The Returns to Art Investing:

Long-Run Evidence from a Latin American Market[1,2]

Abstract

We analyze the risk-return profile of 5,002 artworks executed by 62 Venezuelan artists and sold at auction worldwide between 1969 and 2014, the longest art returns period ever assembled for an emerging market. We propose and estimate a Venezuelan art price index through a hedonic price regression. Arithmetic annual dollar returns averaged 7.96% (geometric mean annual returns were 3.05%, or about observed inflation). The main investment attribute of including Venezuelan art in a diversified portfolio resides in its very low correlation with Venezuelan and U.S. stocks and bonds. We also examine the relation between art returns and economic variables.

Keywords: Art returns, hedonic pricing model, Venezuela, alternative investments

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[1] Please, be advised that the length of some of the sections of the paper were reduced in order to adhere to BALAS' Annual Conference submission style guidelines, which require the paper to have a maximum of 20 pages, and the abstract to have a maximum of 100 words, among other conditions.

[2] I would like to thank Odalys Sánchez (Galería Odalys) and Patricia Velasco (Sala Mendoza) for their help in providing information regarding past auctions held at their galleries. The usual disclaimer applies.

The Returns to Art Investing: Long-Run Evidence from a Latin American Market

Introduction

The international art market has attracted increasing interest, not only among art collectors and museums, but also among individual and institutional investors. The later, have approached the art market in the hope of enjoying potentially high returns and enhanced portfolio diversification. According to The European Fine Art Fair (TETAF), 64 billion dollars worth of art where negotiated in 2015 (McAndrew, 2016). Furthermore, Kräussl, Lehnert, Martelin (2016) document the extraordinary growth in prices experienced by works of contemporary art in the new millennium.

Latin American art has enjoyed a growing awareness around the world during the past decades (Barnitz, 2006). It is the collective artistic expression of South and Central America, the Caribbean, and Latin Americans living in other regions and artists that migrated (mostly from Europe) to Latin America. Throughout Latin America, the blending of Native American, European and African cultures has shaped a distinctive tradition. The rich diversity of Latin American art is reflected in extraordinary art collections in the region, such as those of Patricia Phelps de Cisneros, Ella Fontanals-Cisneros, Eugenio López Alonso, Adolpho Leirner, Bernardo Paz, Juan Yarur, Mauro Herlitzka, Tanya Capriles de Brillembourg, and Solita Mishaan. In Venezuela, in particular, the art scene had been dominated by religious iconography and heroic motifs up to the 19th century. However, in the 20th Century, Venezuelan art, as well as the art practiced in many of the other countries of the region, was strongly influenced by modernism. Starting around the 1950s, Venezuelan artists developed their own version of modernism and geometric abstraction, and at the same time searched for a more universal form of abstract art.[3]

The few studies that have been undertaken on Latin American artistic and economic development have progressed along separate paths (Edwards, 2004). Only a few economists have used economic methods and data to analyze issues related to Latin American art. And, to the best of our knowledge, no other authors have constructed *country specific* art indices in Latin America (except for a first preliminary approach conducted by Edwards, 2004). I plan to contribute to bridge this gap by proposing and estimating an art price index of Venezuelan artists. Venezuela, the fourth largest economy in Latin America since the 1950s and until recent times, has also enjoyed one of the leading art markets in the region.

We estimate a hedonic regression price index for Venezuelan artists based on auction sales prices, between 1969 and 2014. Once we compute art returns, we calculate their correlations with respect to a series of local and international

[3] For more on the development of art in Venezuela since the mid 20th Century see Ramos (2007), Jiménez (2008), and Pérez-Oramas (2008). For a perspective on Venezuelan art in the 21st Century, see Suazo (2012).

asset classes and macroeconomic variables. The lower the correlation with respect to other local and international investments, the higher the benefits would be to investors attempting to diversify their portfolios into the Venezuelan art market.

Results of this study are relevant for the following reasons. First, the market for Latin American artists in general (and Venezuelan artists in particular) has been growing steadily during the past three decades, and this has meant that a rising number of investors/collectors (from Latin America and from other parts of the world) have been purchasing works of art from artists from the region. And we know very little about the potential implication that this trend may have had on the risk-return profile of the portfolios of investors who, apart from traditional investments (stocks and bonds) have invested in works of art executed by Latin American (and, in particular, Venezuelan) artists. The results of this paper help shed light on these issues.

Second, and similar to the case of stocks and bonds, art prices should reflect investors expectations regarding the future evolution of the economy, and also be affected by the economy. There exists a high component of "home bias" in buying art because investors and collectors are attracted to invest in their own country's artists (by buying these works in local and international auctions, and at art galleries and fairs). Thus, it is expected that local economic conditions will affect the domestic art market, and thus the construction of a price index of local artists becomes especially relevant (Renneboog and Spaenjers, 2014). For example, Goetzmann, Renneboog and Spaenjers (2011) consider that the majority of the works traded in the auctions that they analyze were carried out by British investors and collectors because the auctions were conducted in Great Britain. Also, Renneboog and Spaenjers (2014) study the art markets of Western Europe and the U.S. and document that local factors (local GDP and local stock returns) affect the prices of works of art executed by artists of the respective country, although less so in the case of high-end artists. We explore the relation between Venezuelan art returns and economic variables in the last part of the paper.

1. Literature review

Besides the aesthetic satisfaction provided by art, studies conducted in other countries (mainly the U.S.) also suggest that art, when considered from the investments point of view, tends to reduce the risk of a portfolio constituted only by stocks and bonds. This is because the correlation between art returns and stocks and bonds returns has been found to be relatively low. Art investing has also been shown to protect against the risk of inflation (see Garay, Gómez and Zambrano, 2015, for a literature review).

Baumol (1986), using repeat-sales data between 1650 and 1960 obtained from the book by Reitingler (1961), argues that art prices behave randomly; and while there can be large gains and large losses within short periods of time, real returns over the long term were only 0.55% per year. Goetzmann (1993) found that, over the last three centuries, equity market returns and wealth had a significant impact on art market prices. Pesando (1993) uncovered strong evidence of underperformance by masterpieces compared to the rest of the art market. Mei and Moses (2002), using a very extensive data on repeat-sales of 4,896 works of art between 1875 and 2000, found that art returns were above those of fixed income, but slightly below those of stocks, and that art returns are less volatile and have low correlations with other assets.

Campbell (2008) compares the studies on art returns undertaken by various authors and documents that, on average, real returns for art are moderate. Also, art returns tend to be above inflation and are higher than those of government bonds, but lower than those for equities. Worthington and Higgs (2005) analyzed the risk and return of investing in the Australian art market during the period from 1973 to 2003. Using 37,605 paintings sold at auction from sixty Australian artists, they constructed an art price index with a hedonic price method and found that the nominal average annual return of Australian art was 6.96%, with a standard deviation of 16.51%.

Taylor and Coleman (2011) analyze the investment attributes of over 4,000 works of art sold at auction by Australian Aboriginal artists, and find that this type of art generated an annual nominal return of 6.6%, with a standard deviation of 17.9% between 1982 and 2007. They also found that Australian Aboriginal works of art have unique features and techniques (different from Western art) that affect their prices, and that their returns are slightly negatively correlated to other assets, thus providing diversification benefits.

Renneboog and Spaenjers (2012), using data from 1.1 million sales held at auction houses around the world between 1957 and 2007, applied a hedonic regression analysis to estimate the impact of a series of variables on art prices. They found that the following attributes affect art prices: Size, technique, signature, date, subject, auction house, author attribution dummies, and location of the auction. They also found that art exhibited returns of 3.97% per annum in real dollars during the period of study. Finally, Goetzmann, Renneboog, and Spaenjers (2011) used two hundred years of 1,336 repeat-sales data collected for sales made at auction houses in London, and found that art prices are positively related to income inequality, after controlling for stock returns.

