Economic Crises in England, 1270-1520

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PEOPLE, MARKETS, GOODS:
ECONOMIES AND SOCIETIES IN HISTORY

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Economic Crises in England, 1270–1520: 
A Statistical Approach

MARK CASSON AND CATHERINE CASSON

Introduction

This chapter examines crises in the late medieval English economy from 1263 to 1520 using a statistical approach. Historians have identified crises in different ways. Some have suggested that a crisis is best defined as an event that contemporaries themselves thought of as a crisis. The subjectivity of this approach means, however, that different generations may use different criteria, so that crises at different times are not strictly comparable. An alternative is to assess crises in terms of their impacts, but the measurement of impact can also be problematic; for example, a crisis may have a substantial local impact but be insignificant nationally. Furthermore, crises may impact differently on different groups of people, for example, the rich and poor, landowners and labourers.

Statistical data can generate a more comprehensive chronology of crises.


than a collection of contemporary accounts. For England there are particularly extensive data-sets, derived from government administrative records, which historians have examined for fluctuations in previous literature.\(^3\) Annual statistical data are available on a range of economic variables, including prices, wages, output and money supply, as explained below. Time series for some variables go back as far as 1250.

One way of identifying crises from statistical data is to search for peaks and troughs. Identifying peaks and troughs is not so simple as it may appear, however. Peaks and troughs in time series data are defined with reference to the years before and the years after. A peak value over a decade is not necessarily a peak value over a century. One way of addressing this problem is to fit an equation to the data and assess peaks and troughs with reference to the fitted values.\(^4\) Crises are then assessed in terms of annual deviations from the fitted values. The ‘best fit’ line can be estimated by the method of least squares. This is the essence of the approach presented in this chapter: crises are identified by the deviations of economic variables from their fitted values.

When potential crises have been identified from statistical data, the crisis years concerned can be compared with crisis years identified in the secondary literature. The two lists can be matched up and discrepancies noted. The literature on the medieval English economy has identified a good number of crisis years, because different authors have used different criteria for identification purposes. An advantage of the statistical approach is that it provides a consistent analysis of crises based on explicit criteria applied to publicly available information. The judgements arrived at by statistical methods can therefore be independently verified. Furthermore, the criteria can be adjusted to ensure that only a limited number of crisis years are identified over any given period, allowing the researcher to focus their attention on the most critical situations.

Existing historiography on crises in medieval England has tended to be fragmented, with crises often examined largely in isolation from each other and sometimes examined using separate sources of evidence.\(^5\) This chapter

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\(^4\) A simple example of fitting an equation to data is to draw a straight line through a scatter diagram in such a way that the sum of the squares of the distances of the points from the line is as low as possible. The methods described below generalise this simple principle to more complex situations.

examines the presence of crises in a set of annual observations on prices, wages, output, money supply, population and crop yields. These time series were selected because there is already an established tradition of using some of them in order to identify crises, and because they cover different aspects of economic activity. For statistical reasons all the variables except crop yields are measured in logarithms.

It would be possible to analyse these variables separately, looking first at prices, say, and then at wages, and so on. Many of these variables are closely related, however, for example, prices are correlated with wages and money supply. This chapter analyses all the variables together. It uses a simultaneous equation model of the medieval economy, which comprises three separate equations: a price equation, an output equation and a wage equation. According to this model, prices depend on wages, output and money supply, wages depend on prices, and output depends on prices and wages. There is two-way causation: for example, prices depend on wages while wages depend on prices. Where there is two-way causation, lags are used to identify the separate effects. For example, the model postulates that prices depend on the previous year’s wages and wages depend on the previous year’s prices. This means that the impact of wages on prices can be inferred from the correlation between current prices and past wages, while the impact of prices on wages can be inferred from the correlation between current wages and past prices.

The methods used to fit the model from the data have been published elsewhere. Because of the lags, the model has a recursive structure, and this allows each of the three equations (for prices, output and wages) to be estimated independently of each other without any bias. The price equation is adapted from the price equation used by Mayhew. Simultaneous equation models have been widely used for forecasting modern economies, but this model is the first of its kind to be applied to the medieval economy, so far as the authors are aware. Similarly, this is the first attempt to use the residuals from a simultaneous equation model to identify historical crises in either the medieval or modern periods.

Sources of data

Before considering the methods used to analyse the data in detail, it is useful to consider the background to the data being used. The start date of 1263 was chosen because it is the earliest period when continuous runs of annual data are available, while the finishing date of 1520 immediately precedes the take-off of Tudor price inflation.8

Price and wage data for the study came from Allen’s price and wage indices, which are nominal sterling values expressed in logarithms.9 The process of auditing steward’s accounts on the great ecclesiastical and monastic estates generated a large amount of regionally representative information on prices and crop yields. Wage information for skilled workers is recorded in the financial accounts of cathedral building and castle building. In the case of the wage data, missing observations were interpolated by Allen.

