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Tracking Unemployment in Wales through Recession and into Recovery

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Our results are preliminary, please do not cite without permission from the authors. We would like to thank Tim Fearnside for producing the maps in Figure 4 and David Blackaby for his helpful comments.

Abstract
This paper assesses turning points in the economic cycle of Welsh unitary authorities by applying a mathematical algorithm to the claimant count unemployment data. All but one unitary authority has now emerged from recession (Anglesey being the exception). We also date the business cycle for the UK and country-level employment data and Wales has emerged from recession but Scotland is yet to exit recession. We estimate a logistic model which utilises housing sector and survey data to forecast the Welsh employment cycle. The model predicts that employment in Wales will continue to grow into 2011.

JEL Classifications: C22, E32, E37, E40
Keywords: classical business cycles, forecasting

1. Introduction

The economic cycle is of interest to national policy makers, businesses and to devolved administrations like the Welsh Government as it tries to use the economic leavers it has at its disposal to mitigate the impact of any economic downturn. In this paper we analyse the economic cycle in unemployment claimant count at the Unitary Authority level to assess how the Welsh local economy has fared in the recent recession. We investigate the classical business cycle, measuring absolute falls in economic activity rather than deviations around a trend which are referred to as growth cycles. We date turning points in the classical cycle using a mathematical algorithm. Our results find that all but one unitary authority have now emerged from recession in Wales (Anglesey being the exception).

We compare the turning points of the cycle in the Welsh employment[1] and claims to the UK aggregate and other countries within the UK. The employment cycle in Wales emerged from the recession in August 2009 with claims following in November 2009. Scotland's employment and claimant count are yet to emerge from recession along with Northern Ireland's claimant count.

We utilise our estimated business cycle chronologies for Welsh employment to estimate a quarterly logistic regression model to forecast the Welsh employment cycle. We use leading indictor information from the housing sector and the Chamber of Commerce quarterly economic survey in the forecasting exercise. Our model predicts continued expansion for Welsh employment into 2011.

The structure of this paper is as follows. In section 2 we date the turning points for Welsh Government Office Region level monthly employment and claimant count data. We compare this to the UK aggregate and the other countries within the UK. In section 3 we date the turning points in Welsh Unitary Authority level monthly claimant count data. In section 4 we present results from a quarterly forecasting exercise with a logistic regression model for the Welsh employment cycle that utilises survey data. Finally we offer some concluding comments.

[1] We analyse these measures as consistent regional GDP data does not exist at a higher frequency than annual and the Gross Vale Added (GVA) data that is reported in Regional Trends is a nominal measure and therefore does not reflect real activity in a region.

2. Welsh Employment Cycle Compared to the UK

We utilise the classical business cycle dating mathematical algorithm developed by Artis, Marcellino and Proietti (2004)[2]. This algorithm locates local maxima (peaks) and local minima (troughs) in the data series and enforces the alternation between these by eliminating spurious turning points. The approach is nonparametric and similar to Pagan's dating method (Harding and Pagan, 2002 and 2006) which in turn relates to the Bry and Boschan (1971) cycle dating used by the National Bureau of Economic Research (NBER).

The underlying Markov chain can be described as at any time *t*, the economy can be in either of two mutually exclusive phases: expansion (E_t) or recession (R_t). Our convention is that a peak terminates an expansion and a trough terminates a recession. To enforce the alternation of peaks and troughs it is useful to distinguish turning points within these two phases:

$$E_t \equiv \begin{cases} EC_t \\ P_t \end{cases}$$

$$R_t \equiv \begin{cases} RC_t \\ T_t \end{cases}$$

From the expansion continuation (EC_t) we can make a transition to the peak (P_t) or continue the expansion, but not vice versa as only $P_t \rightarrow RC_{t+1}$ is admissible. Analogously, from recession continuation (RC_t) we can make a transition to the trough (T_t) but $T_t \rightarrow EC_{t+1}$ with the probability of 1. The dating rules impose a minimum duration of a phase of 5 months. We also impose the minimum length of the entire business cycle (from peak to peak) to be 24 months.

The cycle dating algorithm is applied to Welsh Government Office Region data (at the NUTS1 level) from the labour market statistics of the UK National Statistics Authority (data codes are listed in Appendix A at the end of this paper). We compare the Welsh region to the UK aggregate, Scotland, England and Northern Ireland employment and claimant count data. We analyse monthly, seasonally adjusted employment and claimant count data. The employment data reported in the Labour Force survey starts in April 1992 and ends in June 2010. To gauge how the regions fared in the last national recession of the early 1990s we also analyse unemployment claimant count data which is available back to 1971 but we begin our

[2] We would like to thank Tommaso Proietti of allowing us to use his code produced in OX.

analysis from January 1988 to August 2010[3]. The claimant count records the number of people claiming Job Seeker's Allowance (prior to October 1996 it included all unemployment-related benefits). For the UK we analyse the seasonally adjusted series which includes all claimants aged 18 or over.

Table 1: Cycle turning points for UK Employment

Turning Point	UK	Wales	Scotland	England	Northern Ireland
Peak	1990m6			1990m6	
Trough	1993m3	1993m5	1993m1	1993m3	1993m7
Peak			1995m2		
Trough			1996m2		
Peak		1997m6	1997m12		1997m10
Trough		1998m6	1998m8		1998m8
Peak		2000m11	2000m12		1999m8
Trough		2001m5	2001m12		2000m3
Peak		2004m4			2003m2
Trough		2005m5			2003m11
Peak	2008m4	2008m5	2008m4	2008m4	2008m4
Trough	2010m2	2009m7		2010m1	2009m4

Table 1 lists the dates for the turning points in the employment cycle for the UK and countries within. Wales, Scotland and Northern Ireland experience five recessions from the 1990s compared to two in England. The Welsh employment cycle is shown in Figure 1 along with peak and trough turning points in the business cycle (the vertical axis notes the minimum amount of employment from the trough of the 1990s recession in May 1993 to the most recent maximum of the peak in May 2008 after which the latest recession is dated to have commenced for Wales). Welsh employment entered the current recession in June 2008, one month later than the rest of the UK. The figures for the other countries can be found in Appendix B. Northern Ireland's employment emerged from the current recession first in May 2009, followed by Wales in August 2009 and then England in February 2010[4]. Scotland's employment is yet to be dated to have emerged from recession but in Figures B.3 there is a visible increase at the end of the sample (but not enough observations beyond this to date the trough).

[3] The seasonally unadjusted data includes 16 year olds in the claimant count up to 1988, after that a rule change to the benefits system only 18 years olds and over are included.

Figure 1: Turning Points for Welsh Employment

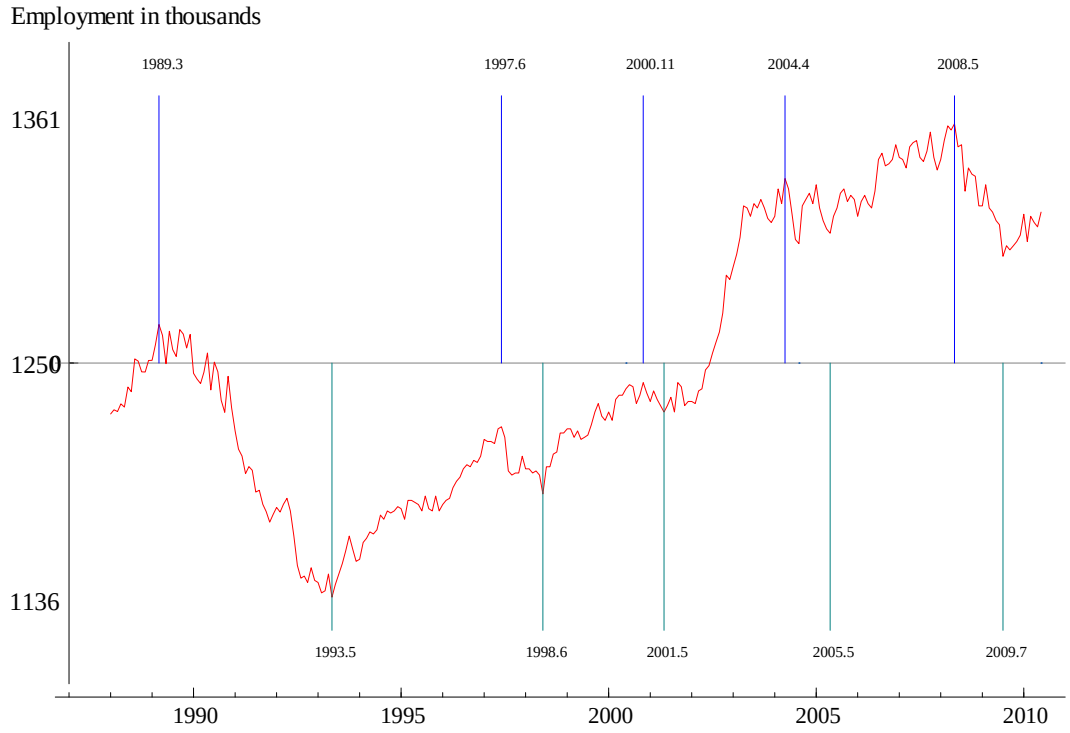


Table 2 lists fewer turning points dates for the claimant count cycle for the UK and countries within[5]. By this measure the Welsh claims cycle, Figure 2, now enters the current recession in February 2008 earlier than most of the UK (in April 2008) apart from Northern Ireland in September 2007 (also earlier than the employment cycle). The Welsh claimant count cycle has emerged from recession at the same time as England in November 2009 but Scotland and Northern Ireland's claimant count still appear to be increasing (see Figures B.4 and B.8).

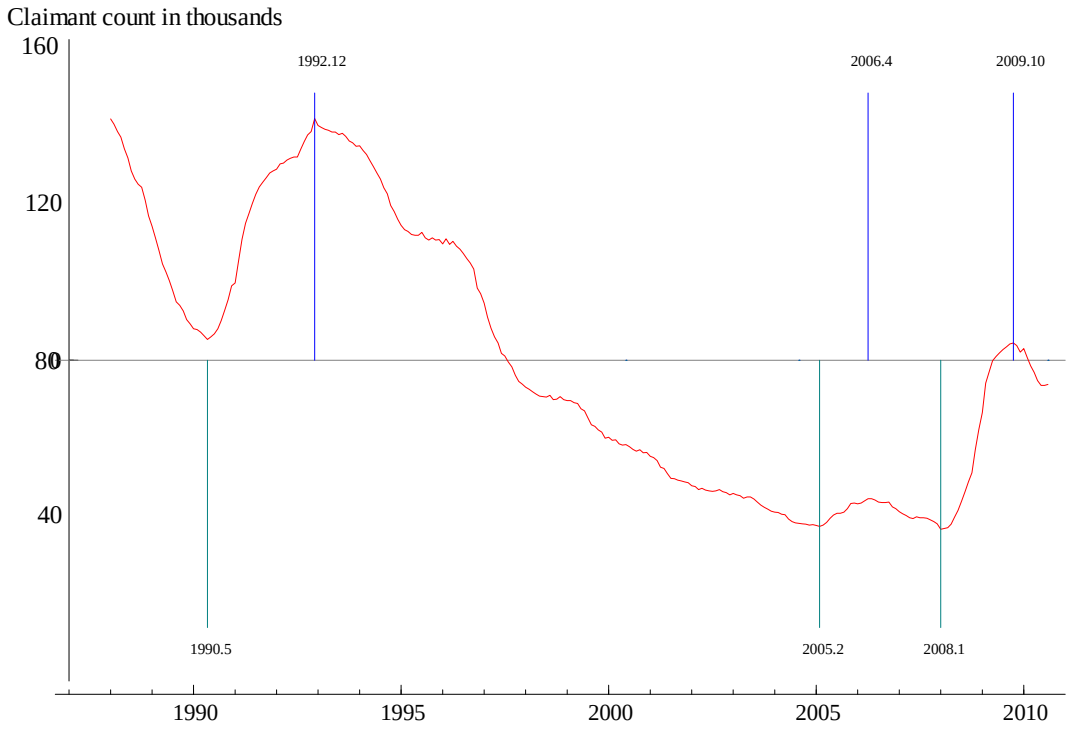
Table 2: Cycle turning points for UK Claimant Count

Turning Point	UK	Wales	Scotland	England	Northern Ireland
Peak	1990m5	1990m5	1990m8	1990m4	1990m8
Trough	1992m12	1992m12	1992m12	1992m12	1993m2
Peak	2005m2	2005m2	2005m7	2005m2	
Trough	2006m10	2006m4	2006m7	2006m10	
Peak	2008m3	2008m1	2008m3	2008m3	2007m8
Trough	2009m10	2009m10		2009m10	

[4] The Proact scheme introduced by the Welsh Assembly in 2008 and part-finance by the European Social Fund offered subsidised training places to companies facing redundancies. The Welsh Assembly has recently reported this has helped 10,000 people keep their jobs during the recession.

[5] Note that we date *peaks* in claimant count data *at local minima* and *troughs* at the *local maxima* as unemployment is inversely related to output and movements in it are a contra-cyclical measure of the business cycle.

Figure 2: Turning Points for Welsh Claimant Count



We convert our monthly employment cycle dates to quarters to enable us to forecast the Welsh economy with a logistic regression model using data which is relevant to Wales (see Section 4). We take the claims peak of May 1990 for the start of the 1990s recession as we do not have accurate employment data earlier than 1992.