Studies on the investment attributes of art in emerging markets are scarce. One of the few studies is by Kraeussl and Logher (2010), who studied the art markets of artists from three of the largest emerging art markets and over the following periods: Russia (1985-2008), China (1990-2008), and India (2002-2008). The authors found that the average nominal annual dollar returns in these three markets were 10%; 5.7%, and 42.2%, respectively, all above dollar inflation

rates, especially in the remarkable case of India. However, the periods analyzed, especially in the case of India (only seven years), less so in the case of Russia, are relatively short to draw a firm conclusion on the long-run investment attributes of these art markets. It must be noticed that the emergence of these three economies has been relatively recent (Russia, after the collapse of the Soviet Union in the early 1990s, China and India, after their economies were opened and started to experience fast rates of economic growth). In our case, we are fortunate to be able to study the investment attributes of an emerging art market using a much larger period (45 years).

Two main techniques have been used in the literature to construct art price indices, the repeat-sales method and the hedonic pricing method. The repeat-sales method consists in estimating the returns recorded by a specific artwork that has been sold at least twice over a sample period. An advantage of the repeat-sales method is that it computes changes in art prices based on sales of the same artwork, and so it circumvents the difficulty of trying to account for price differences in artworks, which are heterogeneous by nature. However, a main problem with this method is that it only considers a small fraction of all the artworks that had been sold at auction during a certain period of time, as only a few of those transactions are usually repeat-sales. Another disadvantage of the repeat-sales method is that works of art that have appreciated more in value are more likely to come to the market, thus biasing prices upwards. Goetzmann (1993) argues that this endogeneity in sales inherent to the repeat-sales method causes a selection bias. Kortweweg, Kraussl, and Verwijmeren (2015) confirm Goetzmann's contention and find an asymmetric V-shaped relation between sale probabilities and returns. Using a sample of 32,928 repeat-sales between 1960 and 2013, they find that average annual returns to art decline from 8.7% to 6.3% when this bias is corrected, and that the Sharpe ratio declines from 0.27 to 0.11. They conclude that even though investing in a broad art portfolio is not profitable (apart from the aesthetic benefit of owning art), there may be value in pursuing a targeted strategy in which a particular style or top-selling artists are followed.

The hedonic pricing model was proposed by Rosen (1974). Unlike the majority of economic goods, works of art are characterized as being heterogeneous goods, a feature that makes them virtually unique and unrepeatable. However, what is known in the market is the composite price of a work of art that contains no information regarding the marginal prices of the attributes that build it up (e.g. name of the artist, size of the art lot, etc). It is thus necessary to determine the implicit price (i.e., the hedonic price) or contribution of each of these attributes within the total price due to their high heterogeneity and ease of differentiation. As explained by this author, the hedonic price model contains two stages. The first stage consists in the estimation of the implicit or shadow prices of each of the attributes of a good. This stage provides a method for decomposing an economic good into its most important features. The second stage corresponds to the estimation of the demand and supply functions of each of the characteristics of the good. However, the unavailability of social and

economic data of consumers of artworks (such as age, income level, etc.) has not allowed researchers using hedonic pricing models to perform the second stage of the hedonic model. As a result, researchers have had to assume that the art market is in equilibrium (i.e., that demand and supply are equal) when using the hedonic price model. The main advantage of the hedonic pricing model is that it uses all the transactions that took place at auctions during a certain period of time, and thus it considers a much larger database than the repeat-sales method.

Many authors have estimated art price indices using the hedonic pricing model. Buelens and Ginsburgh (1993), Agnello and Pierce (1996), Worthington and Higgs (2005), and Renneboog and Spaenjers (2012) have used the hedonic price index method applied to art markets. The hedonic price index method allows not only the assessment of general movements in art prices and returns over time, but is also useful as a means to compare the performance of art investing compared to the performance of other assets. Furthermore, art price indices estimated using this method also allow the comparison of yields of individual artists with a market benchmark.

Finally, it must be noted that auctions represent, together with galleries and merchants, the main channels through which artworks are traded. However, studies on the returns to art have almost exclusively focus on sales prices of works of art sold at auctions because of the availability and relative transparency of this type information.

2. Data and Methodology

The data set consists of 5,002 sales at auction of works of art executed by Venezuelan artists. The list of Venezuelan artists was found by consulting the nationality of the artists covered by Blouin Art Sales (artsalesindex.artinfo.com), and complementing that list with the names of artists that appear in Galería de Arte Nacional (2005). We did not include buy-ins, that is, works of art that were offered at auction but whose prices did not meet the reserve price, or minimum price set by the seller. The first sales in the database occurred in 1969, and the last sales took place in 2014. The information on these sales was collected from different sources. First, we used the information provided by Blouin Art Sales, which records sales of artworks at auction houses from around the world. We supplemented this information with auction sales records from Galería Odalys and Sala Mendoza. Galería Odalys held more than 200 art auctions between 1991 and 2014. Many of the artworks auctioned at Odalys appear in Blouin Art Sales, but others are not reported by this database. We proceeded to include the missing auction sales by inspecting the catalogs of this auction house. Sala Mendoza conducted almost uninterrupted annual art auctions of mostly Venezuelan artists between 1957 and 2007. This information is not covered by Blouin Art Sales, and thus we collected it by hand after inspecting the respective

auction catalogs. Unfortunately, the data between 1957 and 1968 is very scarce and consisted of an unusually large number of foreign artists and, as a result, we were not able to include these years in the study. In spite of this, and to the best of our knowledge, the database that we were able to assemble is the largest data base of works of art sold by Venezuelan artists at auction to date.

Figure 1 shows that the number of works of art executed by Venezuelan artists and auctioned worldwide during the sample period fluctuated substantially from year to year, reaching the highest numbers in 1997, 1998 and 2004. Also, the first part of the sample period (from 1969 and until the late 1980s) recorded the lowest number of works of art sold at auction. It is thus clear that a hedonic regression analysis should be followed to construct the Venezuelan art price index, given that we suspect that not enough repeat-sales Venezuelan art price data would be available to be able to construct a country art price index.

Following the results reported in the literature (Campbell, 2008, Worthington and Higgs, 2005, and Renneboog and Spanjers, 2012), we hypothesize that prices of works of art by Venezuelan artists should be significantly related to a set of variables in the following form:

$$ln\, P_{kt} = \alpha + \sum_{m=1}^{M} \beta_m \times X_{mkt} + \sum_{t=1}^{T} Y_t \times D_{kt} + \varepsilon_{kt} \qquad (1)$$

Where:

P_{kt}: Price (in natural logarithm) of art work *k* auctioned at year *t* (excluding the "buyer's premium")

X_{mkt}: Value of the attribute *m* of art work *k* auctioned at year *t*

D_{kt}: Dummy variable that takes the value of 1 if art work *k* is sold in year *t* and 0 otherwise

β_m: Price of attribute *m*

Y_t : Coefficient with respect to the year-dummy variable (these estimated coefficients are then used to calculate the value of the hedonic price index each year, as will be explained later).

Equation (1) assumes that the market valuation of each attribute does not change. The hedonic regression model will be estimated by running an Ordinary Least Squares Regression. The functional form of the model will be semi-logarithmic because this specification provides a better adjustment for the regression (see Worthington and Higgs, 2005). The unbalanced nature of our panel data set prevented us from using more advanced times-series regression methods.

