

# The South African Art Market

## Explosive Behaviour

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# Introduction



# The South African Art Market

Surge in popularity of Modern and Contemporary South African art

Huge increase in prices in run-up to Great Recession

Record prices at international and local auctions

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

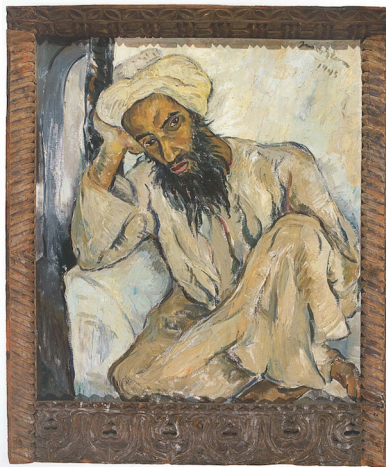
Prompted many claims of a "bubble" in the art market

Objectives:

- 1 Construct indicators of art market prices over time
- 2 Test for a "bubble" in the SA art market



# Arab Priest - Irma Stern



# Data



# South African Art Auction Data

AuctionVault/Citadel auction data:

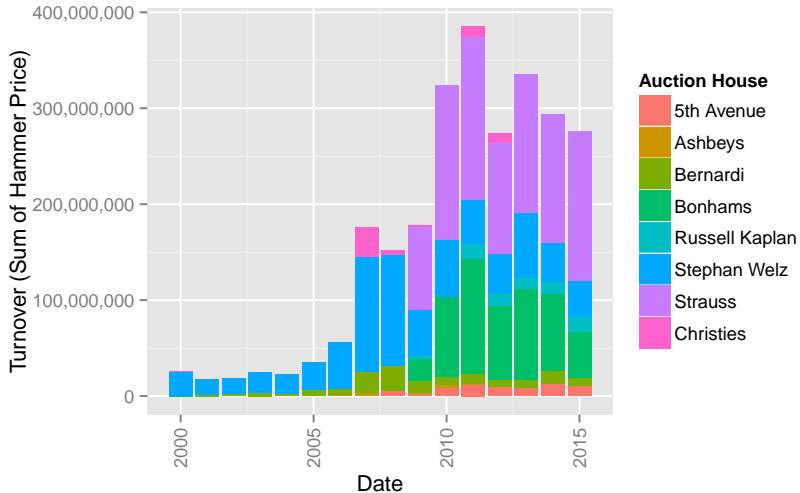
- 2000-2015
- 8 auction houses
- 50,560 sales
- 4,361 artists
- Various characteristics for each records

Public auction prices vs. private prices

Bought-in lots

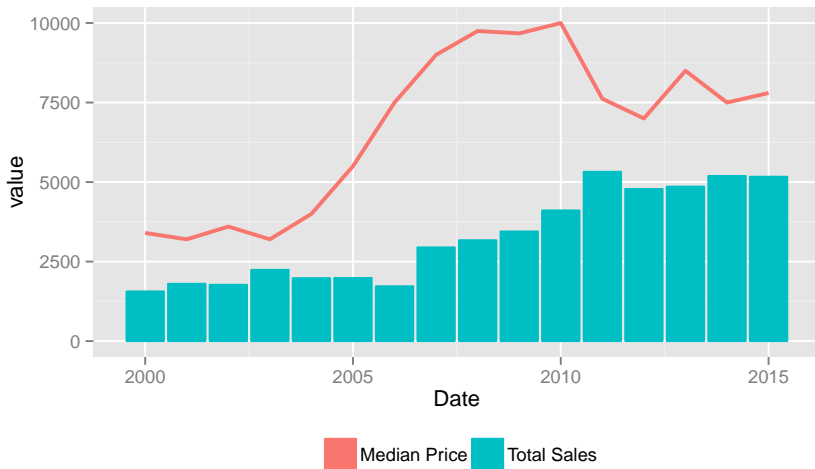


# Turnover





# Sales and Prices



# Methodology



# Measurement Methodology

Accurate measurement is difficult:

- Assets are heterogeneous (unique) & involve large transaction costs
- Less liquid than traditional assets & low transaction frequency
- Small part of the overall market is traded at any given time
- Composition & quality not constant

Estimation methodologies:

- 1 Naïve or central tendency methods
- 2 Repeat sales regressions
- 3 Hedonic regressions
- 4 Hybrid models



# Central Tendency methods

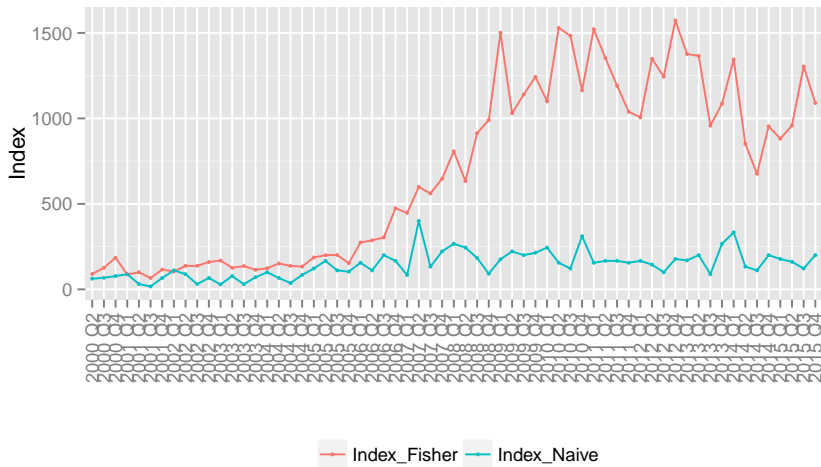
Average (median) price over time

Slight improvement by stratification e.g. ABSA

- Median price
- Stratified Fisher indices



# Central Tendency Indices



# Hedonic regression methodology

Prices described by characteristics:

$$\ln P_{it} = \alpha + \sum_{j=1}^z \beta_j X_{ij} + \sum_{t=1}^{\tau} \gamma_t D_{it} + \epsilon_{it}$$

Strip observable characteristics to obtain “standard asset”

