Historical Data for Hong Kong

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Outline

- Background
- Historical Database
- State-Space and Kalman Filtering Approach to Missing Data
- Concluding Remarks

Background

- Promote research on Hong Kong's monetary & macroeconomic history.
- Enhance the understanding of the risks and challenges the Hong Kong economy faces by studying past events and developments of importance to the local economy.

Background

- Monetary Regimes in HK
  - 1852 - 1935: Silver Standard
  - 1936 - 1972: Pound Sterling Standard
  - 1972 - 1974: U.S. Dollar Central Rate
  - 1974 - 1983: Free-floating
  - 1983 - present: U.S. Dollar Standard

Database

- Compilation and sources
- Coding and formats
- Selected series in graphs

Compilation

- Relevant
- Reliable
- Consistent: measuring the same variable
- Continuous
  - 2 methods to deal with discontinuities
  - Method 1: Supplement from other sources.
  - Method 2: State-space form and Kalman filtering.

Sources

- Governmental Publications
  - *Hong Kong Blue Book, Hong Kong Government Gazette Supplement No. 4, Hong Kong Administrative Report, Hong Kong Monthly Digest of Statistics, Hong Kong Annual Digest of Statistics.*

- Newspapers/ Periodicals
  - *South China Morning Post, Hong Kong General Chamber of Commerce Annual Report.*

Sources

- Books
  - C.F. Joseph Tom, "*The Entrepôt Trade and Monetary Standards of Hong Kong, 1842 - 1941*" (1963), "*Monetary Problems of an Entrepôt: The Hong Kong Experience*" (1964).
  - G.B. Endacott, "*An Eastern Entrepôt*" (1964).

Coding

- The coding for all the data series will be posted along with the database.
- A code consists of three parts.
- First Part: Group Code
  - identifies the category to which a series belongs, e.g. Cur - Currency in Circulation, G - Government, Tr - Trade.

Coding

- Second part: Detail Code
  - gives the details about a series, e.g. Paper - paper notes, Rev - Revenue, Exp - Export.

- Third part: Frequency Code
  - gives the frequency of the series, e.g. A - Annual, M - Monthly, F - Fortnightly, W - Weekly.

Coding

Code	Group	Details	Frequency	Series
Curpapera	Cur: Currency in Circulation	Paper: Paper Notes	A: Annual	Annual Notes in Circulation
Greva	G: Government	Rev: Revenue	A: Annual	Annual Government Revenue
Trexpa	Tr: Trade	Exp: Export	A: Annual	Annual Export

Data Format

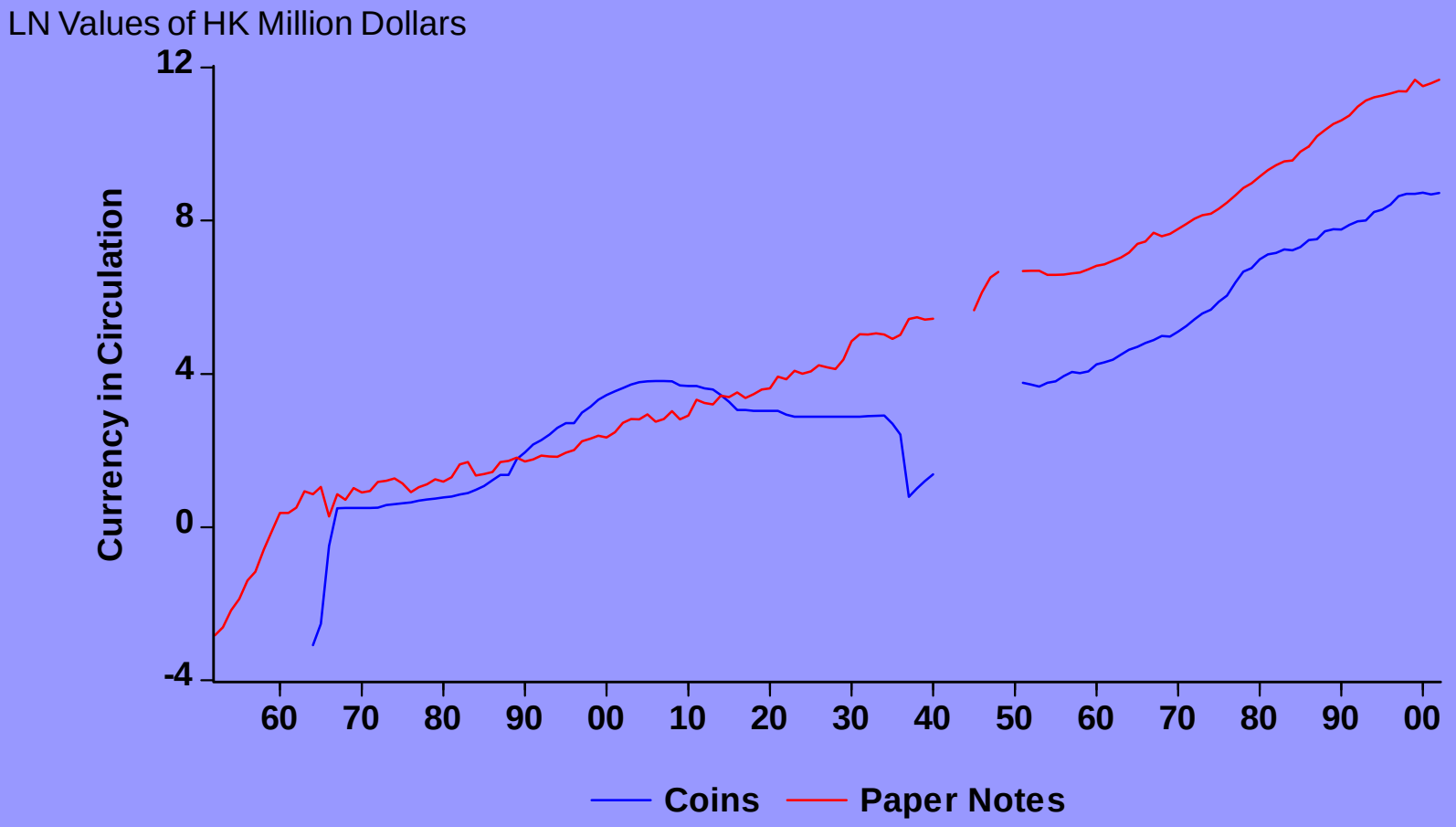
- *Eviews*: database; *Excel*: data files.

- *Eviews* Export Options: TSD file, Text, *Lotus*, *Excel*.

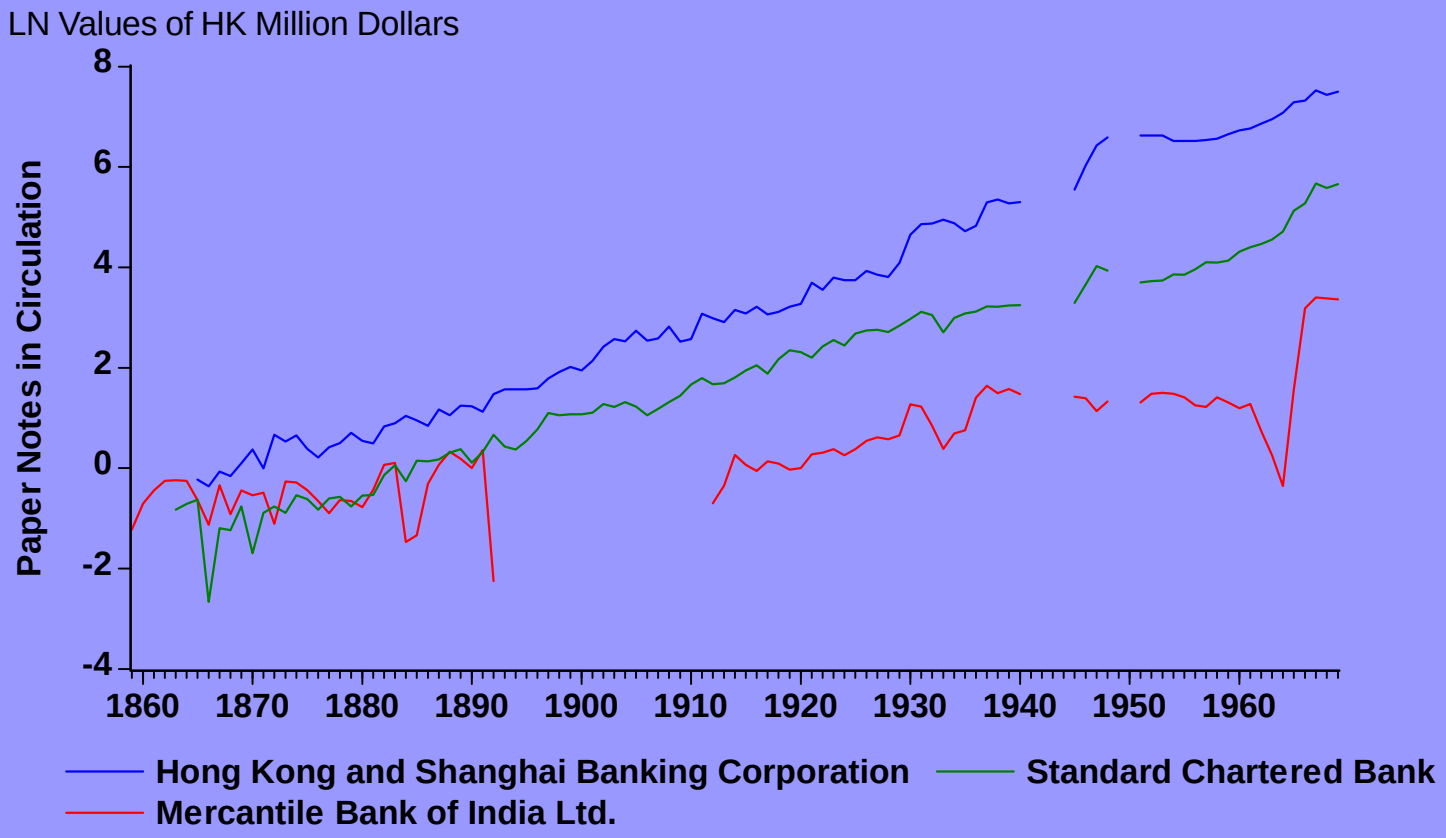
Data in Graphs

- Currency in Circulation
- Exchange Rate
- Government Finance
- International Trade
- Food Price
- Wage Rates

