Where was the global price of silver established? Evidence from London and New York (1878-1953)

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Abstract

This paper utilises a newly compiled data set of monthly silver prices for the London and New York markets, as well as the monthly Dollar-Sterling exchange rate, from 1878 and 1953 in order to investigate the source and flows of information and price discovery between those markets. Results indicate that London was the dominant market and pricing leader of silver throughout this period. Further evidence suggests that there existed dynamic information flows both within years and decades. These phenomena can be explained due to the use of silver for agricultural market payments and international silver production flows respectively.

Keywords: Silver; Price Discovery; Information Flows; Historical data.

1. Introduction

By the 1930's there was one 'Global' price of silver, due to improved communications technology such as the telegraph , and not a collection of local prices (Herbert [1932]). This paper uses a newly transcribed data set of monthly silver prices for the London and New York markets, and the monthly Dollar-Sterling exchange rate, covering 1878-1953 to assess where this 'global' price of silver was being set. This research investigates the long-run flow of information and price discovery of in international silver markets while adding to the literature using long-run data sets to assess this issue (Jordà et al. [2019]).

In the 19th century silver was still the currency for large part of the world (White [1917]). The decline of monetary silver began in 1837 when Germany began demonetising silver, quickly followed by Scandinavia. Further declines continued in the following years as in 1877 the Latin Monetary union stopped minting silver and by 1893, Austria, Hungry and India also abandoned silver coinage (Hasan [2006]). China was the last Major nation to stop using monetary silver in 1935.

London had a long tradition of precious metals trading, with some bullion banks which operated during this period pre-dating the formation of the Bank of England (O'Connor et al. [2015]). London was considered to be the market where buying and selling orders from all over the world interacted (Herbert [1932]). It's geographical location between New York and Bombay also provided more certainty in the timing and delivery of forward contracts. Up to the 1920's, London's position as a centre for commodity trade was further enhanced due to a dominance in trade with the Far East where silver was in demand from China and India for monetary purposes. Mexico and America were the major suppliers, but their silver generally flowed first to London and only then onto final destinations in the Far East (Spalding [1922]).

The London silver price was established through a daily auction (The Silver Fixing) which started in 1897 and continued until 2014, when its name was changed to the LBMA Silver Price. There were four Bullion brokers involved in the daily Fixing [1], who also worked together to regulate issues such as commissions in the market (Blagg [2014]).

Handy and Harman, the New York Bullion dealer, had been closely linked to London from the late 1860's and had begun the practice of publishing a dollar silver price based on the London price less shipping and insurance costs. This came to be the 'official Price' in the US market, which was used in contract writing. As American supplies of new silver increased they began to quote a silver price for 'nearby delivery in New York' (Harman [1932]).

But there was an argument as to the "Global" price of silver was set. Herbert [1932] stated that the London prices was regarded as "the" silver price even in the United States. However some silver market analysts, such as Hochschild quoted in Herbert [1932], stated that New York was a more prominent market than that London, and he believed that Shanghai and Bombay were the two most important markets in the period after the first world war.

Insert Figure 1 about here

Support for the argument that the United States was the silver price leader of the day surround the fact that most international mining production before 1930 was found to have passed through either New York or San Francisco, both of whom were primary selling markets for the substantial levels of production that continued to grow at pace as presented in Figure 1. Bombay and Shanghai operated primarily as the largest sources of global demand, with London operated as a central node connecting both of these regions as the supply of silver moved from the west to the east. Much of the silver sold on the London Fixing London never passed through it physically (Herbert [1932]).

Much research on modern silver markets has pointed to the market being efficient (Aggarwal et al. [2016]) and New York being the most important market for silver (Vigne et al. [2017]).

[1] Mocatta and Goldsmid, Sharps and Wilkins, Pixley, Abell, Langley and Bland, and Samuel Montagu and Co.

However to date there is no research that addresses issues that require a longer term data set of silver prices, due to a paucity of reliable higher frequency data prior to 1968 (Blagg [2014]).

