Modelling South African Art Prices

An analysis of post-2000 price behaviour

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Introduction

The South African Art Market

Surge in popularity of South African art

Record prices at international and local auctions

- Irma Stern's *"Arab Priest"* sold for £2.7m in 2011 by Bonhams
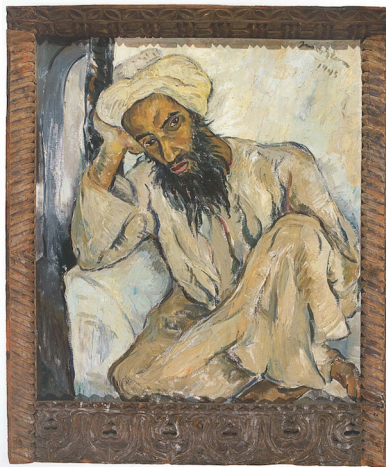- Irma Stern's *"Two Arabs"* sold for R19m in 2011 by Strauss & Co

Prompted many claims of a "bubble" in the art market

Objectives:

1. Construct SA art price indices over time
2. Use simple hybrid repeat sales method (robustness test)
3. Test for evidence of a bubble in SA art market prices (application)

Arab Priest - Irma Stern

Two Arabs - Irma Stern

Data

South African Art Auction Data
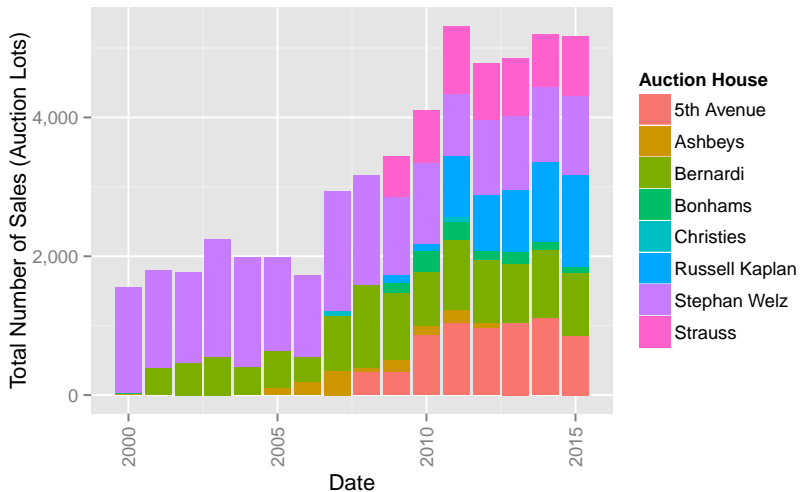
Auction data from AuctionVault:

- 2000-2015
- 8 auction houses
- 52,059 sales
- 4,503 artists
- Various characteristics for each record

Public auction prices vs. private prices

Bought-in lots

Total Sales by Auction House

Methodology and Results

Measurement Methodology

Construction of price indices for unique assets is challenging:

- Low transaction frequency
- Only a small part of the overall market is traded at any given time
- Artworks are unique (heterogeneous)
- Composition or quality-mix not constant over time
- Difficult to compare prices over time

Estimation methodologies:

1. Central tendency methods
2. Hedonic regressions
3. Repeat sales regressions
4. Hybrid models

Central Tendency methods

Simple measure of central tendency price distribution (average or median)

Do not adequately control for quality-mix changes over time

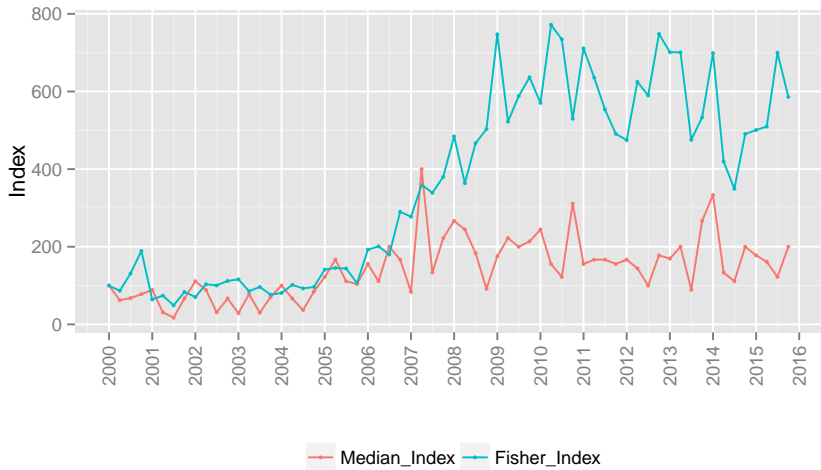Still dependent on the mix of objects that come to market