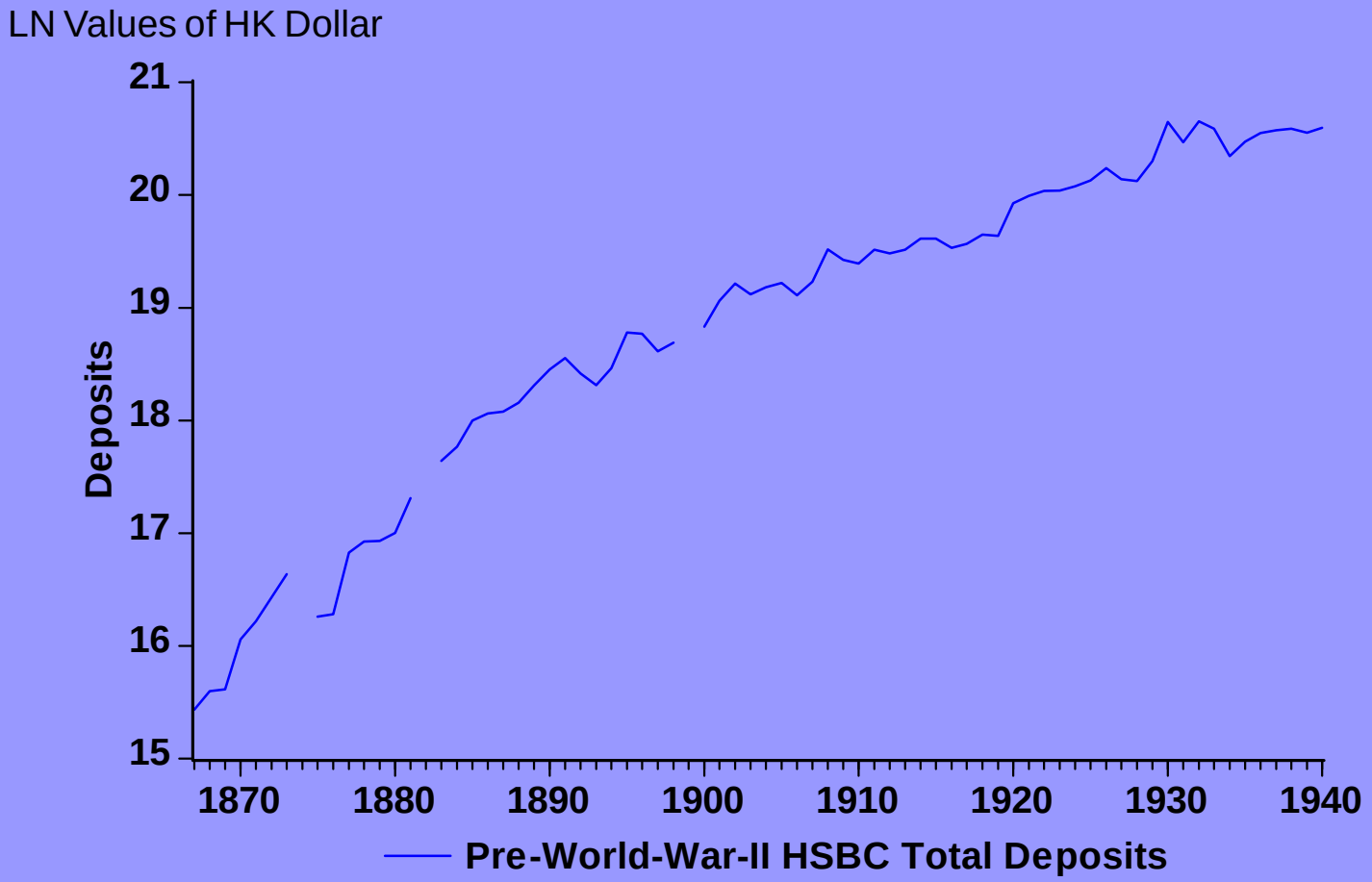
Currency in Circulation, 1852-2002



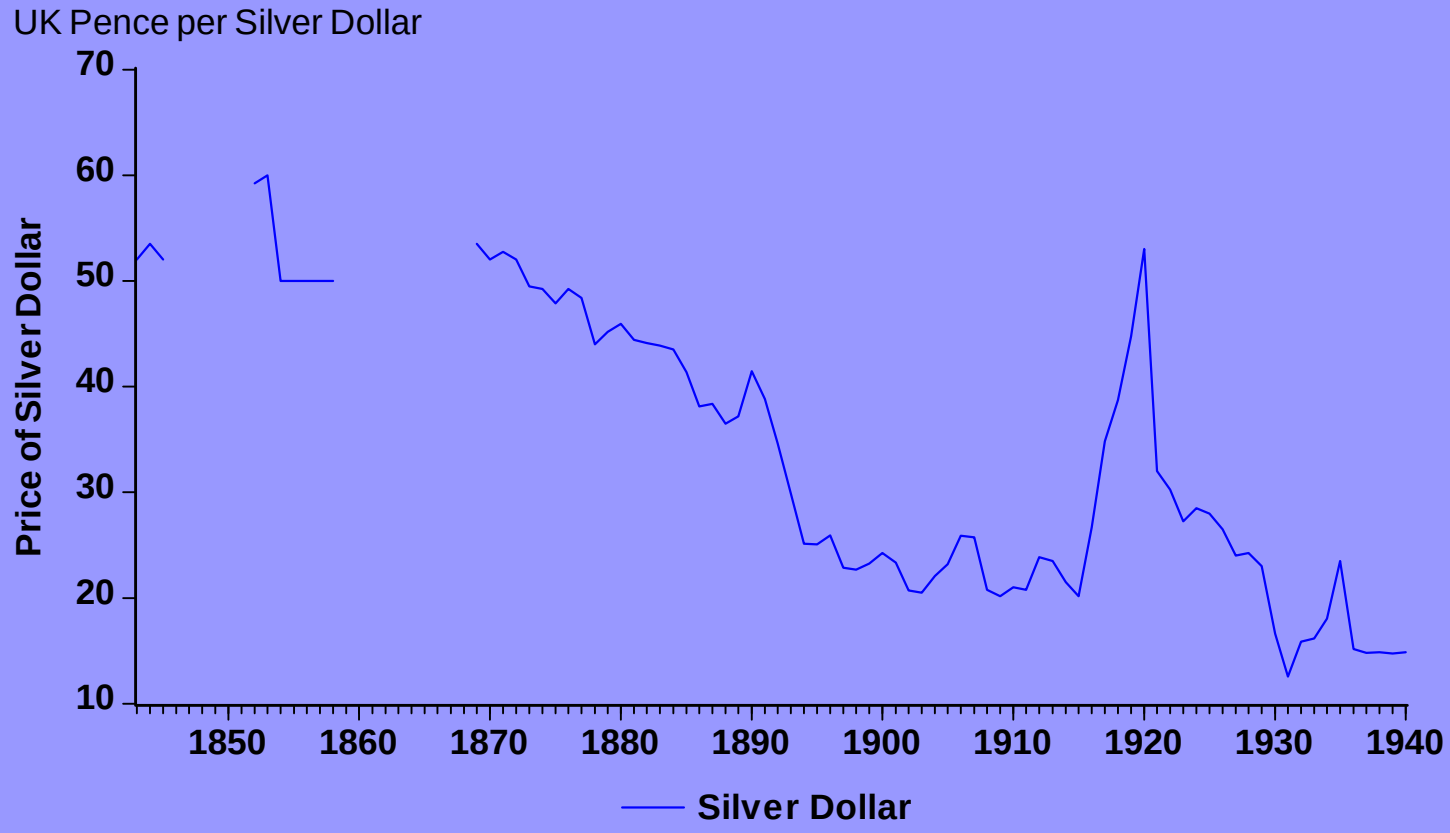
Paper Notes by Bank, 1859-1969



