

Return to wine: A comparison of the hedonic, repeat sales, and hybrid approaches

**James Fogarty - School Agricultural and Resource Economics
University of Western Australia**

Estimating the return to wine is not straightforward

- Heterogeneous product
- Sales are infrequent

Sales data has new vintages and missing observations

Brand_{vint}	P₁	P₂	P₃	P₄
Grange ₉₀	400	-	420	410
Grange ₉₁	-	-	310	-
Moss Wood ₉₁	-	120	-	-
Moss Wood ₀₅	110	-	-	115
Hill of Grace ₀₂	-	350	360	-

Initial approaches considered only adjacent observations

Brand_{vint}	P₁	P₂	P₃	P₄
Grange ₉₀	400	-	420	410
Grange ₉₁	-	-	310	-
Moss Wood ₉₁	-	120	-	-
Moss Wood ₀₅	110	-	-	115
Hill of Grace ₀₂	-	350	360	-

- Discard most of the available information
- Sample selection issues

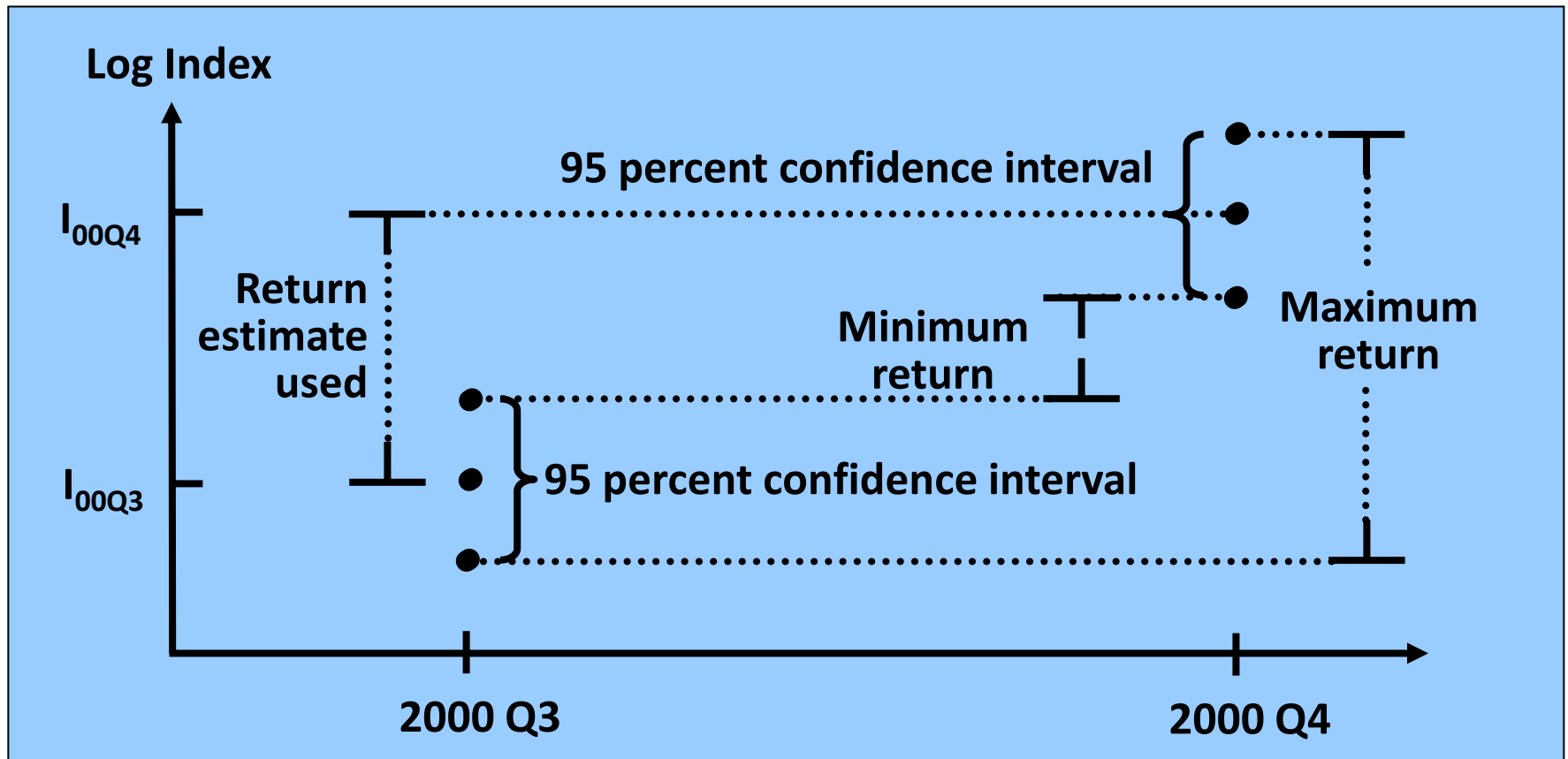
Then the repeat sales regression approach developed in the housing literature was applied