Price evidence suggests that a long period of stability from the time of the Norman Conquest (and possibly earlier) was succeeded by a rise in prices in the period 1170–1300.10 There were several spikes in prices between 1300 and 1348, although from 1320 the underlying trend was downward. Prices are graphed against time in Figure 3.1. The top dashed line shows the actual level of prices, while the bottom solid line shows their deviation from a linear trend, which was fitted by the method of least squares. The scale of prices is shown on the right-hand axis, and the scale of the deviations on the left-hand axis. Prices can be negative as well as positive because they are measured in logarithms. Deviations are negative when the actual value is below trend. Prices rose in 1348–69, and then began a further decline between 1370 and 1500, after which an upward trend resumed, which continued well into the sixteenth century. Prices spiked in 1438 and slumped 1439–72, which is generally regarded as a period of trade depression.11

The money-supply data is measured by the stock of coin, estimated from the accounts of mints, supplemented by information from recoinages and hoards. Mint accounts provide information on issues of new coin, while recoinages provide direct information on stocks, and hoards provide estimates of the physical depreciation of the stock. This chapter uses Mayhew’s recent

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Figure 3.1. Prices (in logarithms), 1264–1520: level and deviations from mean

Figure 3.2. Silver coin stock (in logarithms), 1264–1520: level and deviation from trend
annual stock series for silver and gold coin, for 1220–1750. The silver stock is graphed in Figure 3.2 and the gold stock in Figure 3.3. As before, the actual levels are shown by the top dashed line, and the annual deviations from trend shown by the lower solid line.

Sterling coinage was exclusively silver until 1344. Thereafter the stock of gold coinage grew rapidly until 1370, and then declined, 1370–1411. In the meantime the stock of silver coinage increased between 1250 and 1310, when it began a rapid decline, 1310–1412, punctuated only by a brief recovery, 1350–56. By 1412 silver was less than 20 per cent of the gold stock (in nominal sterling value). The gold stock peaked in 1424, declined to 1463, and then slowly increased between 1463 and 1520. The silver stock also recovered, quickly at first, and then more slowly, 1412–1520.

In this study the output variable is GDP (gross domestic product) per head. This is derived from estimates of GDP compiled by Broadberry, Campbell, Klein, Overton and van Leeuwen from a variety of sources, including crop yields from manorial accounts and trade flows from customs accounts. GDP

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13 Stephen Broadberry, Bruce Campbell, Alexander Klein, Mark Overton, Bas van Leeuwen, British Economic Growth, 1270–1870: An Output Based Approach, London School of
is calculated at constant prices using modern procedures for national income accounting, and this allows the series to be linked to existing post-1750 series. The output series is graphed in Figure 3.4. It shows a strongly rising trend. The most significant period of growth is after the Black Death, 1350–1420. The volatility of output tends to fall over the period, the most volatile period being before the Black Death.

Population data is a difficult data-set to establish for the medieval period, as there was no equivalent to a census, and the alternative potential sources of taxation lists and muster rolls are available only for selected years. It is also difficult to establish mortality rates from epidemics of disease from the available sources. As a result, there is a wide margin between ‘high’ and ‘low’ estimates of medieval population, even though there is often broad agreement over whether population was rising or falling at any given time. The population series comes from the same source as the output series, and represents just one possible interpretation of the available evidence. Its most striking feature is the
Figure 3.5. Wage (in logarithms), 1264–1520: level and deviation from trend

Figure 3.6. Crop yields (index for barley, wheat and oats), 1270–1470: level and deviation from deterministic trend line
sudden fall in population at the time of the Black Death. This was followed by continued decline in the century 1350–1450, when slow growth resumed.

Wages are graphed in Figure 3.5. This gives an impression of wage rigidity which may be false. Interpolation means that if the wage level is similar at the beginning and end of a period then, in the absence of intervening observations, it is assumed to be constant throughout. Other wage series suggest greater volatility, but these rely on very small numbers of observations in intervening years, and so may reflect, not underlying variation, but random error. Periods of rigidity are interspersed with occasional periods of dramatic change. This is consistent with inertia due to custom or regulation, which occasionally breaks down under the pressure of long-run market forces. The evidence suggests that there were two main wage regimes: a low-wage regime at the beginning and end of the period, 1264–1300 and 1465–1520 respectively, and a high-wage regime, 1310–35 and 1364–1463; the main exception is a temporary but substantial drop in wages, 1336–60.