Slight improvement by stratification (e.g. ABSA)

Estimated as a baseline:

- Median prices
- Stratified Fisher indices (by artist and medium)

Central Tendency Indices

Hedonic regression methodology

Prices modelled as a function of asset attributes:

$$\ln P_{it} = \sum_{t=1}^{T} \delta_t D_{it} + \sum_{j=1}^{J} \beta_{jt} X_{jit} + \sum_{k=1}^{K} \gamma_{kt} Z_{kit} + \epsilon_{it}$$

Control for quality by attributing implicit prices to characteristics

Strip observable characteristics to obtain "standard asset"

Time dummies provide "pure price effect"
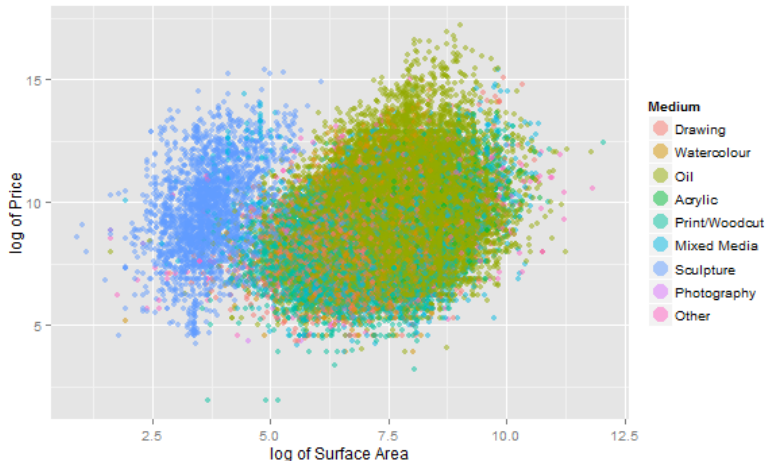
Potential omitted variable bias

Artwork Attributes

- Size
- Auction houses
- Mediums
- Authenticity dummies
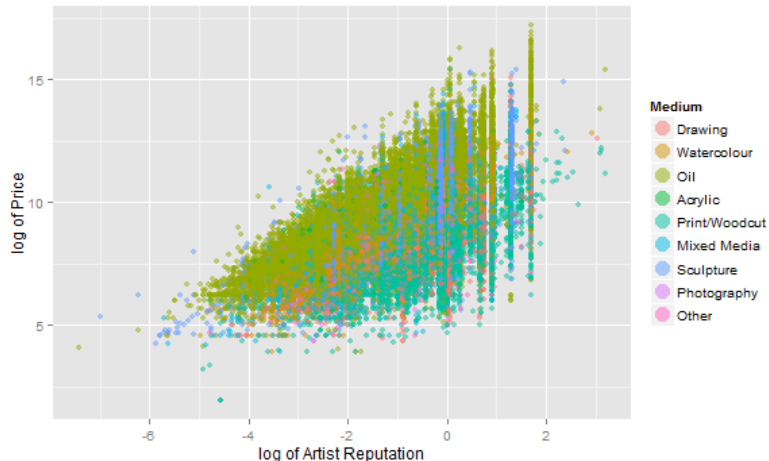- Number of works in the lot
- Date dummies
- Artist