Brand_{vint}	P₁	P₂	P₃	P₄
Grange ₉₀	400	-	420	410
Grange ₉₁	-	-	310	-
Moss Wood ₉₁	-	120	-	-
Moss Wood ₀₅	110	-	-	115
Hill of Grace ₀₂	-	350	360	-

- Uses a large proportion of the data
- Still some sample selection issues
- In practice the standard errors on returns are large

Large standard errors have implications for asset comparisons

- Mean return unlikely to be effected
- Risk is likely to be understated



Most recently the hedonic price regression approach has been used

Brand_{vint}	P₁	P₂	P₃	P₄
Grange ₉₀	400	-	420	410
Grange ₉₁	-	-	310	-
Moss Wood ₉₁	-	120	-	-
Moss Wood ₀₅	110	-	-	115
Hill of Grace ₀₂	-	350	360	-

- Uses all of the data
- Smaller standard errors than repeat sales
- Fails to take advantage of matching sales

The Hybrid model is a refinement of the hedonic model

Start with a general hedonic model

$$\begin{aligned} \text{Price} = & \text{Attribute vector} \\ & + \text{time dummy variable vector} \\ & + \text{specification error} \\ & + \text{random error} \end{aligned} \quad \text{eq (1)}$$

Separate the data into two sets

- Set 1 = all wines that appear only once, index these wines with i
- Set 2 = all wines appearing more than once, index these wines with j

For all wines in Set 2 the specification error can be removed

- let the first sale for wine j occur in time period t

$$\begin{aligned} \text{Price}_{jt} = & \text{Attribute vector} \\ & + \text{time dummy variable vector} \quad \text{eq (2)} \\ & + \text{specification error} \\ & + \text{random error} \end{aligned}$$

- and let the second sale occur in time period T

$$\begin{aligned} \text{Price}_{jT} = & \text{Attribute vector} \\ & + \text{time dummy variable vector} \quad \text{eq (3)} \\ & + \text{specification error} \\ & + \text{random error} \end{aligned}$$

By differencing the attribute vector and the specification error term drop out:

$$\begin{aligned} \text{Price}_{jT} - \text{Price}_{jt} = & \\ & + \text{time dummy variable vector} \quad \text{eq (4)} \\ & + \text{random error}_{jT} - \text{random error}_{jt} \end{aligned}$$

Where the time dummy variable vector has minus one at time t and one at time T

The combination of the hedonic model and the repeat sales model is the hybrid model

- The removal of the specification error for repeat sales increases the efficiency of hedonic model

Full technical details on how to implement the approach are given in the paper – focus on results

Data Summary

- 14,102 sale observations from Langton's**
- Time period 1988 Q1 – 2000 Q4**
- 84 brand types (super premium wines)**
- 36 vintages (1965 -2000)**
- Mainly Cabernet and Shiraz**
 - 43 percent Cabernet**
 - 38 percent Shiraz**
 - 8 percent Chardonnay**
 - 10 percent other varieties**

