in the auction houses during the period 1820-1970.

Fiver years later, Rengers and Velthuis (2002) analyzed the determinants of prices for contemporary art sold in gallery modelled on three different levels: the work of art (size, material), the artist (age, sex, place of residence, institutional recognition), and the gallery (location, institutional affiliation, age).

The same year Valsan (2002), investigated the relationship between the market value of art and the nationality of the painter. A sample of modern and contemporary Canadian and American paintings sold in the international auction houses is analyzed during the period 1987-1996. In general, the price of Canadian art is well below that of American art. Even after adjusting for painting characteristics, Canadian paintings appear to be less expensive still.

Between the researches carried out in Spain, we can emphasize the research by Guadalajara, Blasco, and Guijarro (2000) at the Polytechnic University of Valencia. This paper examines the Contemporary Spanish art market, analyzing the international auction houses sales during the period 1990-2000. The proposed models for each Contemporary Spanish artist use as explanatory variables: the size, the technique, the nationality of the auction house and the sold date.

The works finished until recently estimate the value of the individual works of an artist or a group of artists, using in all of them as explanatory variables related to the artists: their age, their nationality, their residence country or the prices reached in previous sales.

Recently, Caballer, and De la Poza (2005), and De la Poza (2006) used the net-metric and biblio-metric variables for examining the art market. The sample was the 100 most quoted painters in terms of turnover in the international auction houses for the years 2003 and 2004.

The painters were selected on the basis of their turnover in 2003, updating their turnover for 2004, which explains the sample reduced from 100 to 74 painters as the research only took in account the sold oil on canvas paintings, excluding other kind of techniques or supports.

The net-metric variables were quantified with the engines Google and Yahoo, during the period February-June 2005, while biblio-metric variables were quantified accounting the number of words written about each artist. The choice of the Encyclopaedia was done attending to their international relevance and nationality.

The ones selected were:

1. Universal Encyclopaedia Larousse Multimedia 2003. Publishing Spes S.L.

2. Encyclopedia Británnica 2005 by Británnica Editors.

3. Encyclopedia Espasa.2002. Espasa Calpe. Madrid.

4. Universal Great Encyclopedia. 1998. Caroggio, Durvan. Barcelona, Bilbao.

5. Encyclopaedia of Art. 1991. Arnaldo Monadatori Editori, S.P.A.-Milan.

Of all of them, Britannica Encyclopaedia was the more influent explanatory variable (with a 37,9%) of the turnover of the oil on canvas works of art sold in the international auction houses in 2003 from the painters of our sample.

It shows evidence that the older edition the Encyclopaedia has less relevance given to the Contemporarian artist, and more to the Old Masters what means more or less number of written words about their masterpiece respectively.

On the other hand, there was any relationship between the turnover sales of oil on canvas in 2003 and the number of quotations in Internet one year later in 2005. This can be due to the fact that the sales were analyzed for a very short period and also the sample of artists was not representative of the international art market.

2. OBJECTIVES

In consequence, the main goal of this work is to analyze the influence of the biblio-metric variables and net-metric variables in the volume of turnover of the art market during a period of time wide enough, 9 years 1997-2005. Also, we examine whether the influence of the metric variables increases when the dependent variable and the metric variables have been quantified in closer periods of time.

3. SOURCES OF INFORMATION

This way, the research began building a ranking of 40 artists according to their turnover in the international auction houses for the period of time 1997-2005 .Using the data bases Art Price.

It was considered the turnover of the 40 artists selected during a large period of time. This allows us to know the possible relation between the annual turnover and the metric variables.

A short period of time would not let us know how turnover evolves in relation to the biblio-metric and net-metric variables in an objective way, as there are years that the birthday, death of an artist can be celebrated. This alters the turnover in an artificial way. Exhibitions and events around the world could alter the net-metric variables (number of quotations in the Google and Yahoo search engines).

On the other hand, a period of time too wide is not possible in terms of data, as the availability of information of sales turnover is limited.

Art Price publishes every March since 2002 and reports about the art market of the previous year. This report includes the ranking of artists of the year according to the sales turnover.

The annual art Market report was not published in previous years (1997-2001) and it has been necessary to carry out an accurate search of the artists that composes the ranking of the 40 more quoted artists in terms of sales turnover for building it.

