Prices: Sources, Problems, Solutions

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Prices are central to economic history. They tell us about the relative values of what was produced and consumed in the past. Taken together, they tell us about the value of money or, alternatively, whether there was inflation or deflation. They tell whether different assets were becoming more or less valuable. Most economic historians are users of price information, but they might want, or need, to be more cognizant of where those prices come from and of how accurately they may capture such valuations. Here we address these issues, for commodities rather than assets and mainly for the eighteenth and nineteenth centuries. We focus on price currents and newspapers, both major sources for price information in this period. We hope that producers of price series may benefit from these reflections on some problems with the prices found in these sources and that users may be warned about underlying sources of error.

The paper is organized as follows. First, we ask where the prices found in price currents and newspapers came from. Then we make a brief summary of surviving printed sources of price data and give some idea of their product coverage. The core of the paper addresses four problems in working with price data: missing observations, price inertia, price ranges and splicing.

Where do prices come from?

Records of the prices at which market transactions take place might come from the buyers, the sellers or, in cases in which the market regulations required that transactions be recorded, from market authorities. Hence prices may be found in the account books of farmers or the ledgers of firms, though such sources are relatively rare and often survive only for short periods, a great exception being that bureaucratic behemoth, the Dutch East India Company.[1] Traces of prices paid may survive in records of large consumers, notably governments but also religious, charitable or educational institutions. From such sources come most price series for medieval and early modern Europe. Or prices may be found where governments, national or local, saw fit to keep track of the prices of key goods. The most obvious examples are the widespread assizes of bread, as well as the national corn returns in Britain.[2] In Ireland local authorities recorded the prices of different grades of butter sold in the Cork market.[3] But most markets were not so thoroughly regulated or monitored.

[1] Pim de Zwart, "Globalization in the Early Modern Era: New Evidence from the Dutch-Asiatic Trade, c.1600-1800", *Journal of Economic History*, 76, 2 (2016): 520-558.
[2] Liam Brunt and Edmund Cannon, "Variations in the Price and Quality of Grain, 1750-1914: Quantitative Evidence and Empirical Implications", *Explorations in Economic History*, 58, 1 (2015): 74-92.
[3] James S. Donnelly jr, "Cork Market: Its Role in the Nineteenth-Century Irish Butter Trade", *Studia Hibernica*, 11 (1971): 130-63; Liam Kennedy and Peter M. Solar, *Irish Agriculture: A Price History* (Dublin: Royal Irish Academy, 2007)

The main actors in most markets were merchants, often both as sellers and as buyers. Merchants' private records, where they survive in large numbers, are a fruitful source of price information. But merchants also had reasons for sharing information about prices. If they bought or sold on behalf of persons situated at a distance, they might keep them apprised of market trends by letter. If they had many correspondents, these letters might take on, at least in part, a more formal character with the merchant's observations repeated, sometime in print, to most or all of his clients. Price lists in merchant letters date back to the medieval period.[4]

A rare view of this world of merchant circulars came when in 1835 the Commissioners appointed to inquire into the management of the Post Office Department took up the issue of the costs of sending commercial information by post within Britain and Ireland and with other countries.[5] Merchants, mainly from London, argued that their "price currents" deserved a preferential rate. By this they did not mean three publications that survive from the 1830s; the *London Mercantile Price Current*, *Prince's Price Current* and *Wettenhall's Course of Exchange* were newspapers and circulated as such. The merchants were concerned with their own reports on market conditions which the Post Office treated as letters. As James Cook, a produce broker, noted, "there are prices current published almost every day, particularly after large public sales" (p. 16). Henry Burgess, asked if many prices current were published in London with reference to different trades, replied, "yes; sugar, coffee, cotton, and corn, dry-salteries, and a great many other trades" (p. 21). These specialized reports of market prices were often distributed in significant numbers--the witnesses speak of circulations in the hundreds, even thousands. Not all were sent by the post; some were sent in bulk by coach or ship.

The testimony of G.M.V Dadelzen, a general merchant with offices in London, Liverpool and Scotland, gives an idea of the flows of commercial information (p. 19). He regularly sent London price currents to his agents in Hamburg, Prussia and the Mediterranean, and presumably to his various offices. His firm also sent its own market reports, printed on the back of letters, "80 to 100 every foreign post night". Dadelzen received prices current from Liverpool and Glasgow, subscribed to the Hamburg price current and stated that "similar ones are sent to us every post day." He estimated that at Hamburg and Amsterdam hundreds of copies were printed every day.

Much of this price information was produced from self-interest. Many "prices current" were produced by London commission merchants and brokers in order to keep their customers in cities and towns around the U.K. up to date on prices. They also hoped to attract new customers, for by the 1830s London merchants were seeking to bypass regional distributors and sell directly to grocers and other local retailers (pp. 16, 30).

The testimony to the Commissioners thus reveals a large undergrowth of specialized "prices current", of which, unfortunately, few remain for the scrutiny of economic historians. We are left with the more general price currents that, as newspapers, ended up being conserved in the British Library and other repositories. But it would not be surprising that the general price currents and the newspapers got much of their information from these more specialized

[4] John J. McCusker and Cora Gravesteijn, *The Beginnings of Commercial and Financial Journalism* (Amsterdam: NEHA, 1991), p. 22.
[5] PP 1836 XXVIII (50), *Fifth Report of the Commissioners appointed to inquire into the Management of the Post Office Department*.

"prices current". On the relatively rare occasions when newspapers do cite their sources, they were reproducing or summarizing some merchant house's circular. In the early issues of the *Economist* prices for cereals were from Messrs Gillies and Horne's Circular, and in 1848 New York prices were quoted from Messrs Abraham Bell and Son's Circular and New Orleans prices from that of Messrs Morton, Toulmin and Coats.

One particularly good description of commercial information concerns the reports on the Liverpool cotton market received in 1835 at the Lloyd's Rooms in Manchester:

> …the first report appears at four o'clock p.m., and gives the tone of the Liverpool market up to half-past one o'clock of the same day, with the opinion of the writers as to the probable business of the day—the second report arrives at seven o'clock, giving the sales of the day, and on Fridays, also sales of the week, and arrives here in time to enable foreign merchants to advise their friends of the prices of this important staple.[6]

It would be surprising if these reports were not the source of the detailed commentaries on the cotton Liverpool cotton market that appeared in Liverpool and Manchester newspapers at the time.[7] These newspapers quoted sales and prices of upwards of twenty sorts of cotton.

The cotton market was hugely important and concentrated in Liverpool, so reporting was highly organized. This was probably also the case for other commodities such as East India produce sold in London and Amsterdam, for wool sold in London and Bradford and for coal in the London market. In the coal market Ralph Clarke, a London coal factor, was sending prices of various coals to coal-owners and merchants in the north around 1800; such price information has been sent regularly since the early 1770s.[8] But the markets for agricultural produce and raw materials in smaller cities and towns such as Hull, Aberdeen or Cork were unlikely to have generated printed circulars. The prices found in their local newspapers are likely to have come from asking local merchants about the state of the markets.

Since few of these ephemeral market reports survive and even less is known of how they were compiled, we must trust that newspapers and general price currents were able to find well-informed market participants and to obtain from them regular and accurate accounts of the prices at which transactions were taking place. But, of course, this need not always have been the case, so we should consider the internal consistency of the price information contained in these sources and, where possible, test it against other sources. After a brief discussion of the surviving sources of price information, we take up various problems that arise when working with the data in price currents and newspapers.

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[6] *Manchester Courier* 30 May 1835.

[7] The first monthly prices current for cotton was issues by Ewart and Ruston, Liverpool merchants, in 1785; in 1805 it became a weekly circular. Other merchants started issuing circulars, but they ultimately joined together for a general circular, which may have been what arrived at the Lloyd's Rooms in Manchester (https://www.ica-ltd.org/about-ica/our-history/).

[8] Smith, Raymond, *Sea-Coal for London: History of the Coal Factors in the London Market* (London: Longmans, 1961), p. 147.

Surviving Printed Sources of Price Information

The biggest problem with price currents is their spotty survival. It is probably not surprising that in the seventeenth and eighteenth centuries few people held onto single sheets with time-sensitive information. McCusker and Gravesteijn's invaluable survey of price currents published in Europe up to 1775 shows very few long or complete runs.[9] By the late eighteenth century, as price currents became somewhat more substantial, governments became more bureaucratic, trade associations started to form and libraries came into being, one would have hoped for more complete survival of these documents. Yet for Europe's two most advanced economies, the Netherlands and Britain, the surviving price currents have large gaps in the industrial revolution era. As a result, Posthumus' great compilation of Dutch prices essentially stops in the 1788 and doesn't resume until around 1830. Even during the eighteenth century data for some years are missing in Posthumus, though sometimes can be found in a contemporary manuscript housed in Harvard's Baker Library, but even this source contains gaps.[10] In Britain *Prince's Price Current*, which started in 1776, survives only for 1779-1785, 1796-1799 and from 1814 onward and the *Universal London Price Current*, which started in 1784, only for 1787-1789. A drawback of these surviving early British price currents is that most pertain to wartime years. From the late 1810s and early 1820s there were several competing London price currents, of which fairly complete runs can be found in the British Library. In the 1920s Silberling used some additional years of the London prices currents, then in the Board of Trade Library, but these originals seem to have disappeared.[11] The gaps in the British and Dutch publications make it necessary in some cases to resort to the much more complete run of Hamburg price currents, which began in 1733.