Table 3: Classical Business Cycle turning points for Welsh Unitary Authority Claimant Count Nomis, data monthly 1988m1-2010m8

Turning Point	Anglesey	Blaenau Gwent	Bridgend	Caephilly	Cardiff	Carmar-thenshire	Ceredigion	Conwy	Denbighshire	Flintshire	Gwynedd
Peak	1990m6	1990m9	1990m4	1990m6	1990m5	1990m6	1990m6	1990m6	1990m6	1990m6	1990m6
Trough	1993m1	1993m5	1992m12	1992m12	1993m8	1992m12	1992m12	1993m4	1993m8	1993m9	1992m12
Peak	1996m1	1995m5	1998m5			1994m12	1994m10	1995m5	1995m5		1995m6
Trough	1996m6	1996m3	1998m11			1996m6	1995m9	1996m6	1996m5		1996m6
Peak			2002m5		2001m9	1998m9			1998m5		
Trough			2003m4		2002m9	1999m4			1999m2		
Peak	2005m9	2003m12	2004m10	2003m12	2004m12	2004m12	2005m5	2005m3	2004m5	2004m7	2005m9
Trough	2006m8	2006m4	2006m4	2006m5	2006m4	2007m2	2006m1	2006m7	2006m6	2006m4	2006m4
Peak	2008m3	2007m5	2008m2	2007m11	2007m10	2008m4	2008m1	2007m9	2007m11	2007m11	2007m11
Trough		2009m10	2009m7	2009m10	2009m11	2009m10	2009m12	2009m10	2009m11	2009m9	2010m1

Turning Point	Merthyr Tydfil	Monmouth-shire	Neath Port Talbot	Newport	Pembroke-shire	Powys	Rhonda, Cynon, Taff	Swansea	Torfaen	Vale of Glamorgan	Wrexham
Peak	1990m7	1990m1	1990m5	1990m5	1990m9	1990m6	1990m5	1990m5	1990m5	1990m5	1990m6
Trough	1992m12	1993m5	1991m11	1993m11	1993m6	1992m12	1992m12	1992m12	1992m12	1993m4	1992m12
Peak	1995m9		1992m7		1995m4	1998m9					
Trough	1996m2		1993m8		1995m10	1999m5					
Peak	1997m11		1998m4	2000m9	2001m12	2003m1		1998m5			2002m1
Trough	1998m6		1999m4	2001m8	2002m8	2003m11		1999m2			2002m11
Peak	2004m6	2005m3	2004m7	2005m4		2005m2	2004m11	2004m11	2004m11	2004m7	2004m8
Trough	2006m3	2006m8	2005m12	2006m6		2006m8	2006m5	2005m12	2006m10	2006m6	2006m6
Peak	2007m11	2008m1	2008m1	2007m12	2008m3	2008m2	2008m1	2007m12	2007m12	2007m9	2007m11
Trough	2009m10	2009m6	2009m5	2009m10	2009m10	2009m6	2009m10	2009m9	2009m7	2009m10	2009m9

3. Turning Points in Welsh Unitary Authority Level Data

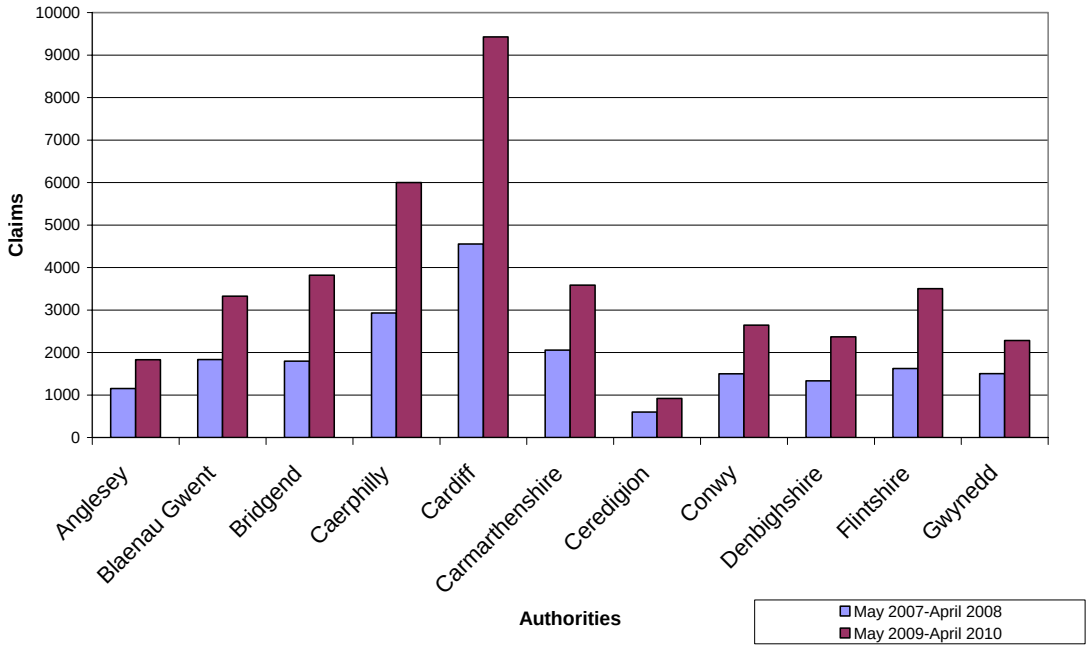
To analyse cyclical activity in the sub-regions of Wales we downloaded the Welsh unitary authority level claimant count data from the NOMIS web-site. At this level the data is seasonally unadjusted so we filter the series with the X12-arima process in PcGive (Doornik and Hendry, 2001). Table 3 lists the peak and trough classical cycle turning points for the Welsh unitary authorities. Charts of the seasonal adjustment are shown for each unitary authority in Appendix A where areas that are more reliant on tourism have the most defined annual cycles (see Gwynedd and Conwy).

In Figure 3 we illustrate with bar charts the level of claimant count for the 22 Welsh Unitary Authorities. We compare the "trough" turning point of the cycle and take the average of the level for a year between May 2007 to April 2008 and the "peak" turning point which most authorities have reached over the latest sample May 2009 to April 2010. The largest increase in claims over these two samples has been experienced by Monmouthshire at 143% (although at lower level of total claims compared to other authorities). Other authorities which have witnessed more than a doubling of claims between these two samples are Bridgend (112%), Caerphilly (105%), Cardiff (107%), Flintshire (116%), Newport (103%), Pembrokeshire (133%), Rhondda (120%), Torfaen (101%), Vale of Glamorgan (114%) and Wrexham (116%).

In Figure 4 we chart the geographical progression of the recession through Wales over time in a sequence of maps (similar to Crone, 2006, for US States). We begin in June 2007 when Blaenau Gwent entered recession. The economy of Blaenau Gwent mirrored that of much of industrial South Wales. As late as the 1970s coal and steel were seen as the backbone of its industrial economy. The decline of these industries has given rise to the incessant search for replacement jobs, however, the area struggled more than many other areas to modernise and restructure its economy and currently has the lowest employment rate of the 22 Unitary Authorities in Wales. It also has the lowest level of weekly earnings, £361.60 per week, £83.80 below the Welsh average. In 2008 28% of Blaenau Gwent's workforce were employed in manufacturing, the second highest in Wales and well above the Welsh average at 14%. The recession started with a banking crisis but it was a relatively deprived area strongly dependant on manufacturing which was first to enter recession in Wales. In October 2007 Conwy and Vale of Glamorgan enter recession and Cardiff enters in November 2007. By December 2007 a number of northern authorities have entered recession and these have high proportions of people employed in the manufacturing

sector with Flintshire being the highest in Wales at 34%. In early 2008 a greater number of southern authorities enter recession until the last authority of Carmarthenshire enters in May 2008.

Figure 3: Average Annual Level of Claimant Count for Welsh Unitary Authorities Comparing Peak and Trough Business Cycle Turning Points



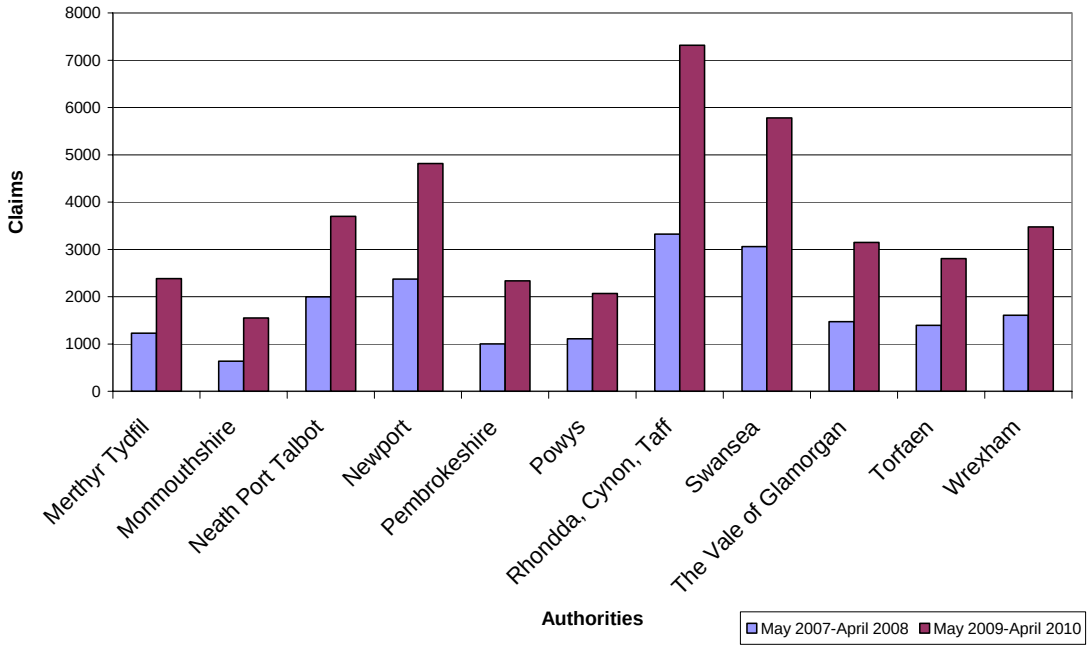
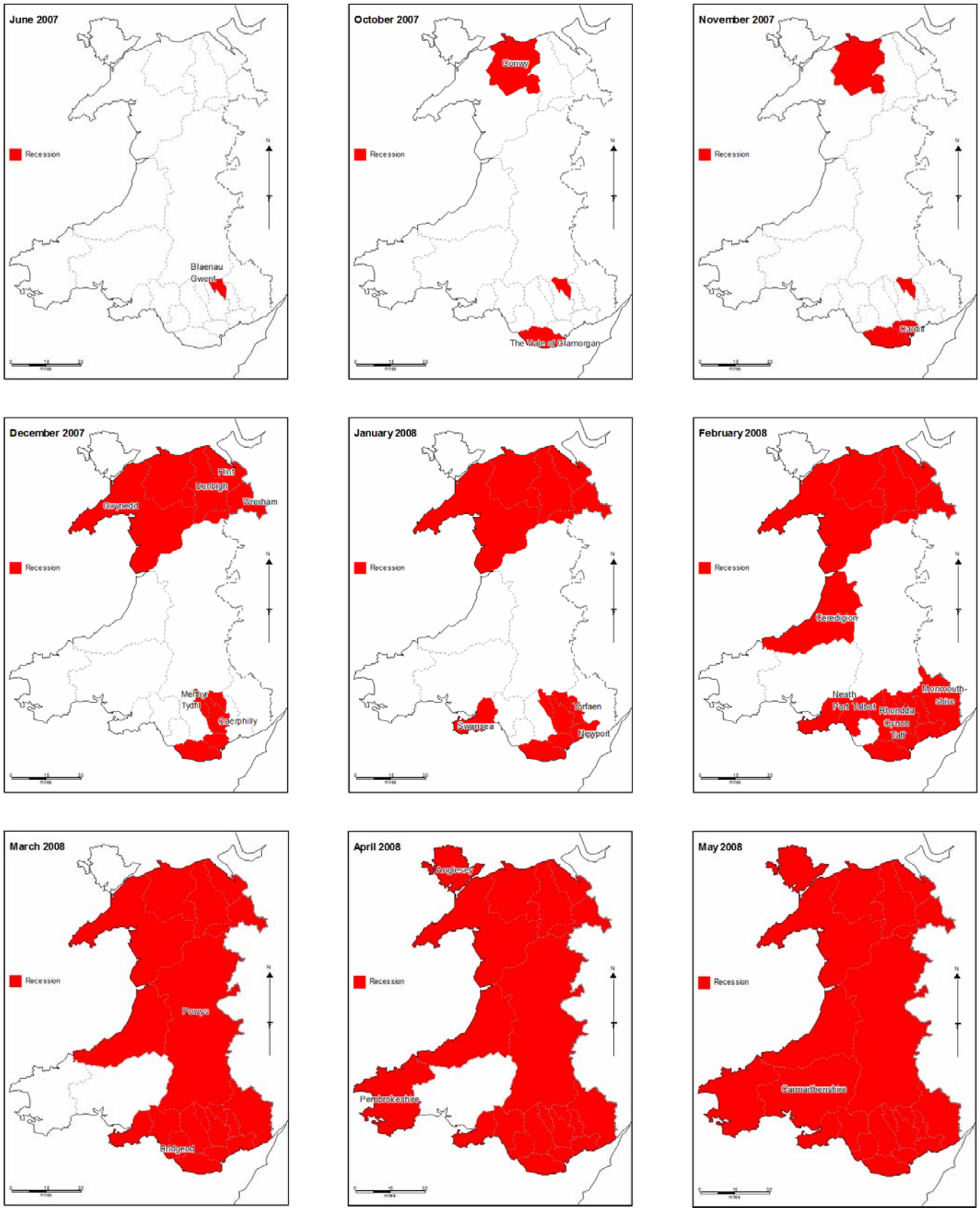


Figure 4: Geographical Progression of Welsh Unitary Authorities into Recession



We can see from Table 3 and the charts in Appendix C that all but one unitary authority has reached a trough turning point for claims as they are now falling. Table 4 lists the order in which the Welsh unitary authorities exit recession along with the Welsh aggregate. Neath Port Talbot is the first unitary authority to emerge from the current recession in Wales in June 2009 (possibly helped by the car scrappage scheme stimulating output at the Port Talbot steel plant), this has an index t-5 as it left the recession 5 months before Welsh aggregate claims in November 2009. The only unitary authority not to have been dated to emerge from the recession is Anglesey but from Figure C.1 it is apparent that claims have been falling since the start of 2010. Anglesey has the lowest gross value added per capita in the whole of the UK and has seen major job losses, across a number of industries, during the recession, including over 400 at Anglesey Aluminium, over 250 at the electronics plant at Eaton and 180 at the Gaerwen meat processing plant. Holyhead, the largest town on the Island, has the highest unemployment rate in Wales.

Table 4 lists the proportion of employees in the manufacturing, construction and service sectors along with those employed within the service sectors of "finance, IT and other business activities", "public administration, education and health" and "tourism related" (this data is from the 2008 ONS Annual Business Inquiry where a survey of 78,000 businesses is conducted in December each year at location of employees workplace). We estimate the Spearman Rank correlation coefficient to test if the order the authorities entered recession was correlated with the share of employment in each sector. We found some weak evidence that authorities with a higher share of construction employment entered recession earlier (with 0.32 estimated correlation coefficient, significant at the 15% level). We also checked to see if the order that authorities emerging from recessions was linked to employment in any particular sector and here we found that authorities with a higher share of services (0.38, significant at 10% level) or tourism (0.32, significant at 15% level) were earlier to leave the recession but those with a higher proportion of employees in manufacturing (-0.45, significant at 5% level) or finance (-0.42, significant at 5% level) were late leaving recession. The story that this recession was finance-led is not upheld in Wales and it appears that areas with higher proportions of employees in manufacturing and finance and related sectors were actually later to emerge from recession.