Crop yields are derived from a database compiled by Campbell, which draws upon various regional studies of manorial accounts. The data comprise an index of yields for three key crops, barley, wheat and oats, 1270–1470, supplied by the author. They are graphed in Figure 3.6. Crop yields are the most volatile of the time series (high variance and low autocorrelation) and exhibit a downward trend. They are relatively high in 1264–1315, but then erratic 1315–48, with bad years in 1315–17 and 1321 and very good years in 1333 and 1338. Crop yields fall after the Black Death, but recover between 1376 and 1395, before declining, 1396–1438. There are further good years in 1458 and 1463.

**Statistical methodology: identifying a crisis**

In the simultaneous equation model the three variables explained by the three regressions – namely price, output and wages – are used as crisis indicators. A large deviation from the fitted value of any one of these variables is a potential indicator of crisis. Positive and negative deviations may signify different types of crisis, however. Consider inflation and deflation, for example. Inflation may signify a shortage of consumer goods, perhaps as a consequence of failed harvests. On the other hand, it could also signify a boom caused by an increase in credit and consequent shortage of building materials. Similarly, deflation could signify a depression in which labour is laid off and unemployment results. On the other hand, deflation could arise from a good harvest and an abundant supply of consumer goods.

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When interpreting price deviations, historical context matters. In a modern industrial economy, deflation is often regarded as a symptom of depression, caused by falling demand for consumer goods, rather than as the beneficial effect of a good harvest. Similarly, inflation is associated with boom and prosperity, rather than with famine due to a bad harvest. It is essential to bear in mind that the dynamics of an agricultural economy dependent mainly on short-term credit are different from an industrial economy dependent on long-term finance. Where output is concerned there is less ambiguity, however. Crisis is likely to be associated with low output rather than high output. In an agricultural economy low output is likely to be associated with low crop yields, but in an industrial economy it is more likely to be associated with low consumer confidence. In an agricultural economy, a combination of deflation and high output may be regarded as a symptom of a good harvest, whereas a combination of deflation and low output could be a symptom of genuine economic crisis due, for example, to the export of coinage in a foreign war. On balance, in a medieval context it is appropriate to consider inflation as the more likely indicator of a crisis, but crises involving deflation certainly cannot be ruled out.

The wage data used in this study relate mainly to regulated wages set by administrators or by guilds, and therefore do not directly reflect the short-run state of the labour market. Wage changes may reflect several years
of cumulative change that have finally attracted administrative intervention. In this context the most plausible symptom of crisis is a reduction in wages, for example, to reduce unemployment and make goods cheaper, although it is possible, at least in theory, that an increase in wages might be administered in an attempt to quell social unrest.

To identify potential crises in any year it is necessary to compare the deviations of each of the three variables with some critical value. The critical value needs to be small enough that significant deviations can be found, but large enough that not every deviation suggests a crisis. An appropriate criterion is that the deviation should exceed two standard deviations, as calculated from an appropriate estimate of variance. The relevant variance can be estimated from the variance of the actual data around the fitted values. When the distribution of deviations is approximately normal, on average the deviations in about 2.5 per cent of years will appear as significantly positive, and in another 2.5 per cent of years as significantly negative. Thus potential crises will appear in either 2.5 or 5 per cent of years, depending on whether significant deviations must be either positive or negative, or can be both.

Statistical methodology: stochastic trends

There are two main kinds of trends: deterministic and stochastic. A deterministic trend is exemplified by the linear trend shown in Figure 3.1. To estimate a linear trend a variable is regressed against time and the deviations calculated from the residuals. A stochastic trend emerges when a variable depends on its own history, that is, on its own previous values. In the simplest case, the value of the variable depends just on its value in the previous year (one-year autoregression). In more complicated cases it may depend on values in much earlier years as well; in practice, however, it is not usually helpful to go back further than three years, because it becomes difficult to disentangle the effects from different years.

Where stochastic trends are present there will be autocorrelation in the residuals from a fitted linear trend. Careful examination of Figure 3.1 shows that when the deviation from trend is negative in one year it is likely to be negative in the next, and similarly for positive values. Over the period 1264–92, for example, all the residuals are negative, while over the later period 1312–25 they are all positive. Figure 3.7 introduces a stochastic trend as well. It shows the results of regressing price against time and against its own previous value. Regressing against time eliminates the deterministic trend (as in Figure 3.1), while regressing against previous price eliminates the stochastic trend.