Newspapers also published prices, but they are generally very poor substitutes for the specialized price currents. The British price currents of the 1780s contain prices for hundreds of products, and often distinguish several varieties of these products. Newspapers at that time tended to confine themselves, above all, to grain prices. Only very rarely would newspapers quote prices for other agricultural products or for coal. From London newspapers Jan Klovland and I were able to construct fairly complete series for the prices in the metropolis of nine major agricultural commodities from 1770 (though the series for butter began only in 1779 and that for potatoes in 1808).[12] Also from newspapers, Liam Kennedy and I have compiled agricultural price series for the south coast of Ireland from the mid-1760s and for northeast Ireland from the mid-1780s.[13] For earlier years historians of both countries have had to rely on contract prices paid by large public or private institutions or on the prices received by large estates.

Only in the early nineteenth century did British newspapers begin systematically reporting broader ranges of agricultural prices as well as the prices of some non-agricultural goods, but their coverage still remained very thin compared to the price currents. Later in the nineteenth century specialized periodicals, such as the *Mark Lane Express* (agricultural

[9] John J. McCusker and Cora Gravesteijn, *The Beginnings of Commercial and Financial Journalism* (Amsterdam: NEHA, 1991).
[10] Harvard Business School, Baker Library, Special Collections: Kress Collection, Notitie der prysen van diverse waaren en Koopmanschappen uyt de prys couranten (Memoranda of the prices of various wares and merchandise from the price courants), Amsterdam, 1709-1787, 6 volumes
[11] Norman J. Silberling, "British Prices and Business Cycles, 1779-1850", *Review of Economics and Statistics*, 5, supp. 2 (1923), 223-247.
[12] Peter M. Solar and Jan Tore Klovland, "New series for agricultural prices in London, 1770-1914", *Economic History Review*, 64, 1 (2011), 72-87.
[13] Liam Kennedy and Peter M. Solar, *Irish Agriculture: A Price History* (Dublin: Royal Irish Academy, 2007)

products), *The Grocer and Oil Trade Review*, the *Meat Trades Journal*, the *Dundee Price Current and Trade Register* (flax, hemp and jute), and *The Mining Journal*, become useful sources of price information for specific industries.

Missing observations

A common problem with data drawn from price currents and newspapers is missing observations. Sometimes there are gaps in source survival, but often on some days, or series of days, there are simply no prices quoted in the source. Does this mean that there were no transactions? Possibly. Or does it mean that the publication's contact in the market failed to deliver the information? More likely.

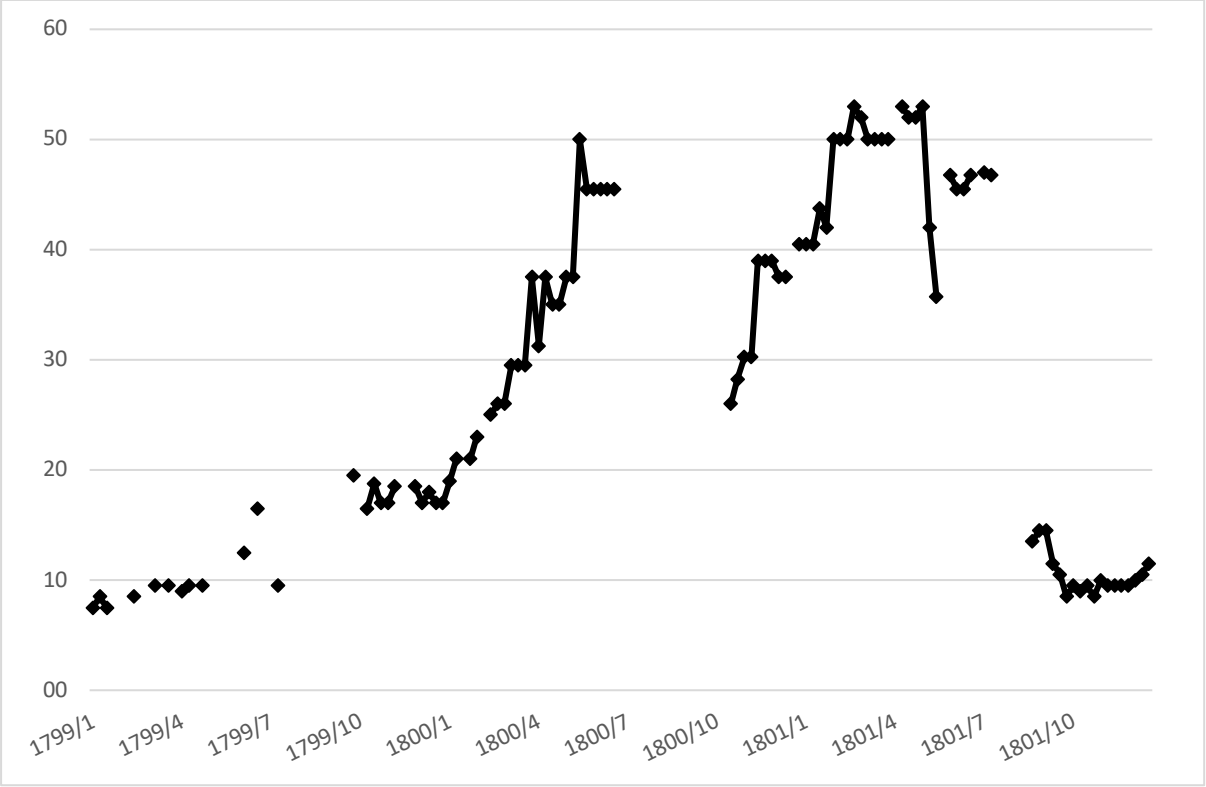
Consider potato prices at Belfast during the subsistence crisis of 1799-1801, an episode during the prices of potatoes and cereals rose to levels comparable to those in the famine of the late 1840s without a comparable mortality peak.[14] As can be seen in Figure 1, there are many missing observations in the weekly price quotations from the *Belfast Newsletter*, especially during the late spring and early summer of 1800 and 1801, periods when we would expect prices to be at their peak. A few of these missing observations correspond to weeks when no copies of the Newsletter survive and somewhat more to surviving issues in which no prices were quoted for any products. Reporting of prices is notably infrequent in 1799. However, most missing observations for potato prices from early September 1799 until the end of 1801 occurred in weeks in which there was a quotation for the price of oatmeal, the other main foodstuff in the north of Ireland. There were only four weeks in which oatmeal prices were not quoted, but 32 weeks in which there was no quotation for the price of potatoes per bushel was reported.

There is sufficient price information here to say that prices rose at least fivefold to the spring of 1800, fell sometime in the late summer and early fall, rose again to a peak more or less comparable to that in 1800 by the spring of 1801 and fell back to more or less normal levels sometime in the late July or early August. But the missing observations leave several uncertainties. When potato prices begin to start upward in the late summer of 1799? How far did prices fall back in the late summer and early autumn of 1800 and when did they start upward again? When did the fall in prices, marking the end of the crisis, begin? Was the peak in potato prices higher in 1800 or 1801? Several approaches might be made to answering these questions, all of which involve important assumptions. One would be to search for information on potato prices at other markets in Ireland or in Britain, on the (strong) assumption that markets for potatoes were well integrated. Here it is not necessary that the levels of prices be the same across markets, only that their movements be similar. Unfortunately, the only other market in Ireland and Britain with weekly potato price quotation is Cork, and its returns are even more intermittent than those at Belfast. Another approach might be to use the prices for oatmeal as an indicator on the assumption that this product was a close substitute for potatoes in consumption. There are indeed some similarities in the movements of prices of these two commodities, but one thing seems clear is that the peak in oatmeal price in 1801 was a good deal lower than that in 1800. It turns out that the saving grace in 1799-1801 is that during some of the weeks during which there were missing observations for potato prices quoted in shillings per bushel, there were quotations in

[14] Liam Kennedy and Peter M. Solar, "", unpublished manuscript, 2020.

pence per pottle. In the section on splicing we take up the problem of how to make these series comparable.