$$\text{Artist reputation index} = \frac{\prod_{i=1}^{n}(P_{i,y})^{\frac{1}{n}} / \prod_{i=1}^{m}(P_{i,0})^{\frac{1}{m}}}{\exp\left[\sum_{j=1}^{z}\beta_j\left(\sum_{i=0}^{n}\frac{X_{ij,y}}{n} - \sum_{i=1}^{m}\frac{X_{ij,0}}{m}\right)\right]}$$
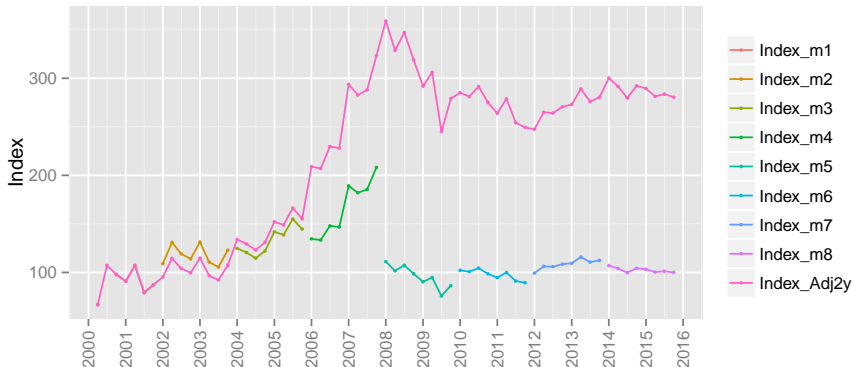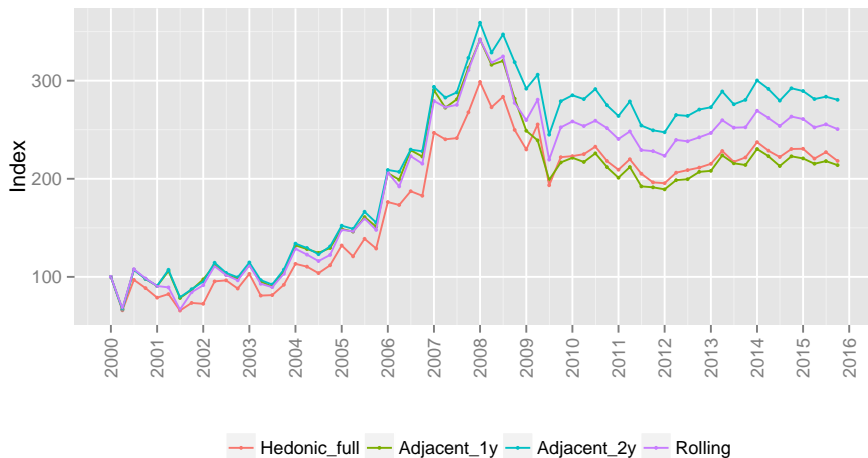
Size or surface area by medium

Reputation

Adjacent Periods

Hedonic Indices

Repeat Sales Regression Method

Track repeated sale of a specific asset over time (e.g. Case-Shiller)

Aggregate sales pairs and estimate average return in each period

$$\ln \frac{P_{t+1}}{P_t} = \sum_{i=1}^{t} \gamma_i d_i + \epsilon_i$$

Controls for all attributes (if they are constant)

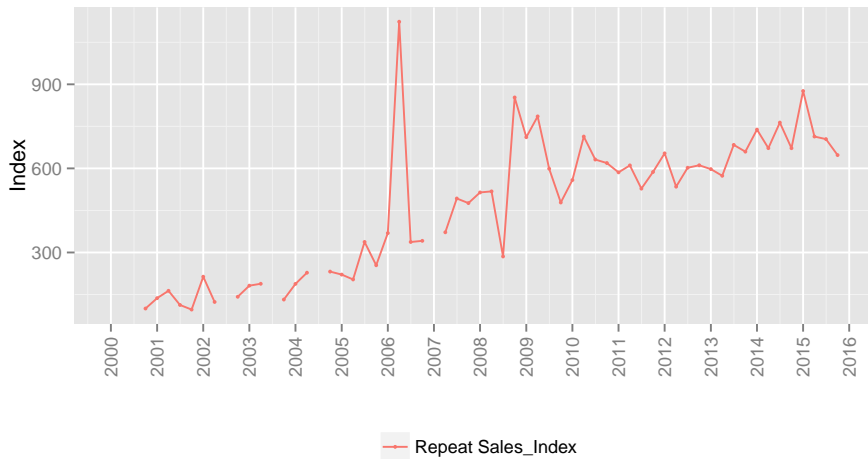Wasteful of data (single-sale data discarded)