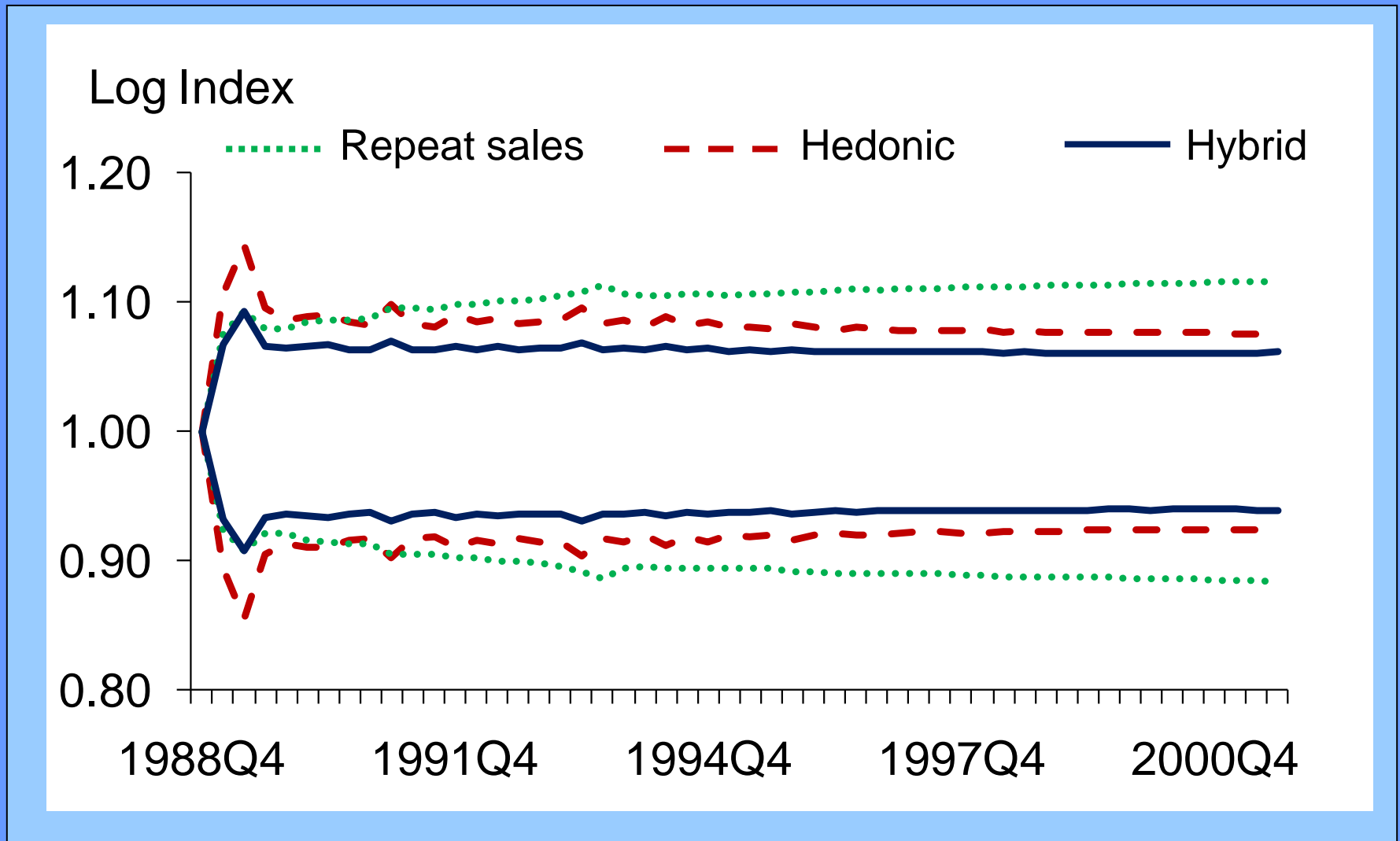
Model performance comparison

Model	Total Return (percent)	Ave. Quarterly SE (percent)
Repeat Sales Model	172.4	5.48
Hedonic Model	129.8	4.36
Hybrid Model	138.0	3.30

- Repeat sales model gives higher return estimates
- Hybrid model gives the most efficient estimates

The efficiency gain can be visualised by plotting the 95 percent confidence intervals

Comparison plot of 95 percent confidence interval - Return held constant to illustrate



How does wine compare to other financial assets?

