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## Investment characteristics of the market for paintings in Turkey: 1990-2005

### Abstract

This study examines the auction markets for paintings in Turkey for the 1990-2005 period. We use a unique dataset of 4431 auction sale records for paintings by 74 Turkish painters and calculate hedonic price indices. Using this sample, we also estimate a separate price index for oil paintings based on 3365 observations. In addition, we estimate the CAPM relationship between the Turkish paintings market and the Istanbul Stock Exchange. Our findings show that investing in the paintings market provided positive real returns which indeed exceed those of stocks, gold, bank deposits, and holding foreign exchange. Furthermore, the returns to oil paintings were found to exceed those in the overall paintings market. Interestingly, and contrary to the general findings in the literature, the volatility of the art market returns turned out to be lower than that of the Istanbul Stock Exchange (ISE 100). Using the capital asset pricing model, we have also found that the beta of the art market investments vis-à-vis the ISE 100 is less than unity. Overall, we conclude that investing in the art market provides a hedge against inflation and might also lead to portfolio diversification opportunities – given a longer investment horizon.

**Keywords:** art as investment, hedonic price index, portfolio diversification, time series analysis.

**JEL Classification:** Z11, G11, C32.

### Introduction

In addition to its aesthetic and cultural value, investing in art objects represents an investment alternative to buying bonds, stocks, or other financial instruments. Nevertheless, the empirical literature on art investments generally indicates lower returns than other financial investment alternatives<sup>1</sup>. However, there is also some evidence that the art market returns have low correlations with the returns on some other investment portfolios (Ashenfelter and Graddy, 2003, p. 770). Hence, investing in arts and collectibles may serve as a means to diversify conventional financial portfolios.

It should be noted the stylized facts of the art market investments mainly come from studies that use data from the art markets in developed countries. In a developing country where the macroeconomic environment is volatile and the inflation rates are high, stocks may not be reliable investment alternatives as many companies may suddenly become distressed (following a currency and/or banking crisis, for example). The fixed income instruments, on the other hand, may end up with negative real returns. Hence, the economic agents might look for other instruments that would serve as a “store of value”, which is usually hard-

currency-denominated assets. Investing in artworks in an emerging market environment is another and less explored alternative that might provide the “store of value” function. It would then be interesting to investigate: 1) if investing in artworks could provide an inflation hedge in such an environment; 2) how the returns to and the volatility of art market investments compare with those of the conventional financial investments. Unfortunately, there are only a handful of studies examining the art market investments in developing countries. [See, for example, Edwards (2004) and Campos and Barbosa (2009) for a study of the returns to Latin American painters works.]

Our study aims to contribute to the literature by examining the relationships between the return on investments in art and other financial investments in Turkey. As a middle-income developing country with frequent financial and macroeconomic crises and high and sticky inflation rates, Turkey stands as an interesting case for examining art market returns relative to other investment alternatives. For example, after the major economic crisis in February 2001, several private and public banks in Turkey went into bankruptcy. The assets of these banks included some important collections of paintings. The subsequent liquidation of these banks’ assets led to the auctioning of their art collections as well. One of these paintings, titled “The Turtle Trainer” by Osman Hamdi Bey was sold for about US\$ 3.5 million in December 2004. This particular sale led to considerable media coverage and public attention to the financial aspects of investing in art objects<sup>2</sup>.

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<sup>1</sup> Frey and Eichenberger (1995), Burton and Jacobsen (1999), and Ashenfelter and Graddy (2003) provide an excellent surveys of the literature of covering most of the studies on the rates of return of various art objects and collectibles. Their conclusion is that art investments have positive returns, but they are generally lower than the returns on stocks. Various studies emphasize the role of psychic returns, that is, non-pecuniary returns and benefits from buying artworks. See Atukeren and Seçkin (2007) for a review of this literature.

<sup>2</sup> Osman Hamdi Bey (1842-1910) is one of the old masters in Turkish painting history. His painting “The Turtle Trainer” was previously sold for about US\$ 600,000 in an auction in 1990. Another painting titled “Istanbul Hanımefendisi” by Osman Hamdi Bey was sold for about 3.5 million British pounds in May 2008 by Sotheby’s in London.