Table I gathers the relation of artists and their total turnover in those years. The ranking takes in account artistic disciplines, such as sculpture, painting, print, photography, drawing, water-drawing, ceramic, etc. Each one has their several varieties in terms of support.

Table I. Ranking of the most quoted artists for the period of time 1997-2005 and its total turnover (€.)

Artist		Turnover (euros)
Picasso		1.266.157.635
Warhol, Andy		739.816.705
Monet Claude		602.968.258
Canaletto Antonio C.		447.033.061
Rothko Mark		372.274.970
Kooning de Willem		321.897.080
Chagall Mark		293.925.250
Basquiat J.M.		279.857.179
Léger Fernand		262.433.336
Freud Lucian		239.447.262
Lichtenstein Roy		216.980.804
Miró Joan		208.117.348
Matisse Henri.		172.550.276
Renoir Auguste		185.523.333
Beckmann Max		173.220.506
Brancusi Constantin		164.898.584
Bacon Francis		158.777.757
Smith David		151.259.004
Dongen van Kees		133.158.408
Giacometti Alberto		143.342.879
Modigliani Amedeo		137.055.040
Degas Edgar		133.281.830
Toulouse-Lautrec de henri		128.841.362
Bonnard Pierre		122.989.268
Pissarro Camille		120.106.135
Calder Alexander		116.629.705
Fontana Lucio		112.935.961
Cézanne Paul		107.606.634
Richter Gerard		110.043.051
Twombly Cy		103.286.897
Koons Jeff		99.108.416
Vlaminck de Maurice		96.574.207
Wu Guanzhong		95.020.149
Kline Franz		92.067.164
Aivazovsky Ivan C.		89.454.065
Guardi Francesco		87.293.049
Moore Henry		85.129.743
Guston Philip		81.875.471
Lin Fengmian		80.838.117
Signac Paul		71.874.325

From the 40 most quoted artists in the international market during the period of time 1997-2005 only 23 artists remained every year in the ranking of the 40 more quoted artists. These 23 artists are the sample to analyze. They are: Picasso, Warhol, Andy; Monet Claude; Kooning de Willem; Chagall Mark; Basquiat J.M; Léger Fernand; Fontana Lucio; Lichtenstein Roy; Miró Joan; Matisse Henri; Renoir Auguste; Dongen van Kees; Giacometti Alberto; Modigliani Amedeo; Degas Edgar; Pissarro Camilla; Calder Alexander; Cézanne Paul; Richter Gerard; Twombly Cy; Vlaminck de Maurice y Magritte Rene.

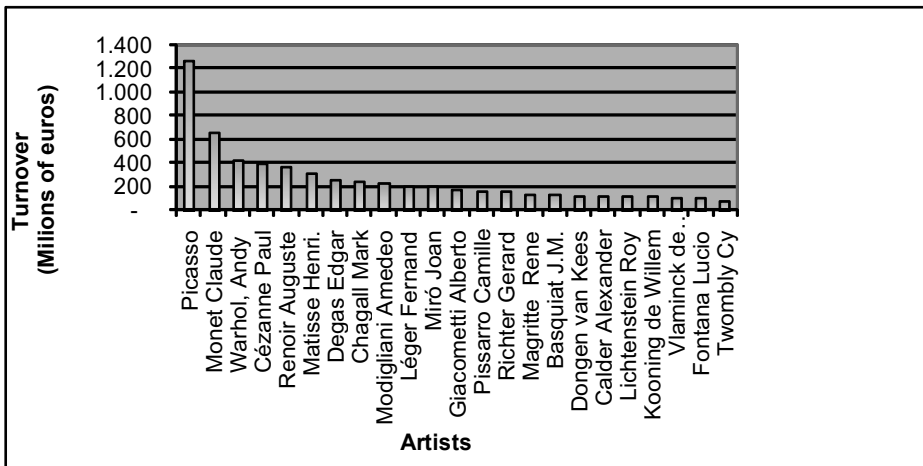**Figure I. The sample of artists during the period of time 1997-2005.**


Figure I shows the turnover per artist for the period of time studied. Figure II shows the turnover trend of the sample of artists in the period considered.

Spanish painter Picasso was the number one in the ranking every year, and also his sold works of art produced a turnover between the 12,57% and the 34% of the total sample.