2. Data

The data used in this paper was transcribed from the annual reports of the Director of the US Mint for the fiscal years 1878 through 1953. These reports carried tables of silver prices up to the 1953 edition. They included the monthly average London and New York Fine Silver price, the price of 99.9% pure silver per ounce in Pounds and Dollars. These reports also provided the monthly average exchange rate between the US Dollar and the Pound Sterling. The monthly averages for each variable would then have been calculated in the same manner, with such stability providing significant robustness and suitability to answer the questions posed in this paper.

Other sources do exist on historical silver prices but these have limitations. Free sources such as the London Bullion Market Association only reach back to 1968 while subscription sources such as The Global Financial Database does have a longer range but a lower frequency (starting in 1000AD but at an annual frequency)[2].

Insert Table 1 about here

The summary statistics for our collected silver prices are provided in Table 1. While the mean and variance of the volatility of both sets are found to be similar, both the level of skewness and kurtosis of United Kingdom silver prices are substantially larger at 1.96 and 23.04 respectively when compared to United States results of 1.42 and 13.23 respectively. Both the maximum and minimum levels of monthly volatility are also more pronounced.

Insert Figures 2 through 4 about here

Figure 2 shows the silver price trend in both the United Kingdom and United States, and the spread between those markets. It is clear that there are a number of distinct periods of behaviour. Prices are found to fall quite substantially throughout the 1890s, however, there are two sharp episodes of exceptional volatility around World War I (July 1914 to November 1918) and World War II (September 1939 to September 1945). This sentiment is echoed when observing the differentials in the spread. In Figure 3, we observe the pricing behaviour of the monthly exchange rate between the US$ and the GBP£. Similar pricing volatility is observed through periods of conflict with

[2]This data set is downloadable from https://sandbox.zenodo.org/record/354662.Xs4ye2hKiUl.

episodes of price fixing visible during periods of tremendous international turmoil. In Figure 4 we observe the volatility of silver prices in both New York and London where there is quite a low level of comparative volatility throughout the 1884 to 1915 period, but episodes of substantial and frequent volatility are evident thereafter.

3. Analysis

We focus on three distinct questions surrounding the flow of information and price discovery between New York and London silver prices. First, we ask as to whether the role of war influenced the pricing dynamics between these international silver exchanges (H_1). Further, we investigate as to whether such dynamics vary on a monthly basis (H_2), and as to whether it changes by the decade analysed (H_3). To complete this task we develop on two standard measures of price discovery commonly employed in the literature: the Hasbrouck [1995] Information Share (IS) (as in Akyildirim et al. [2019], and the Gonzalo and Granger [1995] Component Share (CS) measure, as in Martinez and Tse [2019]. We build on the error correction parameters and variance-covariance of the error terms from the Vector Error Correction Model (VECM):

Hasbrouck [1995] demonstrates that the contribution of a price series to price discovery (the 'information share') can be measured by the proportion of the variance in the common efficient price innovations that is explained by innovations in that price series, whereas Gonzalo and Granger [1995] decompose a cointegrated price series into a permanent component and a temporary component using error correction coefficients.

$$\Delta_{p1,t} = \alpha_1(p_{1,t-1} - p_{2,t-1}) + \sum_{i=1}^{200} \gamma_i \Delta p_{1,t-i} + \sum_{j=1}^{200} \delta_j \Delta p_{2,t-j} + \varepsilon_{1,t} \tag{1}$$

$$\Delta_{p2,t} = \alpha_2(p_{1,t-1} - p_{2,t-1}) + \sum_{k=1}^{200} \varphi_k \Delta p_{1,t-k} + \sum_{m=1}^{200} \phi_m \Delta p_{2,t-m} + \varepsilon_{2,t} \tag{2}$$

where $\Delta p_{i,t}$ is the change in the log price ($p_{i,t}$) of the asset traded in market i at time t. The next stage is to obtain the component shares (CS) from the normalised orthogonal coefficients to the vector of error correction, or:

$$CS_1 = \gamma_1 = \frac{\alpha_2}{\alpha_2 - \alpha_1}; CS_2 = \gamma_2 = \frac{\alpha_1}{\alpha_1 - \alpha_2} \tag{3}$$

Given the covariance matrix of the reduced form VECM error terms where:

$$M = \begin{pmatrix} m_{11} & 0 \\ m_{12} & m_{22} \end{pmatrix} = \begin{pmatrix} \sigma_1 & 0 \\ \rho\sigma_2 & \sigma_2(1-\rho^2)^{\frac{1}{2}} \end{pmatrix} \tag{4}$$