Art price indices for a given market or for various types of paintings help investors to obtain an overview of the developments in the market and provide them with a better idea of the performance of their art investment portfolios as compared to other financial investment alternatives. The auction houses are relatively new institutions in Turkey and they neither provide effective art market investment analyses nor calculate art price indices. To the best of our knowledge, a price index for the paintings market in Turkey was first calculated by Seçkin and Atukeren (2006a; 2006b) using auction sales records on 1030 works by 13 painters for the 1989-2005 period. In this study, we reinvestigate the relationships between the return on investments in paintings in the Turkish art market. Here, we extend the analysis in a number of ways. First, we now have auction sales results for more than 4400 works by 74 painters. Secondly, the availability of larger number of observations also allows us to construct a separate price index for oil paintings. Furthermore, we calculate the return to investments in paintings in both TRL and USD terms in separate estimations. The returns expressed in USD terms are important to know for an international art investor, or a collector, or for a Turkish investor with an international asset portfolio as the risk-return profile in the Turkish paintings market would then be directly comparable to the risk and return on other US dollar-denominated international assets. The problem, however, is that converting the price index calculated in TRL into US dollars by using the TRL/USD exchange rate as a deflator is not fully correct. It is true that the Turkish lira is flexible in principle, but it is a managed-float and there are periods of high real appreciation, followed by large depreciations. Hence, the artworks auctioned during times of real appreciation would look more valuable in USD terms than those with similar characteristics auctioned at the time of a currency crisis. This problem is aggravated by the nature of the art auction markets. Art auctions do not take place everyday. They are rather concentrated in the first and the fourth quarter of the year. In the third quarter, especially, there are only very few auctions. That is, the distribution of the auctions within a year is highly skewed and the average exchange rate change for a given year is not necessarily a good deflator. As a result, the more precise way to construct the price index in USD terms for the Turkish art market is to re-estimate the model using the USD prices of the auctioned paintings as the dependent variable.

The next step in our analyses is the examination of the risk and return relationship in the Turkish paintings market vis-à-vis other conventional financial investments (e.g., stocks, bonds, foreign exchange,

gold, bank deposits) in Turkey. In doing so, we also estimate various CAPM formulations. We conclude with a discussion of the results obtained and suggest future directions for research.

## 1. Econometric model, sample characteristics, and estimation results

**1.1. The econometric model.** The repeat-sales approach and the estimation of a hedonic price regression are the most widely used methods for estimating the returns on art investments. The repeat-sales approach can be used if there are sufficiently large and representative number of paintings that are sold more than once over the period of investigation. Baumol (1986), Frey and Eichenberger (1993), and Mei and Moses (2002) are some well-known studies that employed the repeat-sales method. Nevertheless, in art markets, there need not be a continuum of sales of the same object. This leads to loss of substantial information and possible sample selection bias. The advantage offered by the repeat-sales approach is that it avoids the inherent difficulty in hedonic price models to find adequate proxies for the characteristics of the traded objects.

The hedonic price approach, on the other hand, uses all available data on traded objects, be it repeated-sales or not. The hedonic price index model employs a number of dummy variables as explanatory variables to capture the characteristics of the item at hand. In the literature, the characteristics of paintings represented by the  $X$ 's in equation (1) generally include: the name of the painter, the date of the painting's making, the dimensions (height, width, or total area, as well as the square of the total area), the medium it was painted on, the technique used, the genre of the painting, and any other information on the painting and the painter.

The time dimension is also captured by means of a dummy variable which takes the value "1" for the period the auction transaction occurs and "0" for all other periods. If there are  $M$  number of characteristics on  $K$  number of paintings that are sold over  $T$  time periods, then, the estimable hedonic regression model can be written as:

$$\log(P_{kt}) = \alpha_1 X_{11t} + \alpha_2 X_{21t} + \dots + \alpha_M X_{MKT} + \beta_1 Z_1 + \beta_2 Z_2 + \dots + \beta_T Z_T + \varepsilon_{kt}, \quad (1)$$

where  $\log(P_{kt})$  is the natural log of the price of the item ( $k = 1, \dots, K$ ) sold at time  $t$  ( $t = 1, \dots, T$ );  $X_{MKT}$  is a set of quantifiable characteristics ( $m = 1, \dots, M$ ) of the item  $k$  at time  $t$ ;  $Z_1 \dots Z_T$  are time period dummies; and  $\varepsilon_{kt}$  is a well-behaved error term. In equation (1), the estimates of the  $\alpha$ 's indicate the impact of such characteristics on the price of the painting. The estimates of the coefficients ( $\beta$ 's) of the time

dimension dummies ( $Z$ 's) are used to derive a price index for the market for paintings. Technically speaking, the price variable in equation (1) is denoted in natural logs, hence, the percentage difference between a given characteristic (painter, medium, technique, auction house, etc.) with respect to the variable taken as the base for that category is given by  $\exp(\alpha_j)-1$ . With respect to the time dummies, the rate of change from period  $t$  to  $t+1$  can be calculated by  $\exp(\beta_{t+1}-\beta_t)-1$ .

