

CROP PRICES IN THE AUSTRIAN MONARCHY (1770–1816): THE ROLE OF CROP FAILURES AND MONEY INFLATION

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The paper is based on data about local cereal prices in Bohemia recorded in the course of 46 years (1770–1816) by F.J. Vavák, Czech farmer living close to Prague. This information appeared in a series of his memoirs published within 1907–1938 and in 2009. The data analysis shows that annual means of prices of wheat, rye, and barley are relatively well correlated and can be used for illustration of the state monetary situation. A higher variation of the annual mean values was observed only in times of crop failure and was also related to the new harvest. The data obtained for pea differ from the data mentioned above. It was shown that the market prices were influenced mainly by crop failures caused by weather and climate and by the state monetary policies. The money purchasing power was influenced either by objective causes, like crop failures of reversible character, or by subjective changes caused mainly by inflationary monetary policies which in the case of Austria had conduced to a state bankruptcy.

cereals; market; weather; monetary policy; bankruptcy



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INTRODUCTION

Austria started to change from a conservative Middle Age country to a better, centrally managed one in the 18th century. Reforms of Maria Theresa¹ and Joseph II² simplified and improved the state administration giving more freedom to the citizens either in religion or free motion. The reforms were very difficult to realize in a multinational state³ with complicated borders⁴ being almost incessantly in wars⁵. The expensive wars required to uphold Austrian hegemonic interests, an outdated financial system and a poorly developed economic system were the sources of the Habsburg Empire's continued financial woes. Instead of promoting domestic business and trade, as the basis

for financing a powerful army, the problem was resolved traditionally by various methods of credit. For this reason, Banco dell Giro (1703) was founded, and after its closing down later in 1705 it was replaced by a new bank of this type – Stadt Banco (Venckový et al., 2005). At that time, the conventional currency was 1 gulden = 60 kreuzers.

During Charles VI's regency (1711–1740), Austria borrowed money from its allies and raised growing amounts of private capital to meet the rising need for public finance. The emperor's reform activity was directed primarily at efforts for standardizing the appearance of coins and modernizing the minting process by introducing the screw presses. In 1760s, production of two kinds of money started: copper

¹ 1717–1780, Archduke of Austria and Queen of Hungary (1741–1780) and Queen of Bohemia (1743–1780)

² 1741–1790, Emperer of the Holy Roman Empire 1765–1790, King of Bohemia and Hungary and Archduke of Austria (1765–1790)

³ mainly German, Hungarian, about 10 Slavic languages, Italian, French, Romanian, Dutch, and Flemish

⁴ different countries were united in the monarchy, crudely: the Austrian Hereditary Lands, the Lands of the Bohemian Crown, the Kingdom of Hungary, the Kingdom of Croatia, the Transylvania, the Austrian Netherlands, the Duchy of Milan, the Banat of Temeswar, the Kingdom of Galicia and Lodomeria, the Duchy of Bukovina, the Venetia, the Kingdom of Dalmatia

⁵ The War of the Austrian Succession (1740–48), the Seven Year's War (1754–1763), the War of Bavarian Succession (1778–1779), Austro-Turkish War (1787–1791), the Brabant Revolution (1789–1790), the French Revolution and Napoleon's wars (1792–1815)

coins (1760) and paper tenders, termed Banco-Zettels⁶, with nominal values 5, 10, 25, 50, and 100 guldens (released in 1762). In later releases (1771, 1784, and 1796), values of 500 and 1000 guldens were added. The first few releases of paper tenders were carefully regulated and they represented a welcome source of income for the state finances. This trend was interrupted in 1790s when a long period of wars was started with the French revolution and Napoleon, needing huge amounts of money for financing the military expenses. The rapid money production led to a cruel long-time financial crisis with permanent inflation and a big state bankruptcy in 1811⁷.

There are a lot of information on the financial crisis, state bankruptcy, and further inflation development in Austria. Among them, there is a 46-year long period of careful registration of cereals prices in a small part of Bohemia close to Český Brod. The data are from the memoirs of F.J. Vavák, Czech farmer in the small village of Milčice (Vavák, 1907–1938, 2009). It was shown (Rogers, 1866–1887) that the prices of agricultural products form a basis for prices of foods with a big social influence on the life in the country. This is the main hypothesis of this paper. The content of Vavák's memoirs was many times evaluated by Czech historians (e.g. Pekář, 1990), but there is still missing quantitative evaluation of many data given in the memoirs. The aim of this paper is to analyze Vavák's data on the cereal prices and illustrate different aspects and parts of the crisis period in Austrian society.