We can then calculate the information share (IS) using:

$$IS_1 = \frac{(\gamma_1 m_{11} + \gamma_2 m_{12})^2}{(\gamma_1 m_{11} + \gamma_2 m_{12})^2 + (\gamma_2 m_{22})^2} \tag{5}$$

$$IS_2 = \frac{(\gamma_2 m_{22})^2}{(\gamma_1 m_{11} + \gamma_2 m_{12})^2 + (\gamma_2 m_{22})^2} \tag{6}$$

As used by Corbet et al. [2018], the combined measure is known as the Information Leadership Share (ILS) which is calculated as:

$$ILS_1 = \frac{\left|\frac{IS_1}{IS_2}\frac{CS_2}{CS_1}\right|}{\left|\frac{IS_1}{IS_2}\frac{CS_2}{CS_1}\right| + \left|\frac{IS_2}{IS_1}\frac{CS_1}{CS_2}\right|} \text{ and } ILS_2 = \frac{\left|\frac{IS_2}{IS_1}\frac{CS_1}{CS_2}\right|}{\left|\frac{IS_1}{IS_2}\frac{CS_2}{CS_1}\right| + \left|\frac{IS_2}{IS_1}\frac{CS_1}{CS_2}\right|} \tag{7}$$

We estimate all three price discovery metrics as they measure different aspects of price discovery. The first stage of the analysis focuses on the influence of periods of war, specifically that of World Wars I and II, on the relationship between US and UK silver market price discovery. In Table 2 we observe the relationship for each of the measured IS, CS, IL and ILS. In all scenarios, the UK silver market substantially leads the US in terms of price discovery and information flow. The UK information flow of price discovery is measured as 0.9026 during non-war periods. During wars, this estimated relationship reduces to 0.7858, but the information flow remains strongly sourced in the UK upon US silver markets. London then acted as a nexus for suppliers, in the new world, and buyers, in Asia, in contrast to Hochschild's assertions at the time.

Insert Tables 2 and 3 about here

In Table 3 we specifically analyse as to whether there exist variations in the price discovery and information flow relationship as separated by the month of the year analysed within this unique dataset. Evidence suggests that while the UK silver markets leads the US silver market for price discovery, there are two interesting dynamics. First, there is a substantial variation in the information share of price discovery at the change of each year in December and January, where the average information share of 0.8777 identified within UK silver markets falls to 0.6725 and 0.7420 respectively. Further, a second unexpected result is found in the dilution of the relationship between UK and US silver market price discovery in August to 0.6964, possibly reflecting strong Chinese demand for silver for harvest periods, when silver was more likely to be route directly from San Francisco, rather than through London (White [1917]).

Insert Table 4 about here

Finally, in Table 4 we analyse differentials in the information and price discovery relationship between the UK and US silver markets by decade analysed. Results between 1870 and 1899 are stable

and indicate a persistent leadership role of UK silver markets of approximately 0.885. Throughout the early 1900s we begin to see a reduction in this relationship, with the strongest influence denoted from the US to UK silver markets during the 1930 through 1939 periods at 0.842. There are two potential explanations for these results. First, as denoted in Figure 1, there is a potential role for differentials in production, where between 1884 and 1953, the total value of silver production was found to have reached its lowest point in 1932. Second, the Silver Purchase Act of 1934 forced the US Government to buy domestic and foreign silver for $1.26 for ounce, increasing the importance of US markets in this period.

4. Conclusions

This paper uses three newly transcribed and previously unavailable monthly data sets for London and New York Silver prices, and the Dollar-Sterling Exchange Rate, to examine where the 'Global' silver price was set between 1878 and 1953. We find that London was consistently the dominant market based on all measures of information flow used, but that there was variation in the strength of this dominance during periods of war and at certain month each year. While this data frequency allows this question to be addressed effectively, a data set of daily silver prices for the two markets would allow a more precise analysis.

This new monthly dataset will allow research to take place on many questions which are current in the literature on precious metals, such as whether silver can act as a safe haven for investors in times of financial crashes, see for example Peng [2019], or whether the silver market was efficient in this early period. Finding a reliable source monthly data between 1953 and 1968 would allow researchers to assess where the price was set in the period to the end of Bretton Moods.