Table 4: Order Authorities Emerge from Recession with Proportion of Employee Jobs by Sector in Wales

Recession Date	Unitary Authority	Manufacturing	Construction	Services			
				Total	Finance, IT & other	Public admin	Tourism related
2009m6 (t-5)	Neath Port Talbot	23.7%	5.1%	69.1%	9.6%	31.4%	7.2%
2009m7 (t-4)	Monmouthshire	12.1%	5.8%	81.6%	12.5%	33.7%	10.1%
	Powys	13.1%	4.6%	80.6%	11.4%	33.1%	12%
2009m8 (t-3)	Bridgend	17.5%	5.7%	76.5%	15.2%	33.6%	7.1%
	Torfaen	20.4%	4.2%	74.8%	12.6%	36.4%	5.2%
2009m10 (t-1)	Flintshire	33.7%	6.4%	58.9%	12.5%	17.1%	6.5%
	Swansea	6.6%	4.1%	88.9%	19.6%	38.5%	8.3%
	Wrexham	22.5%	3.6%	72.2%	11.2%	32.2%	6.3%
2009m11 (t)	Wales	13.7%	5.2%	79.1%	14.1%	32.9%	8.6%
	Blaenau Gwent	28.2%	4.3%	67.4%	6.8%	31.1%	6%
	Caerphilly	24.3%	5.2%	70.3%	10.6%	30.9%	7.1%
	Carmarthenshire	10.7%	6.9%	81.6%	10.4%	35.4%	8.2%
	Conwy	4.2%	5.0%	89.6%	9.8%	35.2%	16.7%
	Merthyr Tydfil	16.7%	2.8%	79.9%	8.7%	39.3%	6.6%
	Newport	14.9%	3.2%	81.1%	18%	31.4%	7.1%
	Pembrokeshire	8%	7.8%	82.6%	9.2%	31.8%	15.1%
	Rhondda, Cynon, Taff	17.9%	5.2%	76.1%	7.9%	37%	6.6%
	Vale of Glamorgan	11.1%	5.9%	81.3%	11.5%	34.3%	10.2%
2009m12 (t+1)	Cardiff	5.9%	6.0%	87.9%	25.5%	30.9%	8.2%
	Denbighshire	10%	5.9%	83.3%	8.6%	44.7%	9.6%
2010m1 (t+3)	Ceredigion	5.9%	5.0%	87.3%	8.8%	41.5%	13.2%
2010m2 (t+4)	Gwynedd	7.6%	4.5%	86.1%	8.6%	37.3%	12.2%
	Anglesey	14.9%	6.5%	74.8%	9.9%	28.3%	9.9%
	Great Britain	10.2%	4.8%	83.5%	22%	27%	8.2%

Source: Share of employee jobs from Nomis, 2008 ONS Annual Business Inquiry.

4. Forecasting the Welsh economy

We utilise leading indicator data for the Welsh economy at a quarterly frequency to estimate logistic regression models that deliver probabilities of future business cycle regimes for Wales. The sample that we analyse is from 1990q1-2006q4 and we leave 2007q1-2010q4 for in-sample prediction and forecast activity in 2011q1. Our business cycle chronologies are converted to quarterly dates in Table 5 where turning points for employment were listed in Table 1. The claimant count dates in Table 2 help us date the start of the 1990s recession in Wales.

Table 5: Turning Points for Classical Cycle in Wales

	Monthly dates	Quarterly dates
Peak	1990m5	1990q2
Trough	1993m5	1993q2
Peak	1997m6	1997q2
Trough	1998m6	1998q2
Peak	2000m11	2000q4
Trough	2001m8	2001q3
Peak	2004m4	2004q2
Trough	2005m4	2005q2
Peak	2008m5	2008q2
Trough	2009m7	2009q3

The methodology of the logistic regression model is as follows. Using a data vector $\boldsymbol{x}_{t-h}$ of observed variables up to and including period $t-h$, we construct a h-period ahead business cycle regime predictor of the form

$$p_t = lf\,(\beta' \boldsymbol{x}_{t-h}) \qquad (1)$$

where p_t is the probability that the business cycle regime for at quarter t will be an expansion, based on information up to and including the previous period $t-h$. In practice, we use quarterly data with $h = 1$, so that we model the probability at a horizon of one quarter. This probability is constructed as a logistic function of the available information, so that $lf\,(z) = \exp(z) / [1 + \exp(z)]$, and β is a vector of coefficients. The nonlinear regression used to estimate (1) has the binary regime indicator as the dependent variable (with unity for periods within expansion regimes and zero for periods within recession regimes), while $\boldsymbol{x}_{t-h}$ consists of leading indicators. Using sample information for $t = 1, \ldots, T$, the log-likelihood function for this binary model is given by

$$\log(L) = \Sigma_1 \log(p_t) + \Sigma_0 \log(1 - p_t) \qquad (2)$$

where Σ_1 is the sum over all expansionary months and Σ_0 is the sum over all quarters of recession. Our modelling problem involves choosing $\boldsymbol{x}_{t-h}$ and finding the maximum likelihood estimate of β.

The choice of the components in $\boldsymbol{x}_{t-h}$ is crucial, and we achieve this through a prior selection of potential variables followed by the application of an automated search algorithm. The search aims to minimise the Schwarz Information Criterion (SIC) in the form

$$\text{SIC} = (-2\log L + k \log T)/T \qquad (3)$$

where L is the likelihood value from (2), k is the number of estimated coefficients and T is the number of observations in the sample used for estimation. Thus, (3) implies that an additional variable will be included in the model only if it increases the term $2\times\log L$ by more than the penalty for its inclusion, namely $\log(T)$. Essentially variables are retained only if they make a sufficiently strong contribution to the likelihood value. In this way, we hope to filter out variables whose contribution to the empirical likelihood is limited or "local" and hence that the selected model will reflect stable relationships in the data.

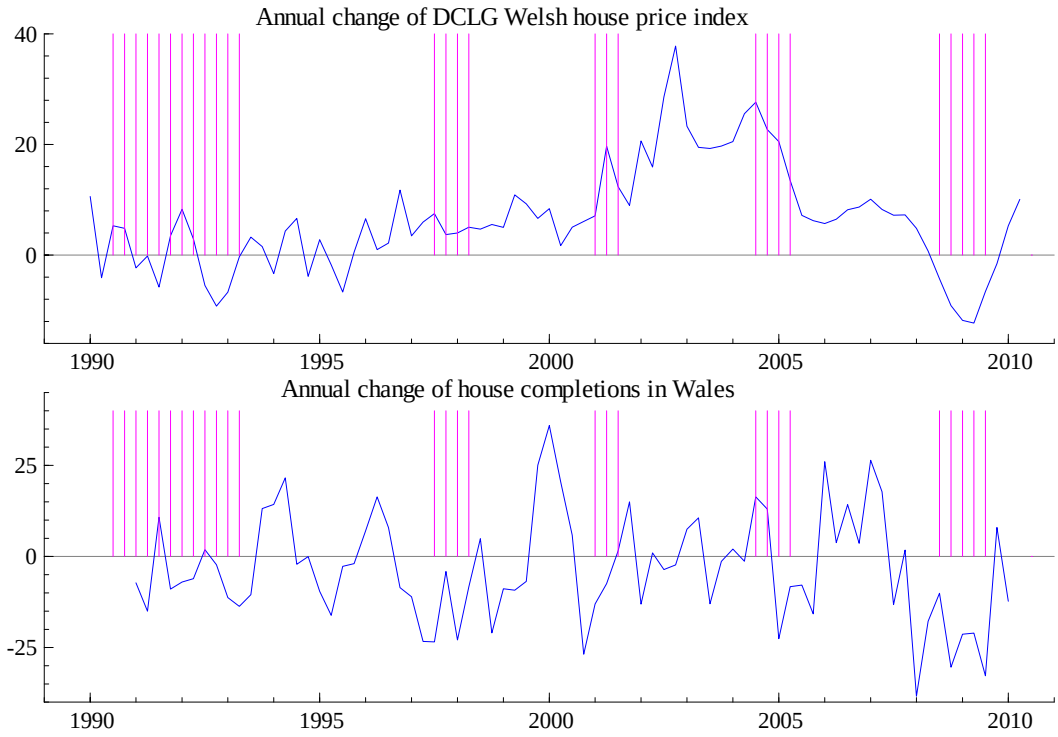
We use two automated search procedures. The first method, *sequential elimination*, works as follows. We select *a priori* a set of K variables $x_{1t}, \ldots, x_{Kt}$. The algorithm then estimates the full model with K variables and calculates SIC for the sample period. Then all subsets of $K-1$ variables are examined, from which the one with the lowest value of SIC is selected. Working with the selected $K-1$ variables the algorithm considers all subsets of $K-2$ variables and chooses that which gives the lowest SIC value. This continues, with one variable eliminated at each stage, until there is only one variable left. At the final stage the algorithm has K selected subsets (using 1, …, K variables) with associated SIC values. From these it chooses that subset which gives the lowest SIC value.

The second search method we employ is the *n-search algorithm*. As with sequential search we start with an initial set of K variables, but the algorithm simply considers from this initial set *all* subsets of k variables, for $k = 1, \ldots, n$ and where n is specified in advance. For the detailed results presented in this paper, n was set to 7.

To forecast economic activity at the regional level we need indicator variables available in a timely manner for Wales. We find that survey data is useful in this respect and also can provide an indication of future expectations of businesses in a

region. We use the Chamber of Commerce's Quarterly Economic Survey (QES)[6] which is the UK's largest and most representative survey of commerce. The last survey used in our sample is Q3 2010 with results lagged by up to four quarters in our model. Businesses are surveyed using postal and on-line questionnaires for a three week period towards the end of the quarter of interest. The questions in the survey take the form of "Excluding seasonal variation, export sales over the past 3 months are: up/same/down", the response from this question is what we refer to as the variable "Manu_Exports" in Table 6 (the "Manu" refers to the manufacturing sector). The QES reports balance figures in response to the questions which are determined by subtracting the percentage of companies reporting decreases from those reporting increases.

Figure 5: Department for Communities and Local Government housing sector



We also analyse housing sector data from the Department for Communities and Local Government (DCLG). The annual change of the house price index is shown in the first chart in Figure 5 along with business cycle phases. Two further measures are available from DCLG for housing starts and completions in Wales. We

[6] The Chamber of Commerce survey data is purchased from them and further details can be found at: http://www.britishchambers.org.uk/zones/policy/reports/quarterly-economic-survey.html.

find that the annual change of housing completions is a useful indicator for the Welsh economy and a graph of this is the second chart in Figure 5.

Taylor and Bradley (1994) find strong interaction between the housing market and the labour market for GB counties. Their research suggests that in the 1990s recession counties with the largest fall in house prices and highest amount of home ownership subsequently experienced the largest increase in unemployment. Their sample ended in mid-1992 and beyond this many regions saw further increases in unemployment. Cameron and Muellbauer (2001) identify a strong link between the housing market and unemployment for GB regions. Using annual data they find a rise of 10% in relative house prices raises relative unemployment rate by 0.16 percentage points with a lag of 3 years. They suggest that two housing market channels are affecting unemployment: the cost of location effect when land price rises discourage potential movers to the region and the wealth effect on restricting regional spending, via the collateral role of housing equity on credit constrained households and firms.

Three models results are compared in Table 6 with variables selected from the housing sector alone in Model 1, Model 2 with the housing sector and variables from the Chamber of Commerce's Service sector survey and Model 3 with housing and the Manufacturing survey. The models are listed in order of SIC with the minimum value signalling the best model. All models select lags 4 and 8 of annual housing inflation, the positive sign at one year signal falls in house price inflation and the larger negative lag at two years shows that house prices increases generally occurred 2 years before the onset of recession. Also selected is the annual change of housing completions which falls one quarter before the recession. Model 2 shows the variables selected from the service sector survey are domestic sales (Services_Sales) which fall one quarter before recession and confidence about turnover (Services_Turnover) which increases one quarter before.

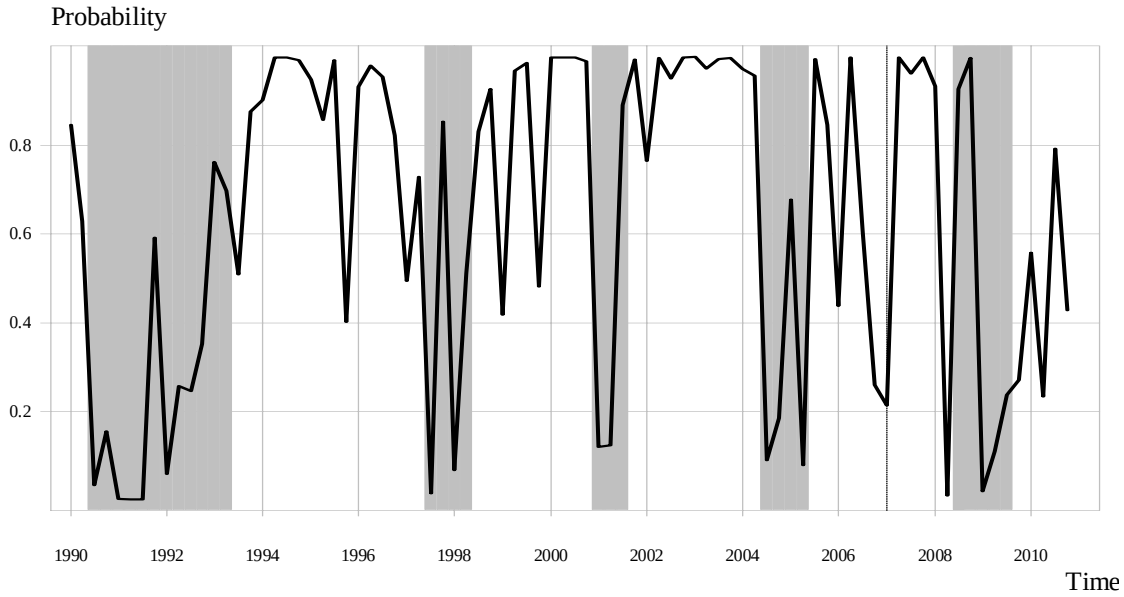
For our best Model 3 the variables that are selected from the QES for the manufacturing are employment expectations (Manu_EmpExpect) and export sales (Manu_Exports) both of which increase one year before recession and home orders (Manu_Orders) which fall one year before. The prediction from all the models is for the continuation of the expansion phase in 2011q1 (with a prediction probability value below 0.5 signalling recession). The logistic probability are shown for Model 3 in Figure 6 where a false signal for recession is shown in 2007 but at this stage the claimant count in many authorities had began to increase.