Control for quality by attributing implicit prices to characteristics

Omitted variable & misspecification bias



# Artwork Attributes

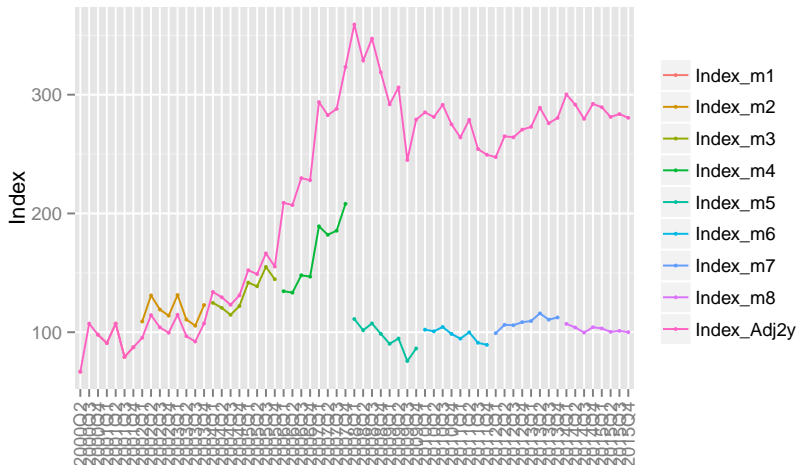
- Artist reputation

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

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

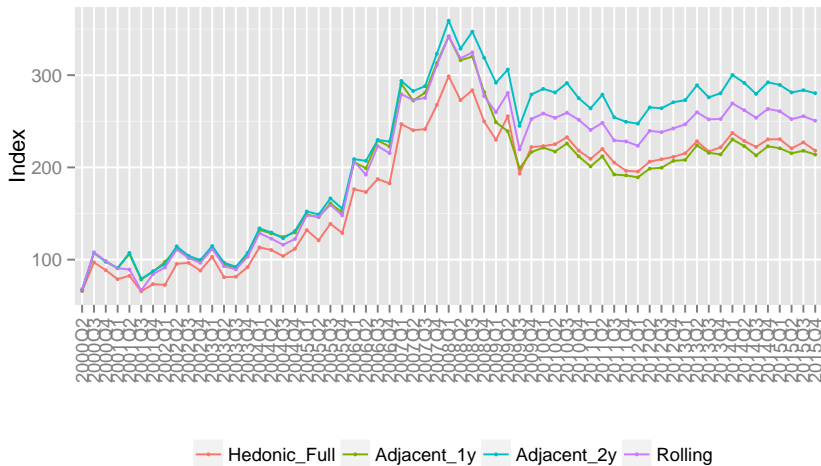


# Adjacent Periods





# Hedonic Estimation Results



# Repeat Sales Regression Method

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

Estimate average return on set of assets in each period

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

Controls for all factors contributing to the variation in price growth

But wasteful of data (resale may only occur infrequently)

Possible sample selection bias

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



# Hybrid Models: The Pseudo Repeat Sales Method

Limited number of repeat sales pairs (561)

- perfect matches (*Wheat Field with Crows*)

Match similar assets over time (*Sunflowers* series)

Address problem of lack of repeat sales

Create (many) pseudo sales pairs:

- Hedonic matching by artist and medium
- Set distance metric



# Index construction methodology

Repeat sales regressions on pseudo pairs:

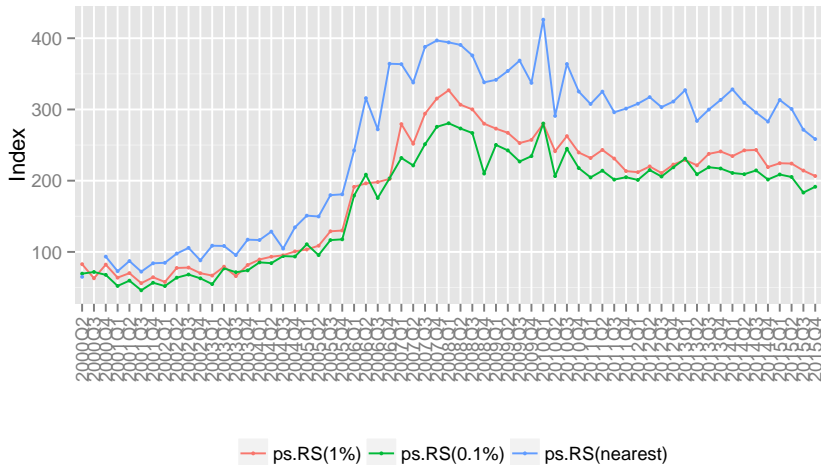
$$\ln P_{bsj} - \ln P_{arj} = \sum_{k=1}^K \beta_k (X_{bsjk} - X_{arjk}) + \sum_{t=0}^{\tau} \gamma_t d_t + \epsilon_{srabj}$$

Control for many possible omitted variables by taking first differences

- includes perfect matches
- interaction and squared terms
- finer mediums, materials (e.g. linocuts)