Figure 1
Potato prices at Belfast, 1799-1801
(shillings per bushel)

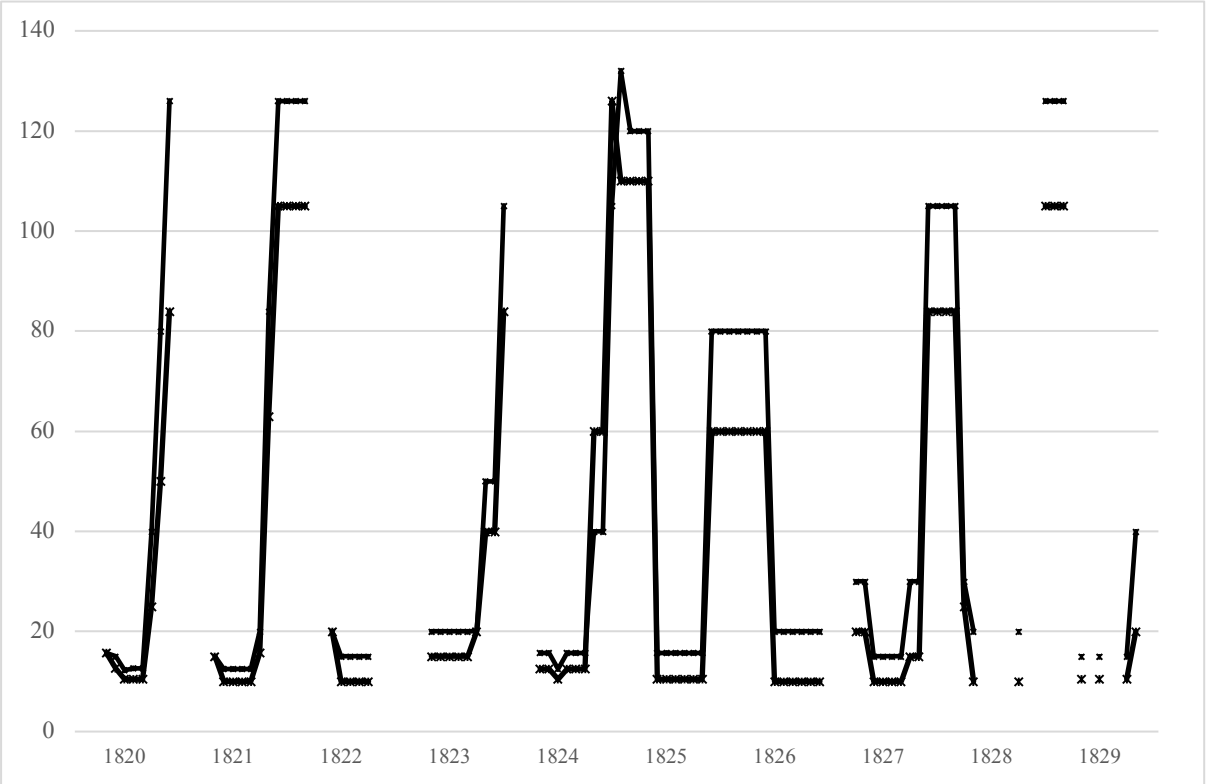


Sources: *Belfast Newsletter*

Sometimes prices are missing in a systematic way. Agricultural commodities generally have very seasonal price movements. In the off-season, when little is traded, there is often no price quoted or if a price is quoted, it is usually a relatively high one. A problem then arises if one wants an average price for the year: averaging across all prices for the year will tend to bias upward the prices in years when the off-season price is quoted relative to years in which it is missing. Unless this effect can be mitigated by weighting across seasons for the quantities traded, it might be better to throw out the off-season observations.

An extreme example of seasonal price fluctuations concerns marine insurance to the Baltic. Since the greatest threat to ships in the Baltic was winter ice, the rates to Riga, when they were quoted at all, rose to staggering levels during the 1820s (Figure 2). Rates were usually missing during the winter months, though the number missing varied from year to year. Since most traffic occurred from late spring to early autumn, a good idea of the average rate prevalent in a given year would call for using only the observations during these months. Taking averages of all the monthly observations yields not only much higher yearly rates but considerable fluctuations from year to year depending on the number of winter rates that were quoted.

Figure 2
Monthly marine insurance rates: London-Riga, 1820-1829
(shillings)



Source: *London New Price Current*

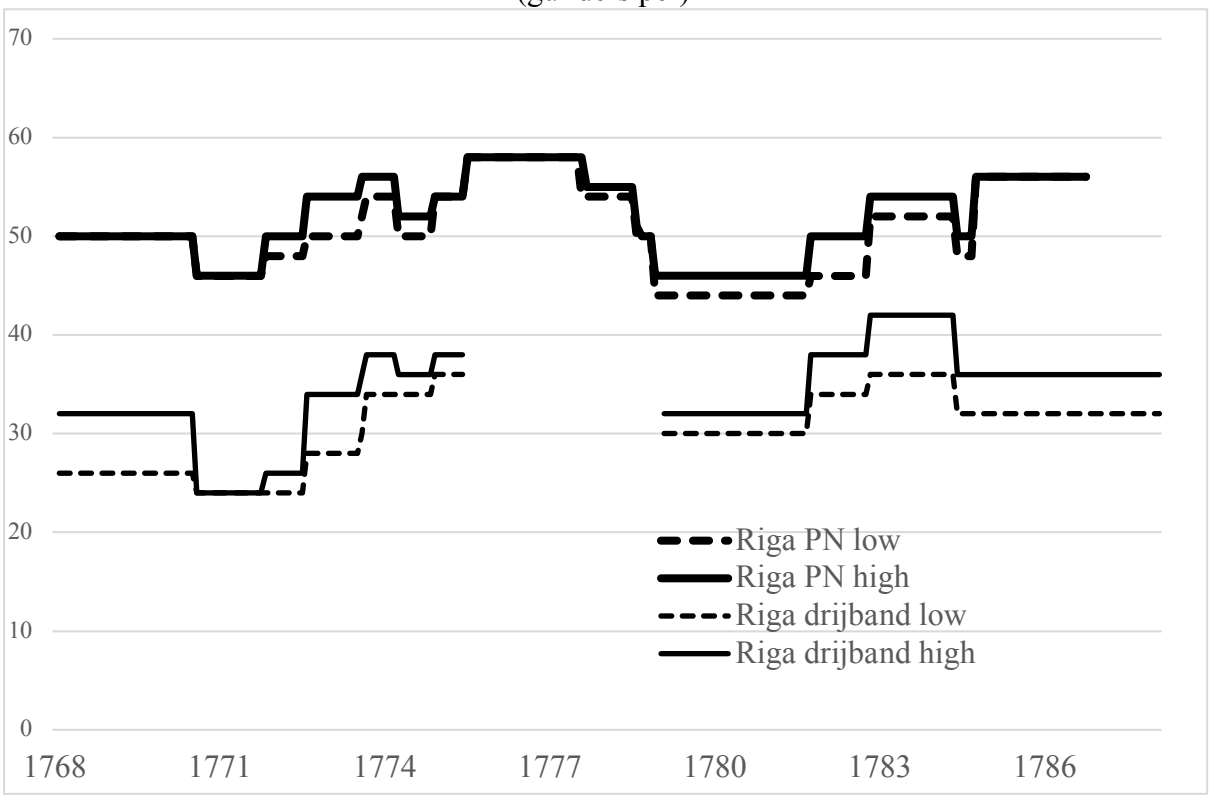
Price inertia

A problem sometimes, but not always, related to missing observations is what might be termed "price inertia". Prices sometimes remain suspiciously constant for weeks, months or even years. In finance this phenomenon goes by the name of zero returns and the prevalence of such unchanged prices is used as an indicator of market (il)liquidity or information flows to participants. The assumption is either that no transactions took place or that no transactions need have taken place. This could also have been true of commodity markets in the past, though other explanations are possible. One is simply that prices were very stable, though often the volatility of prices before and after these episodes of inertia make such stability unlikely. Another is that contemporaries did not find it significant to record relatively small price changes, for example, in fractions of smallest coins in circulation. A more likely candidate is source delinquency. When the publication received no new information on prices for a given day or week, the publisher or printer, instead of leaving the space blank, simply repeated the previous observation. If source delinquency was common, then price inertia would seem to contradict Spooner's assessment of the marine insurance rates quoted at Amsterdam, that "when a price appeared in the list, it may be inferred that the market was 'made'".[15]

[15] Frank C. Spooner, *Risks at Sea: Amsterdam Insurance and Maritime Europe, 1766-1780* (Cambridge: Cambridge University Press, 1983), p. 163.

Because Amsterdam was a major entrepot for European trade, prices there have a relevance not only to the Dutch economy, but to the larger European economy. The city's price current, both in the original and in the Baker Library transcripts, is a well-known source for eighteenth-century prices. Figure 3 shows monthly prices of two sorts of flax imported from Riga between 1768 and 1788. On average the price quotations for Riga PN change only once every thirteen months and those for Riga drijband only once every sixteen months. These average durations, not far from one year, might suggest that the prices would change when information on the harvest became available, but they conceal great variation. The periods of constant prices for Riga PN range from 1 to 34 months and for Riga drijband from 1 to 45 months. Periods of nine to fifteen months, roughly a year, comprise only a third of the intervals for each product.