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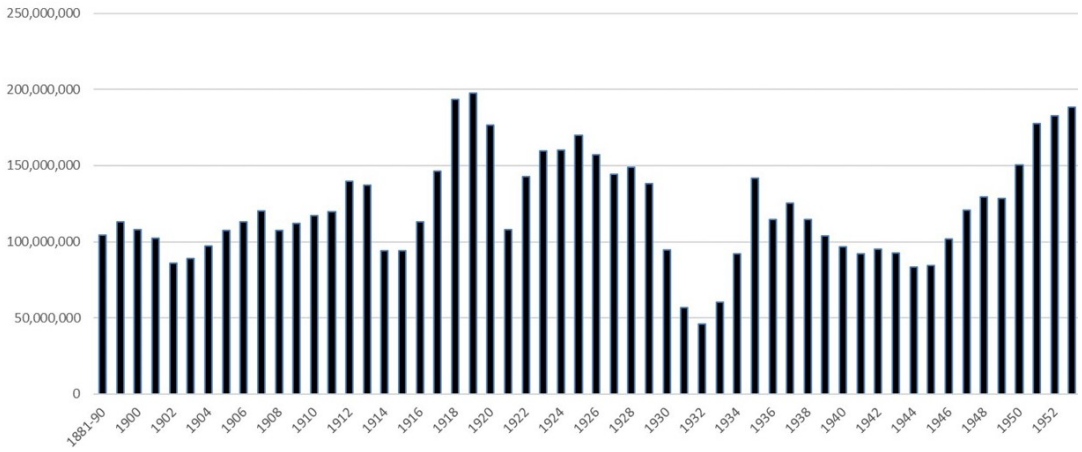
Figure 1: Total Value of World Silver Production in US$'s (1884 - 1953)



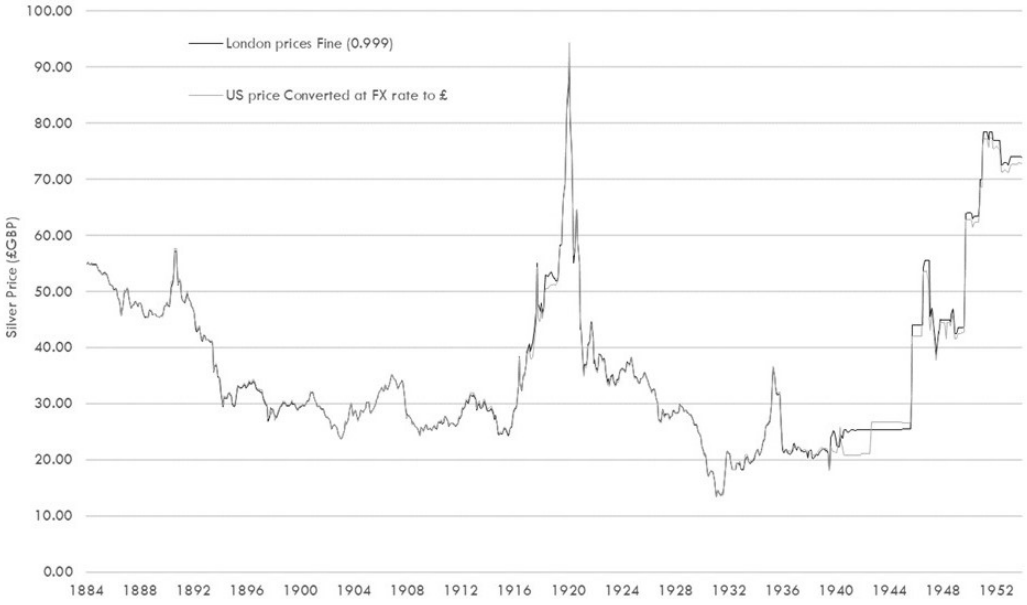
Note: The above figure presents the total value of silver production between January 1884 through December 1953 based on US Geological Survey data. War dates in this analysis are considered to denoted as the period July 28, 1914 through November 11, 1918 for World War I and denoted to be the period September 1, 1939 through September 2, 1945 for World War II.