- limited number of repeat sales pairs (515)

Potential sample selection bias

- e.g. low-quality houses often sell more frequently

Repeat Sales Index

Hybrid Models: The Pseudo Repeat Sales Method

Limited repeat sales or perfect matches (*Wheat Field with Crows*)

Match similar assets over time (*Sunflowers*)

Address scarcity of repeat sales by creating pseudo pairs

Can be derived from the first differenced hedonic model:

$$\ln P_{it} - \ln P_{hs} = \sum_{j=1}^{J} \beta_j(X_{itj} - X_{hsj}) + \sum_{t=0}^{T} \delta_t G_{it} + \epsilon_{iths}$$

Control for possible omitted variables by taking first differences

- interaction and squared terms
- finer mediums & materials (e.g. linocuts and canvas)

1. Match by all attributes, except title (6,642 sales pairs)
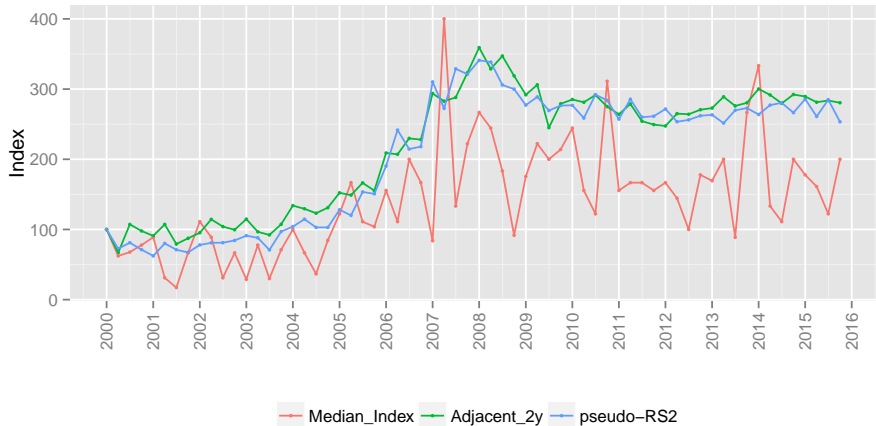2. All attributes, except title & authenticity dummies (7,965)

Pseudo Repeat Sales Indices
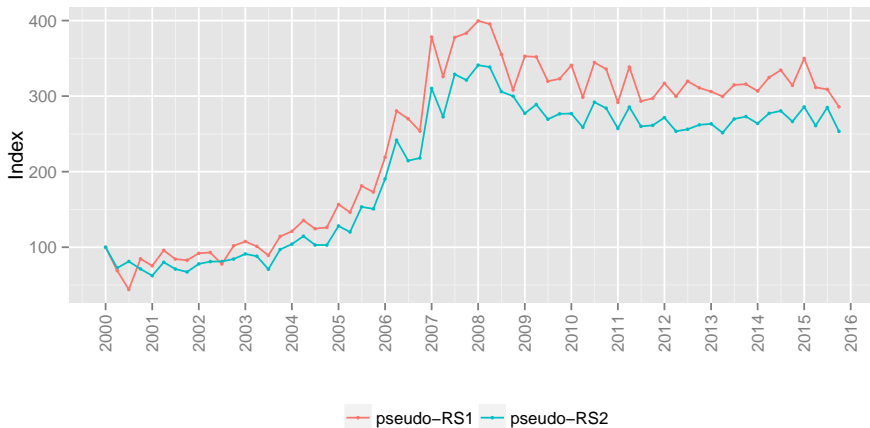
Comparison and Evaluation