Table 6: Forecast Model results for Wales

Variables:	Model 1 Housing sector	Model 2 QES Services & Housing sector	Model 3 QES Manufacture & Housing sector
Intercept	0.889	0.993	1.656
$\Delta_4(DCLGHP)_{-4}$	1.205	1.117	2.248
$\Delta_4(DCLGHP)_{-8}$	-1.699	-1.897	-2.064
$\Delta_4 log(DCLGHC)_{-1}$	1.485	1.687	1.841
$(Services\_Sales)_{-1}$		1.836	
$(Services\_Turnover)_{-1}$		-1.219	
$(Manu\_EmpExpect)_{-4}$			-2.273
$(Manu\_Exports)_{-4}$			-1.649
$(Manu\_Orders)_{-4}$			3.462
Summary Statistics:			
RMSE Sample	0.3934	0.3563	0.3196
Log Likelihood	-31.97	-26.43	-20.74
SIC	80.82	78.18	71.01
Errors In-Sample:			
Expansion	8% (4/45)	8% (4/45)	13% (6/45)
Contractions	43% (10/23)	30% (7/23)	30% (7/23)
Errors Out-of-Sample:			
Expansion	36% (4/11)	18% (2/11)	45% (5/11)
Contractions	20% (1/5)	60% (3/5)	40% (2/5)
Prediction:			
Forecast 2011q1	0.9786	0.9970	0.6721

Notes: In sample data set: 1990q1-2006q4 and out of sample data set: 2007q1-2010q4.

Figure 6: Housing and Manufacturing sector expansion probabilities for Wales



5. Conclusions

This paper applies the mathematical algorithm of Artis, Marcellino and Proietti (2004) to date the cycle of monthly Welsh employment and unitary authority claimant count data to assess turning points in the economic cycle of sub-regions. As of May 2008 all authorities had entered a recession, with claimant count data up to August 2010 we have dated a trough turning point for all but one unitary authorities dated to have emerged from recession.

This paper makes a useful contribution in dating business cycles at the Unitary Authority level where we can see a greater occurrence of recessions. We date three recessions in Welsh claimant count data but 5 for the employment series. At the sub-regional level we date 5 recessions in claims for Bridgend, Carmarthenshire, Denbighshire, Merthyr Tydfil, Neath Port Talbot and Powys. Regional policy could target the districts more prone to recessions and introduce structural policy to ease labour market frictions in those areas.

We find a strong role for the annual change of house prices and housing completions as leading indicators of Welsh employment. Long lags on house price inflation signal that falls in employment follow house price rises after two years and price falls lead declining activity by one year. We also find that manufacturing survey data from the Chamber of Commerce provide the best predictions for Welsh employment. Our cycle dating and forecasting results now show that Wales has emerged from the recession and will continue to grow in 2011.

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Appendix A: Data Details and Seasonal Adjustment

Table A.1: UK and country employment and claimant count data

Code	Description
MGRZ	LFS: In employment: UK: All: Aged 16+: 000s, SA
YCJY	LFS: In employment: England: All: Thousands: SA
YCJZ	LFS: In employment: Wales: All: Thousands: SA
YCKA	LFS: In employment: Scotland: All: Thousands: SA
ZSFG	LFS: In employment: Northern Ireland: All: Thousands: SA
BCJD	Total Claimant count SA (UK) - thousands
DPBE	Regional Claimant count SA: Wales - thousands
DPBF	Regional Claimant count SA: Scotland - thousands
DPBG	Regional Claimant count SA: Northern Ireland - thousands
IBWK	Regional Claimant count SA: England - thousands

Table A.2: 22 NOMIS districts/counties of Wales

Anglesey	Merthyr Tydfil
Blaenau Gwent	Monmouthshire
Bridgend	Neath Port Talbot
Caerphilly	Newport
Cardiff	Pembrokeshire
Carmarthenshire	Powys
Ceredigion	Rhondda, Cynon, Taff
Conwy	Swansea
Denbighshire	Torfaen
Flintshire	Vale of Glamorgan
Gwynedd	Wrexham

Note: Seasonally unadjusted claimant count totals (people claiming Job Seeker's Allowance) available over sample June 1983-August 2010.

Figure A.1: Seasonal adjustment of Welsh district claims

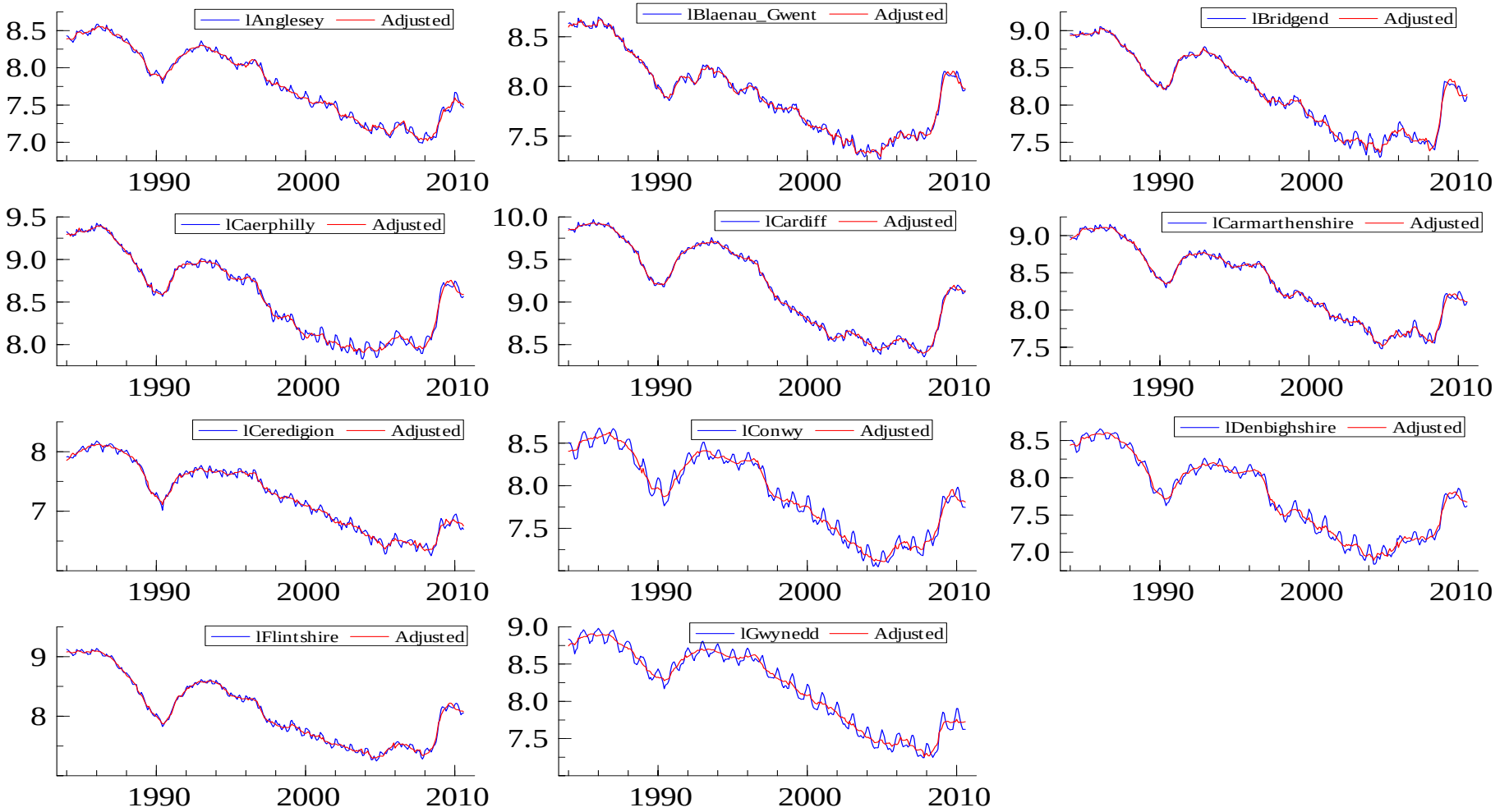
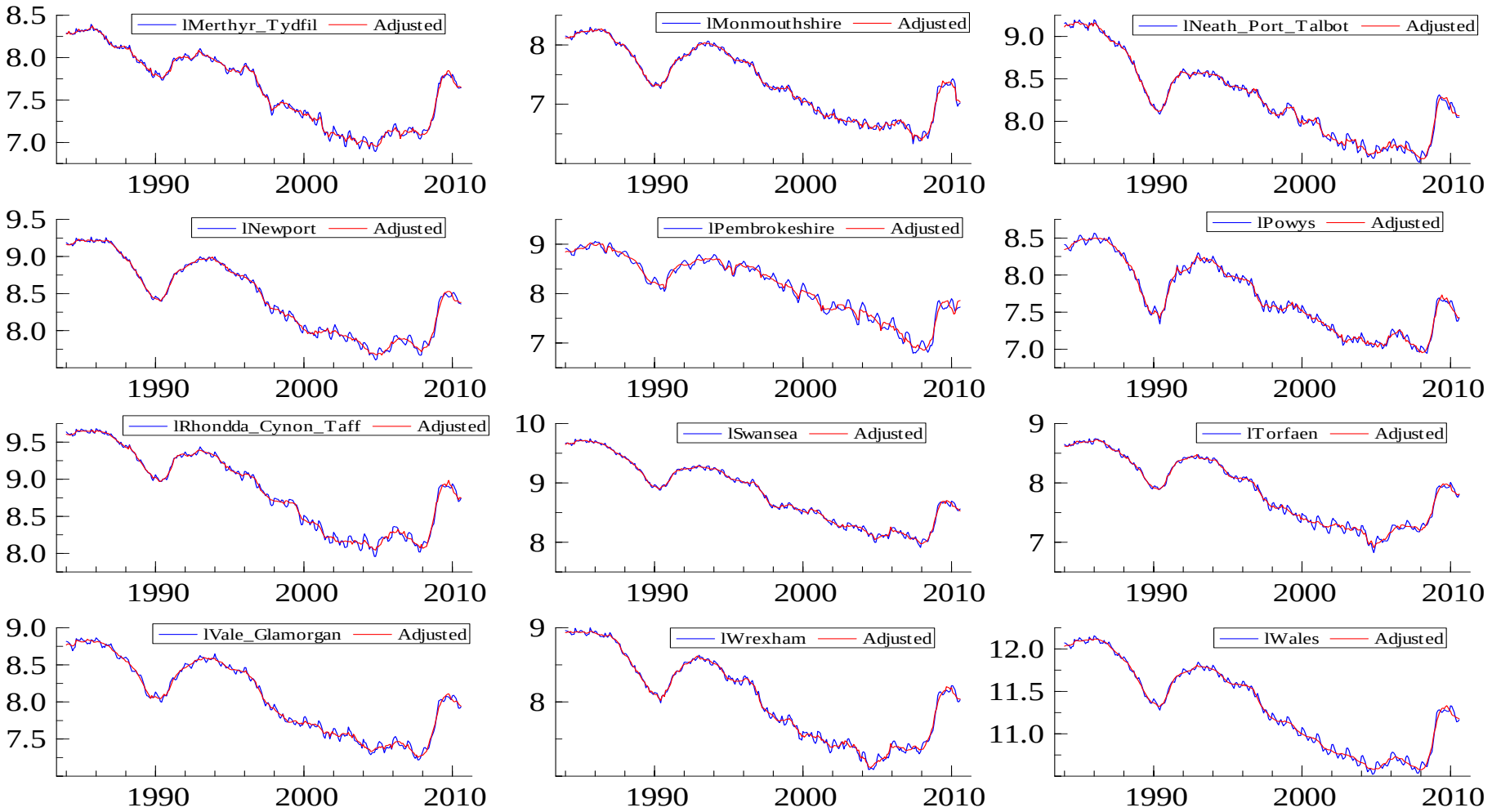