Table 1: Summary Statistics for US and UK Silver Prices, In Pounds Sterling

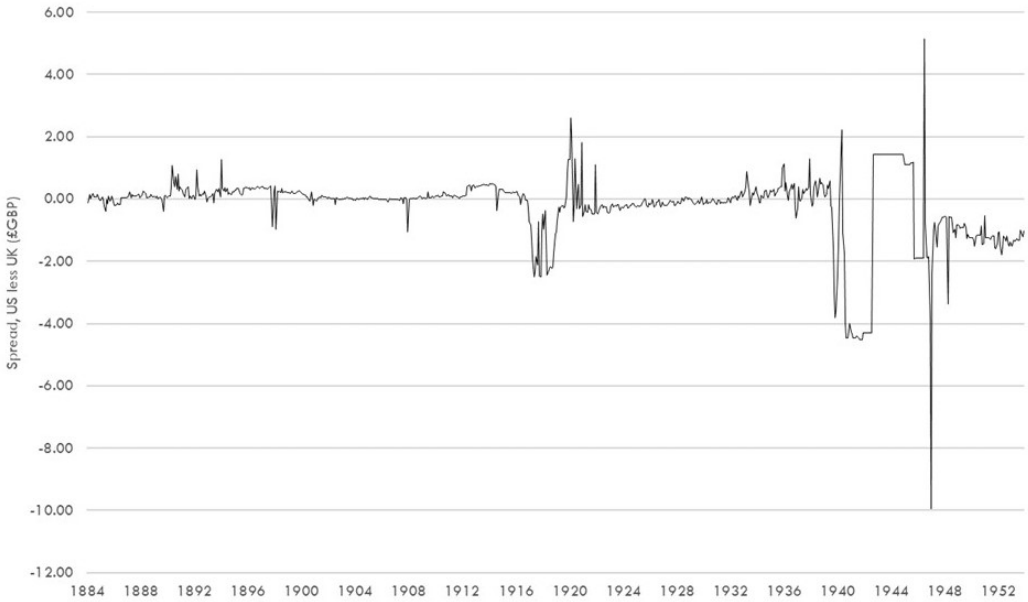
	United Kingdom	United States
Volatility		
Mean	0.00120	0.00117
Variance	0.00176	0.00172
Skewness	1.96172	1.42151
Kurtosis	23.04109	13.23364
Maximum	44.89%	33.38%
Date	Oct-45	Oct-45
Minimum	-21.47%	-19.59%
Date	Dec-20	Jan-36
Observations	840	840
Price		
Maximum	91.77	94.37
Date	Feb-20	Feb-20
Minimum	13.41	13.38
Date	Feb-31	Feb-31

Figure 2: Silver prices and market spread as recorded in the UK and US (1884 - 1953)