MATERIAL AND METHODS

Vavák's data refer to the price of one korec (Bohemeian Strich = 93.54 litres) of cereals on the coachmen market in Český Brod (about 20 km from the eastern border of Prague). The information on prices⁸ is irregular; in some years Vavák gave information nearly every month, in other cases the frequency of data is lower and in the year 1774 he recorded the information only once. Herein, the data for wheat, rye, barley, and pea are analyzed, while information on other products is not within the scope of this paper.

The prices are given in Guldens, the official Austrian money at that time. Our data, extracted from the Vavák's

memoirs (Vavák, 1907–1938, 2009), are given in Fig. 1. Fig. 1a includes annual means for all analyzed cereals; the values are given in the before-bankruptcy currency. The bars denote standard deviations for annual data. The ratio of the standard deviation to the corresponding mean value (coefficients of variation) was small for the years of low prices; in the period 1779–1786 it was about 10%. It increased mainly in the years of peaks (1771, 1790, 1805, and 1812) when it reached values above 30%. This increase was caused by the higher annual variations of the cereals prices, as it is shown in Fig. 2 for wheat. In the period of low stable cereal prices, the wheat price was nearly constant during the whole year of 1794 (Fig. 2). In periods of price changes, the highest prices were observed if the previous yield had not been high and it was clear that the new yield would be good. For example in 1805, the increase of the wheat price after the bad yield of 1804 was changed to decrease before harvest when a new better yield in August was expected. The observed peak of prices in 1805 was a source of higher price variability (i.e. higher coefficient of variation). In 1792, a price decrease was observed after the peak of 1790, when a better yield was expected for 1792.

The real market prices were influenced by the state bankruptcy in February 1811. The development of real market prices is illustrated by Vavák's data for wheat in Fig. 1b. The old and the new currency were changed⁹ with a ratio of 5 : 1 at that time¹⁰, but the price of wheat decreased immediately only to one half of the old price and increased quickly so that the new price in 1815 was higher than the old price of 1810. Thus, the financial problems of the Austrian Monarchy were not fully resolved by the state bankruptcy but they lasted for a long time¹¹ after 1816 when Vavák's record finished.

RESULTS AND DISCUSSION

Commodity prices

The prices of different kinds of cereals in Fig. 1a, b are very variable so that it is difficult to find some precise relation among them. Fig. 3 gives Relative Price

⁶ Oesterreichische Nationalbank, see Vencovský et al. (2005)

⁷ see note 6

⁸ the prices in guldens are given among the other information. The prices of cereals (wheat, rye, and barley) are more frequent, sometimes the price of pea is added. From time to time, the prices of potato, fruits, meat are also given. Sometimes Vavák gave also prices of some craft products on the market

⁹ see note 6

¹⁰ the inflation of the money supply reached big proportions in 1800 and 1806 (Fig. 1b). The reparation payments imposed on Austria in 1809 further deepened the inflation. In December 1810, the government imposed a moratorium on all payment obligations in coin. Just three months later, on February 20, 1811, Austria had to declare national bankruptcy. The Banco-Zettels and the Banco-Zettel divisional coins were to be exchanged (see note 6) for exchange coupons also referred to as "Vienna currency" at 1:5 ratio

¹¹ see note 6

Fig. 1. Development of cereals prices given in Vavák's Memoirs (the points denote annual mean values and the bars are standard deviations of the annual data) (a) graphical summary of data for all varieties (in currency before state bankruptcy in 1811 – prices are given in logarithmic scale); (b) data for wheat expressed in official currency (full symbols – data after the state bankruptcy in which the coins and Banco-Zettels were changed in 1:5 ratio)