Figure A.1: Seasonal adjustment of Welsh district claims continued



Appendix B: Business Cycle Dating for UK and country level data

Figure B.1: UK Employment

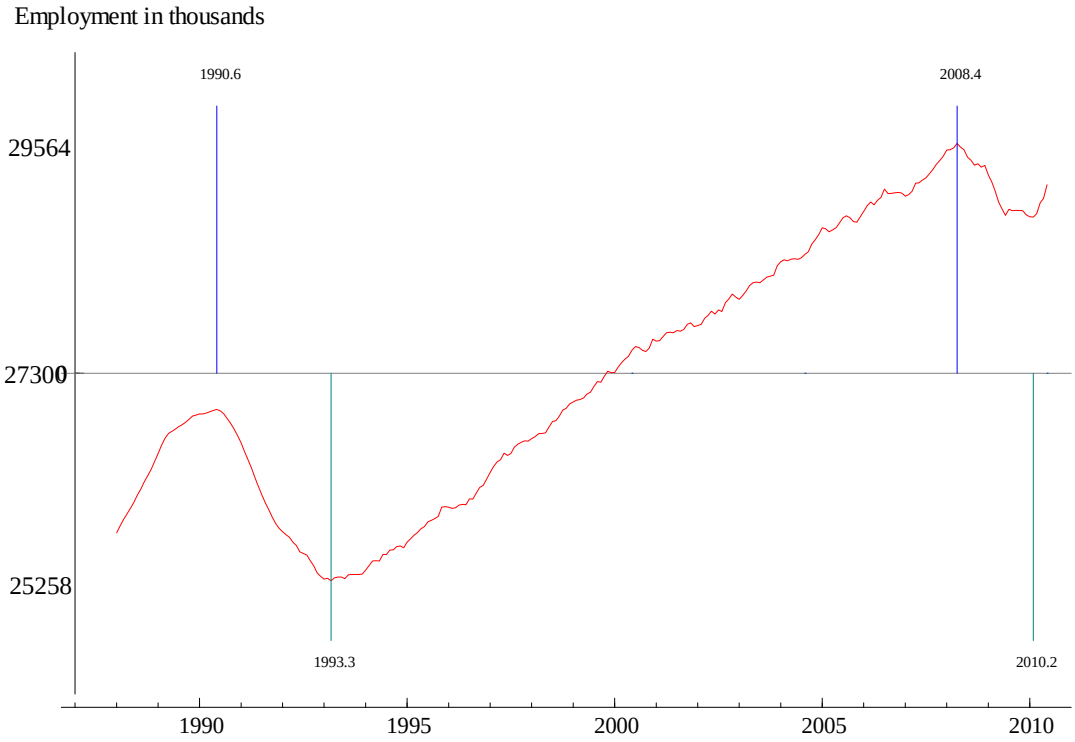


Figure B.2: UK Claimant Count

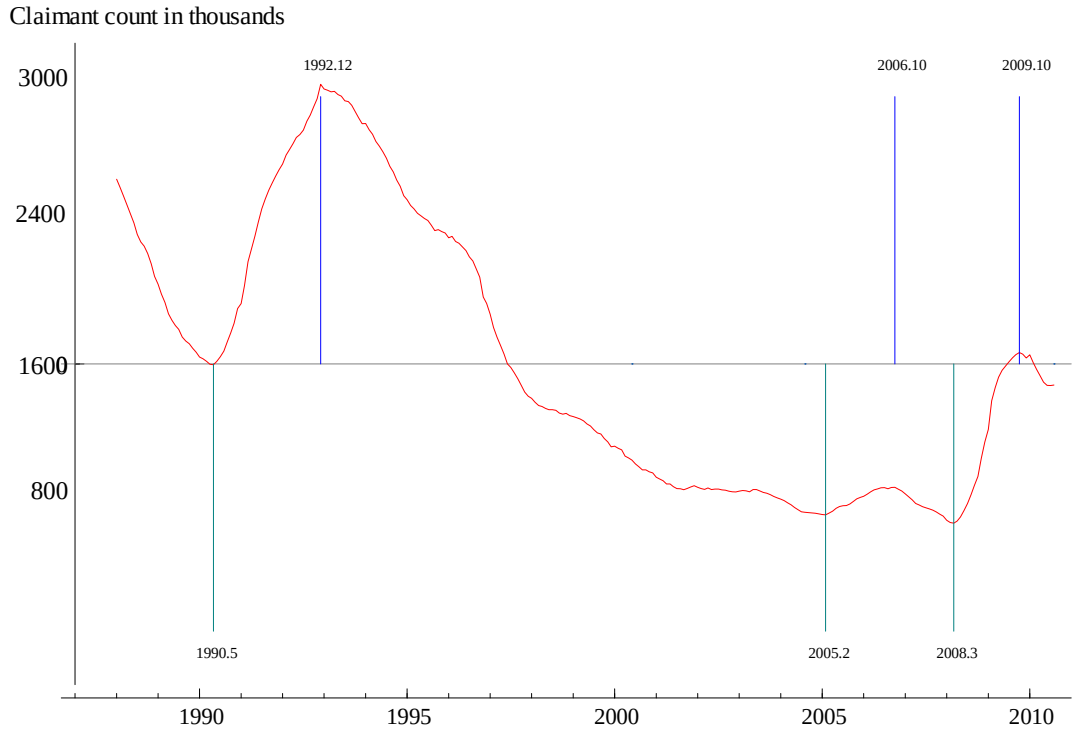


Figure B.3: Scotland Employment

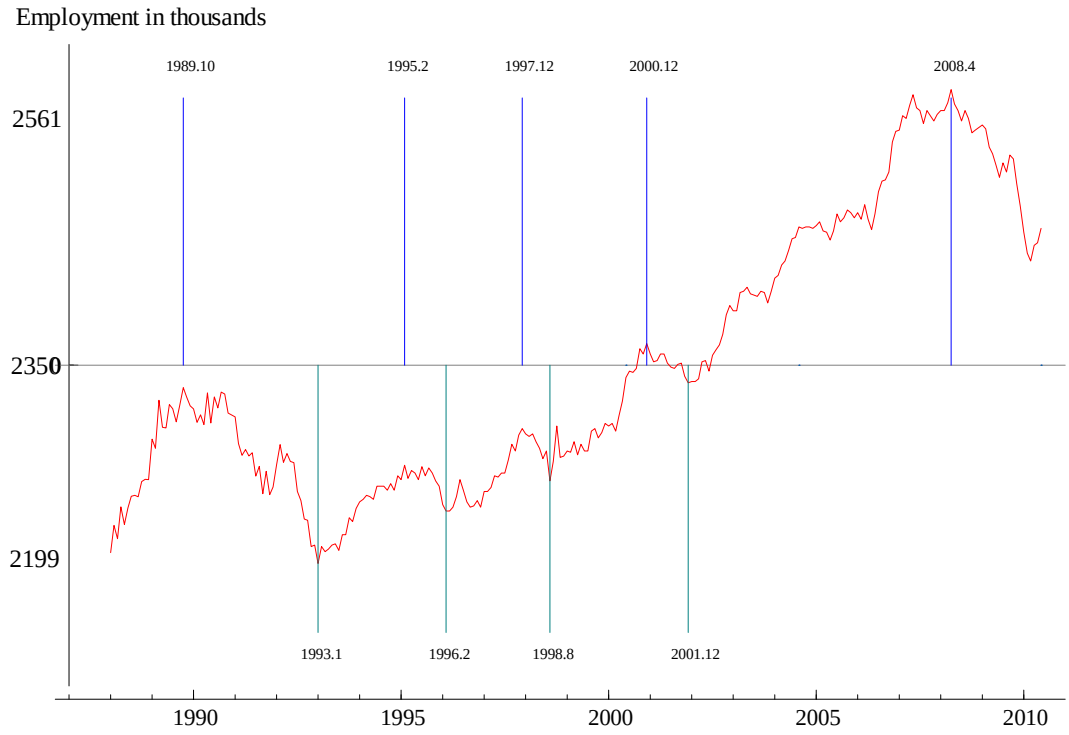


Figure B.4: Scotland Claimant Count

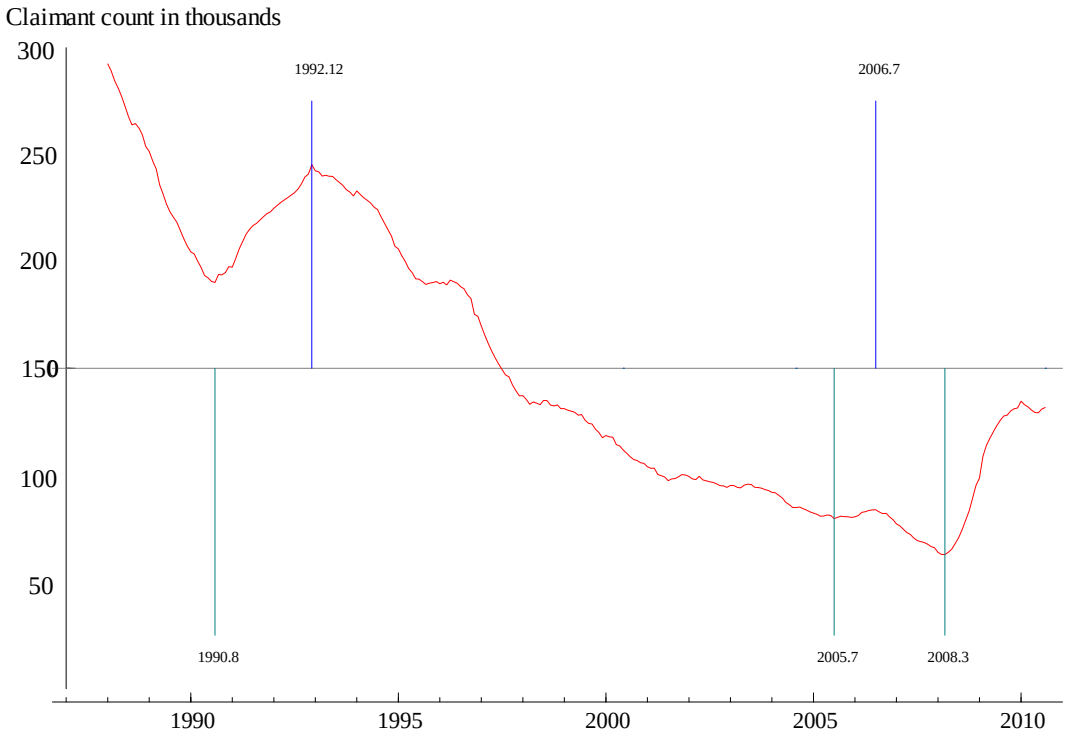


Figure B.5: England Employment

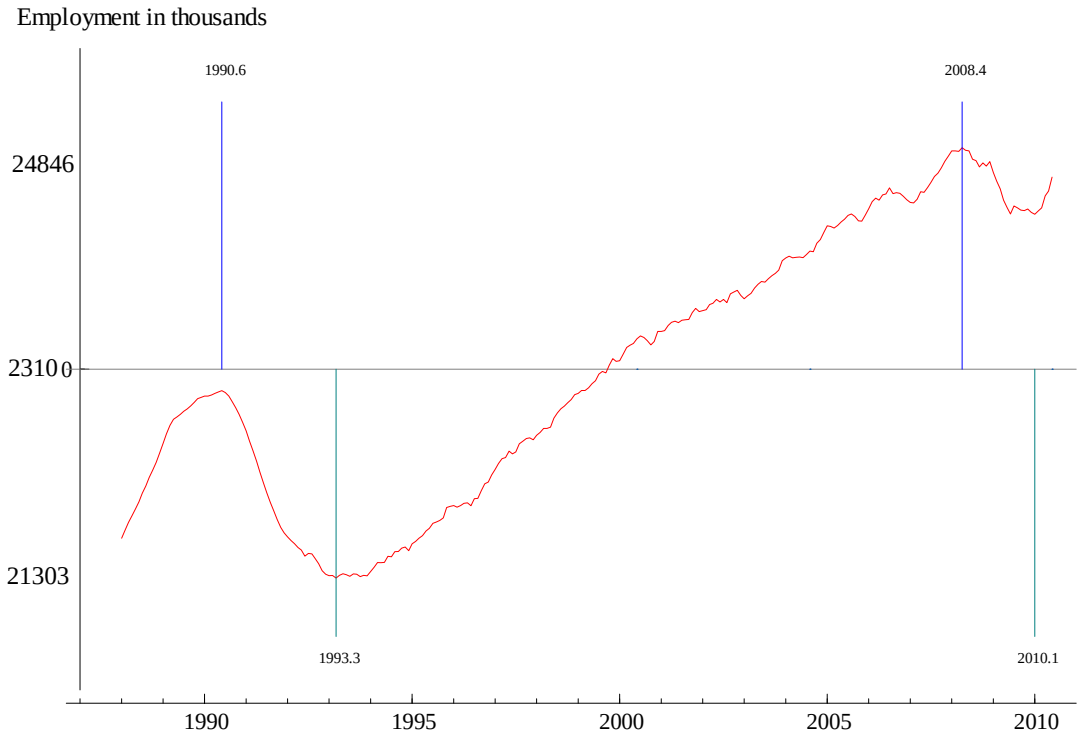


Figure B.6: England Claimant Count

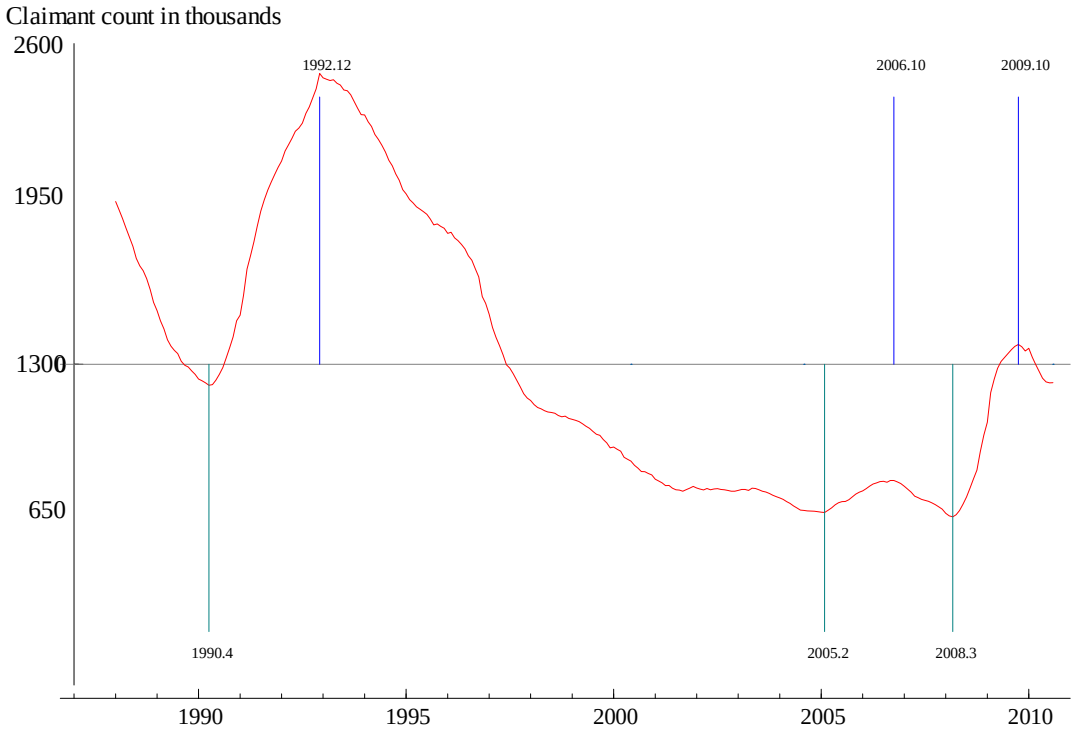


Figure B.7: Northern Ireland Employment

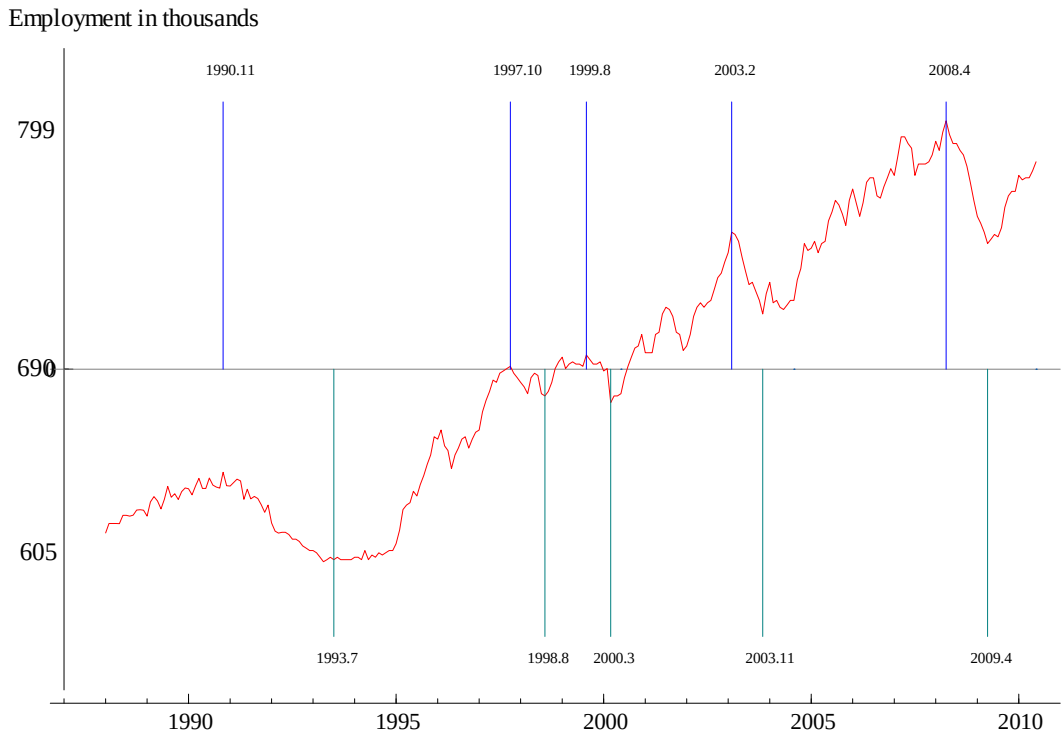
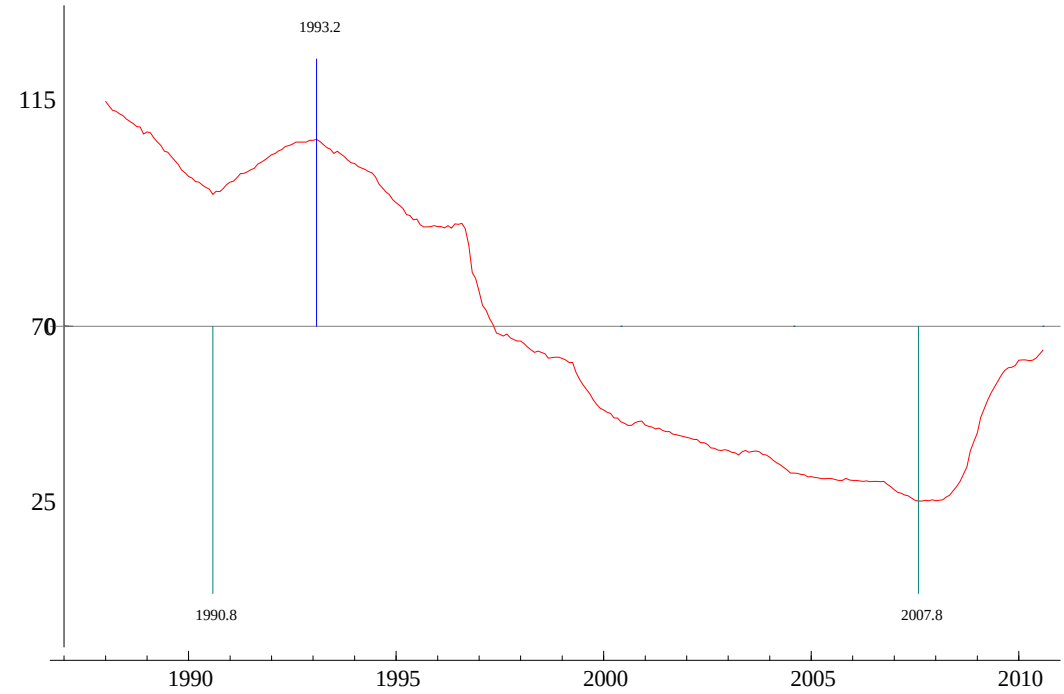