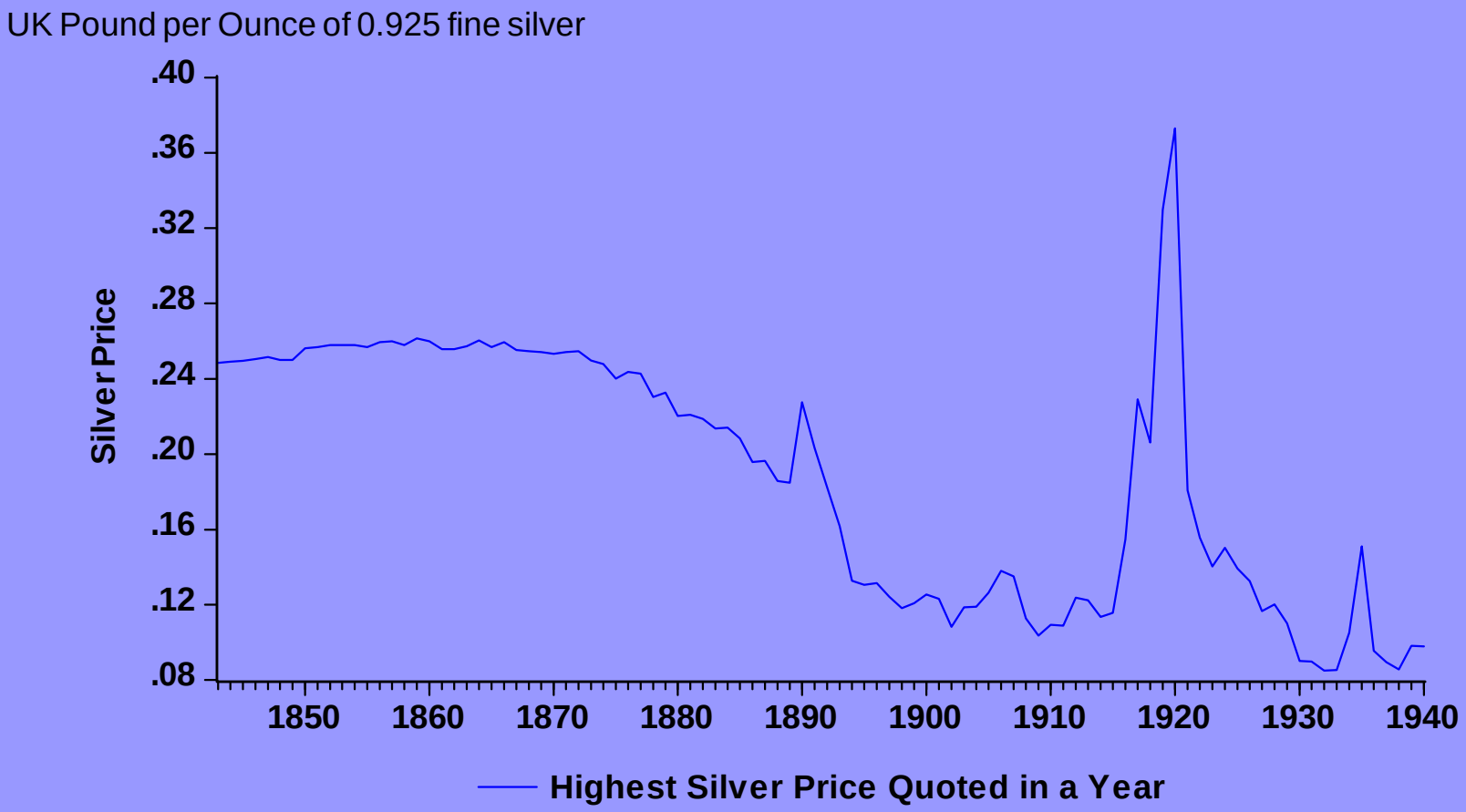
HSBC Total Deposits, 1867-1940



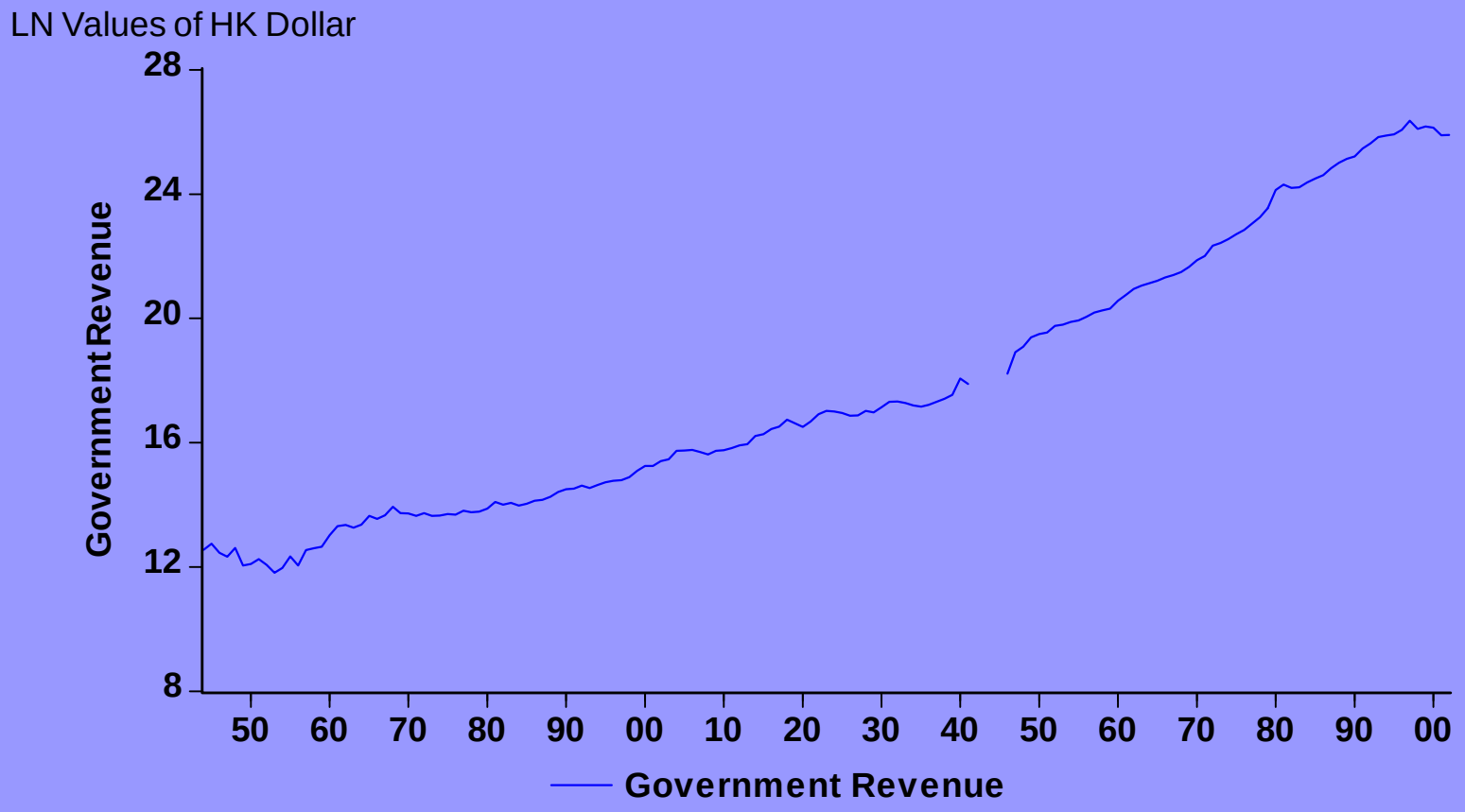
Silver Dollar Exchange Rate in HK, 1843-1940