Figure II. Trend of the turnover of the 23 artists analyzed.
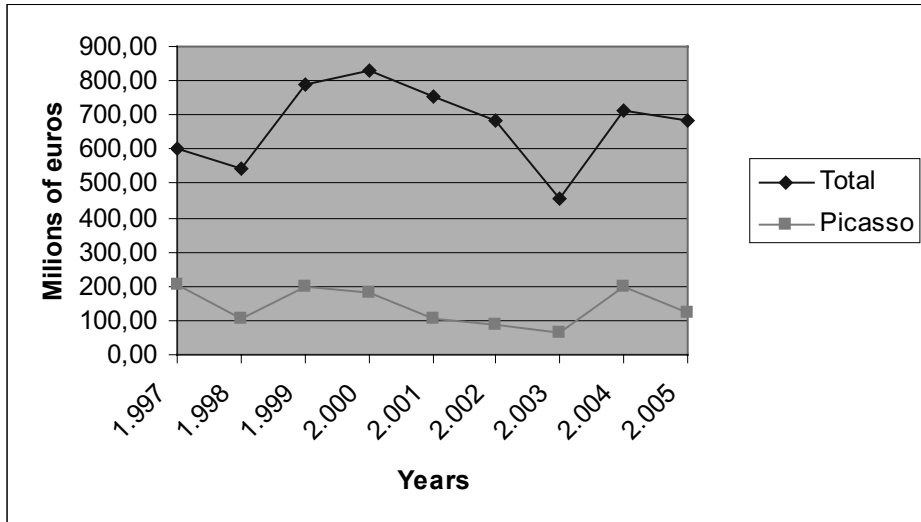
For quantifying the Net-metric and Biblio-metric Variables have been used several sources of information.

<u>Biblio-metric Variables</u>

Only Britannica Encyclopedia in its online version (January 2007) was selected as a biblio-metric variable. This was the only documental source selected as it was the most significant one in the works named before. The Variable Artist was quantified through the number of words written about each artist in order to determine the prestige or reputation of the Artist. (see Table II)

Table II. Quantification of the Biblio-metric variable.

Ranking	Artist	Xb
1	Picasso	5.811
2	Warhol, Andy	440
3	Monet Claude	2.942
4	Kooning de Willem	1.315
5	Chagall Mark	1.932
6	Basquiat J.M.	558
7	Léger Fernand	1.106
8	Fontana Lucio	100
9	Lichtenstein Roy	393
10	Miró Joan	1.363
11	Matisse Henri.	2.711
12	Renoir Auguste	1.978
13	Dongen van Kees	267
14	Giacometti Alberto	1.135
15	Modigliani Amedeo	1.012
16	Degas Edgar	4.359
17	Pissarro Camille	2.639
18	Calder Alexander	1.380
19	Cézanne Paul	3.112
20	Richter Gerard	455
21	Twombly Cy	-
22	Vlaminck de Maurice	300
23	Magritte Rene	450

Net-metric Variables.

Related to the Net-metric Variables different digital sources were used, such as the Yahoo and Google engines. The same engines were used in previous works.

The Net-metric variables are quantified through the number of times that an artist is quoted in the selected engines, in January 2007. Also, the Variable was quantified in different ways, one considering just the artist surname for Google and Yahoo and other considering their names and surnames in Google and Yahoo. For each artist are 4 Net-metric Variables. The second kind of search tries to delete those quotations not related directly to the artist. (See Table III)

Four Net-metric Variables were considered, x_{r1}, x_{r2}, x_{r3}, x_{r4}, which are:

x_{r1} = Number of quotations of each artist in Google (without including first name)

x_{r2} = Number of quotations of each artist in Yahoo (without including first name)

x_{r3} = Number of quotations of each artist in Google (including first name)

x_{r4} = Number of quotations of each artist in Yahoo (including first name)

Table III. Quantification of the Net-metric Variables.