Table 3.1. Estimates of the price regression, showing the effects of introducing additional explanatory variables

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<td>Constant</td>
<td></td>
<td>–0.225*** (0.000)</td>
<td>–0.050*** (0.006)</td>
<td>–0.049*** (0.002)</td>
<td>–0.404* (0.076)</td>
<td>0.586* (0.086)</td>
<td>–0.563* (0.179)</td>
<td>–1.486*** (0.001)</td>
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<td>–0.052*** (0.000)</td>
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<td>–0.070*** (0.000)</td>
<td>–0.011* (0.089)</td>
<td>–0.040* (0.089)</td>
<td>–0.150*** (0.000)</td>
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<tr>
<td>Price lagged 1 year</td>
<td></td>
<td>0.767*** (0.000)</td>
<td>0.933*** (0.000)</td>
<td>0.924*** (0.000)</td>
<td>0.916*** (0.000)</td>
<td>0.782*** (0.000)</td>
<td>0.601*** (0.000)</td>
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<td>–0.341*** (0.000)</td>
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<td>–0.199*** (0.008)</td>
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<td>Price lagged 3 years</td>
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<td>0.168*** (0.003)</td>
<td>0.166*** (0.004)</td>
<td>0.166*** (0.001)</td>
<td>0.065* (0.273)</td>
<td>0.012* (0.389)</td>
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<td>–0.236* (0.259)</td>
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<td>Wage lagged 1 year</td>
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<th>$R^2$</th>
<th>0.598</th>
<th>0.842</th>
<th>0.852</th>
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<td>Adjusted $R^2$</td>
<td>0.597</td>
<td>0.841</td>
<td>0.850</td>
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<tr>
<td>F</td>
<td>379.6***</td>
<td>676.7***</td>
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<td>87.6***</td>
<td>75.7***</td>
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<td>186.4***</td>
<td>8.1***</td>
<td>4.9***</td>
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<td>Heteroscedasticity</td>
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<td>9.9***</td>
<td>4.4***</td>
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<td>(0.002)</td>
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<td>No. observations</td>
<td>257</td>
<td>256</td>
<td>254</td>
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Note: * indicates 10 per cent significance, ** 5 per cent significance and *** 1 per cent significance. Prices, GDP, money stock, wage and population are all measured in logarithms. White robust standard errors. Normality of the residuals is tested using a Jarque–Bera test. Serial correlation is tested using a Breusch–Godfrey LM test based on an $F$-statistic with two lags. Heteroscedasticity is tested using a Breusch–Pagan–Godfrey test based on an $F$-statistic. These estimates are based on data as collected by the authors from the originators on or shortly before 1 October 2013. Some of the data series may have been revised since then. For further details, see Casson and Casson, ‘Modelling the Medieval Economy’.
Comparing Figure 3.7 with Figure 3.1 shows that including a stochastic trend produces a much better fit; the variance of the residuals is much reduced, and their pattern is very different, because they change sign with greater frequency.

The relevant price regressions are shown in Table 3.1. The first column illustrates the estimation of a deterministic linear trend. The second column includes a stochastic trend based on a one-year lag. The third column includes a stochastic trend based on lags of up to three years. The inclusion of a one-year price lag raises $R^2$ (the proportion of the variance that is explained by the regression) from 0.598 to 0.842, but the inclusion of two additional lags increases it by only a small amount, to 0.852.

The importance of stochastic trends may be explained by the persistence of shocks. Suppose that there is a good harvest, for example. With a relatively stable population, demand remains unchanged but supply increases, and so prices will fall. Faced with lower prices, farmers may withhold some grain as seed, while speculators may buy up grain, to store for human or animal consumption in the following year. As a result, supply will be high in the following year as well, so that, other things being equal, low prices will persist. Prices may therefore exhibit inertia; according to the model, however, this inertia is due, not to institutional rigidity in the market, but rather to price adjustments that encourage speculative storage.

Statistical methodology: causation

Once the effects of persistence have been eliminated, further analysis can be carried out to ascertain the causes of shocks and so, by implication, the causes of crises. Inflation was identified above as an important symptom of crisis. According to the Quantity Theory of Money, inflation can be caused by an increase in the money supply. In this case deviations in price will be correlated with changes in money supply. If price deviations are regressed on money supply, the influence of money supply in generating crises can be determined. The residuals from this regression can then be used, in turn, to assess whether additional factors affect crises.