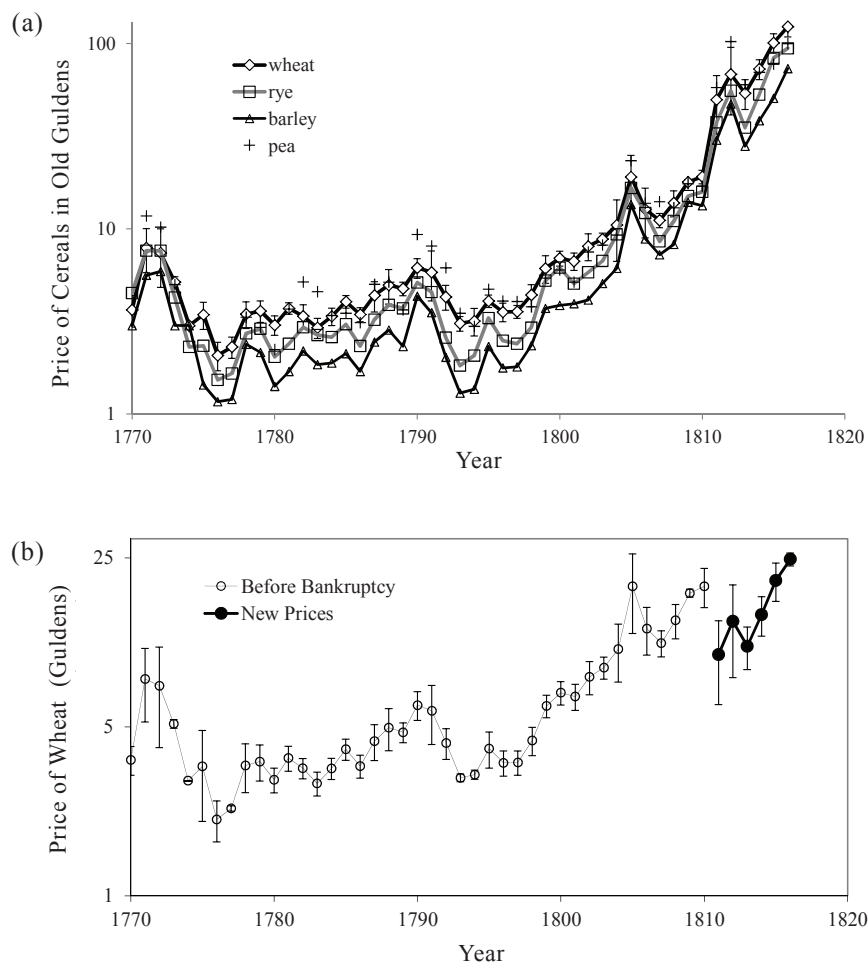
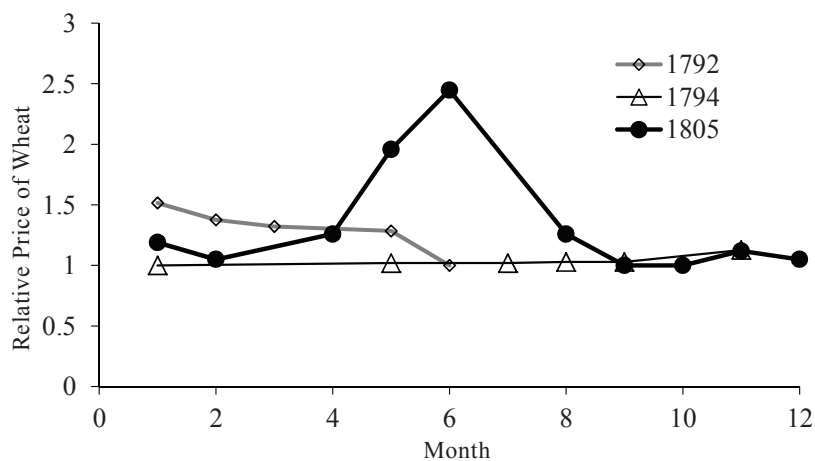


Fig. 2. Annual Relative Price of wheat ((actual wheat price – annual minimum wheat price)/annual minimum wheat price) plotted against time in the actual year



Difference (RPDs) based on price of wheat (PW) for rye, barley, and pea plotted versus time. RPD(X) for product X was calculated by the following formula:

$$RPD(X) = (PW - PX)/PW$$

where:

PX = price of product X

Fig. 3 shows that the calculated RPDs were very variable with the highest variability observed for RPD

of pea, which oscillates from negative to positive values so that its long-time mean value was approximately zero. Negative RPD values were very rare for rye (1770–1772) and they were not detected for barley. This means that the price of wheat was higher than the prices of rye and barley. Mean RPD values of 0.217 and 0.422 were found for rye and barley, respectively. These values gave a simple relation among mean values of the cereals prices:

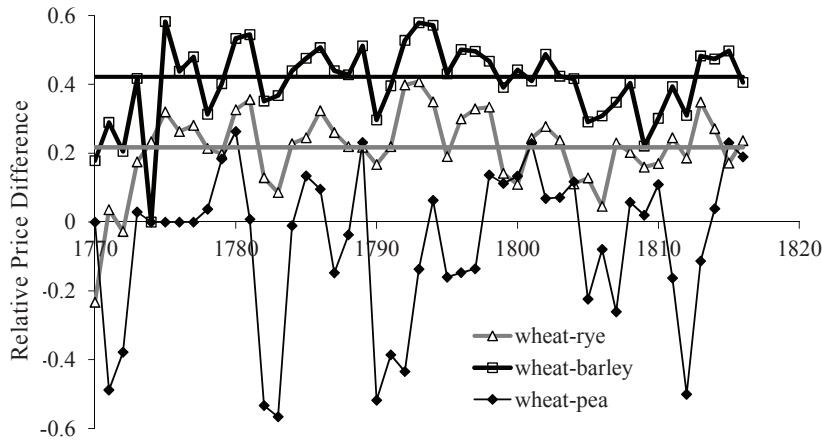


Fig. 3. Development of Relative Price Difference (RPD) for rye, barley, and pea (based on wheat) during the whole inspected period

$$PW \approx 1.217 \quad PR \approx 1.422 \quad PB$$

where:

PR = price of rye

PB = price of barley

The observed differences from the mean values are similar for rye and barley. The most important minima of the RPD curves in Fig. 3 were observed in the years 1770, 1783, 1790, 1805, and 1810.

The relatively stable RPD (at least among wheat, rye, and barley) allowed us to limit our analysis only to wheat, i.e. the cereal for which we had the most complete data. The price development of peas was a little different than the price development of the other cereals given by Vavák. This difference is difficult to explain; it could be caused either by the market needs or by the agronomic properties of pea in relation to the other cereals.

Price development and Gulden purchasing power

Trying to minimize the market differences between different products, we used a new parameter, termed RPP (Relative Purchasing Power), which was calculated by the following formula:

$$RPP = PC/PT$$

where:

PC = comparative price

PT = actual price

The comparative prices for all products were selected as the mean value of the actual prices in the period 1779–1783, where the prices of cereals were relatively stable even if the weather was not optimal¹². For wheat $PC = 3.35 \pm 0.08$ Gulden (the value given after symbol \pm is the standard deviation calculated

for the annual mean values). The same values for rye and barley were 2.57 ± 0.13 Gulden and 1.87 ± 0.06 Gulden, respectively. The RPP expresses the volume of the product that could be bought by the same amount of money as in the comparative period of 1779–1783.

The obtained RPPs for wheat are given in Fig. 4. The RPPs in the comparative period were approximately 1. Most of the actual values were lower than 1, indicating a decrease of the money purchasing power. The increase of the RPP above 1 indicates higher purchasing power than in the comparative period. Comparing Fig. 1 and Fig. 4, it is clear that, in agreement with the definition of RPP, the peaks from Fig. 1 correspond to negative peaks in Fig. 4. An increase of the price in Fig. 1 corresponds to a decrease of RPP in Fig. 4.