Figure B.8: Northern Ireland Claimant Count



Appendix C: Business Cycle Dating with Welsh District Claimant Count data

Figure C.1: Anglesey

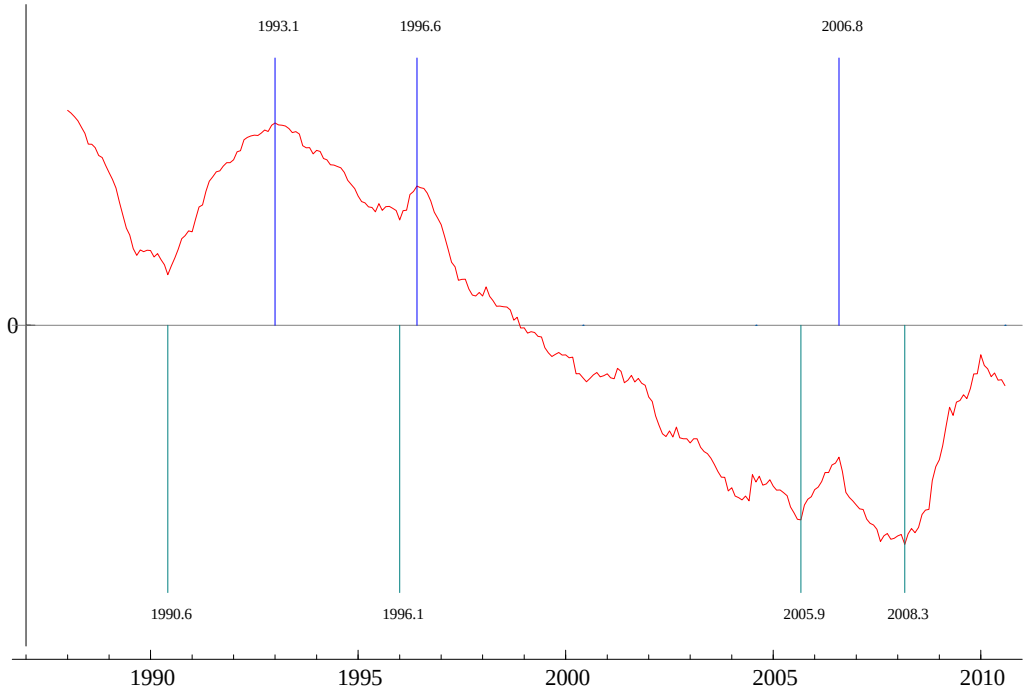


Figure C.2: Blaenau Gwent

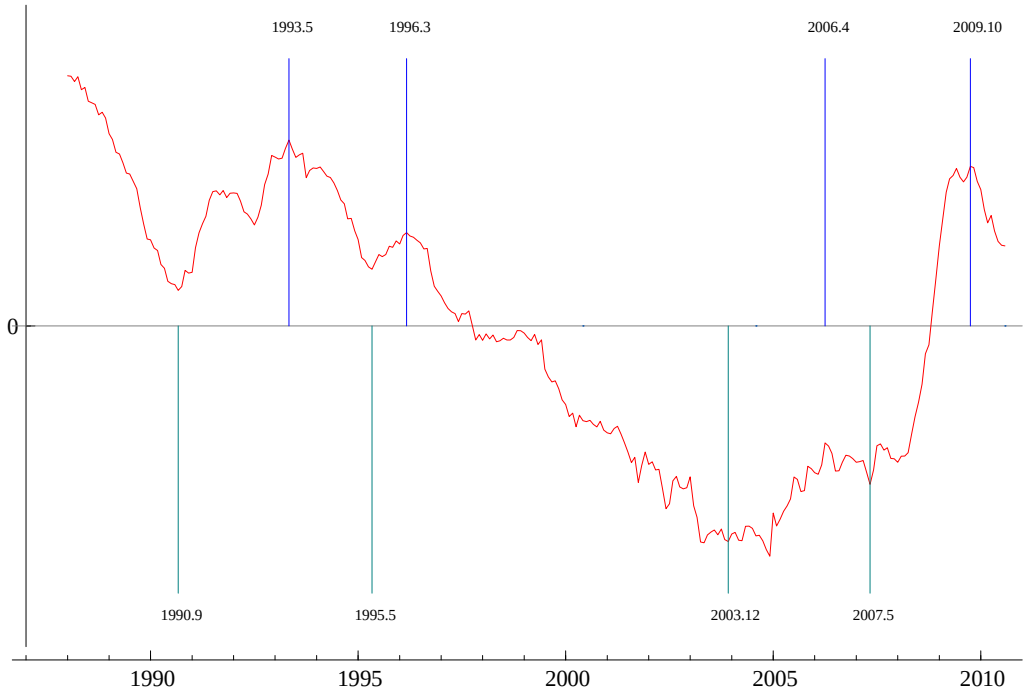


Figure C.3: Bridgend

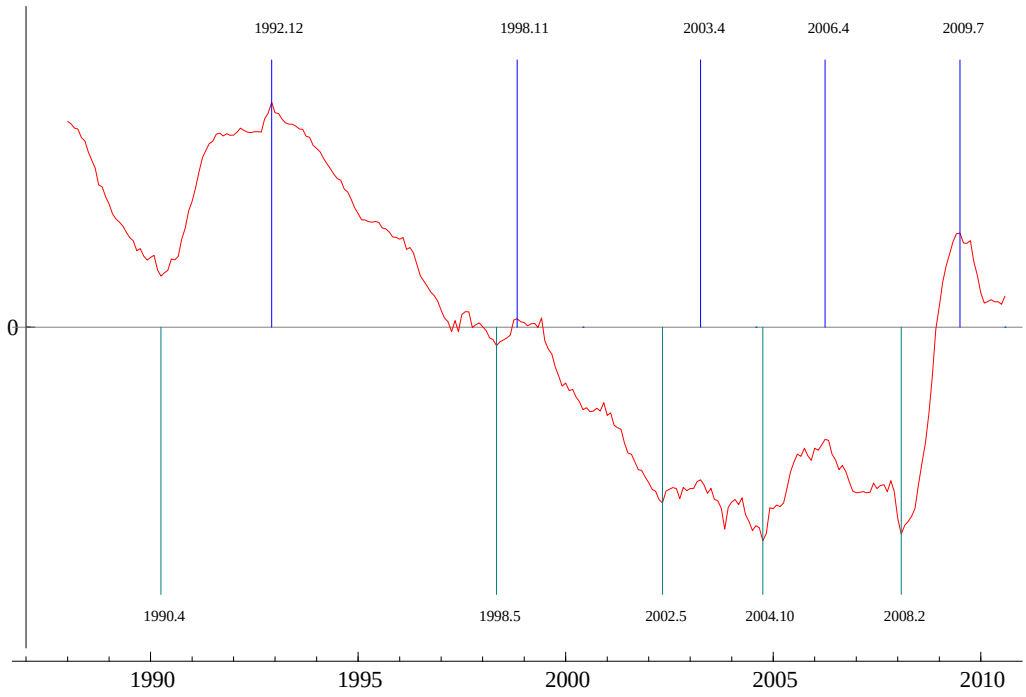


Figure C.4: Caerphilly

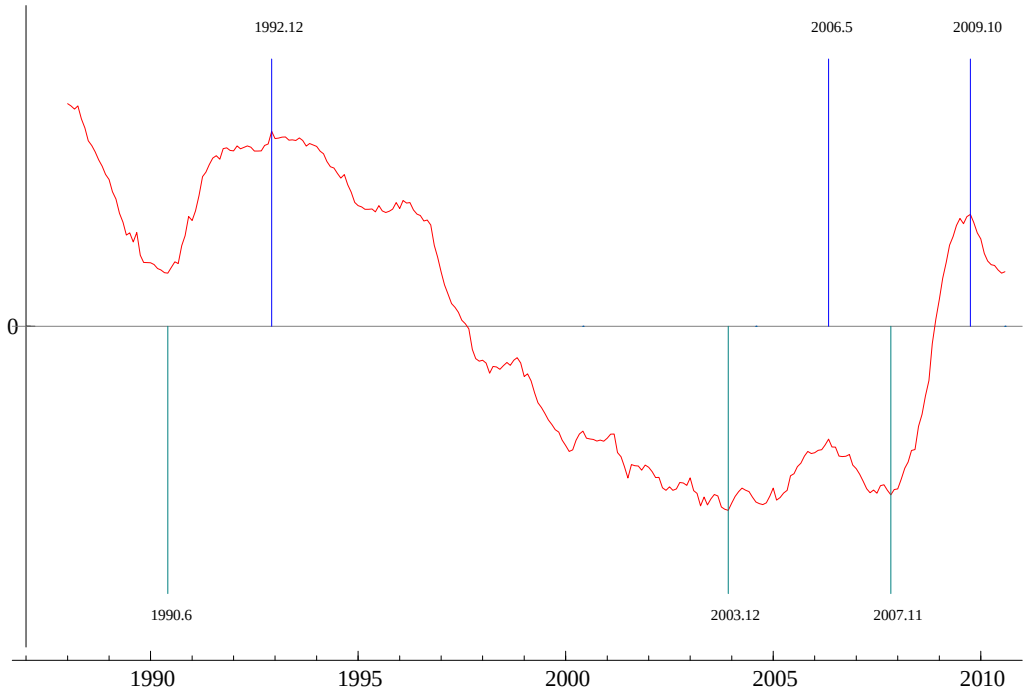


Figure C.5: Cardiff

Figure C.6: Carmarthenshire

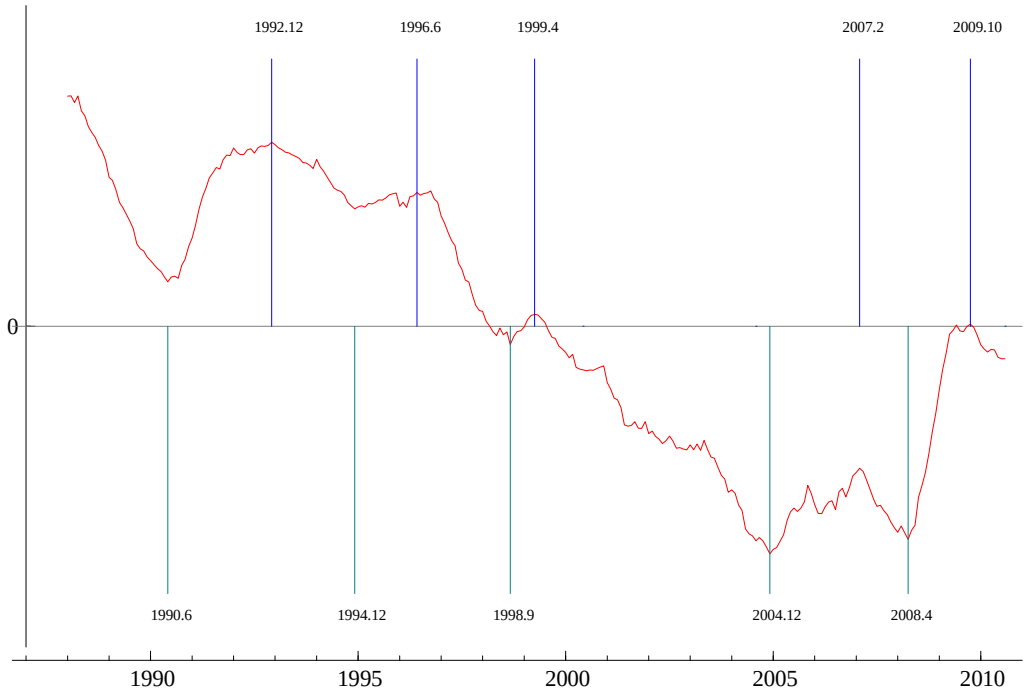