A simple test of the Quantity Theory is reported in column 4 of Table 3.1, where money supply is introduced into the regressions. Results for silver coinage and gold coinage are reported separately, since the two metals may have different roles. For example, when silver is the main circulating medium, and gold acts mainly as a store of value, silver will tend to have a greater impact on prices than gold. A dummy variable is also introduced to allow for unobserved foreign gold in circulation prior to the introduction of sterling gold coin in 1344. The results reported in this column suggest that neither silver nor gold has a major influence on price.
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<td>1264–1520</td>
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<td>(0.318)</td>
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<td>0.896***</td>
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<td>−0.002</td>
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<td>(0.242)</td>
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<td>Economic crises in England, 1270–1520</td>
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| Wage change lag 2 | 0.237 | -0.014 | 0.005 | -0.681*** | -0.018 | -0.021 |
|                  | (0.506) | (0.853) | (0.910) | (0.045) | (0.772) | (0.681) |
| Crop yield       | -0.237*** | 0.074 | -0.001 |
|                  | (0.000) | (0.000) | (0.788) |
| Crop yield lag 1  | -0.018 | -0.055 | -0.003 |
|                  | (0.635) | (0.000) | (0.699) |
| Crop yield lag 2  | -0.006 | -0.000 | -0.004 |
|                  | (0.868) | (0.986) | (0.475) |
| Crop yield lag 3  | -0.033 | -0.007 | 0.007 |
|                  | (0.147) | (0.425) | (0.162) |

| R²                | 0.895 | 0.943 | 0.949 | 0.870 | 0.973 | 0.940 |
| Adjusted R²       | 0.884 | 0.941 | 0.947 | 0.849 | 0.971 | 0.935 |
| F                 | 87.0*** | 359.5*** | 402.4*** | 42.0*** | 424.6*** | 186.0*** |
|                  | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Normality         | 28.2*** | 17.2*** | 6,063.0*** | 28.7*** | 27.7*** | 2,453.4*** |
|                  | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Serial correlation| 0.198 | 0.581 | 3.466** | 0.9 | 5.0*** | 5.0*** |
|                  | (0.821) | (0.560) | (0.033) | (0.409) | (0.008) | (0.008) |
| Heteroscedasticity| 1.584 | 1.997** | 0.804 | 0.9 | 1.0 | 0.7 |
|                  | (0.055) | (0.030) | (0.636) | (0.192) | (0.428) | (0.816) |
| No. observations  | 237 | 249 | 194 | 183 | 194 | 194 |

Note: For notes on estimation methods and diagnostic tests, see Table 3.1. The correlations between the residuals 1264–1520 are as follows (probability values in brackets): price–income: 0.000 (1.000); price–wage: 0.265 (0.000); wage–income: 0.014 (0.834). For 1270–1470 the correlations are: price–income: 0.000 (1.000); price–wage: 0.329 (0.000); wage–income: 0.010 (0.891).
The Quantity Theory has other implications. With a constant velocity of circulation and a given money stock, the total value of annual transactions will be constant too, and this implies that high levels of GDP are associated with low prices, and vice versa. In the short run, high GDP could result from high output (high GDP per head) and in the long run from high population. Output and population can be included in the regression analysis; the theory predicts that high output and high population will both reduce prices. The results are shown in column 5 of Table 3.1. The negative impact of output is strongly supported, but the influence of population is weak, though of the expected sign. Note that the gold stock (but not the silver stock) now becomes significant once income is included in the regression.

One of the key assumptions of the Quantity Theory is that wages are flexible, so that the labour market can adjust to maintain full employment. But, as shown above, there is some evidence of rigidity in money wages. In this case the level of wages could influence the level of prices. Column 6 shows the effect of including wages in the regression. Wages are highly significant and have the expected effect: higher wages lead to higher prices in the following year. When wages are included, however, it appears that silver rather than gold influences prices.

Bad harvests are another explanation of inflation. Bad harvests may be the result of low crop yields. The effects of low crop yields may already be reflected in estimates of GDP; it is possible, however, that they have an independent effect as well. This is corroborated by the results in column 7, which show that low crop yields significantly increase prices. The inclusion of crop yields makes output insignificant, suggesting that agricultural output may be a more important determinant of prices than other forms of output.

Results from the simultaneous equation model

The simultaneous equation model is estimated both with and without crop yield data. Without crop yield data the period covered is 1264–1520, and with crop yield data it is 1270–1470. Both sets of results are reported in Table 3.2. The system generates three sets of residuals that are used in combination to analyse crises.

Potential crises are identified by one or more of the following symptoms occurring in any given year:

- Inflation or deflation: large positive or negative price residuals.
- Low output: large negative output residuals.
- Very high or very low wage: large wage residuals.

The results are analysed in three parts. The first part concerns just the price regressions, and is based on Table 3.3. This table is derived from Tables
3.1 and 3.2. It indicates, for each regression, the years in which inflation or deflation was more than two standard deviations from its predicted value. It shows how the years of significant deviations change as more explanatory variables are entered into the regression. Significant deviations from the mean are identified in column 1. The information in columns 2–8 is derived from Table 3.1 and the remaining information in columns 9 and 10 is derived from Table 3.2. The final column (column 10) contains all the explanatory variables used in this study.