On the technical side, it is usually the case in this literature that the residuals are not found to be normally-distributed. Nevertheless, the non-normality of the residuals does not affect the consistency of the parameter estimates. This is because the consistency of the parameter estimates in an OLS regression is obtained through the central limit theorem, which does not require the normality of the error terms (See Greene, 2000, p. 278). Another problem is that if the coefficient estimates cannot be shown to be statistically significant, then, the return estimates can turn out to be arbitrary. The reliability of the standard  $t$ -statistics under non-normality was addressed by Srivastava (1958), who showed that "... for practical purposes, the power of the  $t$ -test is not seriously invalidated even if the samples are from considerably non-normal populations (p. 428)."<sup>1</sup> Still, the construction of confidence intervals to the return estimates in a standard way is not possible due to the skewness of the residuals. This might require Monte-Carlo studies.

**1.2. Sample characteristics.** In this study we include 4431 works by 74 Turkish / Ottoman painters. Despite the large number of observations and relatively large number of painters in the sample, we do not claim to calculate a general price index for the whole paintings market, but rather for a selected portfolio of Turkish painters. Nevertheless, the

choice of the painters is diverse enough and covers many of the well-known Turkish old masters as well as currently active newer generation painters. Table 1 shows the names of the painters, their life span, and the number of their works included in this study. The auction data were obtained from Lebriz (2009) by subscription and cover the period from late-1989 to mid-2006.

As for the medium on which the painting was made, we considered the following: canvas (1728), paper (877), wood (338; includes wood and plywood), cardboard (950; includes carton, cardboard), pressed canvas (88), and duralite (450). There were many different techniques applied to these media, but we considered only those for which there are enough observations to generate meaningful results and aggregated all others (e.g., collate, lithography, serigraphy, and various other pressing/printing techniques) into an "other technique" category. Overall, the techniques included are: oil (3365), watercolor (283), gouache or acryl (188), mixed techniques (248), ink (81), pencil (142), pastel (48), various printing/pressing techniques (40; includes serigraphy, lithography, copper-plate press, and other prints), and others (36). The fact that we have 3365 observations on oil paintings allows us to construct a separate price index for this category.

The data on the price of the paintings sold are available in Turkish Liras (TL) and US dollars (USD) in nominal terms. It should be noted that the Turkish art markets are rather shallow and that the auction houses have become active rather in the more recent times. As discussed before, private art galleries and houses, as well as those operated by commercial banks were the main outlets for the sale of art pieces in the earlier periods. As a result, the distribution of the auctioned paintings by the above list of artists is skewed towards the post-2000 period.

Table 1. List of the painters included in the sample (12/1989-06/2006)

Painter	Life span	# of works	Painter	Life span	# of works
Şeker Ahmet Paşa	1841 - 1907	5	Fahrelnissa Zeid	1901 – 1991	14
Osman Hamdi Bey	1842 - 1910	14	Refik Epikman	1902 – 1974	24
Süleyman Seyyid Paşa	1842 - 1913	22	Aliye Berger	1903 – 1974	6
Halil Paşa	1852 - 1939	75	Fikret Mualla	1904 – 1967	142
Hasan Rıza	1858 - 1913	7	Mahmut Cuda	1904 – 1987	18
Hüseyn Zekai Paşa	1860 - 1919	6	Ali Celebi	1904 – 1993	95
Hoca Ali Rıza	1864 - 1939	230	Hale Asaf	1905 – 1938	1

<sup>1</sup> See Greene (2000, pp. 278-279) for a textbook treatment of the properties of the  $t$ -,  $F$ - and Chi-square tests under nonnormal disturbances. Greene (2000, p. 279) shows that the "...standard  $t$ -test retains a large sample validity...". Davidson and MacKinnon (2004, p. 169) also show that the nonnormal disturbances lead to a noncentral  $t$ -test, which is asymptotically standard normal with a noncentrality parameter. Greene (2000, p. 279) argues that the critical values converge to those from a standard normal from above and suggests that the critical values from the  $t$ -distribution should be used instead of the standard normal distribution.