Figure 3
Prices of Riga flax at Amsterdam, 1768-1788
(guilders per)



Source: Harvard Business School, Baker Library, Special Collections: Kress Collection, Notitie der prysen van diverse waaren en Koopmanschappen uyt de prys couranten (Memoranda of the prices of various wares and merchandise from the price courants), Amsterdam, 1709-1787, 6 volumes

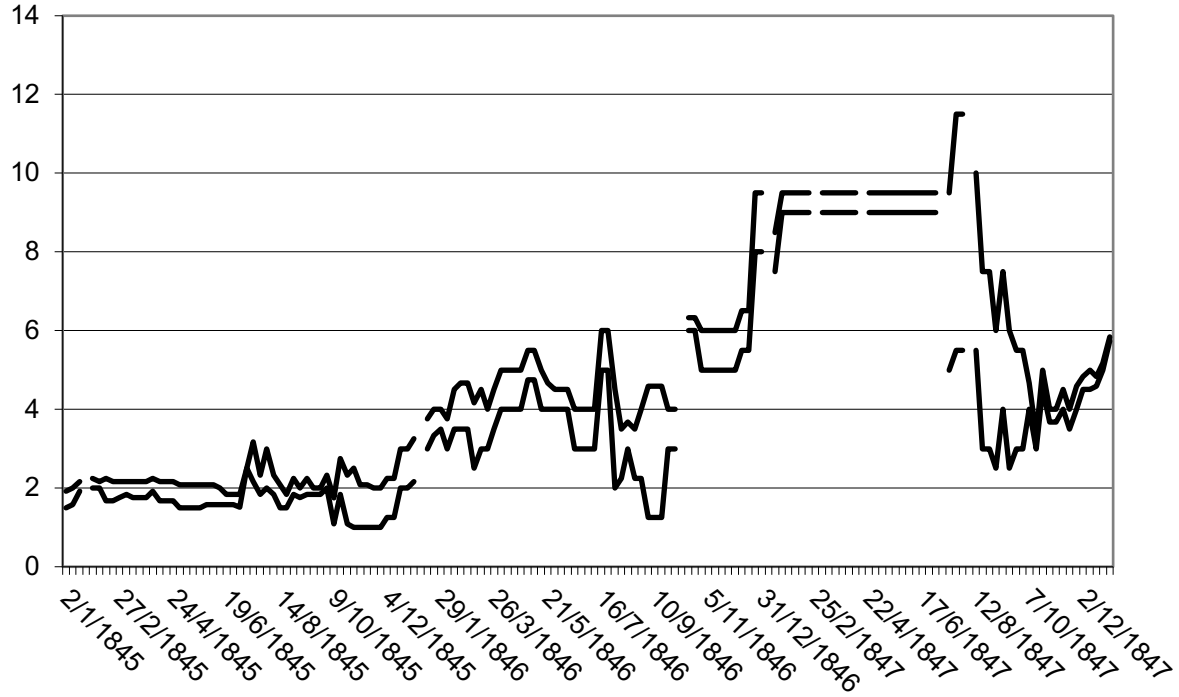
Whilst it is possible that Riga flax was absent from the Amsterdam market for long periods, this seems unlikely. In the 1770s flax and hemp constituted 16 per cent of Amsterdam's imports from the Baltic and were uninterrupted during this decade. Riga was also the Baltic port from which the most ships arrived in Amsterdam in the 1770s.[16] Similar statistical information is, unfortunately, not available for the 1780s, but there is no reason to believe

[16] De Buck, P and J. Th. Lindblad, "De scheepvaart en handel uit de Oostzee op Amsterdam en de Republiek, 1729-1780", *Tijdschrift voor geschiedenis*, 96 (1983), 536-557.

that flax imports from Riga were any less important during that decade. If flax was being traded in Amsterdam throughout the 1770s and 1780s, the long stretches of unchanged prices could have reflected the microstructure of the market. Flax could be stored, so merchants, if they coordinated, may have been able to maintain largely unchanged prices. This would be an economic phenomenon worthy of investigation. Or prices may indeed have changed more often, but these fluctuations were not picked up by the price current.

Another case of price inertia can be observed at Belfast during the Great Famine. As shown in Figure 4, the price of potatoes quoted in the *Belfast Newsletter* remained at the same level from the end of January until early July 1847. Given that potatoes were extremely scarce during this period, it seems implausible that prices did not rise from their January level and that they showed no fluctuations. It was more likely that few or no potatoes were traded and the *Newsletter*, receiving no information concerning the potato market, left the quotations for 28 January in place. When prices did change, on 15 July, they were quoted over a range much wider than normal, from 5 to 9 pence (the usual range was a half to one pence). Two weeks later the range was 5.5 to 11.5 pence. The *Newsletter* seems to have received information on the potato market, but it was ambiguous about the direction of change or there were very large differences in the qualities of potatoes being sold. This anticipates the discussion of price ranges in the next section, but the important point here is that the published prices from January to July did not accurately reflect the scarcity of potatoes at Belfast.

Figure 4
Belfast Potato Prices, 1845-1847



Source: *Belfast Newsletter*, 1845-7.

It is not clear that the researcher can do anything about price inertia other than recognize that the quoted prices may not be informative about the state of the market. It may thus be better not to use them at all, to treat them as missing observations.

Price ranges

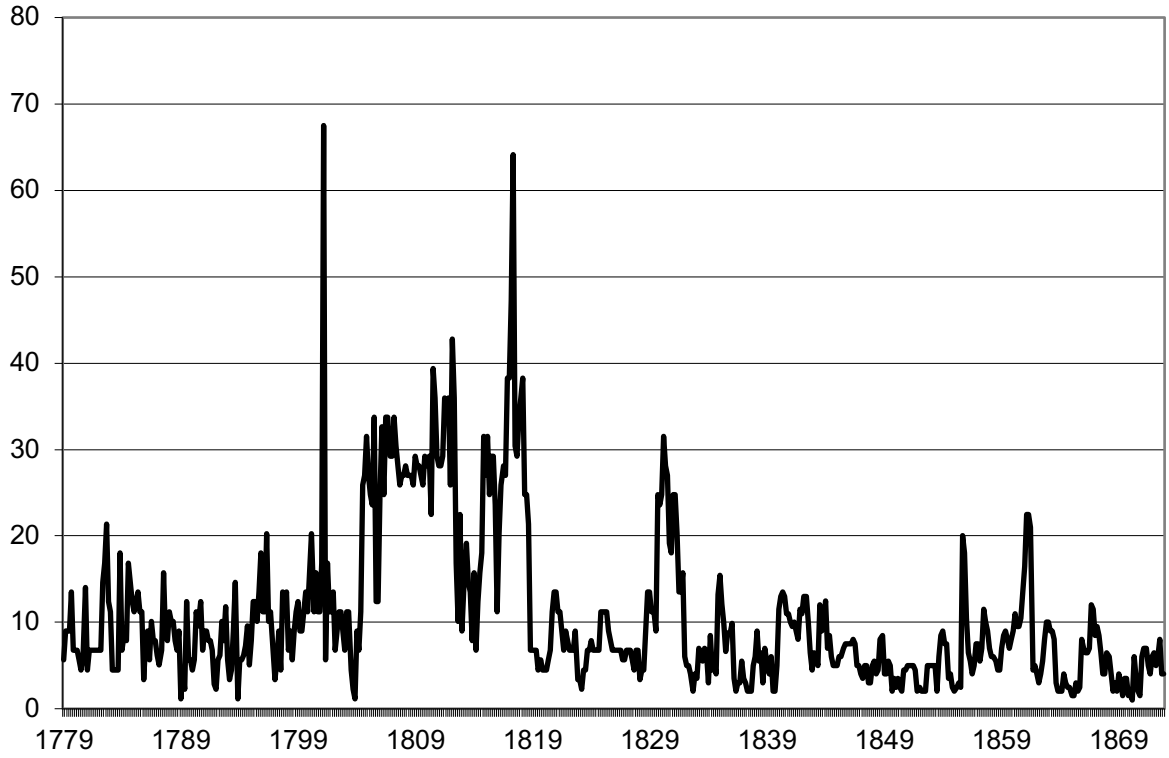
Price currents and newspapers rarely quote a single price. In general, this only happens regularly in cases where the quantities being traded were being recorded, so that the single price is a weighted average price. Examples include the English corn returns and the prices associated with assizes of bread and other commodities. More generally, price currents and newspapers quote a low value and a high value, what might be taken to be the range of prices at which transactions took place. It is tempting to average these low and high values and to work with this average, but it can at times be dangerous to do so, as we shall see in two examples below.

It is relatively rare for a single price to be quoted in price currents and newspapers. When this happens, it may be problematic since it is not clear whether this price represents a view of an average price comparable to earlier or later averages. It could instead be that, because there were few transactions in the relevant period, the price corresponded to the only quality being traded, be it low, high or medium.

Our first example of unruly price ranges concerns wheat prices in Britain. Until the late nineteenth century wheaten bread was central to the diet, particularly in southern England, so wheat and bread bulked large in any index of consumer prices. Yet the wheat prices in the London market showed a marked widening of the range between the low and high prices quoted between 1805 and 1818 (Figure 5).[17] Before and after this period the difference between low and high price quotations was typically five to ten shillings per quarter, but during these years it was more commonly about 30 shillings. Although it was necessary to splice together information from different newspapers to construct the London series, this widening of the range did not correspond to one particular source. These large gaps between low and high prices could be found in all of the major newspapers quoting cereal prices--*Bell's Weekly Messenger*, *Evans and Ruffy's Farmer Journal* and the *Public Ledger* as well as various general price currents—and were not to be found in any of them beforehand or afterwards. Comparisons with the official gazette prices and price series for wheat in Irish markets led to the conclusion that during these years prices for lower qualities of wheat were being quoted, so Jan-Tore Klovland and I decided that the high quotations, rather than averages of the low and high quotations, were a better guide to price movements.

[17] Peter M. Solar and Jan Tore Klovland, "New series for agricultural prices in London, 1770-1914", *Economic History Review*, 64, 1 (2011), 72-87. The spike in April 1801 occurred at a time of particular shortage.