The results may be summarised as follows:

- In 1309 unexplained inflation is identified once output and population effects are controlled for. It disappears again, however, when wages effects are introduced, and reappears after crop yields are introduced. Inflation is also identified in the final regression where crop yields are included. It was a year of good harvests but, even so, prices were well above their predicted level.

- The Great Famine is also a period of unexplained inflation. Although bad harvests lead to inflation, inflation in these years was even higher than expected. Crop failure began in 1315, became worse in 1316, but diminished somewhat in 1317. Unexplained inflation is higher in 1315 than 1316. There are signs of inflation in 1314, the year before the famine, suggesting that other forces besides famine may have been at work. Although inflation continued until 1317, this appears to have been due to persistence rather than to any new inflationary shock.

- The year 1321 also witnessed poor harvests, and once again there is unexplained inflation. The experiences of 1315–16 and 1321 suggest that prices may respond non-linearly to crop failure. This is consistent with the view that stock-piling and panic buying may have exacerbated problems. On the other hand, it could be simply that starving people became desperate for food.

- Prices fell in 1322, when harvests returned to normal, but not so quickly as might be expected. This could be because precautionary stocks of foodstuffs had been run down the previous year and needed to be replenished.

- The year 1330 shows some symptoms of high inflation, but the regression results do not suggest any obvious explanation.

- According to the full regression, prices in 1333 did not fall by as much as might be expected, given the very good harvest that year.

- In 1339, a year of bad harvests, there is some unexplained inflation, but this disappears once exceptionally low output is allowed for.

- The years 1350–51, in the aftermath of the Black Death, also witness unexplained inflation. The effect disappears in 1350 once low crop yields are controlled for, but not in 1351. In 1351 wage increases contribute to inflation.
Table 3.3. Significant residual variation in the annual money price level, analysed according to the number of explanatory variables included in the regression.

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Note: A significant variation is more than double the standard deviation of the residuals from the conditional mean (predicted value) of the relevant estimated regression. X indicates that estimated residuals are not available for the year in question.
There is a run of bad harvests in the period 1367–69, and this culminates in unexplained inflation in 1369. It is possible that destocking occurred in 1367–68, which helped to maintain price, and that there was a sharp jump in 1369 when reserves finally ran out. This is consistent with the view that each year people were expecting a better harvest, but that this did not materialise until 1370, which was too late.

There is evidence of inflation in 1400 once wage impacts are allowed for. This may have been linked to political uncertainty surrounding the deposition of Richard II.

The year 1408 marks the start of a run of poor harvests. Unexplained inflation appears when controlling for three-year price persistence, continues when monetary factors are introduced, but disappears when income is introduced.

There is unexplained inflation in 1428, although it is weaker when wage impacts are allowed for.

In 1437 there is unexplained inflation when controlling for three-year price persistence, but this disappears once monetary factors are introduced. There is much stronger evidence for inflation in the following year, however. These are two consecutive years of bad harvests.

The second part of the analysis concerns the results of the three-equation system, which are presented in Table 3.4. The focus is now on low output and on any significant change in wages. Since the aim is to identify additional years of potential crisis, years already discussed are not mentioned again. There are three years with significantly low output but no significant price effects, 1283, 1374 and 1432, and no fewer than nine years with significant changes in wages and no significant price effects: there are wage increases in 1301, 1305 and 1312, reductions in 1338 and 1341, increases in 1351, 1361 and 1403, a reduction in 1412, an increase in 1413 and a reduction in 1464.

There were poor crop yields in both 1283 and 1374, but output was still low in 1283 even when controlling for crop yields. In 1374, however, low output seems to be explained by low crop yields. In 1432 output was low even though crop yields were normal. Thus 1283 and 1432 appear to be the main years of potential crisis.

Because of the fragmentary nature of wage evidence, it may be misleading to treat each year of significant wage change as if it represented a separate crisis. There is a clear pattern of increases over the period 1301–12, decreases 1338–41, increases in 1361, and volatility 1403–13. All of the wage changes are significant before crop yields are controlled for, but when controlling for crop yields only four are significant: in 1338, 1361, 1403 and 1412. Since none of these wage changes are associated with unexpected price changes, they may be due, at least in part, to administrative action rather than to economic adjustment.
The final stage is to identify a short list of potential crisis years, and examine the events that occurred in these years. Table 3.5 lists the years selected for special study, and some of the most prominent events associated with them.

Internal disputes between the crown and the nobility provide the context to the possible crises in 1309 and 1321. The reign of Edward II is especially identified by historians of fourteenth-century England as one of crisis, and these results therefore correspond with that historiography. The key issue for Edward II’s contemporaries was the favouritism that he displayed towards certain individuals, notably Piers Gaveston and the Despencers.17 This was eventually to contribute to his deposition by Queen Isabella and Roger Mortimer.