Table 1 (cont.). List of the painters included in the sample (12/1989-06/2006)

Painter	Life span	# of works	Painter	Life span	# of works
Ömer Adil	1868 - 1928	5	Zeki Faik İzer	1905 – 1988	172
Osman Asaf	1868 - 1938	39	Nurullah Berk	1906 – 1981	37
Halife Abdülmecit	1868 - 1944	4	Hakkı Anlı	1906 – 1991	58
Ahmet Ziya Akbulut	1869 - 1938	7	Turgut Zaim	1906 - 1974	16
Sevket Dağ	1876 - 1944	93	Sabri Berkel	1907 – 1993	123
Celal Esat Arseven	1876 - 1971	16	Bedri Rahmi Eyüboğlu	1911 – 1975	67
Sami Yetik	1878 - 1945	116	Agop Arad	1913 – 1990	19
Mehmet Ali Laga	1878 - 1947	116	Abidin Dino	1913 – 1993	151
Mehmet Ruhi Arel	1880 - 1931	21	Ferruh Basağa	1915 -	37
Nazmı Ziya (Güran)	1881 - 1937	98	Selim Turan	1915 – 1994	112
Ali Cemal (Benim)	1881 - 1939	6	Nuri İyem	1915 – 2005	182
İbrahim Çallı	1882 - 1960	85	Adnan Varınca	1918 -	72
Hikmet Onat	1882 - 1977	72	Mümtaz Yener	1918 -	2
Mihri Müşfik	1886 - 1954	28	Turgut Atalay (Güneri)	1918 – 2004	89
Feyhaman Duran	1886 - 1970	62	Fethi Karakaş	1918 -	11
Müfide Kadri	1889 - 1911	5	Avni Arbaş	1919 - 2003	156
Avni Lifij	1889 - 1927	60	Mustafa Esirkuş	1921 - 1989	34
İsmail Namık	1892 - 1935	61	Nejat Melih Devrim	1923 - 1995	34
Vecihi Bereketoğlu	1895 - 1973	111	Leyla Gamsız	1924 -	126
Esref Üren	1897 - 1984	195	Lütfi Günay	1924 -	4
Güzin Duran	1898 - 1981	2	Fikret Otyam	1926 -	11
Elif Naci	1898 - 1988	43	Turan Erol	1927 -	5
Cemal Tollu	1899 - 1968	45	Adnan Coker	1927 -	19
Şeref Akdik	1899 - 1972	189	Orhan Peker	1927 - 1978	116
Zeki Kocamemi	1900 - 1959	4	Burhan Doğançay	1929 -	82
Saim Özeren	1900 - 1964	49	Erol Akyavaş	1932 - 1999	16
Hamit Necdet Görele	1900 - 1981	219	Mehmet Güleriyüz	1938 -	7
Nazlı Ecevit	1900 - 1985	39	Komet (Coşkun Gürkan)	1941 -	38
Muhittin Sebati	1901 - 1935	5	Ahmet Fazıl Aksoy	1949 -	136
Fahrettin Arkunlar	1901 - 1971	8	Bedri Baykam	1957 -	37

Notes: Total number of painters: 74; Total number of works: 4431.

Source: Obtained from Lebriz (2009) by subscription.

The following are the auction houses through which the information on the sales of the paintings in our dataset was obtained: Portakal (409), Maçka (913), Artium (822), Koleksiyon (254), Antik (743), Artı Mezat (656), Pera (187), Burak (39), Alif (107), Bali (175), and others (126). Some of the interesting facts and descriptive statistics from our data set are as follows: (1) in 2000 constant OECD prices, the average price is USD 9041, and the median price is USD 2613. (2) The first quartile of the price range is: USD 58 – USD 976. The third quartile is at USD 6569. That is, 75 per cent of the paintings were sold at prices below this figure. (3) Ninety per cent of the

paintings had prices below USD 17,556. (4) Only 31 paintings in our sample were priced above USD 100,000.