Comparison of the indices

Evaluating index smoothness

Table 1: Smoothness Indicators

	Vol	AC.1	HPDeviation	Smoothness
Median	0.606	-0.414	22.34	-0.02
Fisher	0.296	-0.477	5.24	1.00
Hedonic	0.130	-0.394	1.00	1.14
Adj1y	0.126	-0.342	0.93	1.54
Adj2y	0.126	-0.394	0.95	1.17
Roll	0.131	-0.364	1.02	1.36
RepSale	0.444	-0.408	12.01	0.58
ps.RS1	0.135	-0.390	1.10	0.79
ps.RS2	0.124	-0.285	0.92	0.86

Compared to international art price indices
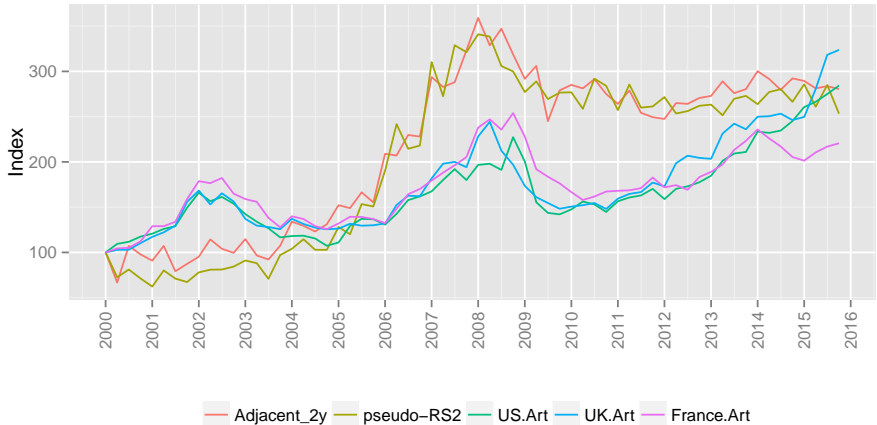
Compared to other local assets
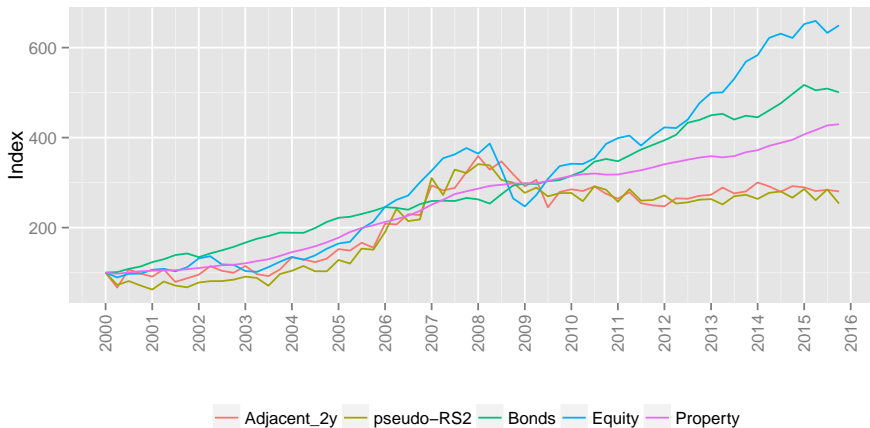
Bubbles

Bubbles in Asset Prices

Rational bubbles: willing to pay more than fundamental value

- expect asset price will exceed its fundamental value in future

Gap between fundamental price and market price

- difficult to determine fundamental value of art

If bubble is present - prices exhibit explosive behaviour

So look for mildly explosive behaviour in price series

Methodology: Explosive Behaviour

Recursive autoregressive models (log real indices):