a) Silver prices as recorded in the UK and US

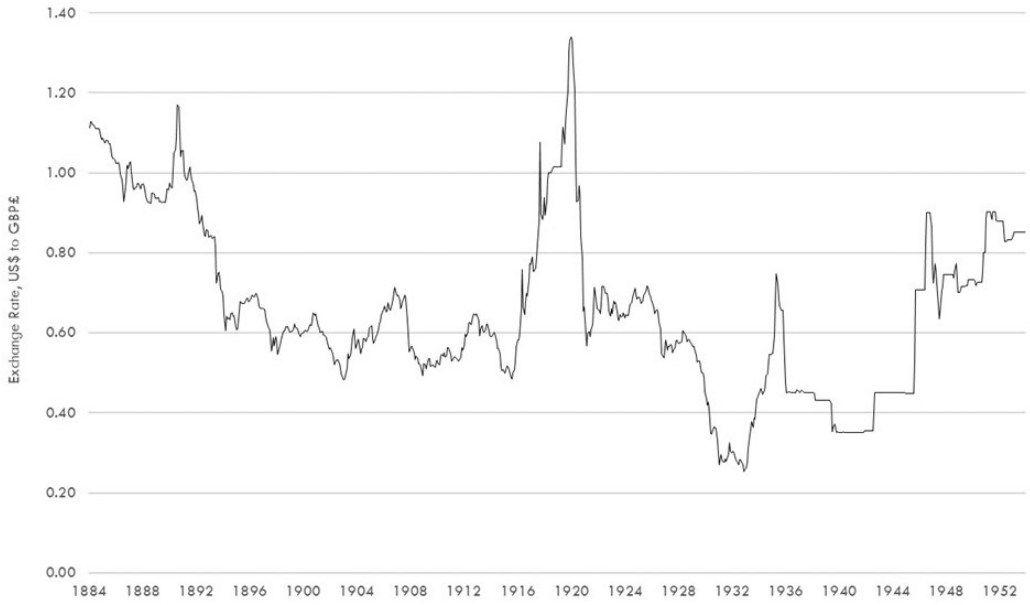


b) The market spread between UK and US silver markets



Note: The above panel presents the price of silver as recorded in the UK and US between January 1884 through December 1953. The lower panel presents the market spread between UK and US silver markets during the same period.

Figure 3: Monthly Exchange Rate US$ to GBP£, January (1884 - 1953)



Note: The above figure presents the monthly exchange rate between the US dollar and the UK pound between January 1884 and December 1953.

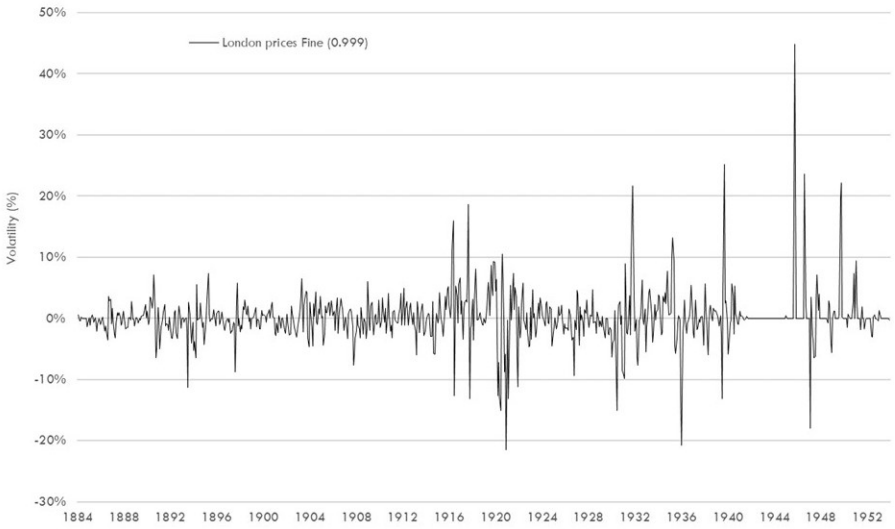
Table 2: Price Discovery and Information Flow Statistics for UK and US Silver Markets

		IS	CS	IL	ILS	Lags
H_1: How did war influence the price discovery relationship?						
YES	UK	0.7858	0.7760	0.8296	0.7975	8
	US	0.2142	0.2240	0.1704	0.2025	
NO	UK	0.9026	0.9150	0.9731	0.9757	17
	US	0.0974	0.0850	0.0269	0.0243	

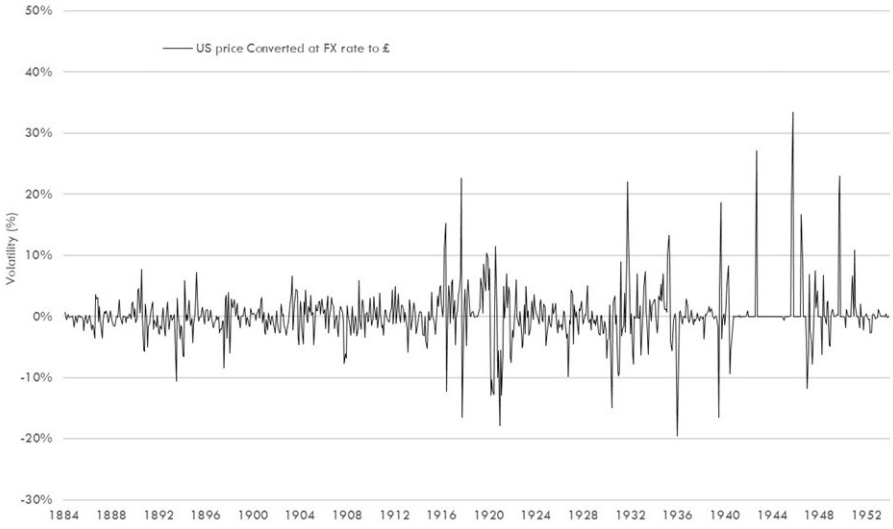
Note: The above table presents the average IS, CS, IL and ILS relationships as represented by the flow of price discovery sourced within the UK and US silver markets during this time.