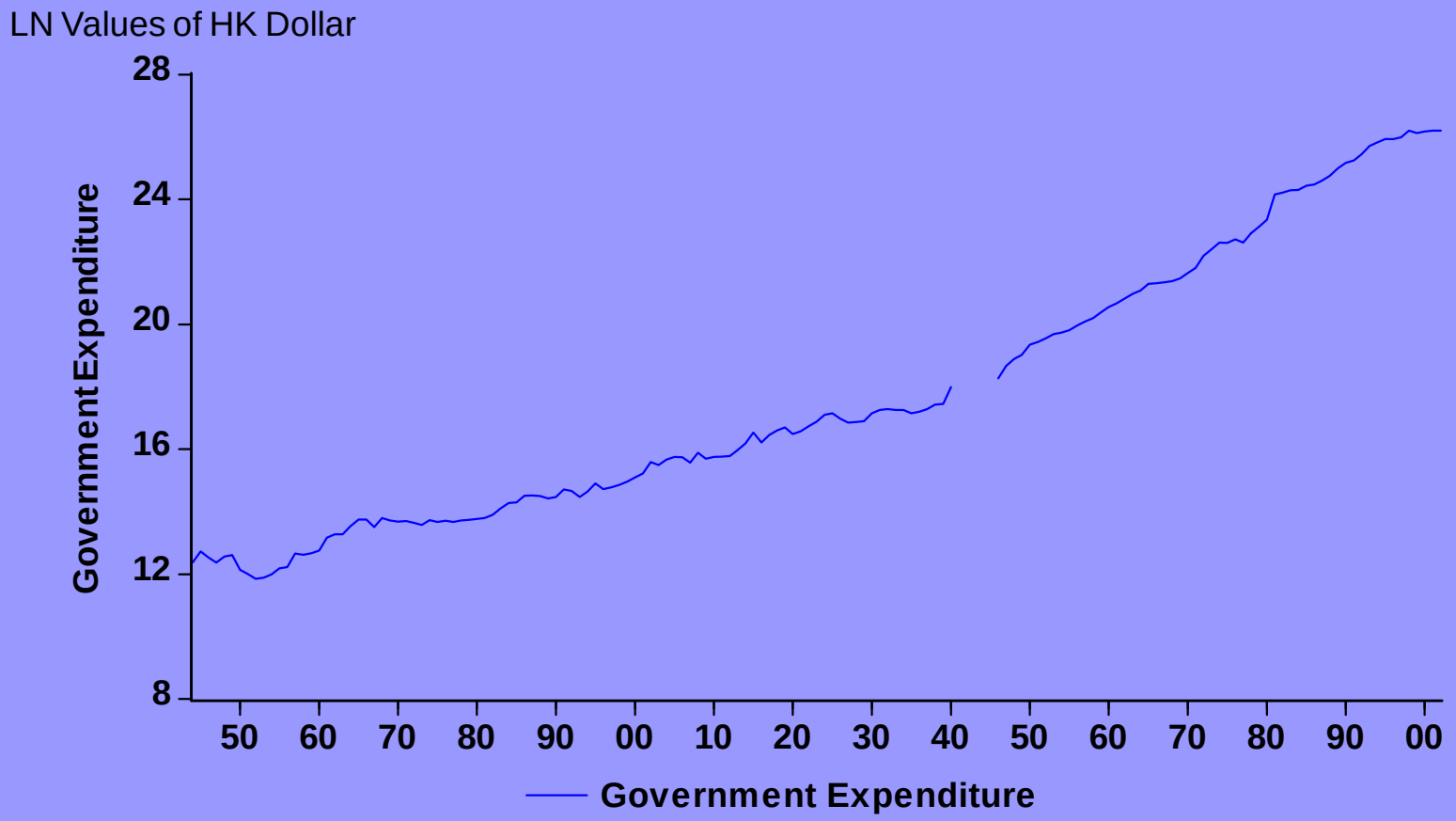
Silver Price in London, 1841-1940



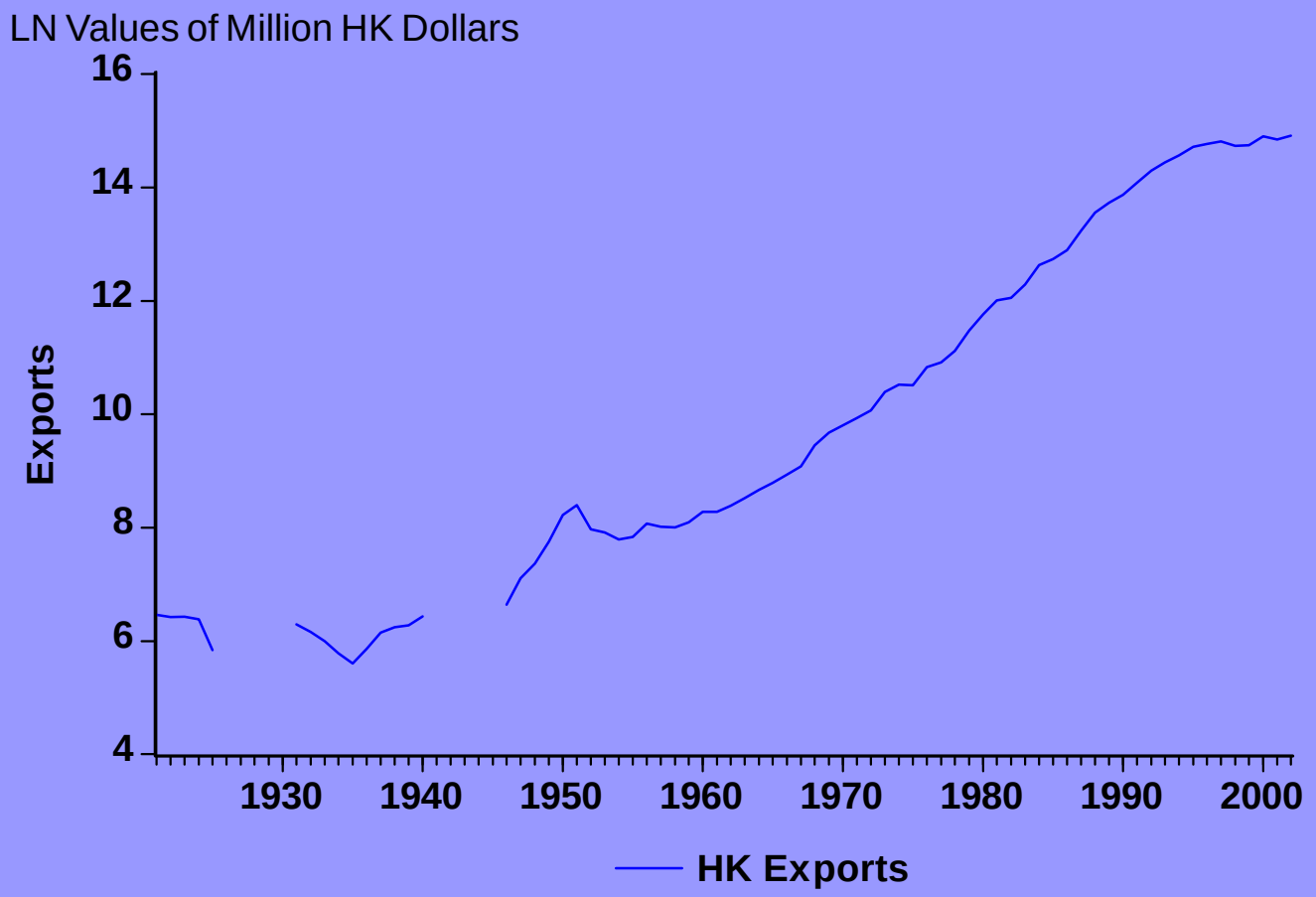
HK Government Revenue, 1844-2002



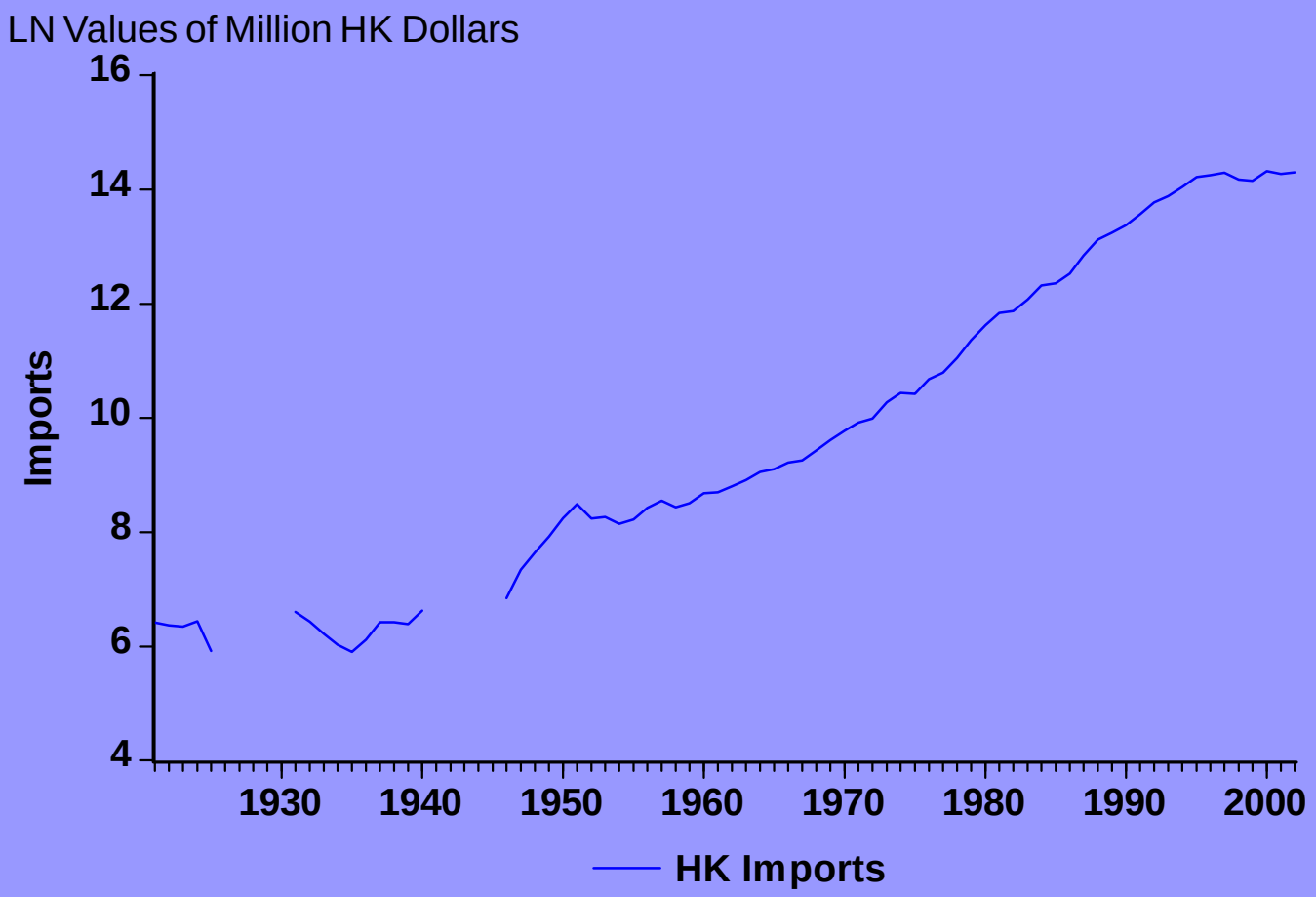
HK Government Expenditure, 1844-2002



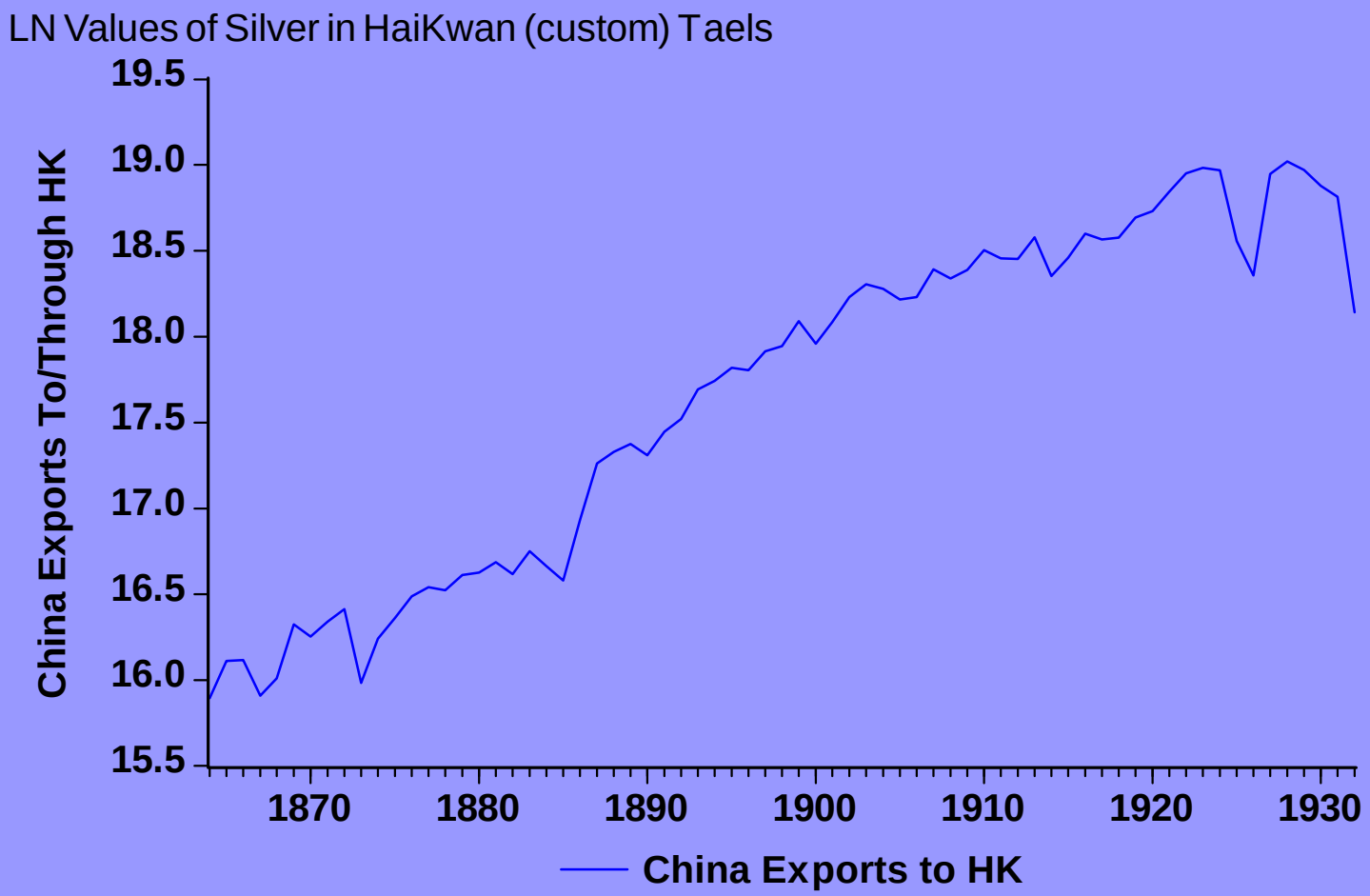
HK Exports, 1921-2002



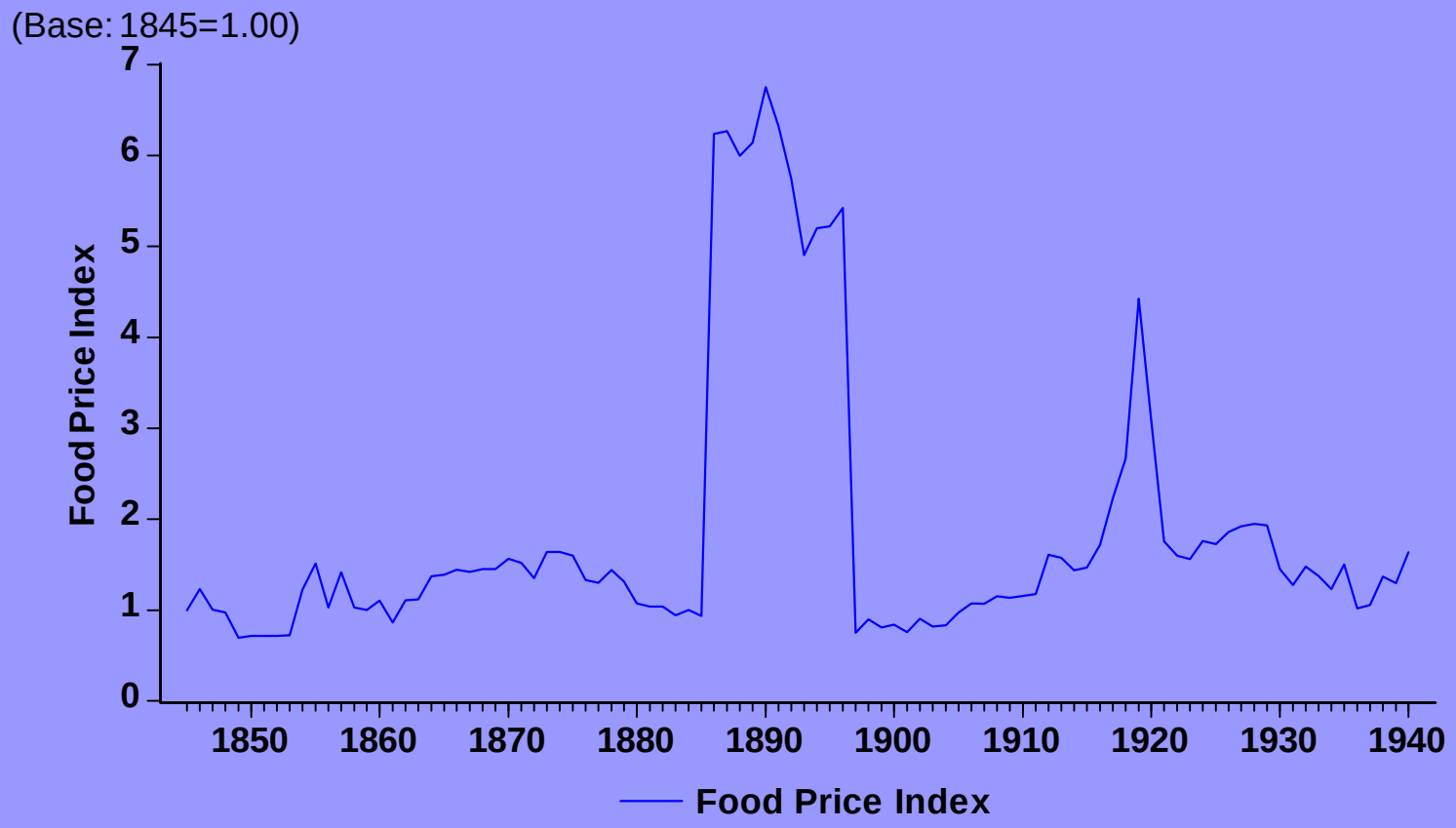
HK Imports, 1921-2002



China Exports to HK, 1864-1932



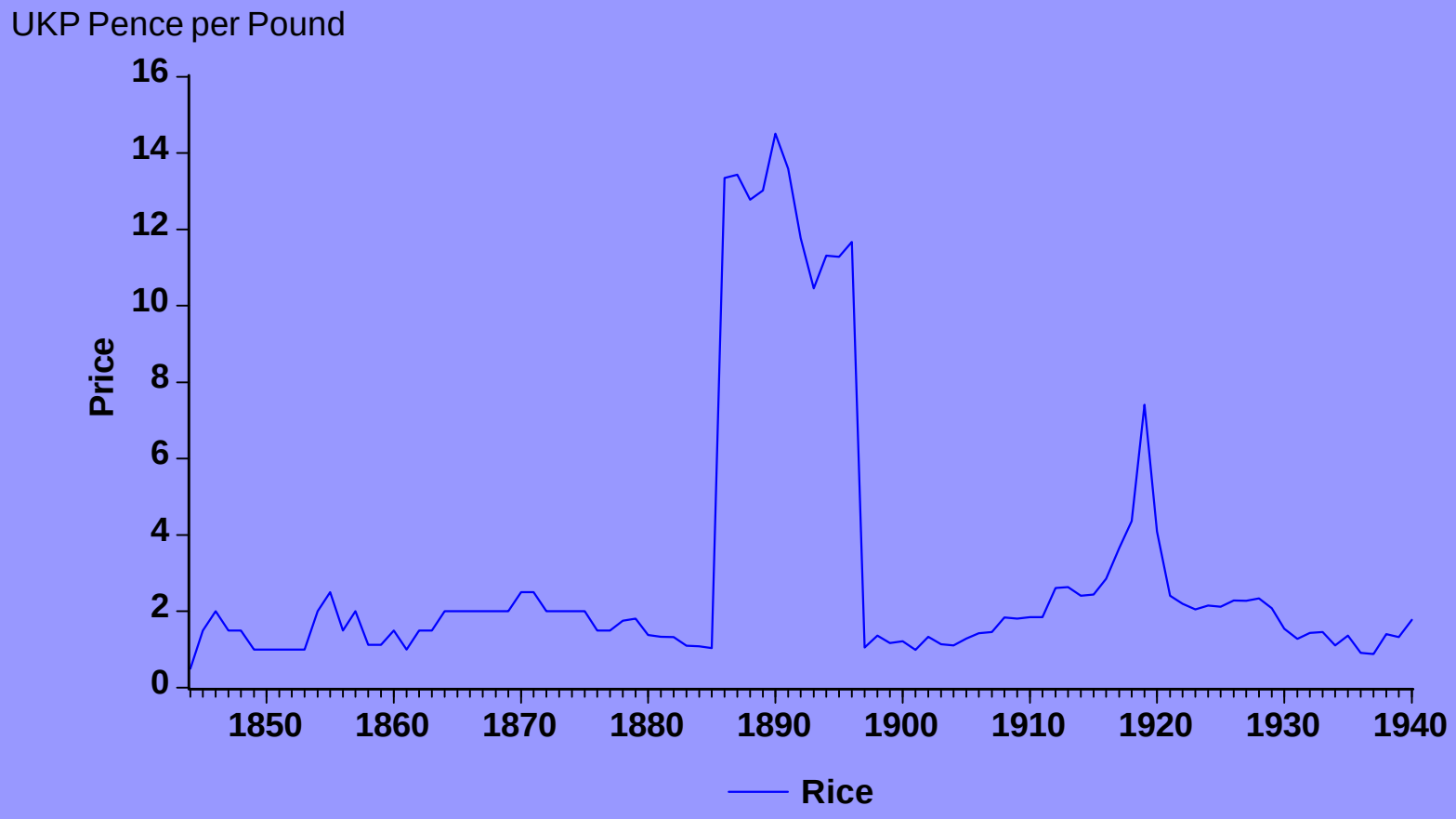
Food Price Index, 1845-1940



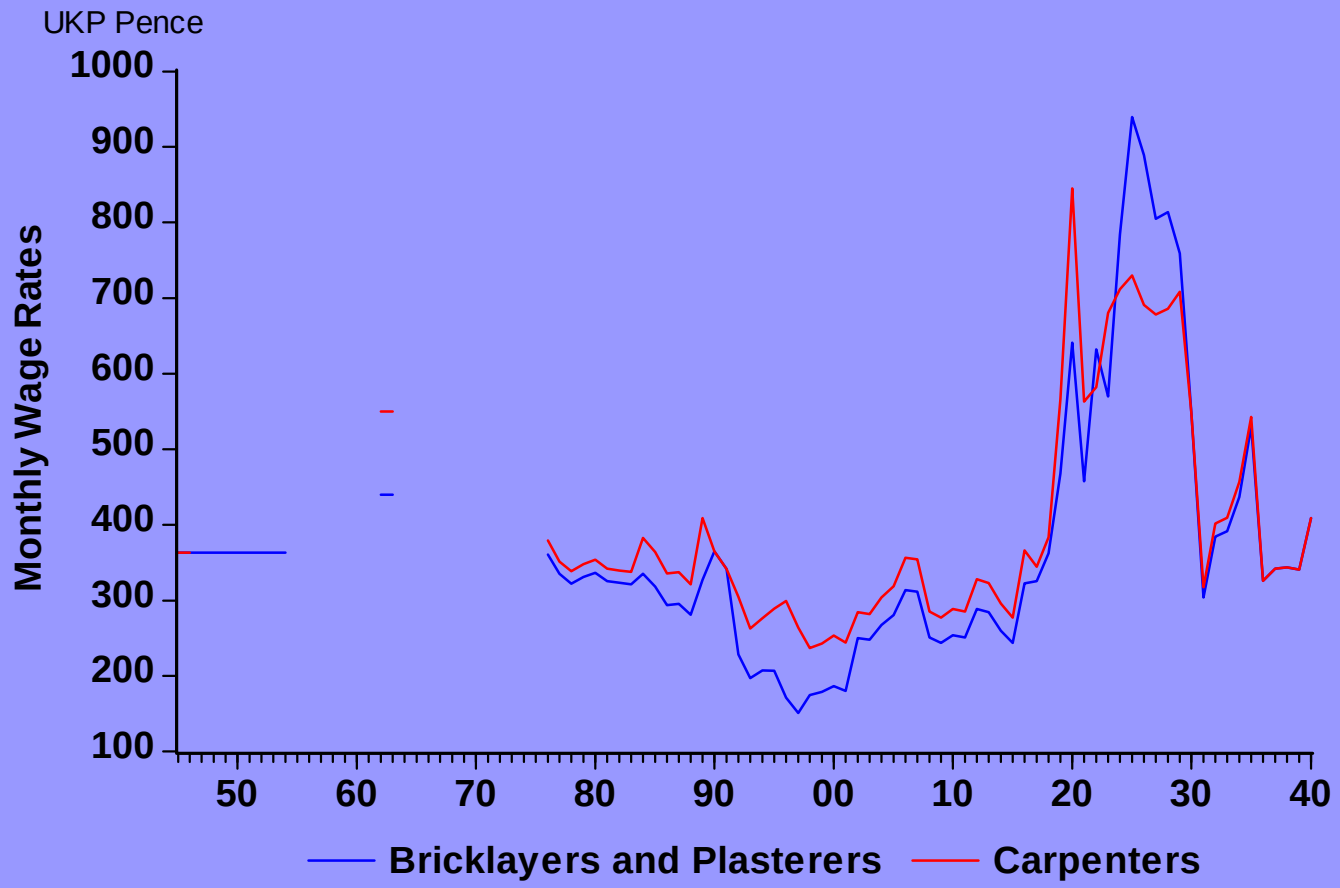
Weights in the Food Basket

Food	Weight(%)	Food	Weight(%)
Rice	30.76	Tea	0.41