Figure 4a is related to the analysis of crop failures in the analyzed time period. The main failures are denoted by arrows. The first one in 1770–1771 started by a big crop failure in the very wet year of 1769 and it continued in the following years. A big famine followed the crop failure, in which more than 10% of the Bohemian population died of hunger and diseases (Pekář, 1991). The RSP of wheat fell down to 0.4 and only slightly increased, although the Bohemian market was supported by cereals brought from Hungary (Vavák, 1907). The market was restored in 1774 and continued with some small oscillations for about 10 years up to 1784. The period of stability was finished by the weather anomaly caused, similarly as elsewhere in the northern hemisphere, by the eruption of the Island volcano Laki in 1783 (Thorðarson, Self, 2003). The year 1784 was extremely cold and wet¹³. In 1785, a 6-year dryer period (1786 is an exception) set on with worse cereal yields. The worst value was reached in the last year of this period; in this year

¹² Vavák's information on weather and cereal yield: 1779 (spring frosts, drought, low yield), 1780 (medium yield), 1781 (drought, low yield), 1782 (spring frosts, drought, lower yield), 1783 (floods, medium yield)

¹³ Vavák describes the cold summer of 1784 when people put on warm clothes in July (Vavák, 1910)

the RPP for wheat fell down to 0.55. The first two thirds of the 1790s were years of market restoration with RPP close to 1 (the wet year of 1795 is rather an exception), but from 1797 to 1816, the final year of Vavák's data, the RPP was falling down. During this period, the falling down of RPP was steeper in the years of crop failure (wet years 1804–1805 and years with dry springs 1808, 1809, 1812, and 1813 – Vavák, 2009).

Fig. 4a shows that the main crop failures can be connected with the solar cycle: the failures at 1770–1771, 1789, and 1804 were located in decreasing parts of the solar cycles close to their maxima. This behaviour was not observed close to 1780 and for time above 1800 the solar cycle was deformed so much to check the rule. The years of crop failures are frequently also the years (1770, 1783, 1790, 1805, and 1810) with minimal value of RPDs for rye and barley (Fig. 3). It means that in the years of crop failures, the prices of rye and barley increased in relation to the wheat price. It could be caused by the market changes: at the time of a crop failure, the product quantity takes precedence over its quality. The crop yields strongly influenced the local market prices because of transport limitations on big

distances. It means the Vavák's data were influenced by the crop yields in Bohemia and especially in its part close to Prague. Even though very wet or dry periods, extreme frosts etc. caused cruel changes in the cereal yields in Bohemia and in its market, the crop market changes were generally reversible: the RPP after crop failure increased, returning approximately to the previous state. Such reversibility was shown by Vavák's data in the periods after the crop market crisis: market recovery in the middle of 1770's, in the beginning of 1790's, and just after 1805.

The role of local crop yields was very important for the local market prices, but there existed another source of the market balance: the monetary policy of state that was formed for the whole Austria in the distant Vienna. It was formed at that time mainly by the currency emissions. The arrows with numbers in Fig. 4b denote currency production (copper coins and paper Banco-Zettels). Whereas releases 1–4 were under control (Ingro, 2000, Vencovský et al., 2005), the releases 5 and 6 were prepared under the pressure to cover the war expenditures, including the war reparations to Napoleon's France. But the market credibility decreased soon after the 4th money release

Fig. 4. Development of Relative Purchasing Power (RPP) for wheat plotted versus time (a) the plot where the years with the main local crop failures are denoted by arrows and solar activity is given by month average of sunspot number (http://solarscience.msfc.nasa.gov/greenwch/spot_num.txt) divided by 100 – it is given by a characteristic oscillatory 11-year cycle; (b) the plot where the production of Banco-Zettels is denoted by arrows and number of release. Development of RPP for gold (Broverman, 2010) and official RPP after the state bankruptcy in 1811 (Vencovský et al., 2005) is also shown. I denotes period of loss of money credibility and hyperinflation