Figure C.7: Ceredigion

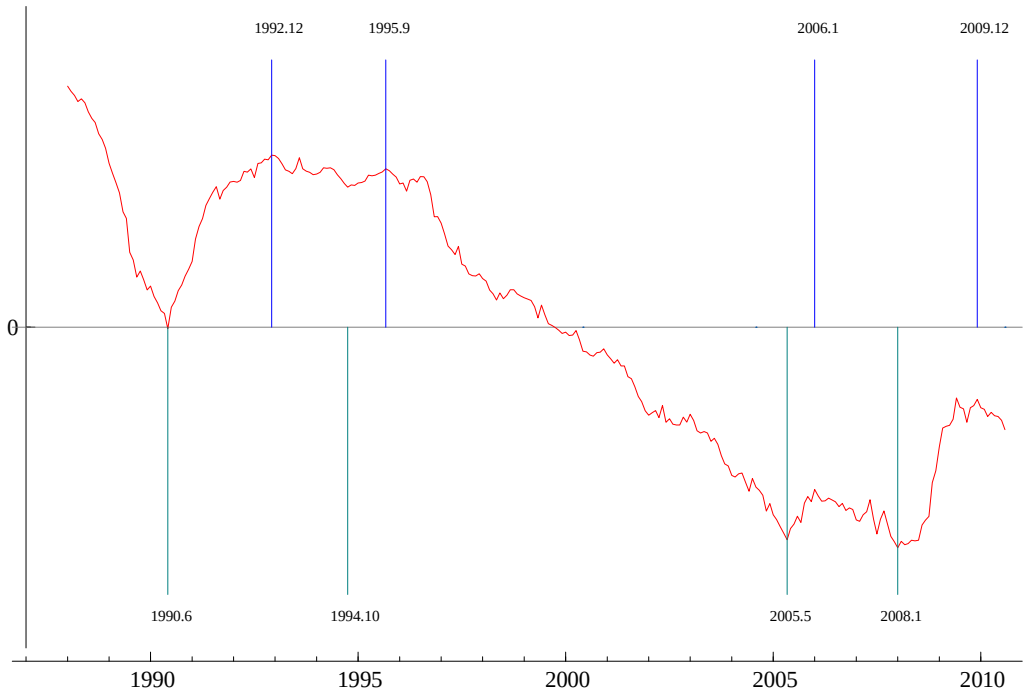


Figure C.8: Conwy

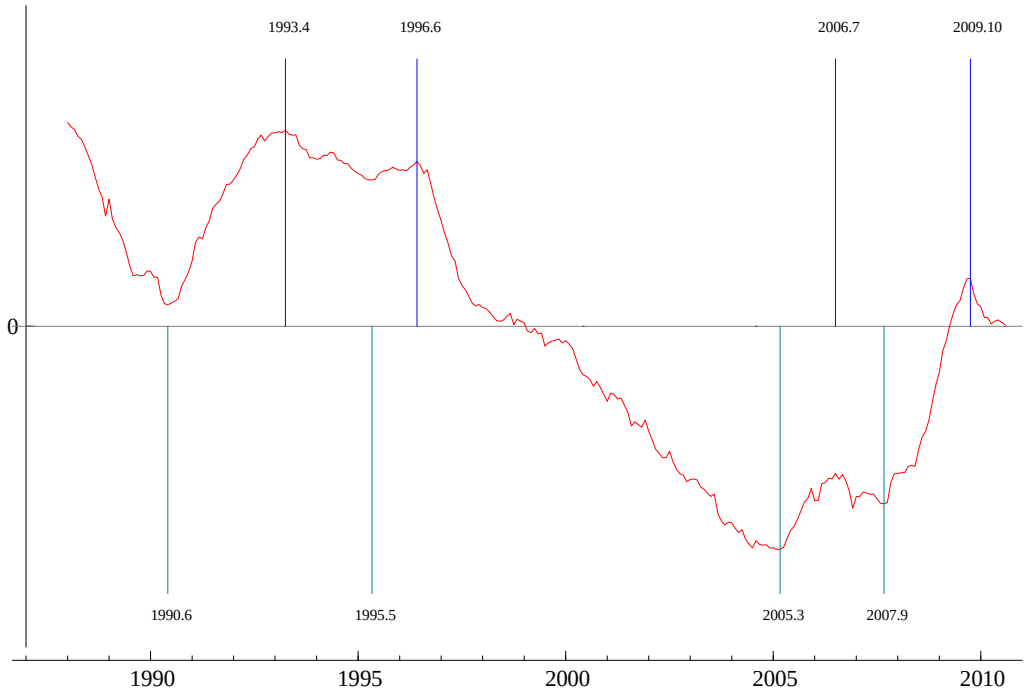


Figure C.9: Denbighshire

Figure C.10: Flintshire

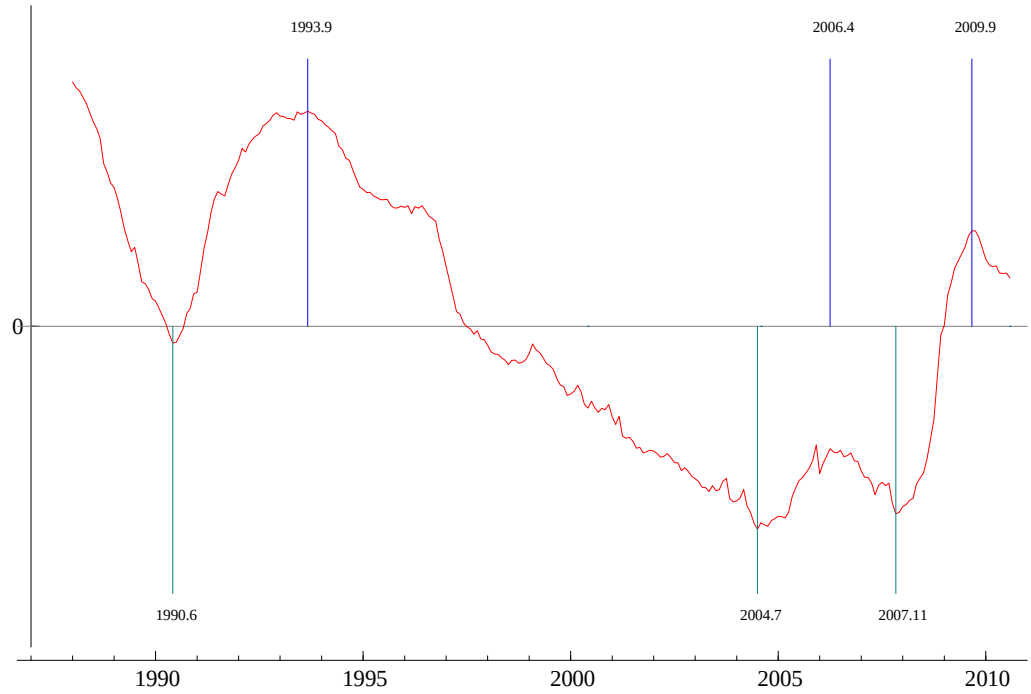


Figure C.11: Gwynedd

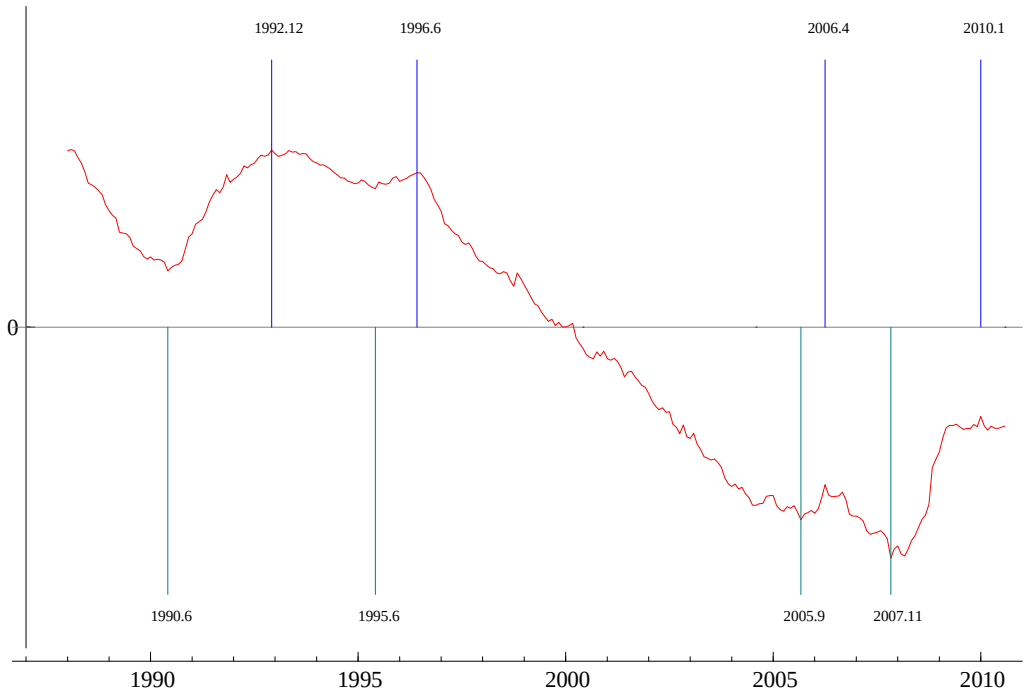


Figure C.12: Merthyr Tydfil

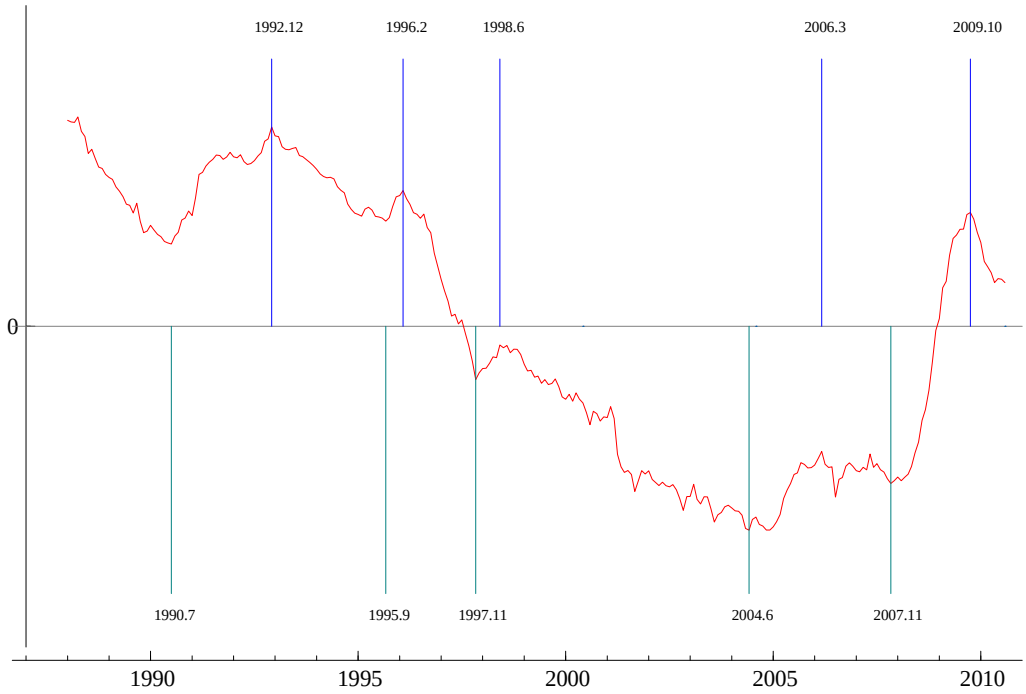


Figure C.13: Monmouthshire

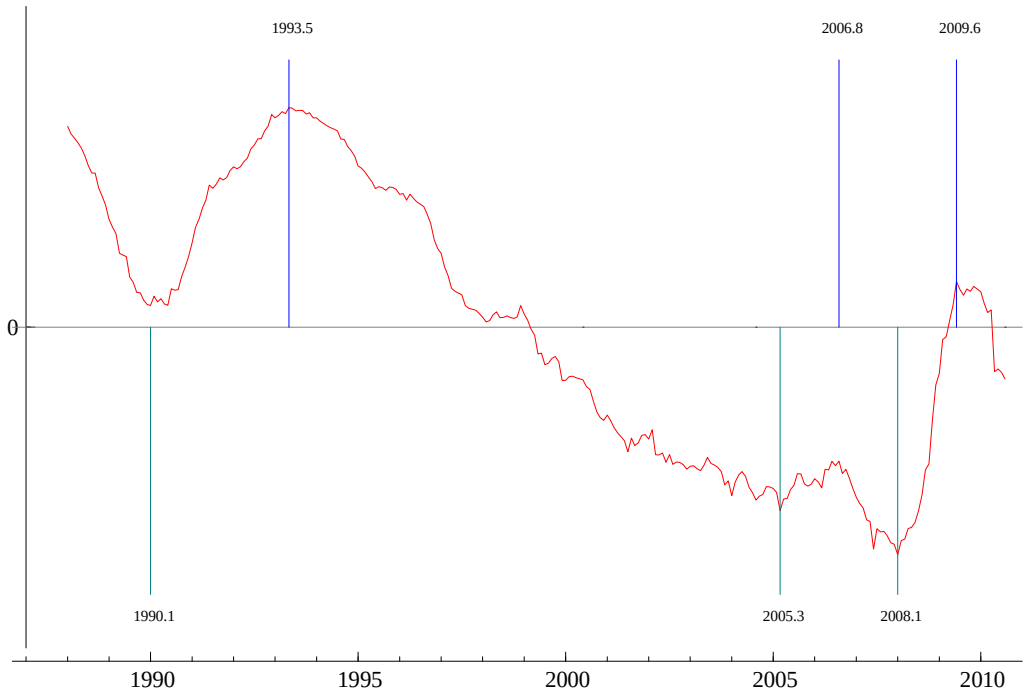


Figure C.14: Neath Port Talbot

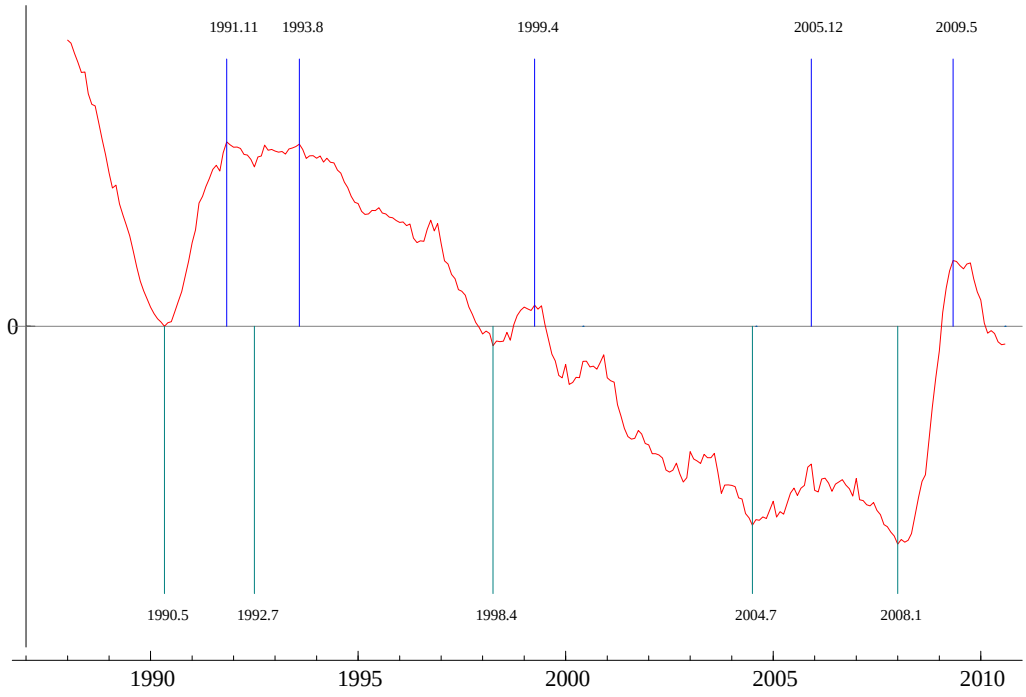