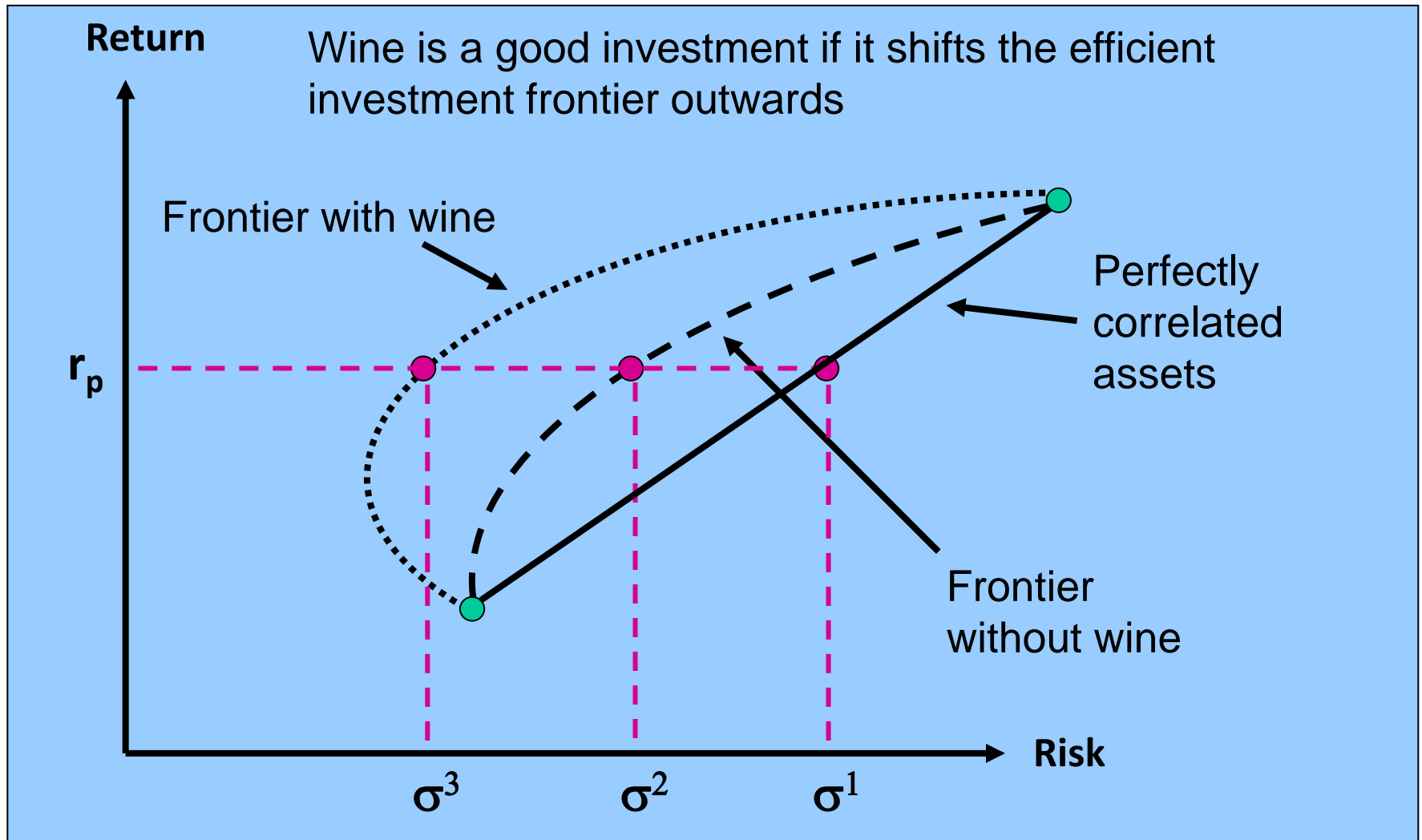
Quarterly rate of return comparison 1988-00

Asset	Return (%)	Risk (%)	Correlation to wine (ρ)
Aust. wine	2.04	3.93	-
Aust. shares	2.67	5.80	.136
Aust. bonds	2.84	3.15	-.106
US shares	4.79	8.14	.131
US bonds	2.91	6.07	.003

- Low return - Medium risk

- Low correlation to standard financial assets

Is Australian wine a good investment class?



A formal test for a diversification benefit

- If you can mimic the return to wine with the other assets in the portfolio it adds no value

Can the return to wine be written as a linear combination of the return to the other assets ?

$$r_{\text{wine}} = a + \begin{bmatrix} b_1 & b_2 & b_3 & b_4 \end{bmatrix} \begin{bmatrix} r_{\text{Au shares}} \\ r_{\text{Au bonds}} \\ r_{\text{US shares}} \\ r_{\text{US bonds}} \end{bmatrix} + e$$

- Wine does provide a diversification benefit

Summary of Results

- Hybrid and hedonic models give lower return estimates than the repeat sales model
- Hybrid model gives the most efficient estimates
- Return to wine is relatively low
 - Correlation between wine and standard financial assets is low
- Wine provides a diversification benefit
- Wine should be both savoured and stored