It should also be noted that the Turkish art auction market also operates in line with the international art auction calendar. There are only a few auctions held in the summer months. The auctions are rather concentrated in the Fall and Spring quarters and to some extent in the Winter. The distribution of the auctions by quarters in our sample is as follows: Q1: 1113; Q2: 1471; Q3: 291; Q4: 1556. Due to the seasonal disparities in the distribution of the auctions, some studies in the literature control for the

time of the year the auction takes place (Agnello and Pierce, 1996) or calculate semi-annual price indices (as H1 and H2 for a given year; see Hodgson and Vorkink, 2004) or construct an auction-year price index starting from the 4<sup>th</sup> quarter of a given year plus the first three quarters of the following year. (That is, the 1989/1990 auction year includes 1989Q4, 1990Q1, 1990Q2, and 1990Q3).

In terms of equation (1), the number of time periods is 18 covering the late-1989 to mid-2006<sup>1</sup>. The number of characteristics associated with the paintings in our sample is made of 74 painters, 6 types of media for paintings, 9 types of techniques, 11 auction houses, a dummy for whether a particular painting has a title (name), and the size of the painting (also the square of the size)<sup>2</sup>. In estimating equation (1), a category had to be omitted from each type of characteristics in order to avoid perfect multicollinearity in the presence of full set of time period dummies for the time of the auction. The choice was made as follows. For the painters, we take Nuri İyem as the basis, and exclude him from the estimation. As a result, the estimated coefficients on other painters reflect how much higher or lower their work was auctioned with respect to Nuri İyem's paintings in our sample. Nuri İyem is a good choice for such a comparison not only because the number of his paintings is high (182) in our sample but especially also because his life span (1915-2005) coincides with both older and newer generations of painters. For the medium of paintings, we took the cardboard category as the basis. For the techniques, we exclude the "other technique" category and compare the performance various techniques against it. Similarly, we excluded the "other" category in the assessing the differences in the prices of paintings sold through various auction houses. Regarding the dimension variable, we use two measures. The first one is the usual overall area of the paintings in

cm-squares (height times width), and the second one is the square of the area. The rationale is that larger size paintings generally sell for more, but the increase in the price needs not be a linear function of the size. Diminishing returns to size can also be captured this way if, for example, the coefficient estimate of the size-square is negative.

**1.3. Estimation results.** We estimate equation (1) by the generalized least squares method and employ White's (1980) heteroscedasticity corrected standard errors. Table 2 displays the estimates of the year-over-year percentage changes in the average price of a representative painting in the Turkish art market in nominal US dollar (USD) and Turkish Lira (TRL) terms. Note that the annual average return estimates on the Turkish painting market were obtained from a single jointly-estimated regression equation that includes the names of the painters, medium, technique, title, size (and its square), and auction houses. The estimation results on time dummies and individual characteristics were not reported to save space but they are available from the authors upon request.

Another technical question is the reliability of the point estimates of the average year-over-year returns. This is related to our earlier discussion of the non-normality of the residuals and the effects of heteroscedasticity. In our study, we expect the range of the year-over-year changes in the Turkish paintings market price index to be small due to the following factors: we have a large sample, we have consistent point estimates of the parameters, the standard errors of the  $\beta$ 's were rather small and heteroscedasticity corrected (which provides efficiency gains), and the implied large-sample t-statistics were highly significant. Hence, the constructed index should be a statistically valid indicator of the price movements in the Turkish paintings market<sup>3</sup>.

Table 2. Hedonic price index for Turkish paintings: average year-over-year nominal return estimates for 1990-2005

	Returns in the Turkish paintings market in TRL	Returns in the Turkish paintings market in USD	Returns in the Turkish oil paintings market in TRL	Returns in the Turkish oil paintings market in USD
1990	108.21	80.40	106.47	75.84
1991	-11.62	-48.90	-7.69	-44.14
1992	9.95	-27.25	9.5	-27.96
1993	119.02	19.89	130.76	32.48
1994	183.80	23.53	208.95	22.8
1995	78.57	7.34	53.99	-5.42

<sup>1</sup> We construct our index for the 1990-2005 period; but we include partial 2006 data to improve the efficiency of our estimates.

<sup>2</sup> In our sample, 2620 paintings (59.13 per cent of the sample) had a title.

<sup>3</sup> We would like to thank an anonymous referee for suggesting a discussion of these issues.