The hedonic price model will include the following variables (already considered by the aforementioned authors):

1) Name of the artist. Each artist is represented by a dummy variable that takes the value of 1 if the art work sold is by that artist, and 0 if it was executed by another artist.
2) A dummy variable that takes the value of 1 if the art work was dated by the artist, and 0 otherwise.

3) A dummy variable that takes the value of 1 if the art work was signed by the artist, and 0 otherwise.

4) Technique used: Works of art will be classified as having been executed in any of the following four categories / dummy variables: i) Mixed medium (MIX), ii) Oil (OIL), iii) Work on paper (WOP), and iv) Other techniques (OTH, any category not included in the previous three categories, such as acrylic, charcoal, etc.). The use of these dummy variables works as follows. For example, if a work of art was executed using oil, the OIL dummy variable takes the value of 1, and the other technique dummy variables take the value of zero.

5) Auction house: Works of art will be classified as having being sold in any of the following auction houses that sell Venezuelan art: i) Christie's (CRT), ii) Sotheby's (STH), iii) Galería Odalys (ODA), iv) Sala Mendoza (MEND), and v) Other auction houses (OTR). These are dummy variables and work as follows. For example, if a work of art was sold at Christie's, the CRT dummy variable takes the value of 1, and the other auction houses dummy variables take the value of zero.

6) Size. Empirical evidence suggests that the price of a work of art increases at a decreasing rate as its size increases. Therefore, the hedonic regressions will include the following two variables: Size and Size squared. The coefficient of the first variable should be positive, while the coefficient of the second variable should be negative.

7) Year in which the work of art was sold. Each year is represented by a dummy variable that takes the value of 1 if the art work was sold in that year, and 0 if it was sold in another year.

The antilog of the estimations of the coefficients of the year dummy variables (Y_t) are used to construct an art price index that controls for the quality of the artworks sold through time. The value of the hedonic price index in year *t* is:

$$\mathbb{III}_t \equiv exp\left(\widehat{Y_t}\right) \times 100 \qquad (2)$$

And the yearly art price return for year *t* is:

$$r_t \equiv \frac{\mathbb{III}_t}{\mathbb{III}_{t-1}} - 1 \qquad (3)$$

The log transformation performed before the estimation can create a transformation bias in our returns estimation if there exists time variation in the heterogeneity-controlled dispersion of prices (Silver and Heravi, 2007, and Renneboog, and Spaenjers, 2012). Triplett (2004) and Silver and Heravi (2007) show that it is possible to fix this bias by correcting index values as follows (and assuming that the hedonic regression residuals are normally distributed in each period):

$$\mathbb{III}_t^* = exp\left[\gamma_t + \frac{1}{2}\left(\hat{\sigma_t}^2 - \hat{\sigma_0}^2\right)\right] \times 100 \qquad (4)$$

Where $\hat{\sigma}_0$ and $\hat{\sigma}_t$ are the estimated variances of the residuals for observations in years 0 and *t*, respectively. The corrected art return estimate in year *t* can be computed as follows:

$$r_t^* = \left[\frac{\text{III}_t^*}{\text{III}_{t-1}^*}\right] \qquad (5)$$

3. Analysis of Results

Table 1 shows the descriptive statistics of the 5,002 works of art by Venezuelan artists sold at auction and considered in the sample, categorized by artist, characteristics of the works sold, auction houses where the lots were sold, and techniques used to execute the artworks. The artist with the highest number of works sold was Tomás Golding (320), followed by Carlos Cruz-Diez (283). The average number of art works sold by the 62 artists in the sample was 81. The minimum number of works sold was 19 by two artists (we only considered artists that had sold at least 15 works of art at auction during the sample period). Following the literature, we excluded sculptures and other three dimensional works of art, as these types of work would require a different equation specification (for a review of how to construct a sculpture price index see Vosilov, 2015). The average (arithmetic mean) price of the works of art sold during the sample period was $11,985; while the median price was a much lower $4,370. As expected, the average price fluctuated significantly from artist to artist, ranging from a high of $110,381 (Gertrudis Goldsmith or Gego), to a low of $785. The standard deviation of prices for each artist also tended to be high, indicating that works of art by an artist may have very different prices, as they may have dissimilar sizes, may have been executed using different techniques, may have been sold at times of booming or depressed art markets, or may have varied for other reasons. Finally, the high observed levels of skewness and kurtosis for many of the variables, and the fact that all the variables had a Jarque-Bera test (results not reported) that rejected the null hypothesis (at the 1% level) that each variable was normally distributed, suggest that art prices are not normally distributed.

According to Table 1, the majority of the works of art sold was dated (3,378 of them or 67.53% of the total) and signed (3,453 of them or 69.03% of the total). However, we must caution that it was not always possible to confirm whether an artwork was actually dated or signed. This is because, in a number of occasions, this information was not provided in the auction catalogs, or when the information was provided it was not accurate. In any case, dated and signed works of art carried a higher average price, as expected, as they provide an added element of authenticity to the artwork. Continuing with Table 1, Galería Odalys was by far the auction house that recorded the highest number of sales of Venezuelan artists (2,669), almost doubling the number of artworks sold at Sala Mendoza (1,418). The finding that most of the auction sales by Venezuelan artists took place at Venezuelan auction houses is similar to that of Renneboog and Spaenjers (2012), who also

found that the main market for artists is their home market. While Sotheby's (345) and Christie's (313) were at a distance third and fourth place, respectively, in terms of the number of lots sold, the prices of the artworks auctioned at these two houses commanded by far the highest average prices ($131,316; and $57,120; respectively). This finding is consistent with the existent literature (Pesando, 1993, Worthington and Higgs, 2005, Renneboog and Spaenjers, 2012), where there was found that these two iconic auction houses tend to sell the highest priced works of art, compared to the rest of the auction houses, except for the case of a few niche markets. Finally, the majority of the artworks was executed in oil (3,067), followed by mixed mediums (852), works on paper (672), and other techniques (411). The highest prices were commanded by artworks executed using mixed mediums, followed by other techniques, oil, and work on paper (in that order).

Table 2 presents the result of the hedonic regression, which was performed using the Ordinary Least Squares (OLS) method, using White's (1980) heteroskedasticity-consistent standard errors and covariance.[4] As commented before, the unbalanced nature of our panel data set does not allow us to use more advanced times-series regression methods than the OLS, which is fixed effects with respect to both time and cross-sections (Worthington and Higgs, 2005, and Taylor and Coleman, 2011, also acknowledged the same constraint). The regression yields a respectable R^2 of 0.71 (an R^2 that is even higher than the 0.64 obtained by Renneboog and Spaenjers, 2012, who used a much larger dataset of more than 1 million artworks sold worldwide between 1957 and 2007), and a statistically significant F-statistic (prob. = 0.0000). We used variance inflation factors (VIFs) to test for multicollinearity. It is generally accepted that a VIF significantly higher than 10 indicates the presence of multicollinearity. None of the estimated coefficients reached a VIF of 10, although a few of them (the coefficients for the years 2000, 1999, 2002, and 2011) were close to 10. Therefore, even though there may be a slight degree of multicollinearity in the regression (the average VIF was only 2.71), we consider that it is not a serious problem.