Artist	Xr1 Google without name	Xr2 Yahoo without name	Xr3 Google with name	Xr4 Yahoo with name
Picasso	2.660.000	9.520.000	31.000.000	16.500.000
Warhol, Andy	2.670.000	11.900.000	11.000.000	6.040.000
Monet Claude	2.040.000	5.100.000	16.000.000	9.710.000
Kooning de Willem	759.000	326.000	1.080.000	515.000
Chagall Mark	942.000	327.000	4.740.000	2.150.000
Basquiat J.M.	117.000	54.700	1.750.000	735.000
Léger Fernand	18.600.000	5.610.000	1.400.000	240.000
Fontana Lucio	23.300.000	12.400.000	1.030.000	1.230.000
Lichtenstein Roy	8.900.000	681.000	1.370.000	1.650.000
Miró Joan	22.900.000	1.880.000	2.090.000	506.000
Matisse Henri.	7.670.000	3.640.000	1.800.000	3.180.000
Renoir Auguste	7.130.000	3.370.000	1.610.000	2.080.000
Dongen van Kees	1.780.000	1.200.000	561.000	153.000
Giacometti Alberto	2.090.000	736.000	1.030.000	832.000
Modigliani Amedeo	3.610.000	1.410.000	1.020.000	758.000
Degas Edgar	4.970.000	2.100.000	1.660.000	2.010.000
Pissarro Camille	1.270.000	595.000	1.220.000	592.000
Calder Alexander	8.220.000	4.560.000	1.310.000	2.230.000
Cézanne Paul	4.450.000	2.970.000	3.860.000	3.370.000
Richter Gerard	44.800.000	24.200.000	1.210.000	926.000
Twombly Cy	356.000	131.000	793.000	427.000
Vlaminck de aurice	542.000	177.000	338.000	86.200
Magritte Rene	2.820.000	1.330.000	1.220.000	505.000

4. METHODOLOGY

The methodology used is the multivariable regression analysis. This let us know the possible influence of the Biblio-metric and Net-metric Variables in the artists' turnovers.

The first hypothesis considers the turnover is a function of the Net-metric and Biblio-metric Variables, and also a function of the time. The model proposed is:

Fij = f (Xbi, Xrki, t, ε)
where:
Fij = turnover of each artist i (1,….,23) in the year j (1997,…….,2005)
Xbi = value of the Biblio-metric variable for the artist i in the year 2007
Xrki = value of the Net-metric variable k (1,2,3,4) for the artist i in the year 2007
t = time, being 1 for the year 1997
ε = white noise

Also, the second hypothesis assumes the turnovers of successive years are more correlated with the metric Variables as they get closer in time. Pearson correlation coefficients are estimated between those variables and the turnover of every year. Subsequently its time evolution is studied:

$\rho_{Fi, Xbi}$ j = f (t)
$\rho_{Fi, Xrki}$ j = f (t)

where:
$\rho_{Fi, Xbi}$ j = Pearson correlation coefficient in the year j (1997,…,2005) between the turnover of each artist and his/her Biblio-metric Variable
$\rho_{Fi, Xrki}$ j = Pearson correlation coefficient in the year j (1997,…,2005) between the turnover of each artist and his/her Net-metric Variable k (1,2, 3, 4)

5. RESULTS

The models estimated with each kind of variable are showed in Table IV.

Table IV. Results of the Regression Analysis.

	Model 1	Model 2	Model 3
	Dependent Variable turnover	Dependent Variable: turnover	Dependent Variable: turnover
Constant	15.432.991 (**)	13.960.792(**)	11.244.240(**)
squared Biblio-metric Variable	3,079(**)		
Net-metricVariable Xr3		3,952(**)	
Net-metric Variable Xr4			7,347(**)
R^2 corrected	0,517	0,670	0,681
F	221,405(**)	418,97(**)	441,184(**)

(**)Significance level 99%

Results show Net-metric variables have more influence on the turnover when they include the name of the artists. Also, Xr4 (yahoo Net-metric Variable) is more influence than Xr3 (Google Net-metric Variable)

Biblio-metric Variables explain up to the 50% of the turnover, while Net-metric Variables explain approximately 70% of the turnover per year.

The Net-metric Variables estimated without including the first name of the artist (Xr1,Xr2) did not result explicative of the turnover in a 99% significance level. This shows the need to specify clearly the name of the artists in the internet searches.

The optimum models show the Net-metric Variables have a lineal behaviour while the Biblio-metric are quadratic. This means, for each additional quotation considered in the engines Google and Yahoo for each artist, the annual turnover increases 3,9 and 7,35 euros, respectively.

On the contrary, Biblio-metric Variable accomplishes the law of marginal increases of turnovers, as when the value of the variable increases the turnover increases more than proportionally.