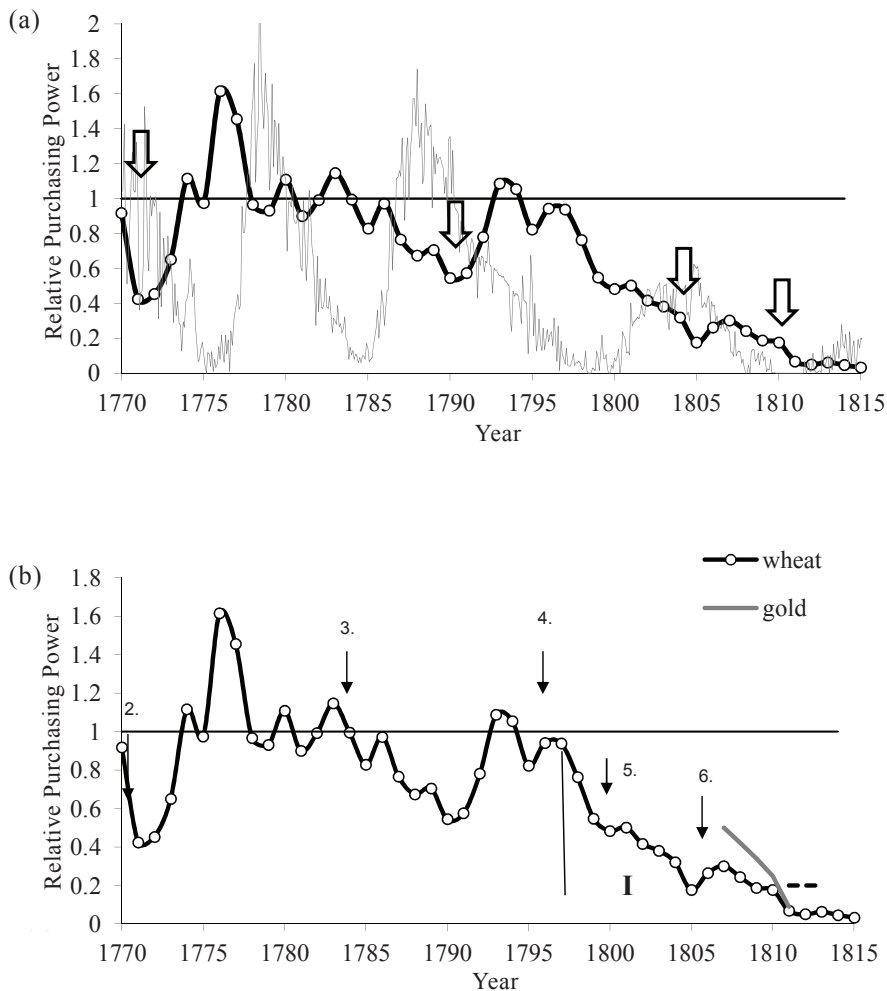


Table 1. Inflation analysis in four periods between 1797 and 1816

	1797–1799	1801–1804	1807–1809	1811–1816
RPP ₀	0.958	0.495	0.303	0.069
<i>i</i> (%/year)	30.9	15.5	26.8	18.7
R ²	0.983	0.983	0.997	0.830

RPP₀ = initial value of Relative Purchasing Power, *i* = inflation rate

in 1796 (Vavák, 1918). The period between the 4th and 5th releases was characterized by a depression of RPP to about 0.4. This is a lower value than by the RPP depression during the terrible crop failure of 1790. The country started to move from Panic to Crash (Kindleberger, 1990; Kindleberger, Aliber, 2005). The RPP depression caused by this inflation process was irreversible with the continuing inflation process similarly as in the present economics.

The inflation process was analyzed using RPP data as the representative information on Relative Purchasing Power in periods between crop failures. The basis of this analysis is the relation between RPP and time *t* under constant inflation rate *i* (Broverman, 2010):

$$RPP = \frac{RPP_0}{(1+i)^t}$$

where:

RPP₀ = parameter (initial value of RPP)

The results of the analysis are given in Table 1. The regression analysis used gave high coefficients of determination (R²): 0.83–0.997. The inflation rates between crop failures were determined between 16–31% per year indicating the bad state of the Austrian financial system be heading to bankruptcy in 1811 and further shocks of the Austrian financial system (Venčovský et al., 2005).

CONCLUSION

Vavák's data well demonstrate the development in the market and financial system in the Austrian Monarchy during the regency of Queen Maria Theresa, Emperor Joseph II, Emperor Leopold II, and Emperor Francis I (1770–1816). The annual mean values of the cereal prices (wheat, rye, and barley) can be used for this purpose. A higher variation in annual data was observed only in times of crop failures and was related to the role of the new harvests. There exist long-time relations among prices of the above-mentioned cereals (not such a relation was observed for pea). The market prices were influenced mainly by the crop failures and the state monetary policy. Whereas the influence of the objective causes, like the crop failures, had reversible character, the changes caused by the long-time inflation were irreversible.

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