Pork	6.98	Milk	0.35
Wheaten Bread	4.02	Beer	0.3
Beef	2.65	Table Salt	0.28
Sugar	0.84	Coffee	0.2

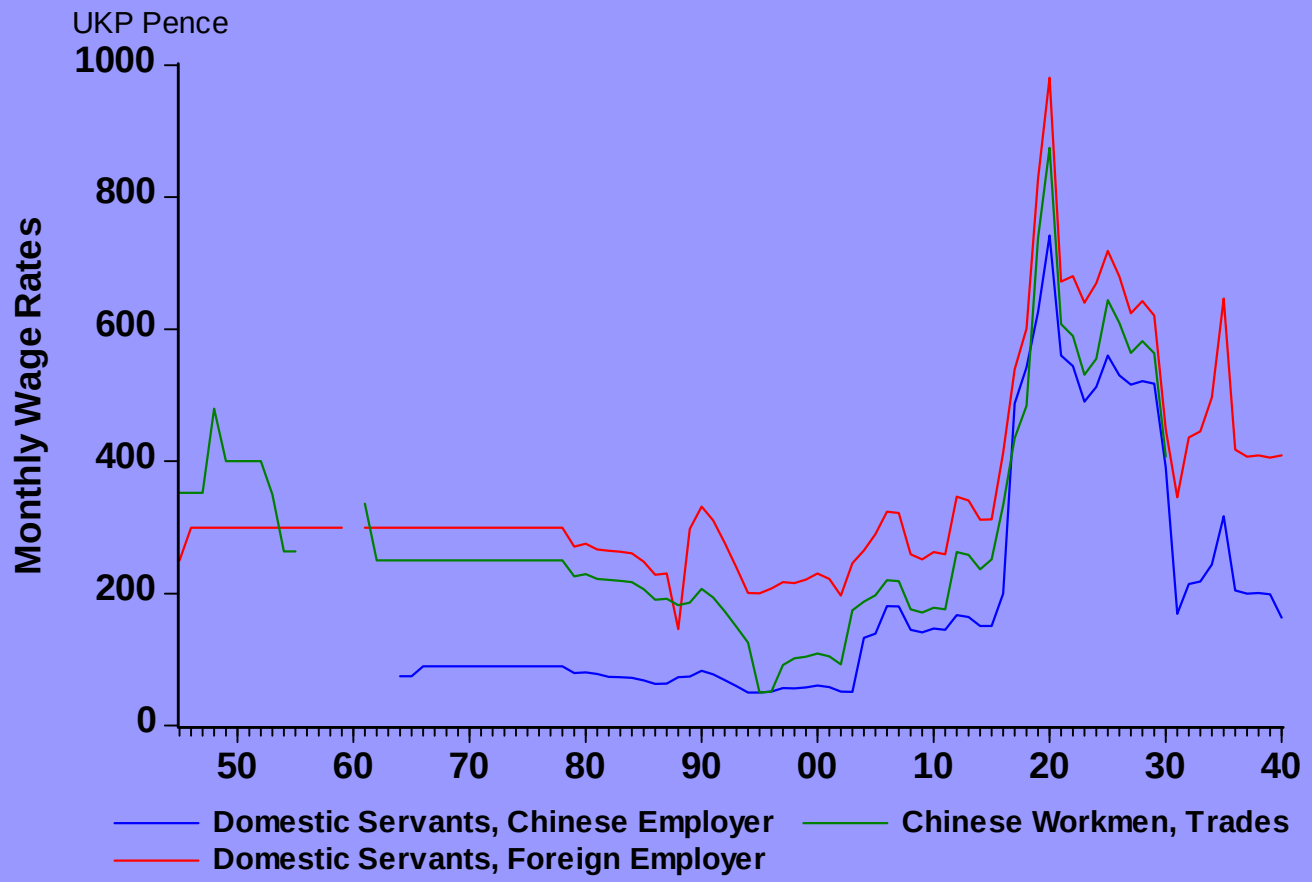
Price of Rice, 1844-1940



Wages Rates for Construction Workers, 1845-1940



Wage Rates for Domestic Workers, 1845-1940



Unified Approach to Messy Time Series

- Missing observations, outliers, structural breaks and irregular spacing
- Basic principle: recursive estimation (state-space form and Kalman filter)
- Missing observations in stock variables (no temporal aggregation)
- Results on historical series

Two Models

- Local level model: a random walk trend plus noise

$$y_t = \mu_t + \varepsilon_t, \qquad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \quad t = 1, \ldots, T$$
$$\mu_t = \mu_{t-1} + \eta_t \qquad \eta_t \sim \text{NID}(0, \sigma_\eta^2)$$

- Local linear trend: a random walk trend with a random walk slope, plus noise

$$y_t = \mu_t + \varepsilon_t, \qquad \varepsilon_t \sim \text{NID}(0, \sigma_\varepsilon^2), \quad t = 1, \ldots, T$$
$$\mu_t = \mu_{t-1} + \beta_t + \eta_t \qquad \eta_t \sim \text{NID}(0, \sigma_\eta^2)$$
$$\beta_t = \beta_{t-1} + \zeta_t \qquad \zeta_t \sim \text{NID}(0, \sigma_\zeta^2)$$