Table 2 (cont.). Hedonic price index for Turkish paintings: average year-over-year nominal return estimates for 1990-2005

	Returns in the Turkish paintings market in TRL	Returns in the Turkish paintings market in USD	Returns in the Turkish oil paintings market in TRL	Returns in the Turkish oil paintings market in USD
1996	102.47	10.71	149.45	32.54
1997	200.96	63.07	184.17	65.77
1998	237.23	98.27	190.17	71.75
1999	-1.23	-39.76	16.77	-29.89
2000	97.55	36.24	88.99	31.58
2001	12.46	-35.43	15.42	-32.17
2002	61.74	19.95	63.57	16.31
2003	13.28	8.71	5.21	2.98
2004	20.29	30.98	27.56	38.92
2005	-5.56	-0.45	-8.52	-5.23

Source: The authors' own estimations.

An examination of the annual average return estimates in Table 2 indicates that the returns on the art market in Turkey have been quite volatile. This is in line with the history of economic developments in Turkey which comprises an environment of persistently high inflation (but not hyperinflation) and frequent macroeconomic and banking crises. For instance, the 1998-1999 and 2001 crises are very well captured by our estimation results. There was indeed another serious economic crisis in 1994, but our results indicate that the art market was not affected by that. This might be because people thought of art as a store of value during that crisis. This point, of course, requires further investigation.

## 2. The price-return relationship in the Turkish paintings market in view of other investment alternatives in Turkey

We now investigate the risk-return relationship in the market for paintings by Turkish artists in view of other financial investments. Table 3 shows the average annual nominal returns on paintings and other investments and the developments in some macroeconomic indicators. First of all, the return on Turkish paintings for the overall 1990-2005 period is 61.3% on an annualized basis. This is substantially higher figure than our previous estimate of 54.9% in Seçkin and Atukeren (2006a). The real average annual real return in the Turkish paintings market is about seven percent for the 1990-2005 period, which is again substantially higher than our earlier estimate of about 0.5 percent. Furthermore, the returns to oil paintings are even higher (62.7 per cent). This result is consistent with the literature as oil paintings are considered to be more durable (than, say watercolor or ink paintings) and as such, they represent a better store of value.

The next question is how the overall paintings market fared compared to more conventional investments, such as bank deposits, buying stocks or gold, or just buying and keeping foreign exchange (USD) at hand. Table 3 shows that art market investments produced higher returns than all alternatives, including stocks. Furthermore, the returns in the Turkish art market were found to be *less volatile* than those of the Istanbul Stock Exchange (ISE 100). These results come as an improvement over our earlier findings due to a more than four times larger data set (4431 auction sales records in the present study versus 1030 earlier) and hence a more representative sample for the Turkish paintings market.

Table 3. Returns to paintings and other financial investments in Turkey

	1990 - 2005
Returns in the market for paintings in Turkey	
Turkish paintings market (TRL)	61.3
Std. deviation	78.8
Turkish paintings market (USD)	8.0
Std. deviation	41.7
Turkish oil paintings market (TRL)	62.7
Std. deviation	74.5
Turkish oil paintings market (USD)	9.1
Std. deviation	36.7
Returns to other financial investment alternatives	
Forex (TRL / USD)	46.1
Std. deviation	44.3
Interest rate (12M TRL deposits)	57.5
Std. deviation	23.5
GOLD (24 kt.)	47.5

Table 3 (cont.). Returns to paintings and other financial investments in Turkey

	1990 - 2005
Std. deviation	41.5
Stock market (ISE 100)	60.4
Std. deviation	88.3
Memoranda	
CPI (Year-average)	54.3
Std. deviation	28.0

Note: %, nominal year-average over year-average change.

Source: The authors' own calculations.

### 3. An application of the CAPM to the market for paintings in Turkey

In general, the CAPM examines the risk-return relationship between a given asset and a market portfolio given the return on a risk-free asset. There are various versions of the CAPM. For the purposes of this paper, we consider the time-series representation by Jensen (1968).

$$(R_{it} - R_{ft}) = \alpha_i + \beta_i (R_{Mt} - R_{ft}) + \varepsilon_{it}, \quad (2)$$

where  $R_{it}$  – the return series on an asset ( $i$ ) over time ( $t$ );  $R_{ft}$  – the return series on a risk-free asset ( $f$ ) over time ( $t$ );  $R_{Mt}$  – the return series on a market portfolio ( $M$ ) over time ( $t$ );  $\beta_{iM}$  – the beta parameter which shows the sensitivity of the excess returns on asset ( $i$ ) to the excess returns on market portfolio;  $\alpha$  – the alpha parameter which shows the part of the excess returns on asset ( $i$ ) that cannot be explained by its risk-return relationship with the market portfolio;  $\varepsilon_{it}$  – a well-behaved error term, which represents the residual unsystematic and diversifiable risk.