Figure 5
Wheat prices in London: difference between high and low quotations
(shillings per quarter)

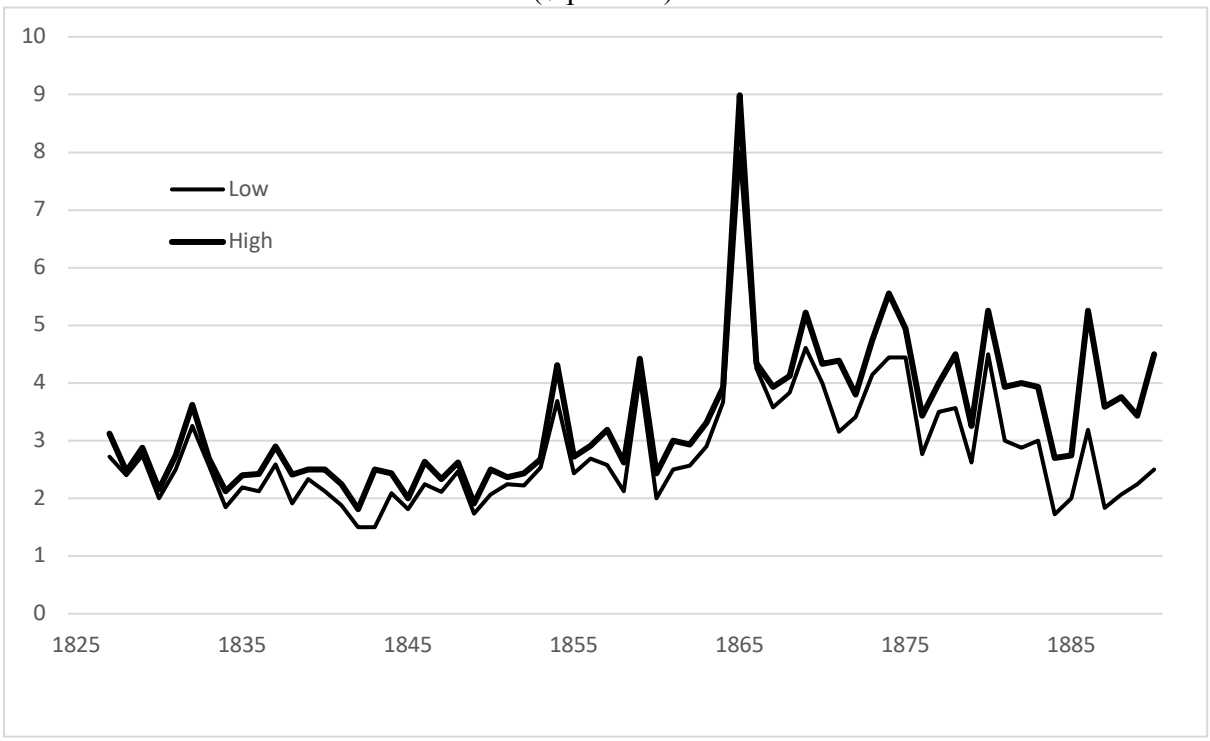


Source: London prices

A second example of how the changing width of price ranges may reflect changes in the qualities of the goods being priced concerns lemons in the nineteenth century.[18] Figure 6 shows the low and high prices quoted for Messina lemons in Boston. Until the 1860s these prices generally moved in synch, with a gap between them of about 25 cents; then, over the next two decades, this gap widened to a dollar and a half. The high quotations suggest that lemon prices, though volatile, stayed more or less at the same, or perhaps declined only slightly from the late 1860s to the late 1880s; the low quotations, by contrast, suggest that lemon prices in the late 1880s may have been only half those in the late 1860s. Over the same period lemon prices in London showed a similar widening of the price range, as it rose from a few shillings in the 1860s to more than five shillings in the late 1870s (Figure 7). But from the late 1870s *The Grocer*, the source of this information, started quoting prices for two sorts of Messina lemons—ordinary and selected. The high price for selected lemons was roughly the same as the previous high price for lemons of unspecified quality and the low price for ordinary lemons was much the same as the low price for lemons of unspecified quality. In the 1880s the ranges of the quotations for each of the two varieties was about five shillings, but the range between the low price for ordinary lemons and the high price for selected rose to over ten shillings. As with the American prices, it is thus difficult to say whether lemon prices in the 1870s and 1880s remained more or less flat or they fell significantly.

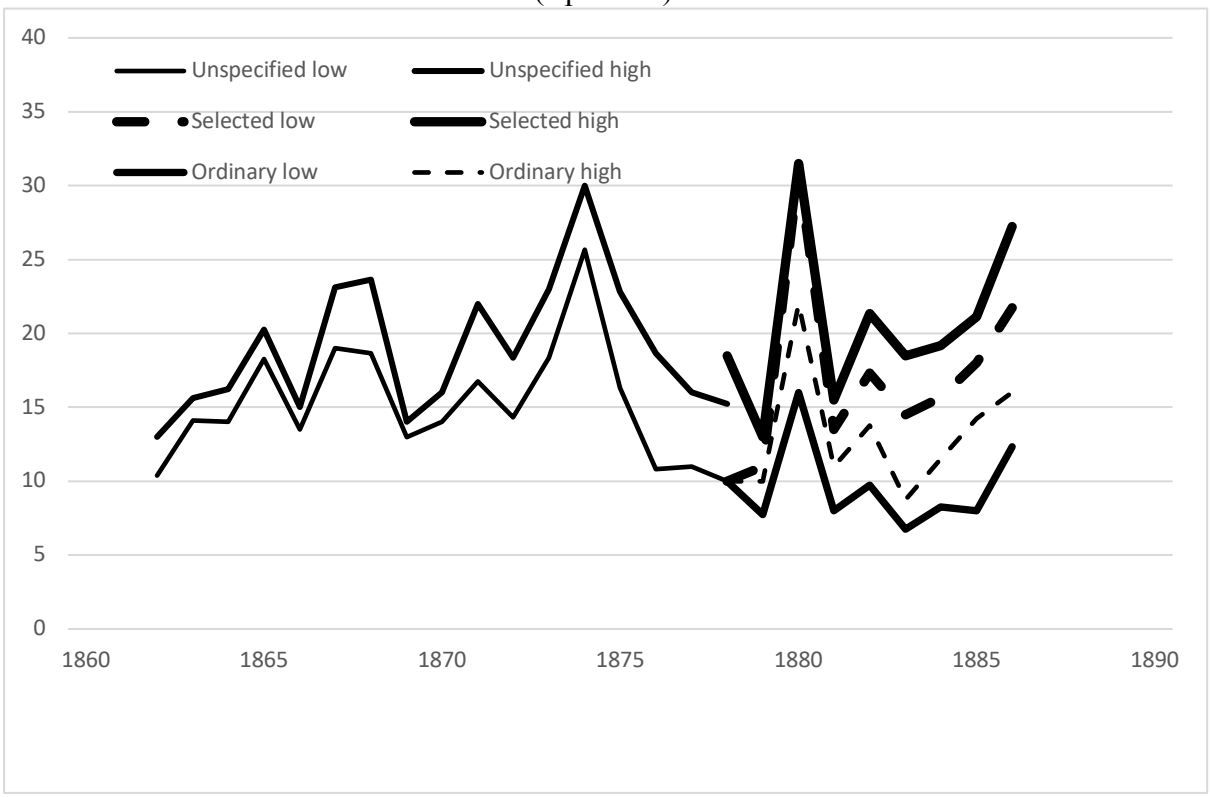
[18] This and the following paragraph are draw from ongoing research with Brian A'Hearn on the Sicilian lemon industry.

Figure 6
Lemon Prices in Boston
($ per box)



Sources: *Boston Courier*, 1827-1841; *Atlas*, 1842-1855; *Daily Advertiser*, 1856-1890.

Figure 7
Lemon Prices in London
(s per box)



Sources: 1862-1886: *The Grocer.*

The range of lemon price quotations increased because a wider range of qualities were being sold in both the Boston and London markets. The British consul in Palermo explained in 1878 that this was due to transport changes:

> "The increased facilities of transport afforded by steam have proved injurious rather than beneficial to the trade. Formerly, when the trade was carried on in sailing vessels, which took 60 or 70 days to cross the Atlantic from Palermo, the export was confined to the best kinds of fruit, as alone able to bear so protracted a voyage. Now that a steamer can accomplish the transit in three weeks or less, fruit of inferior quality is also shipped…"[19]

Consuls also reported over-production in the late 1870s and early 1880s, leading to speculative exports of lesser quality fruit.[20] Contemporary comment thus suggests that the high prices are probably more consistent indicators of the long run trends in prices of a standard commodity, good quality lemons, whilst low prices show the growing importance of lower quality lemons in the market.

These examples suggest that before simply averaging low and high price quotations constructors of price series should carry out a careful analysis of how these ranges behave over time. If there are sudden increases or decreases in the ranges, as in the case of wheat prices, or gradually widening or narrowing of ranges, as in the case of Sicilian lemons, then additional research is called for in order to explain these movements and to find the correct solution for arriving at consistent and meaningful indicators of prices.

