California Blue Chips Index ("RWI-CB5")

Rare Wine Indices

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Contents

1 Introduction and Objective

1.1 Introduction

The California Blue Chips ("RWI-CB5") Index is designed to provide a transparent benchmark for tracking the price performance of iconic Cabernet Sauvignon-based wines from Napa Valley and the Santa Cruz Mountains.

This document details the governing rules, constituent eligibility criteria, calculation methodology, and maintenance policies of the Index. It serves as the guide for all aspects of the Index's construction and management.

1.2 Objective

The primary objective of the Index is to provide wine investors, collectors, and enthusiasts with a reliable and consistent benchmark for the price evolution of a specific segment of the fine wine market. The Index aims to reflect the real-world transaction values of these wines, thereby creating market transparency and providing a tool for performance measurement and academic research.

2 Governance and Disclaimer

2.1 Index Administrator

The Index is calculated and administered by the Index Administrator (Rare Wine Indices). The Index Administrator is responsible for overseeing the methodology and ensuring its consistent application. The Index Administrator is responsible for the review of the methodology, market conditions, and potential changes.

2.2 Data Provider

The data provider for the Index is Wine Labs. Pricing data used in the calculation of the Index is sourced directly from Wine Labs, a fine wine price intelligence platform. Visit www.winelabs.com to learn more.

2.3 Disclaimer

This document is for informational purposes only. The Index Administrator makes no representation or warranty, express or implied, as to the accuracy or completeness of the information contained herein. The Index Administrator is not liable for any errors, omissions, or interruptions in the calculation or dissemination of the Index. The Index is not intended to be, and should not be construed as, investment advice. Inclusion of a wine in the Index does not constitute a recommendation to buy, sell, or hold that wine.

3 Index Universe and Eligibility Criteria

3.1 Eligible Producers

The Index Universe is restricted to wines from:

- Screaming Eagle
- Harlan Estate
- Opus One
- Dominus
- Ridge Monte Bello

3.2 Bottle Size Requirements

Only transactions involving standard 750ml (75cl) bottles are included. Data from other bottle formats (e.g., 1.5L) are excluded unless a reliable volume adjustment can be applied.

3.3 Universe Review

The Index Administrator reviews the list of eligible producers and wine types annually to ensure they remain representative of the madeira market. Any changes to the universe criteria will be documented here.

4 Data Sources and Pricing

4.1 Price Definition

The price used for each transaction in the Index calculation is the final auction price, which is defined as the auction "hammer price" plus any applicable buyer's premium. This "all-in" price reflects the total cost to the purchaser but generally excludes applicable taxes, shipping cost and storage fees. All prices are converted to a single base currency before being used in the calculation.

4.2 Data Validation and Refinement

To the extent possible, the data received from the provider is subject to a cleansing process to identify and correct potential errors. This includes checks for data consistency.

5 Index Calculation and Methodology

5.1 Overview – RSR

The Index is calculated using a **Repeat Sales Regression (RSR)** methodology. The calculation is performed on a quarterly basis using Ordinary Least Squares (OLS). Prior to regression, a median price aggregation step is applied to reduce transaction-level noise, as described in Section 5.3.

5.2 Repeat Sales Requirement

Only wines that have been observed trading at least twice in the dataset are included in the RSR calculation.

For a wine with unique identifier w, let P_{w,t_1} and P_{w,t_2} denote the median prices at which it traded in quarters t_1 and t_2, where $t_1 < t_2$. The log price change is:

$$y_w = \ln(P_{w,t_2}) - \ln(P_{w,t_1})$$

5.3 Median Price Aggregation

Before constructing the repeat-sales pairs, all individual transaction prices for a given wine w within the same quarter t are collapsed to a single **median price**:

$$\tilde{P}_{w,t} = \text{median}\Big(\{P_{w,t}^{(1)},\, P_{w,t}^{(2)},\, \ldots,\, P_{w,t}^{(k)}\}\Big)$$

where $P_{w,t}^{(1)}, \ldots, P_{w,t}^{(k)}$ are the $k \geq 1$ individual hammer prices recorded for wine w in quarter t. This step ensures that each wine contributes at most one observation per period to the regression, reducing noise from auction-specific idiosyncrasies and rendering additional heteroskedasticity corrections unnecessary. All subsequent calculations use the median price $\tilde{P}_{w,t}$ in place of individual transaction prices.

5.4 Design Matrix Construction

The RSR methodology uses a design matrix $\mathbf{X}$ based on the Bailey-Muth-Nourse approach. Let T denote the number of time periods (quarters) in the dataset, and let the base period be the first quarter.