Sixty-one artist dummy variables were included in the regression but are not reported in the table for ease of presentation. As there were 62 artists (dummy variables) in the sample, we needed to exclude one of them when we ran the regression to avoid perfect multicollinearity. The artist excluded from the regression was Antonio Alcantara (AAL). Forty-two of the 61 artist dummies were significant at the 10% level, and 36 of them at the 1% level. Dated artworks command a significantly higher price. In the hedonic regression model, the coefficient of 0.2308 implies that a dated artwork is 25.97% (calculated as $e^{0.2308}$-1) more expensive than an undated one. Contrary to what was expected, the coefficient for the signed variable was negative. We suspect that the lack of clarity in a number of auction catalogs regarding whether an artwork was actually signed or not may explain this counterintuitive finding. This was the only coefficient in the regression that had a signed contrary to what was expected.

[4] The regression was also run using real dollar prices. Results were very similar to those obtained using nominal prices.

Continuing with Table 2, and as expected, artworks sold at Sotheby's and Christie's recorded substantially higher prices (396.26% and 234.27%, respectively) compared to works of art sold at other auction houses (the variable "other auction houses" was left out to avoid the aforementioned problem of perfect multicollinearity). Once again, this result is consistent with previous literature (Pesando, 1993, Worthington and Higgs, 2005, Renneboog and Spaenjers, 2012). These results do not necessarily imply the existence of an arbitrage opportunity in which artworks bought at other auction houses can then be resold at Sotheby's or Christie's for a profit. This is because artworks sold at these two auction houses may have characteristics that are unobservable to us and that confer them a higher value with respect to similar artworks sold at other auction houses (for example, they may have been exhibited at prestigious museums, or they may have provenance, both of which increase their value). Similar to results found in the literature, prices of artworks increase with size (in our case, they rise 0.017% for each square inch increase in area). This increase is decreasing in area, judging by the negative and significant coefficient of the variable AREA2, which is the square of the variable AREA.

Finally, Table 2 presents the coefficients of the year dummy variables (the first year of the sample, 1969, was left out to avoid perfect multicollinearity). Thirty-nine of the 45 year dummy coefficients are statistically significant, almost all of them, at the 1% level. These estimated coefficients are used to construct the (raw) art price index for Venezuelan artist (see Table 3, where the year dummy coefficients are used to construct the index). For example, the value of the art price index in 1970 is calculated as $100 \times e^{-0.1414} = 86.81$, where 100 was the index value for 1969, the year base. The sixth column presents the results of the corrected art price index, following the procedure proposed by Triplett (2004), and explained before. The corrected art price index corrects for changes in price dispersion over time.

Figure 2 shows the evolution of the raw and the corrected art price indices for Venezuelan artists between 1969 and 2014. It can be seen that the 1970s were a period of considerable price appreciation of artworks executed by Venezuelan artists. The Venezuelan economy experienced a boom during those years, as oil prices (the main exports of the country since the 1930s) increased dramatically as a result of the two oil shocks (1973 and 1979). However, art prices declined at the beginning of the 1980s, when oil prices dropped and the economy entered into recession, and as the region entered the "lost decade." The Venezuelan art market was also hit when the local currency was devalued in 1983, and when oil prices collapsed again in 1986, and remained at historically low levels for the next 15 years. As the economy somewhat recovered in the mid to late 1980s, art prices regained some value, at a time when the local inflation rate started to also accelerate.

In the early 1990s the economy grew at very high rates (in part as a result of the short-lived increase in oil prices during the Gulf War, and also because structural economic reforms were implemented), and art prices followed, booming between 1989 and 1992. However, between 1993 and 1994 art prices plummeted, as the country entered a deep recession

and a major banking crisis erupted. Art prices recoverd dramatically in 1996 (with triple digit percentage gains, the highest annual returns recorded during the sample period considered), and continued growing in 1997, as the economy improved. At the end of the 1990s and at the turn of the century, art prices declined mildly, and then experienced a long bull market between 2004 and 2011 (this last year marks the highest level recorded by the art price indices calculated here), as oil prices increased to record levels, and as the economy recovered from the deep 2002-2003 recession. The last three years of the sample period (2012 to 2014) are characterized by falling art prices, as the economy decelerated and entered a deep recession in 2014, and as oil prices started to decline towards the end of that year. By 2014, art prices were at less than half the level that they have reached only three years earlier.

Figure 2 also suggests that there exists a high correlation between the two art price series that were calculated (the correlation is, in fact, 0.90). However, in spite of this very high correlation, it can be noticed that in some of the periods of booming prices in the market for Venezuelan art (such as at the end of the 1970s, between 1991 and 1992, and between 2007 and 2012), the corrected art price index tended to increase by a higher percentage than the increase experienced by the raw index. And in some of the periods when the art market enters a recession (such as in the early 1980s, and between 2012 and 2014), the corrected art price index tends to decrease at a faster rate than the raw index does. However, it can also be noticed that during the brief booming markets of 1989-1991 and 1996-1997, both indices behaved almost identically.

According to Table 4, the average arithmetic mean annual return (in U.S. dollars) to investing in Venezuelan art was 7.75% and 7.96% (for the raw and the corrected art price indices). These returns were above the average annual inflation rate in the U.S., which was 4.27%. However, nominal geometric mean annual returns were 1.93% and 3.05%, respectively. Arithmetic mean returns to art were similar to those of U.S. bonds, and below the returns to both Venezuelan and U.S. stocks. This finding is consistent with most of the evidence reviewed in Campbell (2008). Art returns exhibited the highest standard deviations after Venezuelan stocks. The relatively high standard deviation of the returns to Venezuelan art contrasts with the evidence presented in the literature and reviewed by Campbell (2008). These high standard deviations deteriorate the Sharpe ratios to art investing in Venezuelan artists, when compared to the other investments considered.

Table 5 shows the correlation matrix between Venezuelan art returns and other investments returns and economic variables. It stands out the existence of a relatively low (and even slightly negative, in some cases) correlation between both art price returns and Venezuelan and U.S. stocks, and U.S. bonds and Treasury Bills. These very low to negative correlation coefficients confer Venezuelan art an important attribute for investors attempting to diversify their portfolios, in spite of the relatively inferior Sharpe ratios reported in the previous table. The correlations between both art price returns and the Venezuelan and U.S. inflation rates are positive, although relatively low, thus suggesting that art investing in Venezuela

offers at least a partial hedge against inflation risk. This finding is consistent with the review on the inflation capabilities of art offered in Garay, Gómez and Zambrano (2015). The correlation is negative (and relatively higher in absolute value) with respect to exchange rate depreciations, thus suggesting that art prices do not have hedging capabilities with respect to the risk of the local currency loosing value. Finally, the correlation between both art prices and oil returns is positive (although relatively low). This is not surprising, considering that oil prices are the main source of exports for Venezuela.

4. Conclusions, Implications, and Possible Extensions

We analyzed the risk-return profile of 5,002 artworks executed by 62 Venezuelan artists and sold at auction worldwide between 1969 and 2014. This period is the longest that has been assembled for art returns in any emerging market. We propose and estimate a Venezuelan art price index through a hedonic price regression and find that nominal arithmetic annual returns to the corrected index on Venezuelan art averaged 7.96% in dollar terms (nominal geometric mean returns were 3.05%, or about the observed inflation rate). We also found that Venezuelan art returns have a relatively high standard deviation, thus deteriorating the Sharpe ratio to art investing in Venezuelan artists, when compared to the other investments considered. The returns to art were similar to those of U.S. bonds, and below the returns to both Venezuelan and U.S. stocks. The main investment benefit of including Venezuelan art in a diversified portfolio arise from the very low to slightly negative correlation that Venezuelan art returns have with Venezuelan and U.S. stocks and U.S. bonds. This suggests that the inclusion of Venezuelan art in a diversified portfolio may help reduce the risk of a portfolio comprised by Venezuelan and U.S. stocks and U.S. bonds, in spite of its relatively high standard deviation of returns.