Figure C.15: Newport

Figure C.16: Pembrokeshire

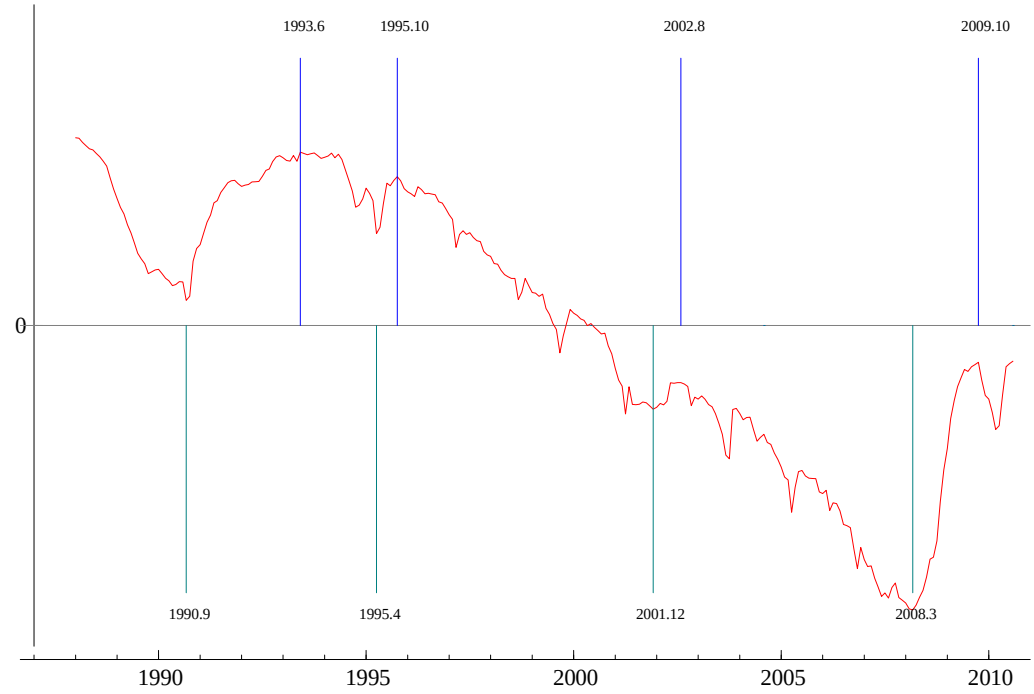


Figure C.17: Powys

Figure C.18: Rhonda, Cynon, Taff

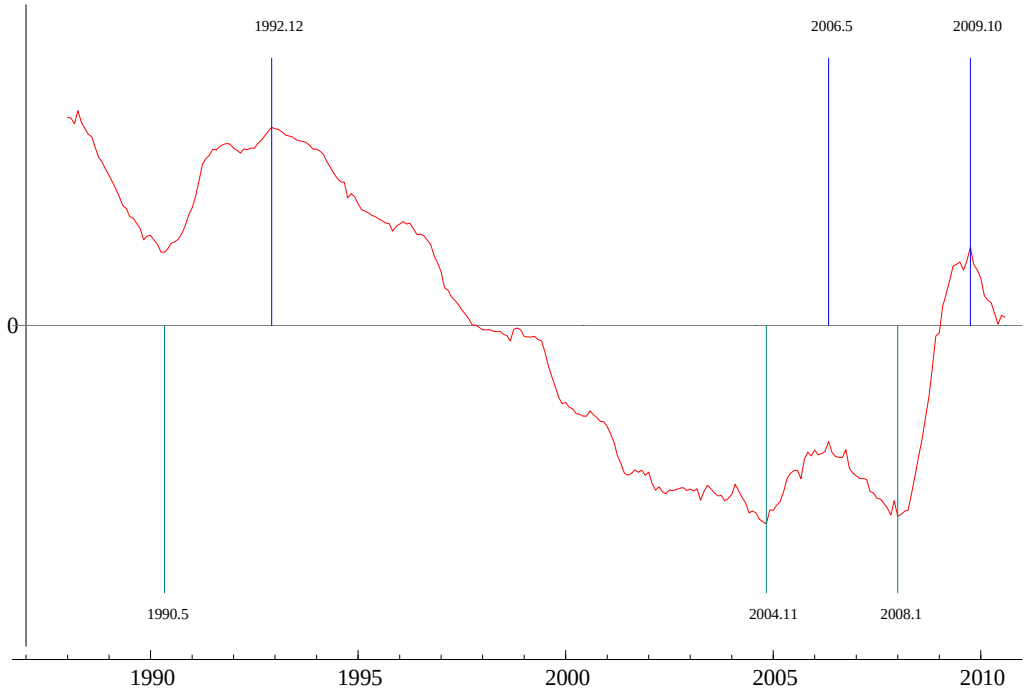


Figure C.19: Swansea

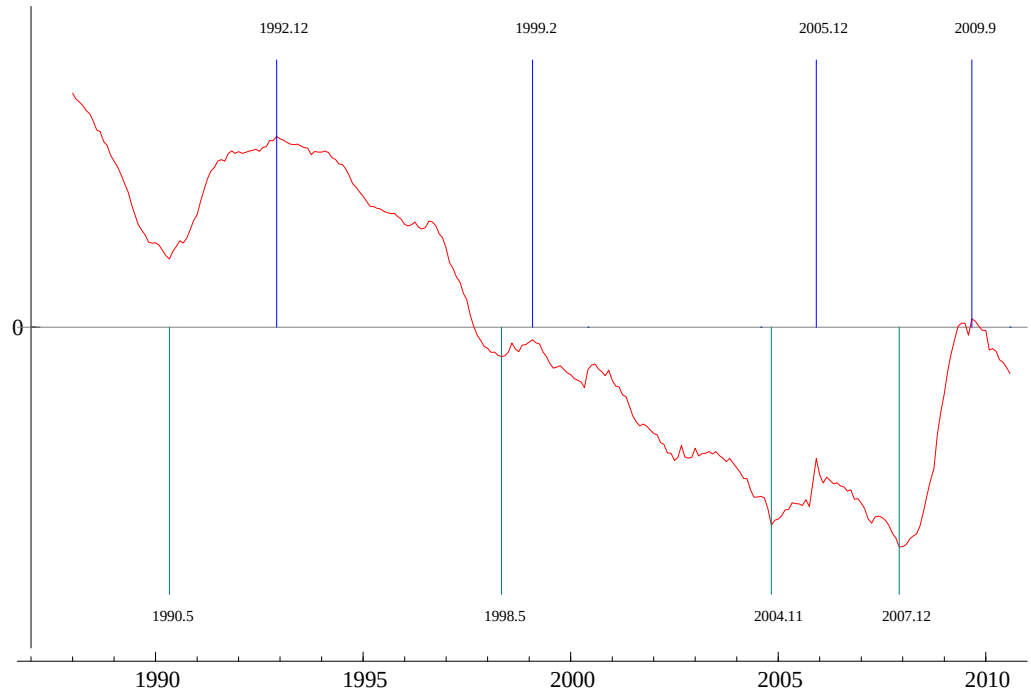


Figure C.20: Torfaen

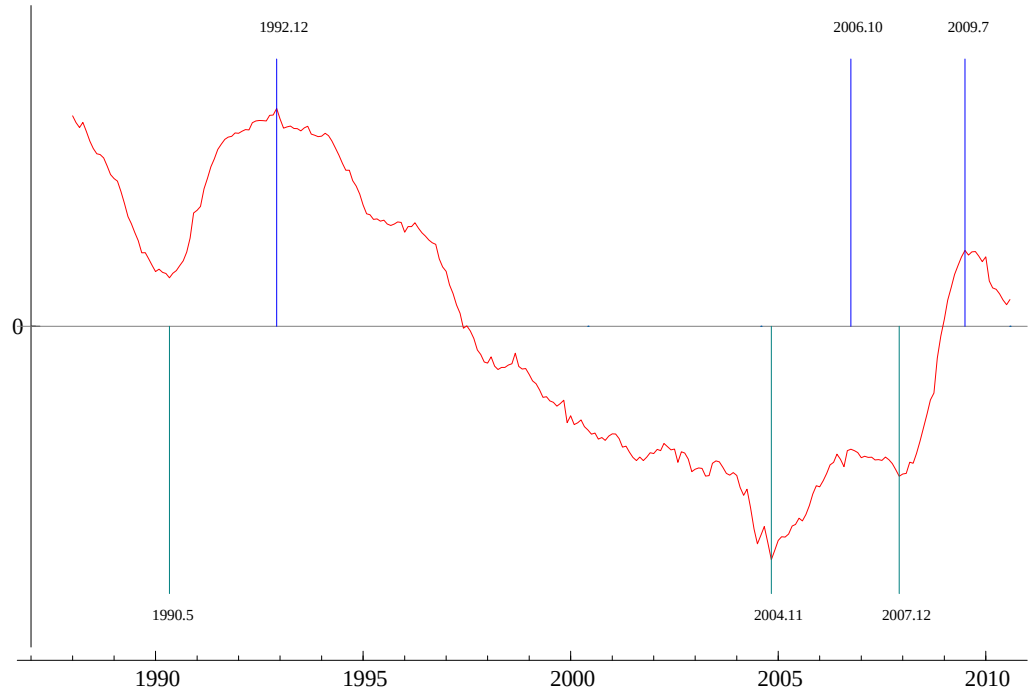
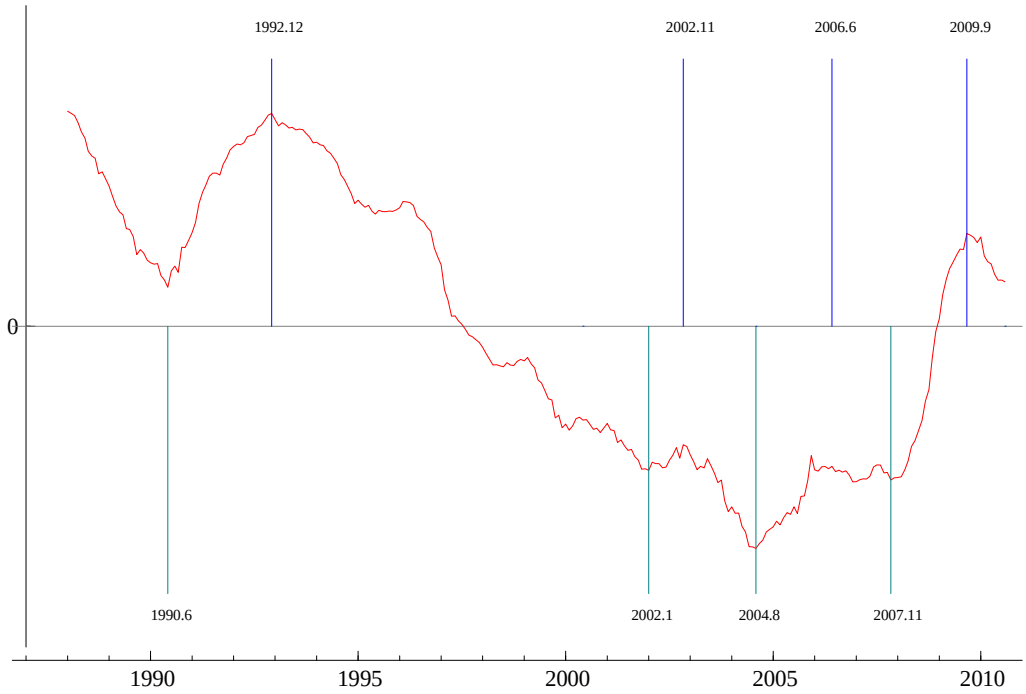


Figure C.21: Vale of Glamorgan

Figure C.22: Wrexham



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