Domestic wars have been identified as another potential source of crises by political historians. Table 3.5 shows that domestic wars have a relatively modest impact. The Welsh wars of Edward I, the Scottish wars of Edward III, and the Wars of the Roses do not seem to have precipitated any economic crises. The main exception is relatively tenuous; the defeat of Hotspur in the Welsh wars occurred in the crisis year of 1403. In addition, significant inflation occurred in 1438, the year of an Anglo–Scottish truce, but the impact is the opposite of what would be expected from cessation of war. The lack of significant impacts of the Wars of the Roses in particular supports recent historiography in the field. While earlier analysis of the Wars tended to see them as protracted and bloody, more recent assessments have emphasised the gaps in the fighting and seen the battles as interspersing peace, rather than peace being only occasional.18

Foreign wars appear to be more significant than domestic wars. The crises in 1338–39 follow the start of the Hundred Years’ War with France in 1337 while the crisis of 1369 occurs when Edward III resumed the title of King of France.19 A sharp reduction in wages in 1412 coincides with Henry IV abandoning Burgundy while inflation in 1428 coincides with the assault on Orleans.

Moving on to consider economic factors, the Great Famine and the Black Death both feature, but it is interesting to note the specific years that appear. For the Great Famine the major years of crop failure are included, but years when diseases of sheep and cattle were rife do not.20 For the Black Death,

Table 3.4. Significant residual variation in prices, output and wages in a simultaneous equation model, including a comparison between estimates for 1264–1520 that exclude crop yield variation and for 1270–1470 that include crop yield variation

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**Note:** See notes to previous table. ‘Income’ signifies GDP per head, and ‘wages’ signify the money wage rate. Output deviations in 1406 and 1407 have been removed from the table because it is possible that they result from errors in the data.
Table 3.5. Possible crises in the late medieval English economy

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<td>Edward I calls two provincial councils, at York and Canterbury</td>
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<td>Selective evidence of inflation</td>
<td>Edward I dies in 1307. Piers Gaveston, favourite of Edward II, returns to England from exile</td>
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<td>1315</td>
<td>Significant inflation (even allowing for variation in crop yields). Reduction in output due to low crop yields</td>
<td>Start of the Great Famine. Major rainfall and flooding. Ordinances make the barons the administrators of the royal revenues</td>
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<tr>
<td>1316</td>
<td>Inflation (before adjusting for persistence). Reduction in output due to low crop yields</td>
<td>Continuation of the Great Famine</td>
</tr>
<tr>
<td>1321</td>
<td>Selective evidence for inflation. Reduction in output due to poor crop yields</td>
<td>The final year of the Great Famine. Political unrest between Edward II and the nobility as the king’s favourites, the Despencers, are banished, but only to be recalled in 1322</td>
</tr>
<tr>
<td>1338</td>
<td>Some evidence of price deflation. Reduction in wages</td>
<td>The Hundred Years’ War with France begins in 1337</td>
</tr>
<tr>
<td>1339</td>
<td>Selective evidence of price inflation. Reduction in output (not due only to poor crop yields)</td>
<td>Edward III invades France, defeats the French at Sluys, and makes a treaty with Philip VI of France. Instability in the wool export trade</td>
</tr>
<tr>
<td>1350</td>
<td>Inflation (after allowing for persistence) and increase in income (after allowing for crop yield variation)</td>
<td>Black Death (1348–49)</td>
</tr>
<tr>
<td>1351</td>
<td>Inflation and wage increases</td>
<td>Statute of Labourers</td>
</tr>
<tr>
<td>1361</td>
<td>Significant wage increase</td>
<td>Plague reappears. Justices of the Peace Act</td>
</tr>
<tr>
<td>1369</td>
<td>Significant inflation</td>
<td>Edward III resumes the title King of France. Charles V declares war on England. Anglo–Scottish truce</td>
</tr>
<tr>
<td>1374</td>
<td>Low output</td>
<td>Dancing mania in Europe. Edward III dies in 1377</td>
</tr>
<tr>
<td>Year</td>
<td>Event Description</td>
<td>Notes</td>
</tr>
<tr>
<td>------</td>
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<td>-------</td>
</tr>
<tr>
<td>1400</td>
<td>Inflation after adjusting for wage impacts</td>
<td>Richard II is murdered, after being deposed the previous year by Henry IV. Welsh Rebellion, led by Owain Glyndŵr, begins, lasting until 1415. Henry IV suppresses a rebellion of the barons. Prosperity in the cloth export trade.</td>
</tr>
<tr>
<td>1403</td>
<td>Wage increase</td>
<td>King Henry IV defeats ‘Harry Hotspur’ (Henry Percy) at Shrewsbury.</td>
</tr>
<tr>
<td>1412</td>
<td>Sharp reduction in wages</td>
<td>Henry IV abandons Burgundy and allies with Orleans in the Hundred Years’ War. Arundel is appointed Chancellor and the Prince of Wales removed from the Council. Henry IV dies the following year.</td>
</tr>
<tr>
<td>1428</td>
<td>Inflation, and reduction in output after allowing for crop yield variation</td>
<td>Assault on Orleans in the Hundred Years’ War with France.</td>
</tr>
<tr>
<td>1432</td>
<td>Low output</td>
<td>An uneventful year.</td>
</tr>
<tr>
<td>1438</td>
<td>Significant inflation</td>
<td>Anglo–Scottish truce for 14 years.</td>
</tr>
<tr>
<td>1446</td>
<td>Low output</td>
<td>An uneventful year.</td>
</tr>
</tbody>
</table>