We also found that the majority of the author attribution dummies used in the regression were statistically significant, that a positive and decreasing relation exists between an artwork's area and its price, that works of art are more expensive when they are dated, and that the technique and auction house where a lot was sold also affected its price. We found the counterintuitive result that signed artworks had lower prices. We suspect that this finding may be caused by the noise created by the imprecision with which signed and unsigned works were recorded at some auction catalogs.

The potential benefits of including Venezuelan art in a portfolio must be outweighed with the following costs that are inherent to art investing: auction house sales commissions (which are usually relatively high, in the 10%-20% range), taxes, insurance and storage costs, and potential restoration costs, among others. And similar to the case of real estate and other alternative investments, art is an illiquid investment (it may take months or even years to sell an artwork, unless the owner is willing to sell a work at a considerable discount). Finally, there exists the risk of counterfeit works.

There are a number of possible extensions of this work. First, art prices should reflect investor's expectations regarding the future evolution of the economy and also be affected by the economy. By constructing art price indices for Venezuela and other markets we may be able to determine whether art returns help predict the future evolution of macroeconomic variables. If this was the case, then we would be able to know the extent to which art prices from auctions might be used by investors, central banks and policy makers as a leading economic indicator.

Second, it would be useful to try to identify repeat-sales in the sample of Venezuelan artists that we have assembled and compute a repeat-sales index, as a robustness check. However, based on the extant literature, we suspect that there may be only a few dozen repeat-sales out of the 5,002 auction sales that we were able to collect. Third, we plan to explore in more detail whether significant short-term and long-term relations exist between Venezuelan art and other local and international asset classes and macroeconomic variables, using Granger (1969) causation and co-integration tests (Johansen, 1991). For this, we would need to construct art price indices at higher frequencies (monthly, or at least quarterly), to be able to measure more accurately the possible existence of meaningful relationships between art returns and economic variables. If we find, for example, that art returns help predict the future evolution of inflation rates, then we would have obtained a finding that would be helpful to investors, central banks, and policy makers alike as a leading economic indicator. Once again, and to the best of our knowledge, we know little to nothing about this issue in Venezuela and, more in general, in Latin America. Unfortunately, and as we documented, not enough auction sales were conducted during the first half of our sample, and auctions were carried out only once or twice a year, thus making it impossible to calculate an art price index at a monthly or quarterly frequency for those earlier years. Fourth, a portfolio optimization under a power utility framework would also help to uncover in more detail the potential diversification benefits of including Venezuelan art into investment portfolios, and recommend the weights that stocks, bonds, and alternative investments such as art should have in an investor's portfolio, based on certain assumptions regarding risk aversion and other variables.

Reported results are of utmost importance for art collectors, art museums, auction houses, galleries, individual and institutional investors (art funds, endowments, and potentially pension funds), and academics. While our paper suggests that broad investments in Venezuelan art did not over-perform financial assets (based on the calculated Sharpe ratios), one must also bear in mind that collectors benefit, apart from the potential financial returns of their purchases, from the aesthetic benefit of possessing "emotional" or "passion" assets such as art. Furthermore, and as suggested by Kortweweg, Kraussl, and Verwijmeren (2015), an investment strategy that targets certain styles or top-selling artists might still be profitable.

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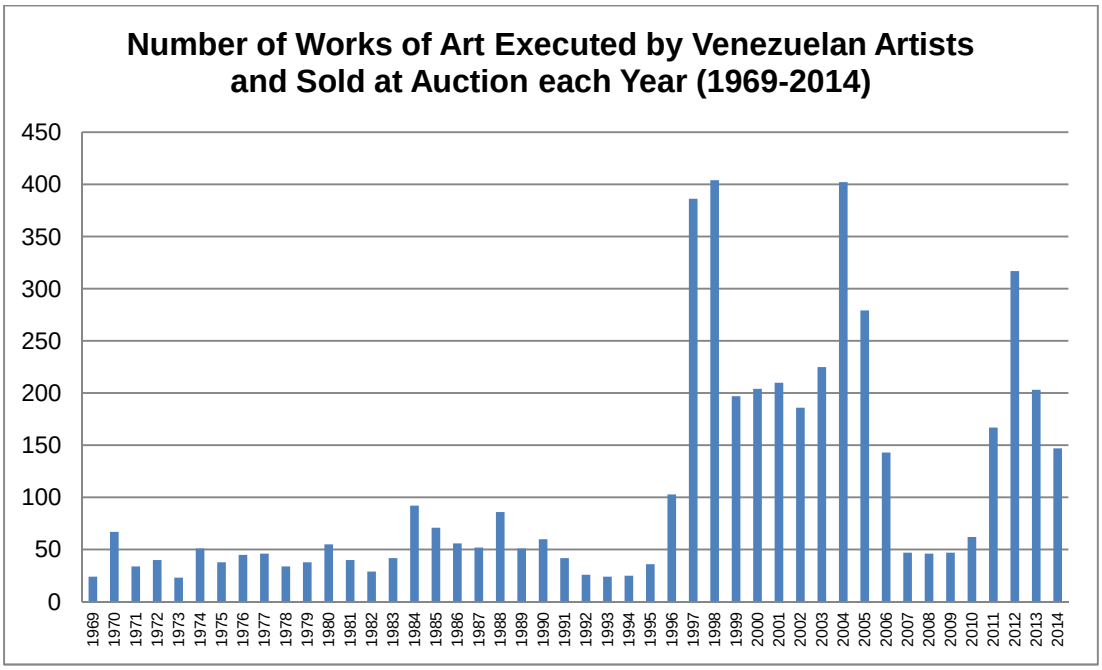
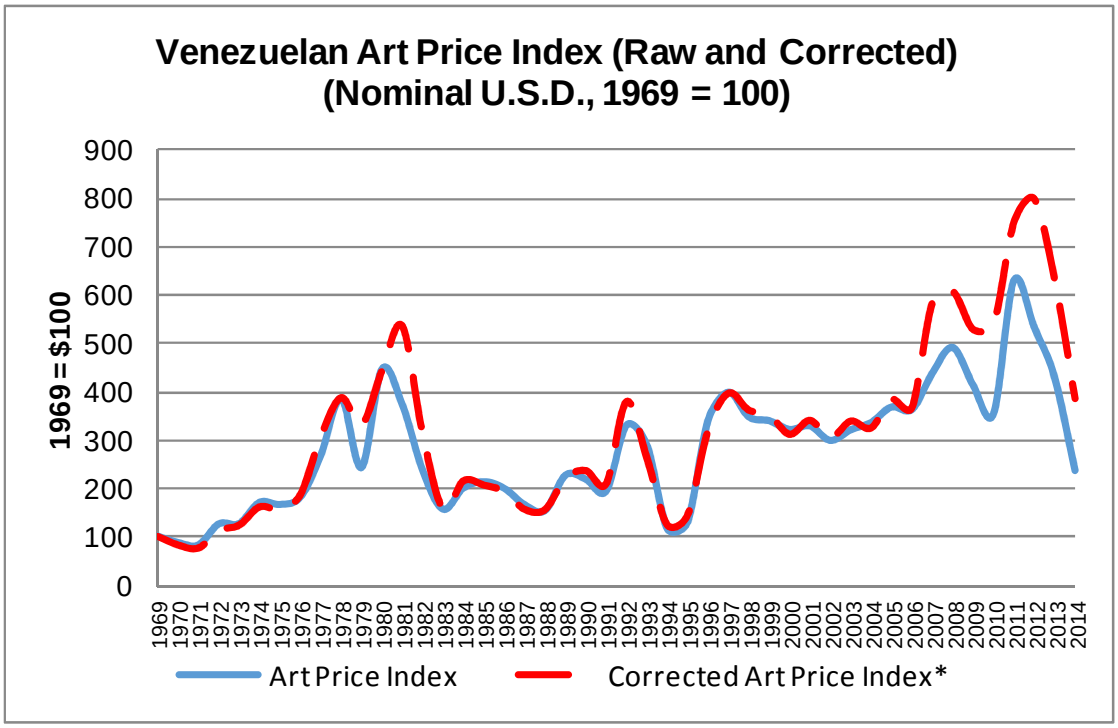
Figure 1



Source: Own calculations based on information available on Blouin Art Sales supplemented with information contained in auction catalogs from Galería Odalys and Sala Mendoza, and not available on Blouin Art Sales.