$$\Delta y_t = \alpha_w + (\rho_w - 1)y_{t-1} + \sum_{i=1}^{k} \phi_w^i \Delta y_{t-i} + \epsilon_t$$
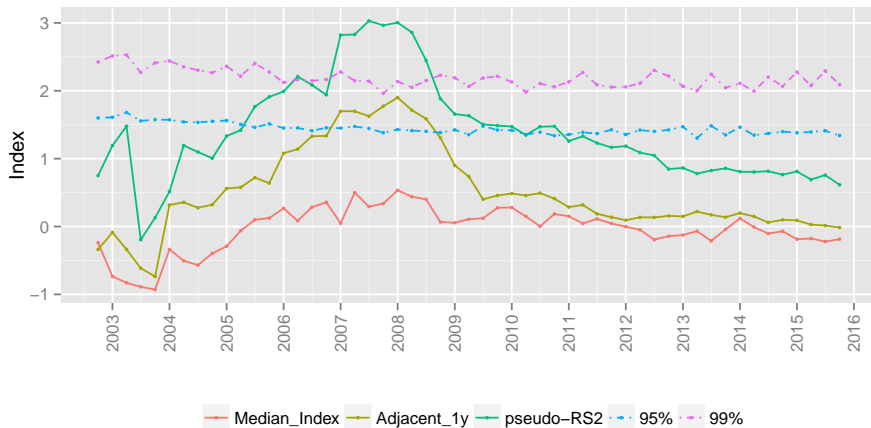
Right-tailed Augmented Dickey-Fuller tests

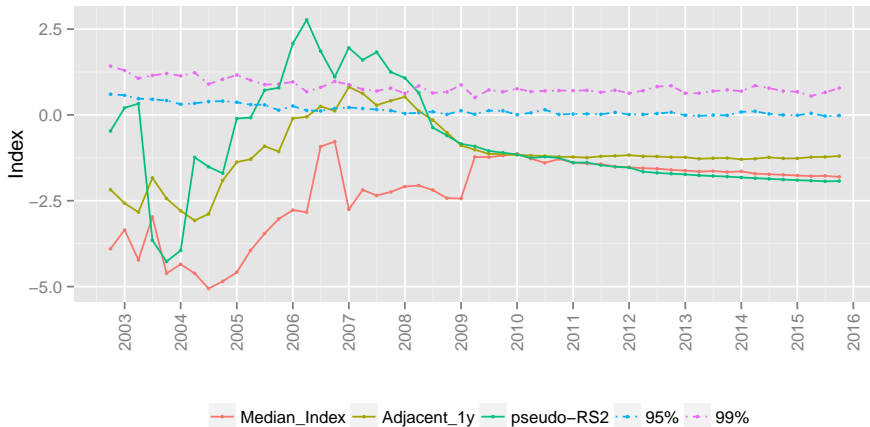Critical values from Monte Carlo simulations

Date stamp origination and termination

Results: No Drift or Trend

Results: Drift

Median_Index   Adjacent_1y   pseudo−RS2   95%   99%

Bubble Dates

Table 2: Dates of explosive behaviour

	None-Start	None-End	Drift-Start	Drift-End
Fisher_Index	2008 Q1	2010 Q3	2008 Q1	2009 Q2
Hedonic_full	2007 Q1	2008 Q3	2007 Q1	2008 Q2
Adjacent_1y	2007 Q1	2008 Q3	2006 Q3	2008 Q2
Adjacent_2y	2007 Q1	2008 Q4	2006 Q3	2008 Q2
Rolling	2007 Q4	2008 Q3	2007 Q1	2008 Q2
pseudo-RS1	2005 Q3	2010 Q1	2006 Q1	2008 Q2
pseudo-RS2	2005 Q3	2010 Q4	2005 Q3	2008 Q2

Conclusion

Conclusion

Regression-based indices:

- Differ from central tendency measures (better i.t.o. smoothness)
- Relatively similar and consistent general cyclical trends

Potential bubble in run-up to financial crisis (2006-2008):

- High transaction costs and no short selling
- Self-fulfilling prophecy and exogenous shock
- Spillovers from other markets through wealth effect

Potential further research:

- Risk-return profile and optimal asset allocation
- Masterpiece effect
- Potential drivers of art prices

Suggestions and Advice?