**3.1. Estimation of the CAPM for the Turkish paintings market.** In this section, we apply the CAPM to the market for paintings in Turkey using the returns in the Turkish paintings market calculated in this paper and the Istanbul Stock Exchange. For the risk-free rate that is needed in the CAPM to calculate the excess returns, we used the interest rate on Turkish Treasury bills. Table 4 shows the results obtained for the 1990-2005 period.

Table 4. CAPM estimates for the Turkish paintings market (1990-2005)

	Estimate	Standard error	t-statistics	Probability
Alpha	-7.3353	14.8389	-0.4943	0.6287
Beta	0.3533	0.1584	2.2298	0.0426
N = 16, R <sup>2</sup> = 0.2621, Adjusted R <sup>2</sup> = 0.2094, Durbin-Watson = 2.3567, F-Stat: 4.97 (p < 0.05)				

Note: The market portfolio is taken as the Istanbul Stock Exchange and the risk free rate is the Turkish Treasury bill yield.

First of all, the estimate of the alpha is not statistically different from zero, and the beta parameter is rather low ( $\beta = 0.353$ ). Furthermore, the beta is statistically significant at 5 per cent level. As a result, it can be said that investing in paintings would have diversified a portfolio that also included stocks for the 1990-2005 period. However, the instability of the beta over time in CAPM estimates is a known problem. To test if this is the case in our sample, we estimate the model again for the sub-sample 1995-2005. The results are shown in Table 5.

Table 5. CAPM estimates for the Turkish paintings market (1995-2005)

	Estimate	Standard error	t-statistics	Probability
Alpha	-0.8624	20.5385	-0.0420	0.9674
Beta	0.4361	0.3165	1.3778	0.2016
N = 11, R <sup>2</sup> = 0.1741, Adjusted R <sup>2</sup> = 0.0824, Durbin-Watson = 2.5294, F-Stat = 1.8983 (p < 0.21)				

Note: The market portfolio is taken as the Istanbul Stock Exchange and the risk free-rate is the Treasury bill yield.

A comparison of the regression results presented in Table 4 and Table 5 does not show substantial differences. The beta estimate is somewhat higher ( $\beta = 0.436$ ), but it is still below unity. It should be noted that the model estimates became statistically less significant. This might possibly result from employing a shorter estimation period. Overall, the CAPM analysis suggests that art market investments might diversify a Turkish domestic financial asset portfolio. Still, the time horizon of the investments should be taken into account. In the shorter run, when macroeconomic developments appear to be a common factor influencing the financial asset returns. In the longer run, however, when markets follow their own fundamentals, art market investments can help diversify a conventional investment portfolio. That is, the art market follows the stock market due to wealth effects, but it still has its own internal dynamics which are not captured by economic developments.

### Conclusions

In this study, we use a unique dataset of 4431 auction sale records from Turkish paintings auction that took place during 1990-2005 and construct a hedonic price index for the Turkish paintings market – both in Turkish Lira and in US dollar terms. In addition, we have segmented the paintings market and analyzed the returns to oil paintings separately. We find that investing in the art market is a viable alternative to conventional investments even in an environment of high inflation and large macroeconomic volatility. The returns in the Turkish paintings market hedge

well against inflation with a real annual average return of rate of more than seven percent during 1990-2005. Furthermore, the returns to oil paintings are found to exceed those in the overall market for paintings. We should also mention that the much-discussed psychic returns due to aesthetic good nature of the paintings are not included in our figures.

Investing in Turkish paintings also competes well with the investments in gold, foreign exchange, and bank deposits. We estimate that the returns in the Turkish paintings market might be slightly higher than those in the Istanbul Stock Exchange (ISE 100) during 1990-2005 and indeed exhibit less volatility.

Furthermore, investing in oil paintings was found to yield even higher returns. Next, we examined the CAPM relationship between the returns to investing in paintings and stocks in Turkey. We have found that the beta is less than unity. Hence, investing in Turkish paintings market might help diversify a conventional financial asset portfolio. Due to the common influence of macroeconomic fluctuations on asset markets and in view of the shallowness of the Turkish paintings market and its positive correlation with the Istanbul Stock Exchange, we emphasize that a long time horizon view should be taken when investing in art markets.

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