Variable time does not appear in the model, this verify the turnovers don't increase or decrease along the time.

Also, Pearson matrix of correlation between explanatory Variables and the dependent Variable annual turnover are shown in Table V.

Table V. Pearson Correlation Coefficients.

		Google search without first name	Yahoo search without first name	Google search including first name	Yahoo search including first name	Britannica Encyclopaedia
Google search without first name	Pearson correlation coefficient	1	0,76360123	-0,17301102	-0,17119331	-0,20876914
	Sig. (bilateral)		2,2419E-05	0,42985419	0,43478999	0,33908351
	N	23	23	23	23	23
Yahoo search without first name	Pearson correlation	0,76360123	1	0,27338359	0,28682985	-0,01363685
	Sig. (bilateral)	2,2419E-05		0,20687765	0,1845214	0,95075754
	N	23	23	23	23	23
Google search including first name	Pearson correlation	-0,17301102	0,27338359	1	0,98044982	0,64861969
	Sig. (bilateral)	0,42985419	0,20687765		2,6096E-16	0,00081463
	N	23	23	23	23	23
Yahoo search including first name	Pearson correlation coefficient	-0,17119331	0,28682985	0,98044982	1	0,69937636
	Sig. (bilateral)	0,43478999	0,1845214	2,6096E-16		0,00020428
	N	23	23	23	23	23
Britannica	Pearson correlation	-0,20876914	-0,01363685	0,64861969	0,69937636	1
	Sig. (bilateral)	0,33908351	0,95075754	0,00081463	0,00020428	
	N	23	23	23	23	23
2005Turnover	Pearson correlation	-0,16958981	0,27876165	0,9491942	0,91201645	0,55156665
	Sig. (bilateral)	0,43916915	0,19772746	5,1502E-12	1,3925E-09	0,0063661
	N	23	23	23	23	23
2004Turnover	Pearson correlation	-0,12591607	0,28381921	0,95816846	0,94025022	0,65547503
	Sig. (bilateral)	0,56699487	0,18937651	6,9625E-13	2,7165E-11	0,00068583
	N	23	23	23	23	23
2003Turnover	Pearson correlation	0,01282426	0,3766582	0,76731821	0,73529166	0,59585082
	Sig. (bilateral)	0,95368863	0,07646727	1,9325E-05	6,4091E-05	0,00269799
	N	23	23	23	23	23
2002Turnover	Pearson correlation	-0,11679304	0,32335051	0,8312771	0,83491019	0,5787747
	Sig. (bilateral)	0,59562258	0,13231773	8,9549E-07	7,247E-07	0,00381019
	N	23	23	23	23	23

2001Turnover	Pearson correlation	0,0010445	0,25328035	0,73541622	0,78927208	0,64576385
	Sig. (bilateral)	0,99622611	0,24357931	6,3814E-05	7,5824E-06	0,0008741
	N	23	23	23	23	23
2000Turnover	Pearson correlation	- 0,19132747	0,19022403	0,90728313	0,94148558	0,79402592
	Sig. (bilateral)	0,38183305	0,38463636	2,363E-09	2,1934E-11	6,1034E-06
	N	23	23	23	23	23
1999 Turnover	Correlación de Pearson	- 0,18681894	0,14444626	0,88159549	0,90549955	0,84808409
	Sig. (bilateral)	0,39336019	0,51081416	2,7417E-08	2,8633E-09	3,2176E-07
	N	23	23	23	23	23
1998 Turnover	Pearson correlation	-0,21112482	0,19379534	0,90097796	0,90181415	0,64455798
	Sig. (bilateral)	0,3335371	0,3756056	4,5826E-09	4,2081E-09	0,00090031
	N	23	23	23	23	23
1997 Turnover	Pearson correlation	- 0,17188048	0,14853804	0,84875234	0,84752835	0,76626201
	Sig. (bilateral)	0,4329205	0,49878358	3,0816E-07	3,3347E-07	2,0163E-05
	N	23	23	23	23	23
**	Correlation is significative at 0,01 (bilateral).					

Figure III shows the evolution of the Pearson correlation indexes are similar in both Internet engines for the period of time considered. The trend of the indexes increases slightly, except for the period 2001-2003, in which the turnover reduced, as figure II shows.