Another example shows how analysis of the ranges of prices quoted, which should be a prerequisite to the construction of any price series, can reveal several features of price data. Ireland supplied large quantities of butter to the London market in the eighteenth and nineteenth centuries. In the early nineteenth century prices for butter of various provenances were quoted, with butter from county Carlow usually among the most prized. Figure 8 shows the differences between the high and low quotations between 1820 and 1840. The prices were extracted bimonthly as close as possible to 1 February, 1 April, 1 June, 1 August, 1 October and 1 December.

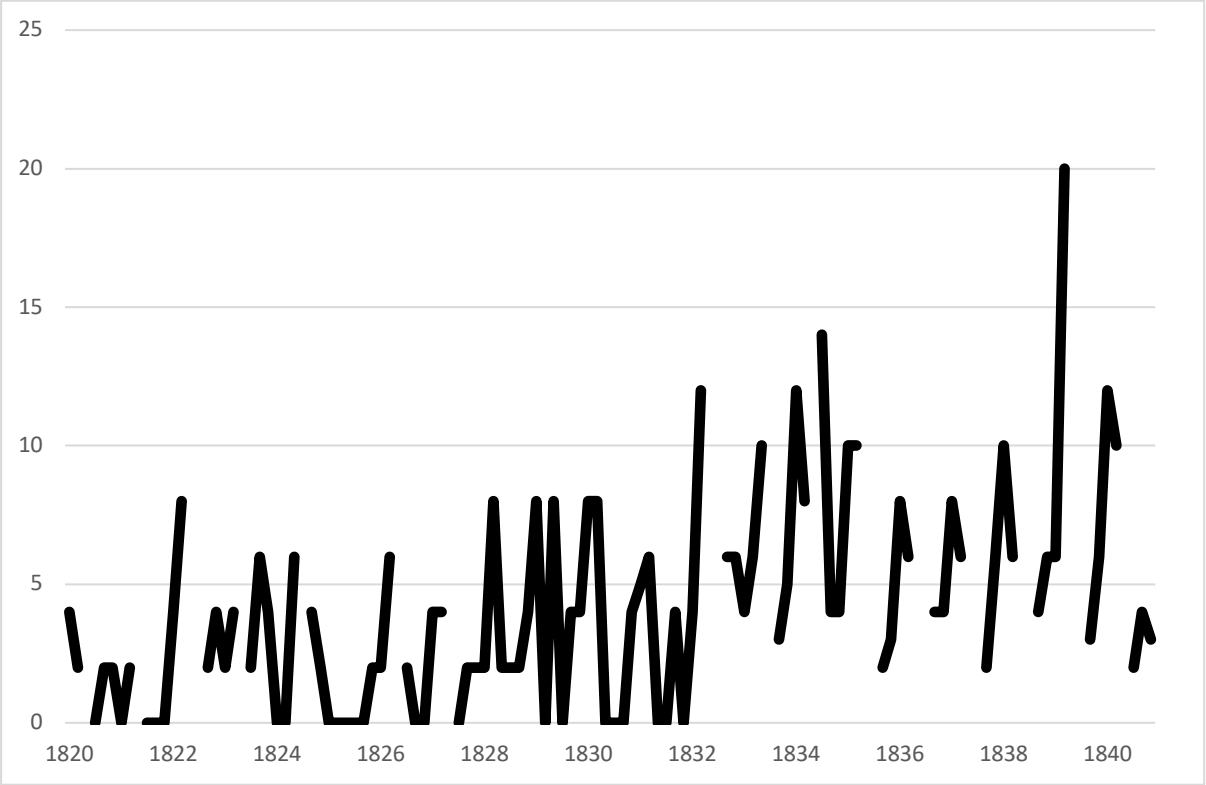
There are clearly many missing observations, which did not arise because the source itself was missing. They show some regularity: thirteen correspond to the beginning of June and nine to the beginning of August, all but two of which occurred in the same year as a missing observation in June. Butter-making and the butter trade were highly seasonal. Cows were intended to calf in the early spring so that their milk production would be at its peak during the months when grass was abundant. Since the calves were initially suckled, butter production fell off, as did exports, in the late spring. The absence of prices in London in subsequent months no doubt reflects the fact that little Carlow butter was coming to the market. Early June and early August also account for ten of the 22 cases in which only one

[19] U.K. Consular Reports, Palermo, Trade and Commerce of Palermo for the years 1875 to 1878 (PP 1879 (947), 1339-1351), p. 1343; Salvatore Lupo, "Tra società locale e commercio a lunga distanza: la vicenda degli agrumi siciliani," *Meridiana*, no. 1, 1987, pp. 81-112.

[20] U.K. Consular Reports, Palermo, Trade and Commerce of Palermo and Sicily for the Years 1881 and 1882 (PP 1883 LXXIII (3736), 1366-1458), p. 1378; Palermo, Trade and Commerce of Palermo and Sicily for the Years 1881 and 1882 (PP 1883 LXXIII (3736), 1366-1458), p. 1378; Sicily for the year 1885 (PP 1886 LXVI (4761), 677-681), p. 678; no. 395, Palermo for the year 1887, p. 3.

price was quoted for Carlow butter, perhaps another indication that not much butter was being sold.

Figure 8
Carlow Butter in the London Market: Width of Price Range, 1820-1840
(shillings)



Sources: *London Mercantile Price Current*, 1820-1840

Closer analysis of the data reveals further evidence of seasonality. As Table X shows, during the summer months the standard deviations of the width of the price range are quite high, which reflects both the numbers of observations for which the range was zero and a few observations for which the range was very large. Price ranges during the year follow two distinct patterns. Toward the end of the year, in early October and early December, both the average width of the range and its standard deviation are roughly half the corresponding values for early February and early April. The October and December observations also contain fewer extremely large ranges.

Table 1
Carlow Butter in the London Market: Seasonality, 1820-1840

	1 Feb	1 Apr	1 Jun	1 Aug	1 Oct	1 Dec
Mean (sh)	5.4	6.3	3.7	1.8	2.8	3.4
Standard deviation (sh)	3.8	4.6	4.2	4.0	1.8	1.9
Ranges > 4 sh	10	14	3	1	2	5
Ranges > 9 sh	4	4	1	1	0	0

Sources: *London Mercantile Price Current*, 1820-1840

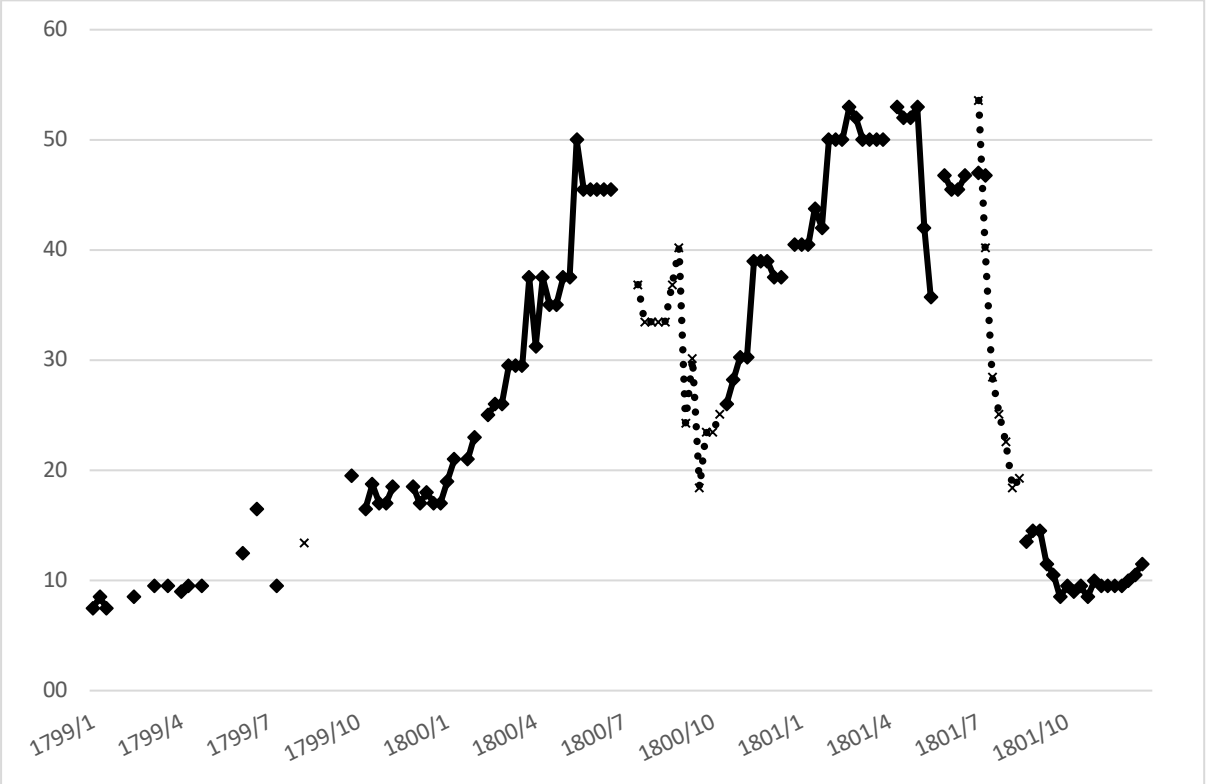
What is to be done with this information about missing observations, single price quotations and seasonality of ranges? If the reason for collecting the butter prices is to examine the returns to or the incentives for farmers, then it might be better to focus on the period of the year when most butter was sold, that is, in the autumn and early winter, perhaps simply averaging the prices for early October and early December. This would also minimize the impact of another feature of the ranges, that they clearly become wider from about 1832 onwards. For all observations the average range increases from 2.6 to 6.6 shillings, but for the observations in October and December only from 2.2 to 4.2.