Note: The terms ‘increase’ and ‘reduction’ must be interpreted in the context of the residuals analysis. ‘Increase (decrease)’ signifies a positive (negative) residual exceeding two standard deviations from the predicted value.
inflation appears in the years after the Black Death, rather than the years of
the plague itself.

The connection between the Black Death and inflation is not so straight-
forward as may appear. Although the Black Death diminished the supply of
agricultural products, it diminished the demand as well; the fall in population
that reduced the labour supply also reduced the number of mouths to be fed.
If the balance between demand and supply remained unchanged then there
is, in principle, no reason for prices to change as well. If the money supply
remained roughly constant, however, while output fell, then the Quantity
Theory of Money would predict an increase in price. If monetary factors
impacted with a lag, then this would explain the lag in inflation. Another
reason for the lagged response could be long-term disruption to the market
system, caused by the death of so many merchants and the disorganisation of
civic and manorial life.

Apart from the Black Death, monetary factors seem to have had little effect.
The stocks of silver and gold are of limited significance in the regression
equations, and the dummy variable for the introduction of gold coinage in
1344 is mostly insignificant too. There is an unexplained increase in the wage
in 1301, following the partial recoinage of 1299–1301, but this disappears
once crop yields are allowed for; the direction of change is unusual too, as
improvement in the quality of the currency would be expected to reduce the
wage. Trade policy too appears to have little effect. There is no discernible
crisis in either 1275, when Edward I introduced the ‘Ancient custom’ on wool
(a tax on wool exports), nor in 1347 when the ‘cloth custom’ was introduced
(although the effects of the latter may be masked by the Black Death).

Other events are also notable for their absence. The Good Parliament of
1376, which saw parliament refuse Edward III’s requests for direct taxation
and a lay subsidy, does not appear as a crisis. This is perhaps because its
decision, while a serious attack on Edward III’s authority at the time, was
reversed the following year.21 The Peasants’ Revolt of 1381 does not appear
to have caused a crisis. While earlier historiography on the Revolt considered
it to be widespread across England and perceived it to have long-term conse-
quences, there has been a move towards down-playing the scale of the Revolt
and its long-term significance.22 The results of this chapter tie in with the
view that the Revolt was not a major crisis.

22 Hilton, ‘Introduction’, p. 3; Hilton, Bond Men; M. McKisack, The Fourteenth Century
Conclusions

This chapter has shown that crises identified directly from statistical data correspond with some, but not all, of the events identified as crises in the established historiography. Both economic and political events feature in the results.

In terms of economic events, the timing of the impacts of the Great Famine and the Black Death is somewhat different from what might have been expected. Certain years of the Great Famine appear in the results, but not all. Meanwhile the immediate aftermath of the Black Death appears more prominently in the results than the high point of the disease itself. For political events, meanwhile, it can be seen that internal disputes between the crown and the nobility correspond with a number of the crises identified in the statistical analysis. In particular the results lend support to the concept of crises in the reign of Edward II. The Hundred Years’ War corresponds with four of the years of crisis identified in the statistical analysis. This may be because, while the fighting took place in France, the financial element of the war had a strong impact on English citizens, as much of the literature has suggested.

While the conclusions so far have discussed crises that may derive from a single dominant cause, the results also show that crises can occur from a combination of events that collectively overwhelm the capacity of institutions. This can be seen in particular with regards to the Great Famine, where the years 1315 and 1321 – identified as crisis years in the statistical analysis – both witnessed a combination of environmental and political disruption. This relationship was identified by Jordan and has been supported by recent research.

From the evidence in this chapter it appears that a problem becomes a crisis when markets are not sufficiently flexible to adjust, or when political authorities are not sufficiently vigilant or decisive. It can also be noted that events whose impact is often considered by historians to have been relatively short-term, such as the Good Parliament and the Peasants’ Revolt, do not appear as crises in the statistical analysis.