State-Space Form

- General state-space form

$$y_t = AX_t + \varepsilon_t, \qquad (1)$$

$$X_t = BX_{t-1} + \nu_t \qquad (2)$$

- Example: local linear trend model

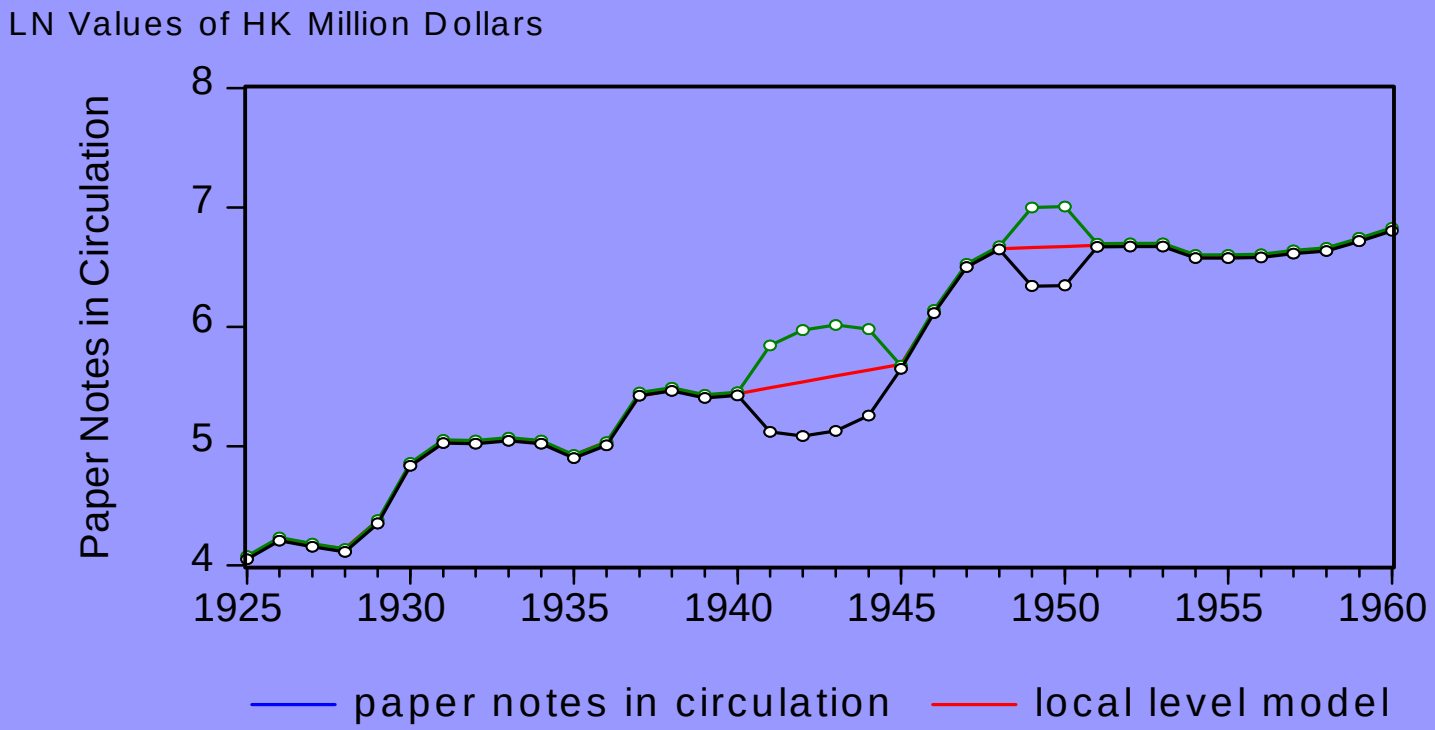
$$y_t = \begin{bmatrix} 1 & 0 \end{bmatrix} \times \begin{bmatrix} \mu_t \\ \beta_t \end{bmatrix} + \varepsilon_t,$$

$$\begin{bmatrix} \mu_t \\ \beta_t \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \times \begin{bmatrix} \mu_{t-1} \\ \beta_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_t \\ \zeta_t \end{bmatrix}$$

Kalman Filtering and Smoothing

- Recursive estimation: predict/update state vectors along time
- If we have $\hat{X}_{t-1}$ using information from y_1 to y_{t-1}, Kalman filter first predicts $\hat{X}_{t|t-1}$
- When y_t is available, Kalman filter updates $\hat{X}_{t|t-1}$ to $\hat{X}_{t|t}$
- Kalman smoothing is also called backing filtering, it revises $\hat{x}_{t|t}$ to $\hat{x}_{t|T}$ using information from y_{t+1} to y_T
- For a missing data at time k, Kalman filter just predicts $\hat{X}_{k|k-1}$ and $\hat{X}_{k+1|k-1}$ without updating $\hat{X}_{k|k}$. If y_{k+1} is available, Kalman filter will update $\hat{X}_{k+1|k-1}$ to $\hat{X}_{k+1|k+1}$

Paper Notes in Circulation, 1925-1960 (with 95% confidence bands)



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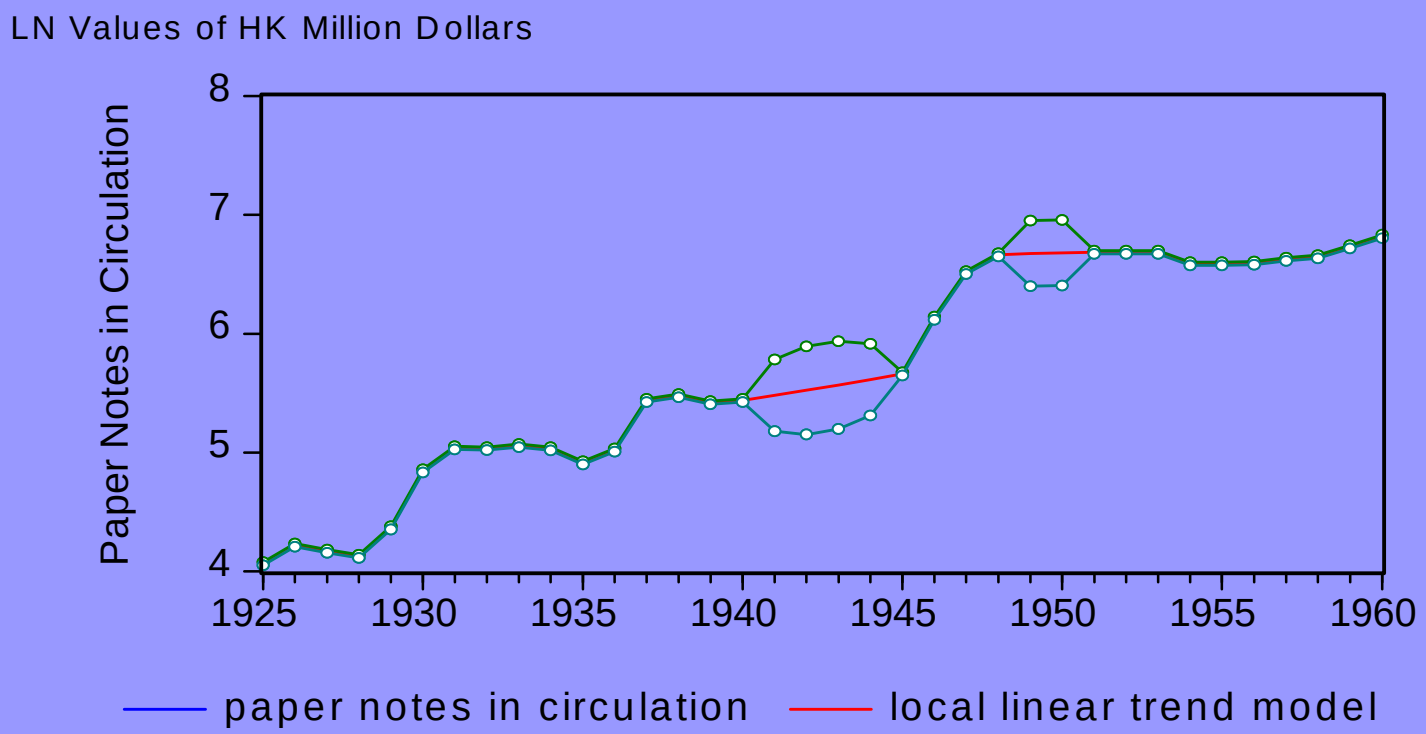