Splicing

The problem of dealing with price ranges may intersect with the necessity of drawing price information from multiple sources. Publications appear and disappear; even if they already or still exist, they start and stop quoting prices, entirely or for particular goods. Hence it is often necessary to join series of price observations from two or more sources. Since the underlying nature of the price information may differ across sources. Such splicing requires careful attention to the underlying nature of the price information in the sources. Otherwise it can lead to discontinuities either in the level or the volatility of prices in the spliced series.

Sometimes it is necessary or desirable to join together information from the same source. Changes can take place in the quality of goods for which prices are quoted or in the denominations in which they are sold. In the case of potato prices at Belfast in 1799-1801, during the summer months potatoes stopped being quoted in shillings per bushel and were instead quoted in pence per pottle. A pottle was a much smaller unit of measure, so these price quotations probably refer to a retail market whereas the quotations per bushel may have pertained to a wholesale market. We do not know the exact contents of pottle of potatoes, nor do we know how the precise relationship between wholesale and retail prices, but we need not do so as long as there is some overlap between the two price series. In this case it regrettably short, only two weeks, but it suggests that the price in pence per pottle be multiplied by 3.48 to arrive at the level of the prices in shillings per bushel. The results of doing so are shown in Figure 9. The observations at the overlap show the imprecision of this splice, but the movements in the summer of 1800 would seem to suggest that the level is not too far off. The spliced series certainly brings much more definition to the movements of potato prices during this episode.

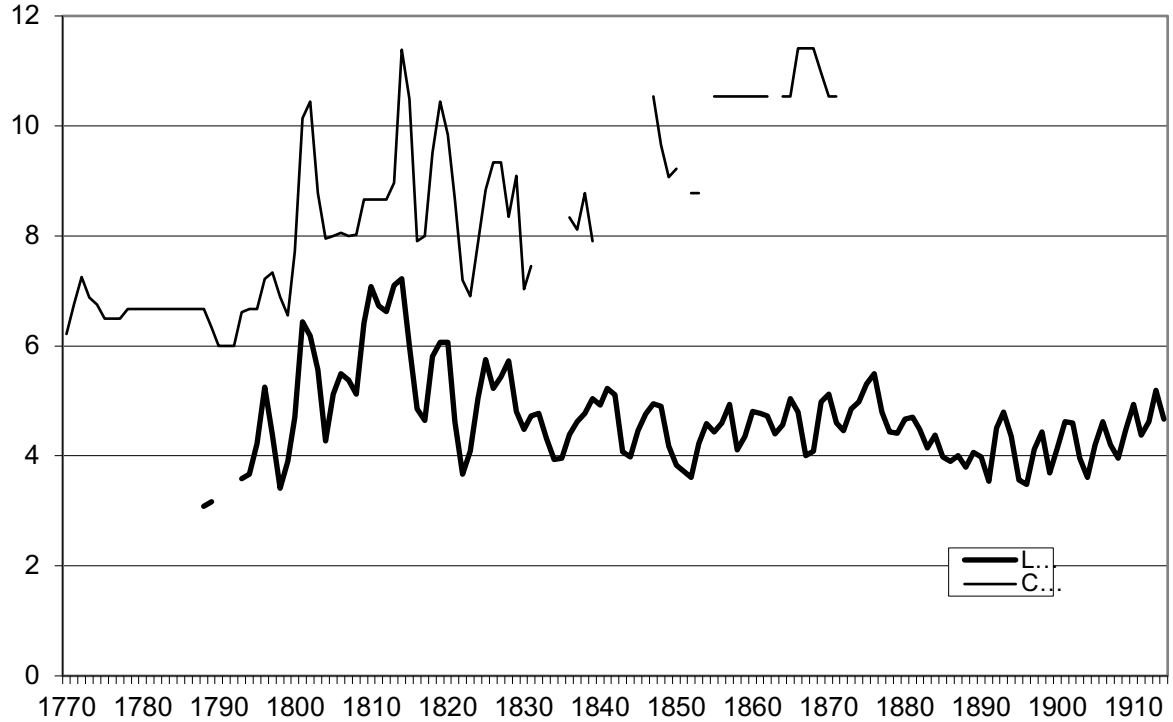
Figure 9
Potato prices at Belfast, 1799-1801
(shillings per bushel)



Source: *Belfast Newsletter*.

In constructing very long series for agricultural prices in England Gregory Clark has spliced together many sources of price information using regression methods. The accuracy of this method depends critically on having sufficiently long overlaps among the series for the regressions to be able to take full account of any differences in levels. When the overlaps are short, things can go badly wrong, as shown in Figure 10, which compares the Clark series for pork in the nineteenth century to a consistent series extracted from London newspapers. The movements of the two series are quite similar between the 1790s and the 1820s, no doubt because Clark's underlying series for this period is drawn from Gayer, Rostow and Schwartz, who relied on similar sources. But the series diverge thereafter, when Clark seems to rely on bacon prices from a 1903 parliamentary return and may have gotten the level at the splice very wrong.

Figure 10
Pork prices in England, 1770-1914



Source: Jan Tore Kloveland and Peter M. Solar, "New series for agricultural prices in London, 1770-1914", *Economic History Review*, 64, 1 (2011), 72-87: 80.

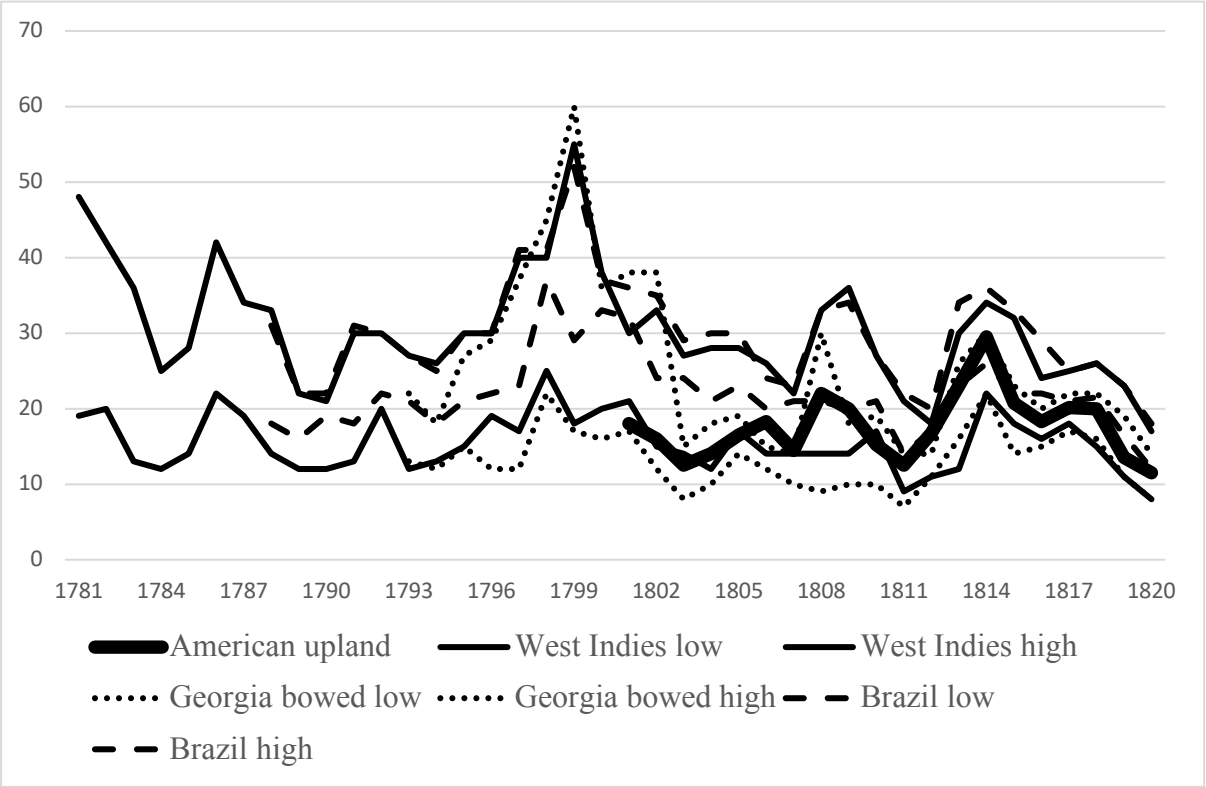
Ideally a lengthy overlap between the series to be spliced permits their movements to be analysed better, though it does not necessarily solve all the problems. Consider the difficulties of figuring out what happened to New World cotton prices during early industrialization. In the eighteenth century Britain drew its cotton from the West Indies and Brazil; in the nineteenth century it imported the bulk of its cotton from the American South. The problem is figuring out what was happening to the price of some comparable quality of cotton over the period from, say, 1780 to 1820. The difficulties can be seen in Figure 11, which is based on the widely used series in Mitchell's *Abstract of British Historical Statistics*. The series for West Indies, Bowed Georgia and Pernambuco cottons, from 1781, came from Tooke's *History of Prices* and ultimately from price currents. The series for American upland, from 1801, was created for a return of wholesale and retail prices prepared in 1903, where the cotton prices are described as having been "extracted from the *Annual Circulars* issued by the Liverpool Cotton Association", itself founded in 1841.[21] Hence the precise origins of this series is not known, raising some doubts about its validity in its early years.