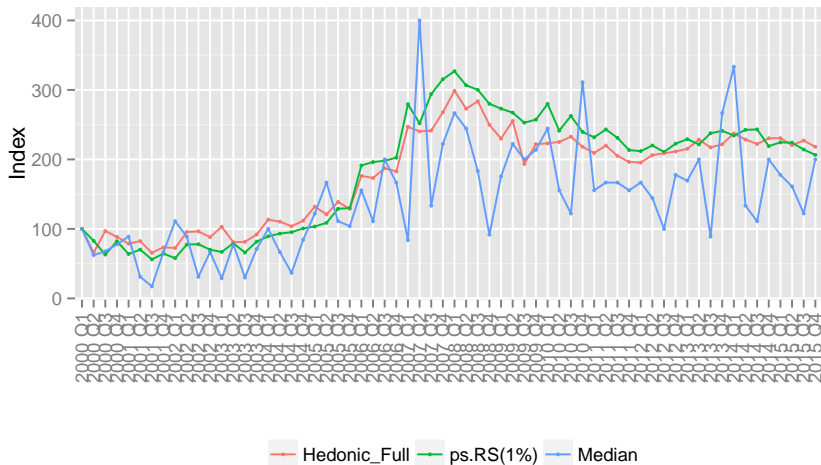
# Pseudo Repeat Sales Results



# Comparison and Evaluation



# Comparison of the indices



# Correlations

**Table 1: Correlations in DLogs**

	Hedonic	Adj1y	Adj2y	Roll	ps.RS(1%)	ps.RS(0.1%)	ps.RS(0)
Hedonic							
Adj1y	0.93***						
Adj2y	0.96***	0.99***					
Roll	0.96***	0.96***	0.97***				
ps.RS(1%)	0.41***	0.38**	0.37**	0.37**			
ps.RS(0.1%)	0.46***	0.46***	0.46***	0.45***	0.71***		
ps.RS(0)	0.55***	0.57***	0.59***	0.54***	0.45***	0.68***	
Median	0.07	0.13	0.13	0.23	0.05	0.14	0.05





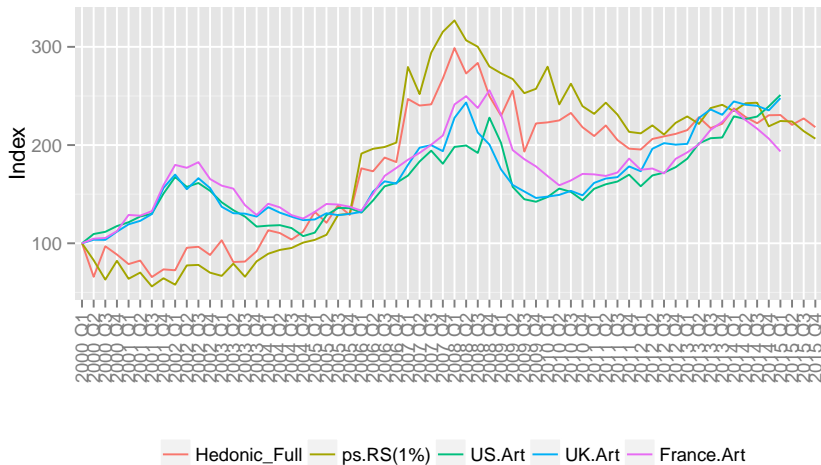
# Evaluating index smoothness

**Table 2:**Smoothness Indicators

	vol	ac.1
Hedonic_Full	0.14	-0.39
Adjacent_1y	0.14	-0.35
Adjacent_2y	0.14	-0.39
Rolling	0.14	-0.36
ps.RS(1%)	0.13	-0.30
ps.RS(0.1%)	0.15	-0.31
ps.RS(nearest)	0.16	-0.44
Median	0.84	-0.31



# Compared to international art price indices



# 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 market fundamental and the actual price

Present value of asset:

$$P_t = F_t + B_t$$

$$F_t = E_t\left[\sum_{i=1}^n \frac{1}{1+r_f} (\gamma_{t+n})\right]$$

$$B_t = \frac{1}{1+r_f} E_t(B_{t+n})$$

Properties of  $P_t$  are determined by those of  $F_t$  and  $B_t$

If bubble is present,  $B_t \neq 0$ , prices exhibit explosive behaviour

So look for mildly explosive behaviour in price series



# Methodology: Explosive Behaviour

Method proposed by Phillips et al (2011)