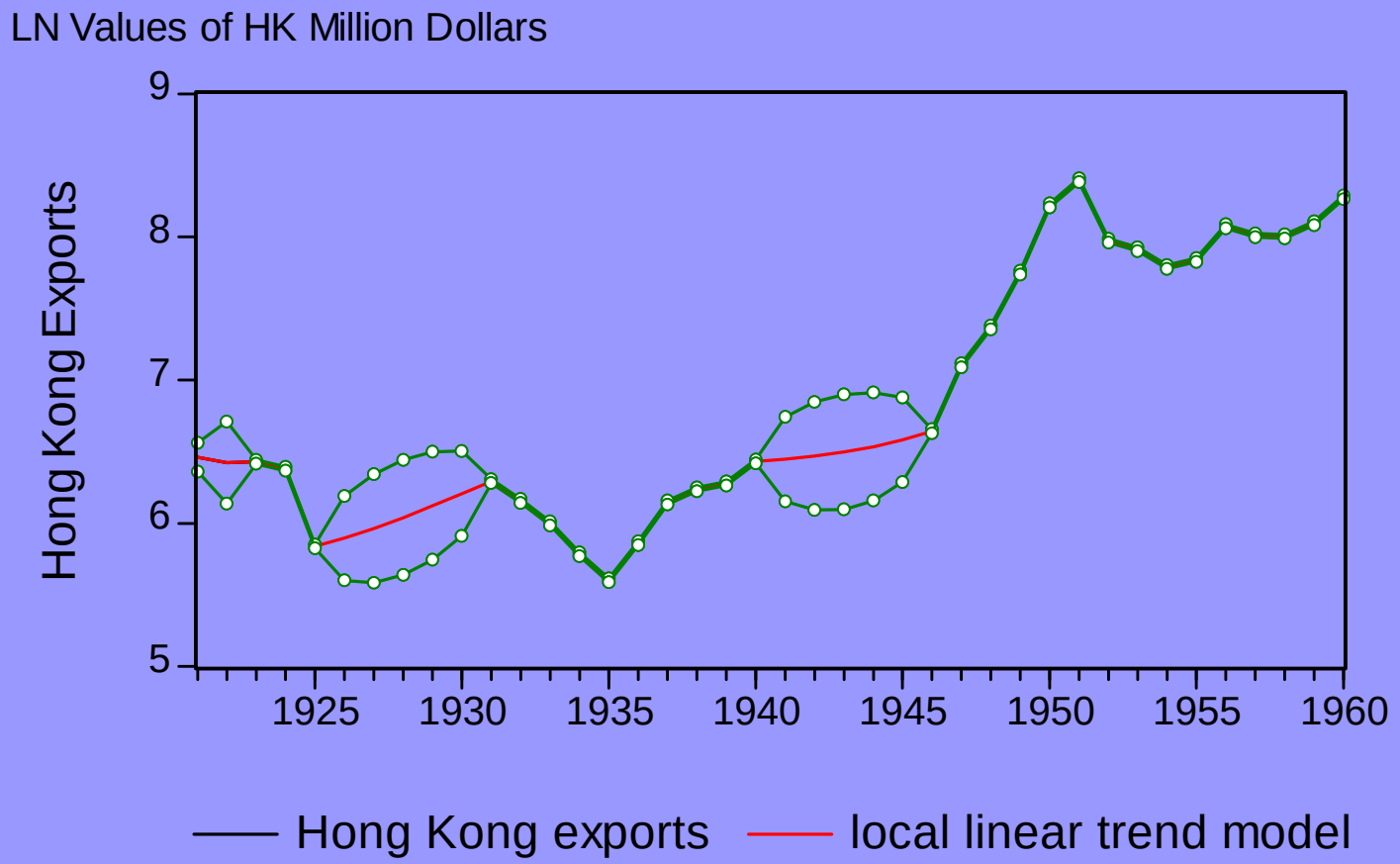
Estimates for Missing Data

1939	5. 419	5. 419	5. 419
1940	5. 439	5. 439	5. 439
1941	NA	5. 484	5. 481
1942	NA	5. 528	5. 524
1943	NA	5. 573	5. 568
1944	NA	5. 618	5. 614
1945	5. 662	5. 662	5. 662
1946	6. 129	6. 129	6. 129
1947	6. 515	6. 515	6. 515
1948	6. 663	6. 663	6. 663
1949	NA	6. 670	6. 674
1950	NA	6. 678	6. 681
1951	6. 685	6. 685	6. 685

Maximum Likelihood Estimates

	Local Level Model	Local Linear Trend Model
σ_ε^2	0.041	0.028
$\sigma_\varepsilon^2 / \sigma_\eta^2$	-	0.301
Log-likelihood	16.825	26.764
Akaike info criterion	-0.218	-0.342

Hong Kong Exports, 1921-1960 (with 95% confidence bands)



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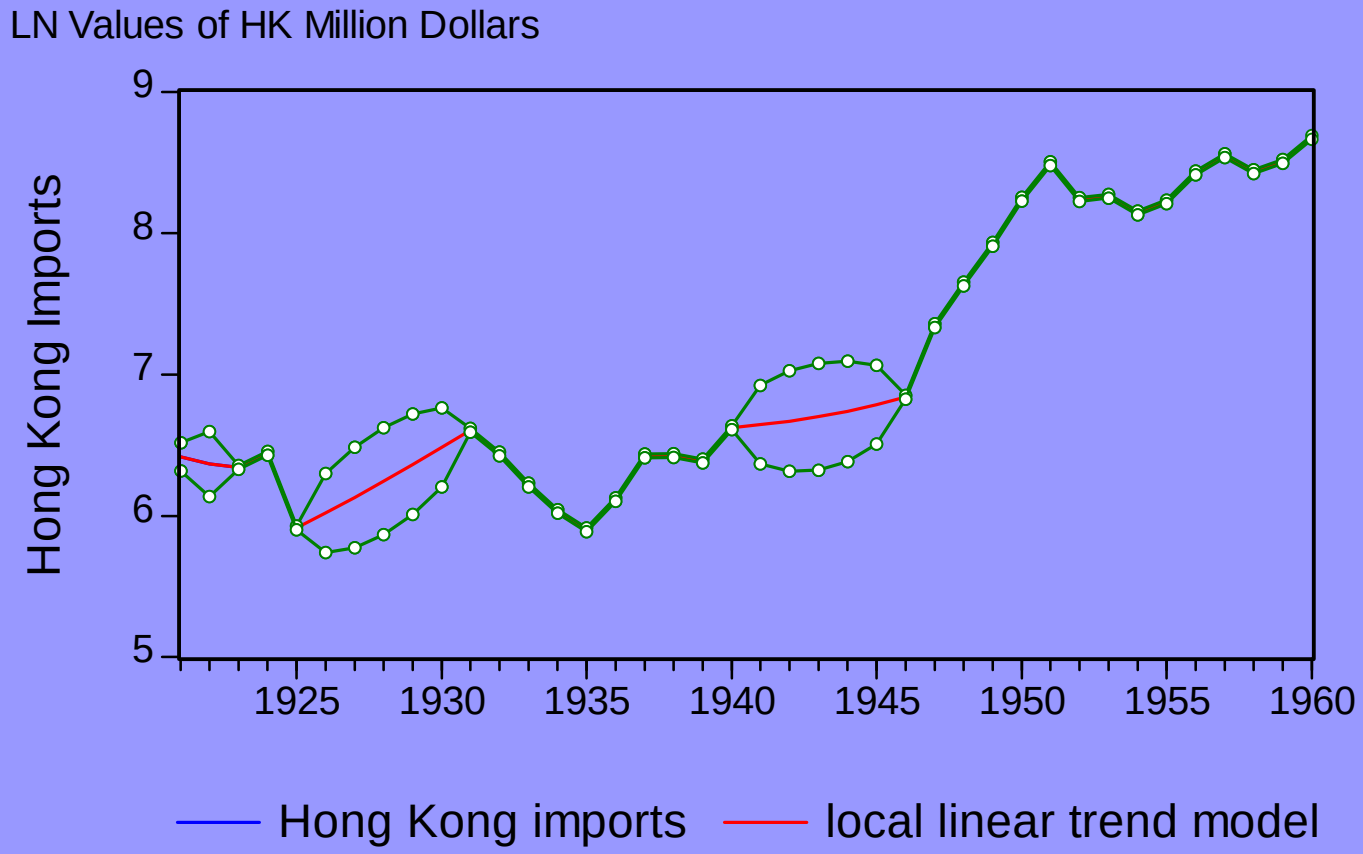
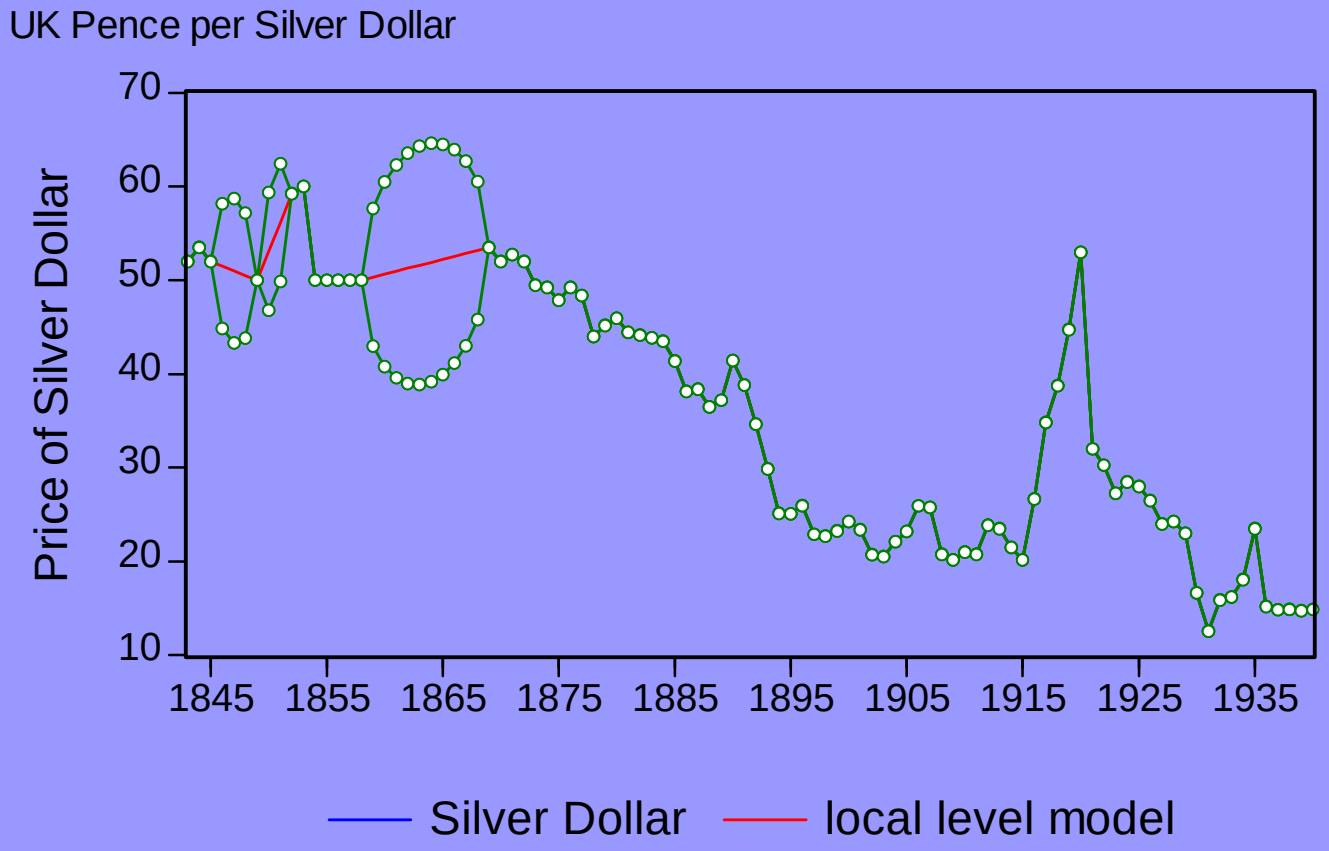


Silver Dollar Exchange Rate in HK, 1843-1940 (with 95% confidence bands)



Concluding Remarks

- Historical database: further expansion
- State-space and Kalman filtering approach is useful to solve the missing data problem
- Questions are welcome