For each repeat-sales pair, we construct a row in the design matrix with $T-1$ columns (excluding the base period):

- A value of -1 in the column corresponding to the sale period t_1
- A value of $+1$ in the column corresponding to the purchase period t_2
- Zeros in all other columns

If n is the number of repeat-sales pairs, then $\mathbf{X}$ is an $n \times (T-1)$ matrix, and $\mathbf{y}$ is an $n \times 1$ vector of log price differences.

5.5 Ordinary Least Squares (OLS) Estimation

The coefficient vector $\hat{\boldsymbol{\beta}}$ is estimated directly by OLS:

$$\hat{\boldsymbol{\beta}} = (\mathbf{X}^\top \mathbf{X})^{-1} \mathbf{X}^\top \mathbf{y}$$

The residuals are computed as:

$$\mathbf{e} = \mathbf{y} - \mathbf{X}\hat{\boldsymbol{\beta}}$$

No auxiliary variance regression or weighting scheme is applied. The median pre-aggregation in Section 5.3 addresses transaction-level noise at source.

5.6 Raw Index Level Calculation

The estimated coefficients $\hat{\boldsymbol{\beta}}$ represent the log price levels relative to the base period. To construct the raw index:

1. Set the base period (first quarter) coefficient to zero: $\hat{\beta}_{\text{base}} = 0$
2. For all other periods $t = 1, 2, \ldots, T-1$, use the estimated coefficients $\hat{\beta}_t$ from the OLS regression
3. Convert to raw index levels by exponentiating and scaling to a base value of 100:

$$I_t^{\text{raw}} = 100 \times \exp(\hat{\beta}_t)$$

where $I_{\text{base}}^{\text{raw}} = 1000$ by construction.

5.7 Cumulative Returns

The cumulative return from the base period to quarter t is calculated as:

$$R_t = \frac{I_t - I_{\text{base}}}{I_{\text{base}}} = \frac{I_t}{100} - 1$$

This represents the percentage gain or loss relative to the base quarter.

6 Index Publication and Maintenance

6.1 Base Date, Level and Chain-linking

The Index has an inception date of Q1 2010; thus, the first reported return is the change from Q1 to Q2 2010. Index levels reported subsequent to Q1 2026 utilize a chain-linking methodology. This approach permits the updating of index parameters while maintaining historical values at their previously published (frozen) levels to ensure time-series continuity. Starting base level:

$$I_{Q1,2010} = 100$$

6.2 Calculation and Publication Frequency

The Index Level is calculated and published on a quarterly basis. The official Index value for a given quarter is calculated and published 14 business days following the end of that calendar quarter (e.g., the value for Q1, ending March 31st, will be published on the 14th business day of April).

6.3 Rounding and Precision

The final Index Level is rounded to two decimal places for publication. All intermediate calculations are performed with a higher degree of precision to minimize rounding errors.

6.4 Index History and Back-testing

Values including and prior to the Q1 2026 base date are considered back-tested simulations. This back-tested data is provided for analytical purposes and reflects the application of this methodology to historical data.

7 Other Technical Notes and Assumptions

7.1 Pairing Methodology

The index uses **all repeat-sales pairs**. For a wine that trades at N distinct quarters, all $\frac{N(N-1)}{2}$ combinations (t_1, t_2) with $t_1 < t_2$ are included as separate observations in the design matrix. The only constraint is that $t_1 < t_2$ with no requirement that sales be consecutive. Including all pairs maximises the use of available price information, which is especially important given the illiquidity of the Madeira market.

7.2 Summary of Assumptions

The index relies on the following key assumptions:

- **Repeat-sales only:** Only wines with at least 2 observed trades are included
- **Time granularity:** Quarterly index using Auction Year and Auction Quarter
- **Constant quality:** Wine identity and bottle size (0.75L) are treated as constant quality
- **Currency:** All prices are assumed to be in the same currency (nominal, no CPI deflation)
- **Median aggregation:** Multiple transactions for the same wine in the same quarter are collapsed to the median price prior to regression

8 Glossary of Terms

Hammer Price & Buyer's Premium The Hammer Price is the winning bid for a lot at an auction, excluding the buyer's premium. The Buyer's Premium is an additional charge on the hammer price of an item at auction, which is paid by the winning bidder.

Repeat Sales Regression (RSR) A statistical methodology that constructs price indices by tracking the same items as they trade multiple times over different periods.