Recursive autoregressive models (log real indices):

$$\Delta y_t = \alpha_w + (\rho_w - 1)y_{t-1} + \sum_{i=1}^k \phi_w^i \Delta y_{t-i} + \epsilon_t$$

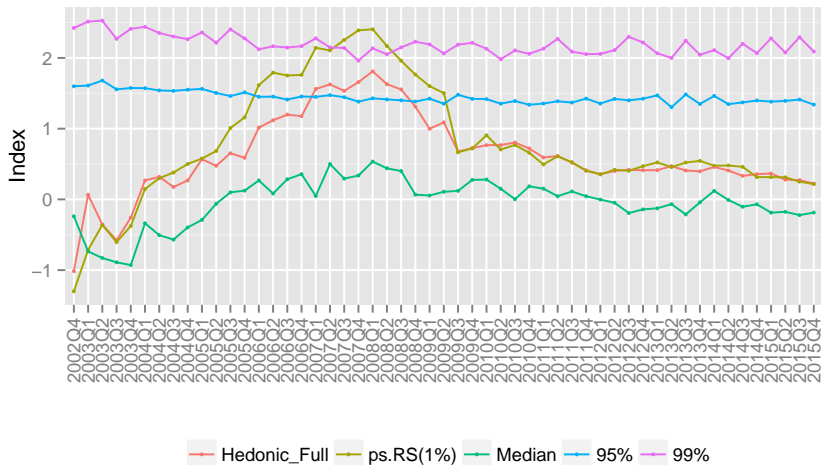
Right-tailed Augmented Dickey-Fuller tests

Critical values from Monte Carlo simulations

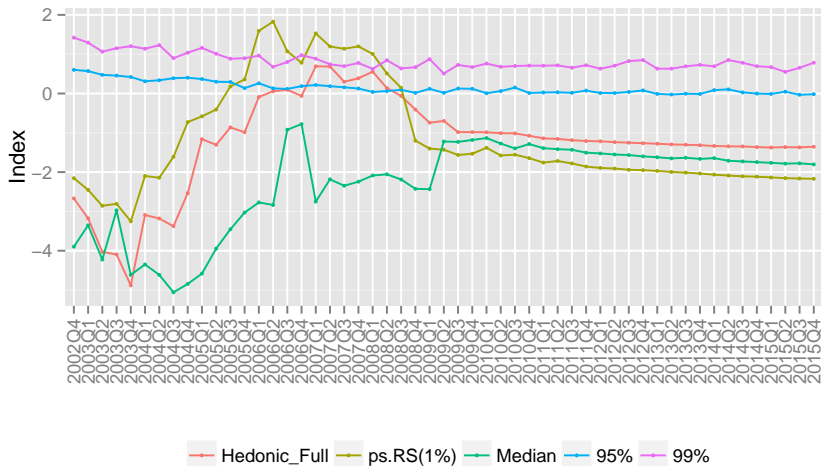
Date stamp origination and termination



# Results: No Drift or Trend



# Results: Drift



# Bubble Dates

**Table 3:** Dates of explosive behaviour

	None-Start	None-End	Drift-Start	Drift-End
Hedonic_Full	2007Q1	2008Q3	2007Q1	2008Q2
Adjacent_1y	2007Q1	2008Q3	2006Q3	2008Q2
Adjacent_2y	2007Q1	2008Q4	2006Q3	2008Q2
Rolling	2007Q4	2008Q3	2007Q1	2008Q2
ps.RS(1%)	2006Q1	2009Q2	2005Q4	2008Q3
ps.RS(0.1%)	2006Q1	2009Q2	2005Q4	2008Q2
ps.RS(nearest)	2005Q3	2008Q3	2005Q3	2008Q1





# Conclusion



# Conclusion

Sukkel sukkel...