Figure 2



Note: This figure presents the raw and corrected art price indices as detailed in Table 3. The corrected art price index corrects for changes in price dispersion over time. The data is presented in Table 3.

Table 1: Descriptive Statistics (1969-2014)

Variable	Acronym	Year born	Year died	Number of Works Sold	Arithmetic Mean ($)	Median ($)	Standard Deviation ($)	Skewness	Kurtosis
Artist name									
Antonio Alcantara	AAL	1898	1991	88	2110	1540	1677	1.84	3.82
Armando Barrios	ABA	1920	1999	72	9141	4391	13273	3.88	20.25
Alberto Egea Lopez	AEL	1903	1958	40	2185	1512	1757	1.38	1.29
Alexis Fernandez	AFE	1969	-	60	2366	1511	2111	1.49	1.38
Arturo Herrera	AHE	1959	-	29	39300	10000	79933	3.56	13.80
Antonio Herrera Toro	AHT	1857	1914	59	2328	1326	3089	3.09	9.76
Arturo Michelena	AMI	1863	1898	69	45554	3023	169279	5.62	34.30
Alejandro Otero	AOT	1921	1990	101	54788	4651	124927	3.44	12.95
Alirio Palacios	APA	1944	2015	63	6846	6000	6315	0.73	-0.29
Armando Reveron	ARE	1889	1954	119	94781	45000	107790	1.82	3.43
Alirio Rodriguez	ARO	1934	-	83	3870	2100	5223	3.63	17.20
Abigail Varela	AVA	1948	-	31	22886	15116	21062	3.41	14.43
Barbaro Rivas	BRI	1893	1967	63	3694	2000	5355	4.36	25.56
Braulio Salazar	BSA	1917	2008	31	1393	940	1474	3.44	13.68
Cruz Alvarez Sales	CAS	1906	1947	33	1543	1300	959	1.02	0.92
Carlos Cruz-Diez	CCR	1923	-	283	82705	27500	121035	2.60	9.51
Cesar Prieto	CES	1882	1976	36	2452	1280	2599	1.67	2.14
Carlos Otero	COT	1886	1977	50	2650	2264	1931	1.25	1.11
Cesar Rengifo	CRE	1915	1980	104	3862	1946	4883	2.66	7.98
Dario Perez-Flores	DPE	1936	-	30	9620	7551	7408	1.62	3.22
Edgar Sanchez	ESA	1940	-	30	7181	3503	13342	4.49	22.45
Esteban Villaparedes	EVI	1933	-	43	1563	1639	867	1.23	2.54
Federico Brandt	FBR	1878	1932	48	8426	5503	9723	2.77	9.10
Feliciano Carvallo	FCA	1920	2012	68	1665	1240	1833	4.44	25.32
Francisco Fernandez	FFE	1897	1990	28	1743	1453	1179	1.30	1.79
Francisco Narvaez	FNA	1905	1982	153	13302	3721	37307	5.35	30.20
Felix Perdomo	FPE	1956	2015	63	1894	1380	1502	1.84	3.92
Gabriel Bracho	GBR	1915	1994	64	1241	1012	783	1.68	3.26
Gertrudis Goldschmidt	GGO	1912	1994	49	110381	45000	156653	1.97	3.61
Giorgio Gori	GIO	1910	1990	34	2699	1427	2864	2.15	5.39
Humberto Jaimes Sanchez	HJS	1930	2003	39	3056	2190	3203	1.88	2.93
Hector Poleo	HPO	1918	1989	144	19455	7255	29627	2.65	7.79
Jose Antonio Davila	JAD	1935	-	72	3965	1860	5061	2.26	4.98
Jacobo Borges	JBO	1931	-	106	6306	1531	10794	2.96	10.00
Joaquin Caicedo	JCA	1917	1983	47	692	580	366	1.81	3.90
Jesus Rafael Soto	JRS	1923	2005	175	77870	10700	167395	3.60	15.52
Juan Vicente Fabbiani	JVF	1910	1989	111	1504	1000	1368	2.22	4.79
Luis Alfredo Lopez Mendez	LAL	1901	1996	241	3011	2459	2124	2.04	6.28
Luis Guevara Moreno	LGM	1926	2010	134	1977	932	7573	11.01	124.91
Leon Pedro Castro	LPC	1913	2003	19	1161	1000	480	1.22	0.61
Mario Abreu	MAB	1919	1993	50	2079	900	2554	1.95	3.57
Marcos Castillo	MAR	1897	1966	123	3679	2386	3349	2.13	5.88
Mateo Manaure	MMA	1926	-	152	5890	1163	18942	4.89	25.63
Manuel Quintana Castillo	MQC	1928	2016	126	2761	1607	4097	4.68	26.23
Omar Carreno	OCA	1927	2013	54	13002	1549	24529	2.39	5.43
Oswaldo Subero	OSU	1934	2016	19	1746	1500	1582	1.62	1.81
Oswaldo Vigas	OVI	1926	2014	139	14765	2816	33703	3.77	15.30
Pedro Angel Gonzalez	PAG	1901	1981	105	5541	4100	7549	5.42	40.78
Pablo Benavides	PBE	1918	2007	77	1708	1263	1753	4.76	31.19
Pedro Centeno Vallenilla	PCV	1904	1982	70	4389	2051	7718	4.52	23.23
Pedro Leon Zapata	PLZ	1929	2015	27	1593	1164	1659	2.21	4.21
Pascual Navarro	PNA	1923	1986	36	1327	1057	1117	0.88	-0.20
Pancho Quilici	PQU	1954	-	31	5199	3622	4998	1.19	0.33
Raul Moleiro	RAU	1903	1985	44	1193	935	767	1.75	2.92
Rafael Ramon Gonzalez	RRG	1894	1975	58	1805	1430	1211	1.68	4.51
Ramon Vasquez Brito	RVB	1927	2012	69	2462	1397	2547	2.42	7.89
Tomas Golding	TGO	1909	1981	320	2088	1820	1293	1.36	2.36
Trino Orozco	TOR	1915	-	89	785	650	502	2.69	9.97
Tito Salas	TSA	1888	1974	54	4381	1080	6042	1.86	2.89
Victor Millan	VMI	1919	1991	57	798	581	794	3.31	13.46
Virgilio Trompiz	VTR	1927	2012	158	2018	890	7089	11.69	142.68
Yobel Parra	YPA	1972	-	32	666	625	264	3.20	13.54
AVERAGE				*81*	*11985*	*4370*	*20487*		
TOTAL				*5002*					
Characteristics of the Work									
Dated	DAT	-	-	3378	21209	2219	73351	7.24	72.40
Signed	SIGN	-	-	3453	15779	1899	59884	8.29	98.53
Auction House									
Christie's	CRT	-	-	313	57120	23000	80262	3.14	14.57
Mendoza	MEND	-	-	1418	2917	1421	4736	5.12	36.10
Odalys	ODA	-	-	2669	3351	1562	6988	7.94	84.10
Sotheby's	STH	-	-	345	131316	56250	177809	2.61	9.02
Other auction houses	OTR	-	-	257	27205	4240	62875	4.13	22.18
Technique used									
Mixed	MIX	-	-	852	51899	6791	114353	4.10	22.71
Oil	OIL	-	-	3067	7603	1785	36284	17.23	442.82
Work on Paper	WOP	-	-	672	3393	1006	9242	7.81	86.17
Other techniques	OTH	-	-	411	32781	3367	87342	4.96	32.15

Source: Own calculations based on information available on Blouin Art website complemented with information contained in auction catalogs from Galería Odalys and Sala Mendoza and not available on Blouin Art Sales.