On the contrary, correlation indexes between Biblio-metric Variables and annual turnover decrease during the period considered.

**Figure III. Trend of the Pearson correlaion indexes for the period
of time considered.**
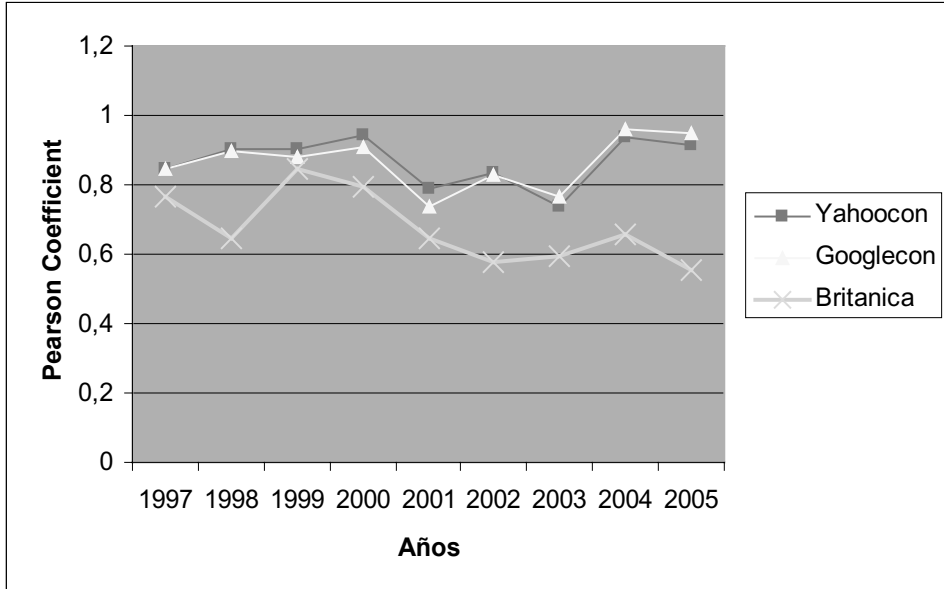
These different trends between both kind of variables could be due to the fact the Net-metric Variables are more updated. This fact would explain our assumption about the net-metric variables converge to the annual turnover in last years more than in the early years studied.

Therefore, applying the regression analysis, variable time did not produce statistically significant results. This assumption was not confirmed by the level of significance (99%), but it is confirmed that the indexes are seasonal. This points out the net-metric variables are good estimators of the annual turnover for the period considered.

6. CONCLUSIONS

This article shows the possibility of using the Net-metric and Biblio-metric variables for quantifying the variable Artist and estimating the annual turnover of the international top artists in the art market.

Biblio-metric variables explain more than 50% of the total annual turnover and the Net-metric variables explain more than the 70%, these estimations are higher than in previous researches.

This increase of the percentage of explanation of the proposed models can be due to the sample used. The sample only contains the 23 international artists that have remained in the ranking of the most quoted artists in terms of annual turnover during

9 consecutive years (1997-2006). Although with the exception of Picasso who was number one of the ranking all years, the rest of artists occupied different positions in the ranking during the period considered. So this is a warranty about the artist's presence in the different media, documental and digital.

Also, we have acquired better results than in previous works. Our research analyzes the explanation of the total annual turnover including the different artistic disciplines while previous works only considered the oil on canvas paintings.

Therefore, in future works will be interesting to analyze both two groups of variables for quantifying the artist joint to other technical and market variables in order to explain the art of work of different artists together.

The trend of both kinds of variables is different; there is a linear relation between annual turnover and Net-metric variables. When a Net-metric variable increases, the annual turnover increases in the same proportion. But the Biblio-metric variable behaves completely different, there are a quadratic behaviour between the Biblio-metric variables and the quantity of words written about each artist.

Also, the possible convergence between the annual turnover and the Net-metric and Biblio-metric variables quantified in 2007 have been analyzed. The results show different trends in both kinds of variables. There is an increasing correlation between the digital variables and the annual turnovers for the period of time studied while the correlation decreases with the documental variables. This can be due to the fact the digital sources reflects the market changes easily, as they are more flexible and faster than the documental sources.

In resume, these results open a way to new researches that let us evaluate the artist through his/her influence in the digital and documental sources, and mainly in the first ones.

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