The problems, then, are how far back to rely on the American upland series and what series should be used to carry it back into the eighteenth century. The most obvious choice would be the other United States series, Bowed Georgia. These two series track each other reasonably well from 1820 back to around 1815, but as one pushes back toward the eighteenth century they are less consistent and into the eighteenth century the Bowed Georgia series shows widely fluctuating widths of the range between low and high prices. Note that it

[21] PP 1903 LXVIII (321), *Wholesale and Retail Prices*, p. 44.

is not even clear where Tooke found the prices in the mid-1790s because *Prince's London Price Current* did not begin quoting prices for Georgia, not Bowed Georgia, cotton until early 1797.

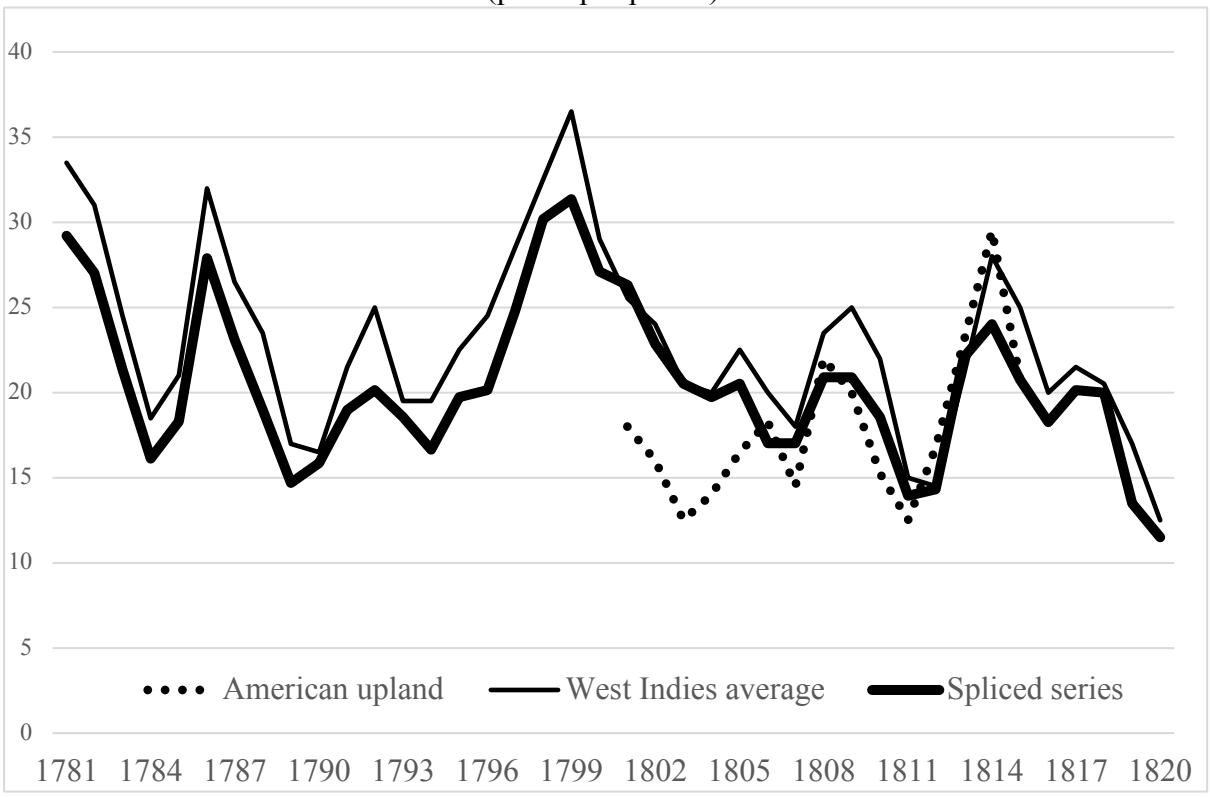
Figure 11
Cotton prices, 1781-1820
(pence per pound)



Source: Brian Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge: Cambridge University Press, 1962), pp. 490-1.

Such doubts about the series for American upland and Bowed Georgia suggest relying on instead on the series for cotton from the West Indies or from Brazil, perhaps splicing one or the other to American upland series from about 1815. Although the general level of Brazil series is higher—it was a finer quality, the width of its price range is more stable than that of the West Indies series, which would be an argument for using the average price for Brazil cotton to extrapolate back to 1788, when the Brazil series begins. Before 1788 there is no option: the average West Indies price is all there is. Figure 12 shows the results of splicing these series together, using the relationship between the series in the six-year overlaps in 1788-93 and 1815-20 to adjust the levels. The newly created series clearly shows a different trend in cotton prices during the first decade of the century from that shown by the American upland series. It also generally lies somewhat below the average West Indies price, which is consistent with American cotton (with the exception of Sea Island) being less fine than that from the West Indies.

Figure 12
Cotton prices, 1781-1820: a new extrapolated series
(pence per pound)



Sources: see Figure 11 and text.

Quality variations

The examples of wheat, lemon and cotton prices have raised the vexed question: what price? Price currents, and sometimes the newspapers, quote prices for several qualities or provenances of a good. There can be too many prices! Table 2 shows the panoply of cotton prices quoted by *Prince's London Price Current* in 1798 and 1814. What was the "West Indian" cotton the price of which found its way into Tooke and later Mitchell? In 1798 ten sorts of cotton, defined by their provenance in the Caribbean, were listed and in 1814 eight sorts. In 1798 their prices ranged from 23 to 37 pence per pound, though for any given sort the width of the price range was 3 to 5 pence; in 1814 the overall range was 6 pence and the typical width 1 to 3 pence. As imports of cotton from the United States grew during this period, three sorts were quoted in 1814 instead of one sort in 1798. The "Georgia" cotton quoted in the late 1790s had a very wide price range, probably incorporating both ordinary "Bowed Georgia" and superfine Sea Island cottons, making it difficult to tell what the trend in prices of US cotton was.

Table 2
Cotton prices, 1798 and 1814
(pence per pound)

6 April 1798			8 April 1814		
Berbice & Cayenne	34.0	37.0	29.0	32.0	Berbice
			31.0	34.0	Cayenne
Surinam	32.0	36.0	32.0	34.0	Surinam
Dominica & Issequebo	28.0	32.0			
St Domingo	26.0	29.0	30.0	31.0	St Domingo
Barbadoes	26.5	28.0			
Grenada	24.0	28.5	30.0	33.0	Grenada
Guadaloupe & Martinique	24.0	28.0	28.0	31.0	Guadaloupe & Martinique
Monserrat & St Vincent	23.5	27.5	28.0	30.0	Monserrat & St Vincent
Providence	23.0	28.5			
Jamaica	23.0	28.0	28.0	30.0	Jamaica
Pernambuco	33.0	37.0	34.0	35.0	Pernambuco
Maranham	32.0	36.0	32.0	33.0	Maranham
Para	32.0	32.0	31.0	32.0	Para
			31.0	33.0	Bahia
			29.0	31.0	Rio Janeiro
Portugal	21.0	26.0			
			28.0	30.0	Lisbon
			26.0	28.0	Oporto
Smyrna	22.5	23.5	24.0	27.0	Smyrna
Salonica	21.0	22.0			
Adonia	21.0	22.0			
Dardinelle	21.0	22.0			
East India Surat	20.0	21.5	22.0	26.0	Surat
Bengal			20.0	22.0	Bengal
Cartagena	22.0	24.0	27.0	30.0	Carthagena
Carracca	23.0	24.0			
Bourbon	31.0	34.0			
Georgia	24.0	37.0	28.0	31.0	Bowed Georgia
			39.0	48.0	Sea Island
			30.0	33.0	New Orleans
Bahama	25.0	28.0	28.0	31.0	Bahama
Trinidad	26.0	28.0			
Bermuda	25.0	27.0			

Source: *Prince's London Price Current*.

The more carefully defined the good is, the more likely the range of prices quoted will be narrow and consistent over time, so that the movements of its price will be more precisely shown. On the other hand, the more carefully defined the good is, the less likely that it may be representative of other qualities of the same good. Ideally, this representativeness should be tested by comparing the price movements of several qualities. Later in the nineteenth century the prices of different qualities of cotton tended to be highly correlated. The problem

with doing the same exercise for the late eighteenth and very early nineteenth centuries is that the survival of the prices currents is very limited and there are few quotations for cotton prices in newspapers until around 1820 when Liverpool newspapers start publishing a range of prices comparable to what is found in *Prince's*.

Conclusion

This survey of the possibilities and pitfalls of putting together price series reflects the experience of over forty years in the business. It is intended as a guide for those who want to exploit the riches still to be found in the price currents and newspapers and as a caution for the users of price series based upon such sources. The latter might want to pay more careful attention to where the prices came from and how the underlying data has been transformed into published series, particularly before subjecting them to elaborate statistical analysis.