Table 2: Hedonic Regression Results (1969-2014)

Ordinary Least Squares (OLS), *White heteroskedasticity-consistent standard errors & covariance*	**Variable**	**Acronym**	**Coefficient**	**Std. Error**	**Prob.**	**Price Impact (%)**
Artists dummies		*(61 artist coefficients included but not reported here for ease of presentation)*				
(Antonio Alcántara, AAL,						
was left out)						
Characteristics of the work	*Dated*	DAT	0.2308	0,029696	0.0000	25.97%
	Signed	SIGN	-0.0725	0,032720	0.0269	-6.99%
Auction House	*Christie's*	CRT	1.2068	0,106451	0.0000	234.27%
(Other houses variable, OTR	*Gallery M.*	MEND	-0.8187	0,097034	0.0000	
was left out)	*Gallery O.*	ODA	-0.6892	0,089115	0.0000	
	Sotheby's	STH	1.6019	0,108994	0.0000	396.26%
Technique used	*Mixed*	MIX	-0.0464	0,069343	0.5037	-4.53%
(Other techniques variable,	*Oil*	OIL	0.0873	0,059134	0.1400	9.12%
OTH, was left out)	*Work on Paper*	WOP	-0.9540	0,071647	0.0000	-61.48%
Area of the work of art		AREA	0.00017	1.33E-05	0.0000	0.017%
		AREA2	-3.65E-09	5.39E-10	0.0000	-3.65E-09
Year dummies		1970	-0.1414	0.170002	0.4055	-13.19%
(1969 was left out)		1971	-0.2008	0.185997	0.2803	-18.19%
		1972	0.2273	0.174015	0.1915	25.52%
		1973	0.2324	0.210414	0.2695	26.16%
		1974	0.5322	0.176682	0.0026	70.27%
		1975	0.5054	0.184898	0.0063	65.77%
		1976	0.5937	0.190336	0.0018	81.06%
		1977	0.9836	0.202193	0.0000	167.40%
		1978	1.3499	0.197120	0.0000	285.69%
		1979	0.8852	0.230083	0.0001	142.34%
		1980	1.4961	0.180144	0.0000	346.42%
		1981	1.3166	0.232435	0.0000	273.07%
		1982	0.8581	0.245619	0.0005	135.87%
		1983	0.4448	0.190233	0.0194	56.02%
		1984	0.6943	0.175469	0.0001	100.23%
		1985	0.7560	0.171205	0.0000	112.97%
		1986	0.6898	0.177643	0.0001	99.33%
		1987	0.5028	0.176749	0.0045	65.34%
		1988	0.4260	0.172556	0.0136	53.11%
		1989	0.8172	0.180062	0.0000	126.42%
		1990	0.7808	0.188238	0.0000	118.32%
		1991	0.6604	0.200225	0.0010	93.56%
		1992	1.1951	0.236165	0.0000	230.38%
		1993	1.0597	0.194005	0.0000	188.56%
		1994	0.1434	0.225369	0.5245	15.42%
		1995	0.2610	0.210041	0.2140	29.83%
		1996	1.2246	0.166665	0.0000	240.29%
		1997	1.3829	0.158413	0.0000	298.66%
		1998	1.2454	0.160186	0.0000	247.45%
		1999	1.2221	0.163439	0.0000	239.43%
		2000	1.1675	0.161555	0.0000	221.38%
		2001	1.1900	0.162547	0.0000	228.70%
		2002	1.0941	0.166872	0.0000	198.65%
		2003	1.1655	0.166059	0.0000	220.74%
		2004	1.2117	0.160131	0.0000	235.90%
		2005	1.3027	0.163532	0.0000	267.91%
		2006	1.2889	0.168268	0.0000	262.87%
		2007	1.4765	0.225621	0.0000	337.78%
		2008	1.5925	0.218521	0.0000	391.58%
		2009	1.4191	0.219719	0.0000	313.35%
		2010	1.2631	0.221479	0.0000	253.64%
		2011	1.8405	0.173932	0.0000	529.95%
		2012	1.6744	0.169825	0.0000	433.54%
		2013	1.4559	0.177033	0.0000	328.83%
		2014	0.8597	0.188615	0.0000	136.24%
		Constant	6.666	0.193773	0.0000	
Number of observations		5,002	Mean dependent var		7.8907	
R-squared		0.7092	S.D. dependent var		1.5662	
Adjusted R-squared		0.7023	Akaike info criterion		2.5469	
S.E. of regression		0.8546	Schwarz criterion		2.7007	
Sum squared resid		3.5669	Hannan-Quinn criter.		2.6008	
Log likelihood		-6.2519	Durbin-Watson stat		1.1209	
F-statistic		1.0181				
Prob (F-statistic)		0.0000				

Source: Own calculations.