Figure 4: Monthly Price Volatility of Silver Prices in UK and US Markets (1884 - 1953)

a) Monthly price volatility of silver prices in the UK



b) Monthly price volatility of silver prices in the US



Note: The above figure presents the monthly price volatility of silver prices in UK and UK markets between January 1884 and December 1953.

Table 3: Price Discovery and Information Flow Statistics for UK and US Silver Markets

		IS	CS	IL	ILS	Lags
H_2: Did the price discovery relationship change by month?						
January	UK	0.6725	0.8406	0.9476	0.9574	46
	US	0.3275	0.1594	0.0524	0.0426	
February	UK	0.9411	0.8133	0.9263	0.9741	52
	US	0.0589	0.1867	0.0737	0.0259	
March	UK	0.9021	0.7947	0.9213	0.9234	46
	US	0.3979	0.2053	0.0787	0.0766	
April	UK	0.8425	0.9548	0.9730	0.9754	9
	US	0.1575	0.0452	0.0270	0.0246	
May	UK	0.8610	0.8876	0.9695	0.9750	9
	US	0.1390	0.1124	0.0305	0.0250	
June	UK	0.8641	0.9098	0.9711	0.9753	54
	US	0.1359	0.0902	0.0289	0.0247	
July	UK	0.9750	0.9456	0.8032	0.9758	52
	US	0.0250	0.0544	0.1968	0.0242	
August	UK	0.6964	0.7604	0.5742	0.6948	52
	US	0.3036	0.2396	0.4258	0.3052	
September	UK	0.9090	0.7813	0.9645	0.9751	13
	US	0.0910	0.2187	0.0355	0.0249	
October	UK	0.8860	0.8327	0.9551	0.9735	8
	US	0.1140	0.2673	0.0449	0.0265	
November	UK	0.8997	0.8176	0.9545	0.9740	51
	US	0.1003	0.2824	0.0455	0.0260	
December	UK	0.7420	0.7453	0.9698	0.9734	47
	US	0.2580	0.0547	0.0302	0.0266	

Note: The above figure presents the average IS, CS, IL and ILS relationships as segregated by each month per year of investigation and represented by the flow of price discovery sourced within the UK and US silver markets during this time.

Table 4: Price Discovery and Information Flow Statistics for UK and US Silver Markets

		IS	CS	IL	ILS	Lags
H_3: Did the price discovery relationship change over time?						
1870	UK	0.8859	0.7869	0.9621	0.9744	6
	US	0.1141	0.2131	0.0379	0.0256	
1880	UK	0.8855	0.7882	0.9622	0.9744	9
	US	0.1145	0.2118	0.0378	0.0256	
1890	UK	0.8829	0.7911	0.9621	0.9743	9
	US	0.1171	0.2089	0.0379	0.0257	
1900	UK	0.8780	0.8071	0.9634	0.9744	9
	US	0.1220	0.1929	0.0366	0.0256	
1910	UK	0.8696	0.7851	0.9591	0.9737	9
	US	0.1304	0.2149	0.0409	0.0263	
1920	UK	0.8594	0.8430	0.9657	0.9743	9
	US	0.1406	0.1570	0.0343	0.0257	
1930	UK	0.8420	0.8071	0.9239	0.9345	9
	US	0.1580	0.1929	0.0761	0.0655	
1940	UK	0.8581	0.8128	0.9616	0.9737	6
	US	0.1419	0.1872	0.0384	0.0263	
1950	UK	0.9065	0.8159	0.9558	0.9744	56
	US	0.0935	0.1841	0.0442	0.0256	

Note: The above figure presents the average IS, CS, IL and ILS relationships as segregated by each decade of investigation and represented by the flow of price discovery sourced within the UK and US silver markets during this time.