Table 3: Raw and Corrected Venezuelan Art Price Indices and their Returns

Year	Coefficients from hedonic regression (Table 2)	Art Price Index	Art Price Returns	Variance Yobserved - Ypredicted	Corrected Art Price Index	Corrected Art Price Returns
1969		100.00		0.5393	100.00	
1970	-0.1414	86.81	-13.19%	0.4345	82.38	-17.62%
1971	-0.2008	81.81	-5.77%	0.3899	75.92	-7.84%
1972	0.2273	125.52	53.44%	0.3151	112.21	47.81%
1973	0.2324	126.16	0.50%	0.4990	123.64	10.18%
1974	0.5322	170.27	34.97%	0.4316	161.35	30.50%
1975	0.5054	165.77	-2.65%	0.4182	156.03	-3.30%
1976	0.5937	181.06	9.23%	0.6010	186.74	19.68%
1977	0.9836	267.40	47.69%	0.8129	306.62	64.20%
1978	1.3499	385.69	44.24%	0.5523	388.21	26.61%
1979	0.8852	242.34	-37.17%	1.1657	331.47	-14.62%
1980	1.4961	446.42	84.21%	0.5273	443.75	33.87%
1981	1.3166	373.07	-16.43%	1.2674	536.91	20.99%
1982	0.8581	235.87	-36.78%	1.1069	313.28	-41.65%
1983	0.4448	156.02	-33.85%	0.5553	157.28	-49.80%
1984	0.6943	200.23	28.34%	0.6869	215.57	37.06%
1985	0.7560	212.97	6.36%	0.4803	206.79	-4.07%
1986	0.6898	199.33	-6.40%	0.4776	193.29	-6.53%
1987	0.5028	165.34	-17.05%	0.4267	156.29	-19.14%
1988	0.4260	153.11	-7.40%	0.5735	155.76	-0.34%
1989	0.8172	226.42	47.88%	0.4869	220.58	41.62%
1990	0.7808	218.32	-3.58%	0.7024	236.88	7.39%
1991	0.6604	193.56	-11.34%	0.6966	209.40	-11.60%
1992	1.1951	330.38	70.68%	0.8191	379.98	81.46%
1993	1.0597	288.56	-12.66%	0.3503	262.54	-30.91%
1994	0.1434	115.42	-60.00%	0.6806	123.88	-52.82%
1995	0.2610	129.83	12.48%	0.7579	144.83	16.91%
1996	1.2246	340.29	162.10%	0.4168	320.07	121.01%
1997	1.3829	398.66	17.15%	0.5335	397.51	24.19%
1998	1.2454	347.45	-12.85%	0.6225	362.21	-8.88%
1999	1.2221	339.43	-2.31%	0.6162	352.75	-2.61%
2000	1.1675	321.38	-5.32%	0.4808	312.12	-11.52%
2001	1.1900	328.70	2.28%	0.6133	341.09	9.28%
2002	1.0941	298.65	-9.14%	0.5829	305.24	-10.51%
2003	1.1655	320.74	7.40%	0.6529	339.50	11.22%
2004	1.2117	335.90	4.73%	0.4750	325.28	-4.19%
2005	1.3027	367.91	9.53%	0.6335	385.67	18.57%
2006	1.2889	362.87	-1.37%	0.5644	367.45	-4.72%
2007	1.4765	437.78	20.64%	1.1185	584.85	59.16%
2008	1.5925	491.58	12.29%	0.9681	609.14	4.15%
2009	1.4191	413.35	-15.91%	1.0358	529.83	-13.02%
2010	1.2631	353.64	-14.45%	1.3874	540.41	2.00%
2011	1.8405	629.95	78.13%	0.8933	751.95	39.14%
2012	1.6744	533.54	-15.30%	1.3519	801.01	6.52%
2013	1.4559	428.83	-19.63%	1.3228	634.49	-20.79%
2014	0.8597	236.24	-44.91%	1.5245	386.62	-39.07%

Note: This table presents the raw and corrected art price indices. The antilog of the estimations of the coefficients of the year dummy variables (Y_t), reported in Table 2, were used to construct an art price index (raw art price index) that controls for the quality of the works of art sold through time. The value of the hedonic price index in year *t* is: $\mathbb{III}_t \equiv exp(\hat{Y}_t) \times 100$, (2), and the yearly art price return for year *t* is: $r_t \equiv \frac{\mathbb{III}_t}{\mathbb{III}_{t-1}} - 1$, (3)

The log transformation performed before the estimation can create a transformation bias in the estimated returns if there exists time variation in the heterogeneity-controlled dispersion of prices (Silver and Heravi, 2007, and Renneboog, and Spaenjers, 2012). Triplett (2004) and Silver and Heravi (2007) demonstrate that, assuming that the hedonic regression residuals are normally distributed in each period, this bias can be fixed by correcting index values as follows:

$$\mathbb{III}_t^* = exp\left[\gamma_t + \frac{1}{2}\left(\hat{\sigma_t}^2 - \hat{\sigma_0}^2\right)\right] \times 100, \qquad (4)$$

Where $\hat{\sigma_0}$ and $\hat{\sigma_t}$ are the estimated variances of the residuals for observations in years 0 and *t*, respectively. The corrected art return estimate in year *t* was then computed as follows: $r_t{}^* = \left[\frac{\mathbb{III}_t^*}{\mathbb{III}_{t-1}^*}\right]$, (5). The corrected art price index presented in the table corrects for changes in price dispersion over time.

Source: Own calculations.

Table 4: Comparison of Venezuelan Art Returns with Other Investment Returns and Economic Variables

1970-2014, Based on U.S. Dollar Returns	Ven. Art Index	Ven. Art Index*	Stocks Ven.	Inflation Rate Ven.	Exchange Rate	GDP Growth	Stocks U.S.	Bonds U.S.	Inflation Rate U.S.	Treasury Bill U.S.	Oil Prices
Arith. Mean Return (%)	7.75	7.96	17.87	26.59	33.93	2.68	11.84	7.90	4.27	5.05	10.91
Standard Deviation (%)	38.89	33.66	80.23	22.13	55.73	5.55	17.21	9.74	2.91	3.29	27.97
Sharpe Ratio	0.07	0.09	0.16	-	0.52	-	0.39	0.29	-	-	0.21
Maximum Return (%)	162.10	121.01	451.07	103.24	267.60	18.29	37.20	32.81	13.50	14.30	96.84
Minimum Return (%)	-60.00	-52.82	-65.65	2.64	-2.27	-8.86	-36.55	-11.12	-0.40	0.03	-46.36

Notes and sources of the data: *Ven. Art Index* is the return on the Art Price Index reported in Table 3, and *Ven. Art Index** is the return on the Corrected Art Price Index reported in Table 3. *Stocks Ven.* is the yearly stock return of the Caracas Stock Exchange (December to December), *Inflation Rate Ven.* is the yearly Venezuelan Consumer Price Index percentage change (December to December), and *GDP Growth* is the Venezuelan annual real GDP growth rates. These three series were obtained from Garay (2006), based on Annual Reports by the Venezuelan Central Bank and by the Caracas Stock Exchange. *Exchange Rate (Bs./$)* is the yearly exchange rate percentage change (December to December) in the quotation Bolivar/U.S. dollar. The source of this series is Garay (2016), based on Annual Reports by the Venezuelan Central Bank, and quotations for the parallel exchange rate market during periods of exchange rate controls. *Stocks U.S.* is the annual returns on the Standard and Poor's 500 Index Return (December to December), *Bonds U.S.* is the annual returns of the U.S. Government 10-year bond, and *Treasury Bill U.S.* is the annual returns of the 3-Month U.S. Treasury Bill. These three series were obtained from Damodaran (http://pages.stern.nyu.edu/ ~adamodar/New_Home_Page/datafile/histretSP.html). *Inflation Rate U.S.* are the U.S. Consumer Price Index percentage changes (December to December), as reported by the U.S. Bureau of Labor Statistics. *Oil Prices* are the historical yearly returns on the free market (stripper) oil prices of Illinois Crude as presented by Plains All American (www.plainsallamerican.com).

Table 5: Correlation Matrix between Venezuelan Art Returns and Other Investments Returns and Economic Variables

Correlation Matrix (1970-2014)	Ven. Art Index	Ven. Art Index*	Stocks Ven.	Inflation Rate Ven.	Exchange Rate	GDP Growth	Stocks U.S.	Bonds U.S.	Inflation Rate U.S.	Treasury Bill U.S.	Oil Prices
Ven. Art Index	1.00	0.90	0.14	0.21	-0.33	0.07	0.02	-0.03	0.17	0.04	0.23
Ven. Art Index*		1.00	0.13	0.14	-0.36	0.16	-0.05	-0.05	0.15	0.06	0.19
Stocks Ven.			1.00	0.12	-0.06	0.21	-0.03	-0.11	-0.02	-0.03	0.10
Inflation Rate Ven.				1.00	0.39	-0.32	0.20	-0.09	-0.32	-0.25	-0.06
Exchange Rate (Bs/$)					1.00	-0.31	0.18	-0.24	-0.40	-0.36	-0.20
GDP Growth						1.00	-0.15	0.10	0.10	-0.06	0.12
Stocks U.S.							1.00	-0.02	-0.12	0.04	-0.32
Bonds U.S.								1.00	-0.06	0.19	-0.22
Inflation Rate U.S.									1.00	0.73	0.12
Treasury Bill U.S.										1.00	0.12
Oil Prices											1.00

Notes and sources of the data: See Table 4