

Housing Investment's Role in forecasting the Business Cycle and the Employment Cycle

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Abstract:

This paper's aim is to analyse the Irish housing cycle using filtering and regression models developed by Leamer. The paper finds that residential investment and the construction sectors have been key contributors to economic growth, and can be used in predicting the business and employment cycle. This paper focuses on the boom years of the Irish property market and its eventual cooling off, which covers a period from 1995 to 2008. There is already much literature available on the boom years of the economy, this paper takes up from where they left off and aims to reassess conclusions drawn from previous papers in light of more recent economic developments.

Contents

List of Figures and Tables:	3
List of Figures:	3
List of Tables:.....	4
Section 1: Introduction.....	5
Section 2: Review of Literature	8
Section 3: Data	10
Section 4: Methodology	10
Section 5: A brief Introduction to the Irish Housing Market:.....	11
Section 6: Components of GDP Growth.....	13
6.1: Contribution to GDP Growth.....	13
6.2 Normalising Contributions and Analysing Recessions:	15
6.3 Analysing the Normal Contribution:.....	16
6.4 The Abnormal Contribution	18
Section 7: What drives the Business Cycle.....	23
Section 8: Volume Cycle v Price Cycle	24
Section 9: The Construction Sector's influence on Total Employment as an Economic Indicator	29
9.1 Can Housing Volume predict Employment Growth?	30
9.2 What Drives the Employment Cycle.....	33
9.3 Other Factors Affecting Employment.....	34
Section 12: Conclusion	35
Section 13: References:.....	36
Section 14: Data Appendix	38
Section 15: Appendix.....	39
15.1 HP filter vs Actual Normal Contribution to GDP Growth of selected sectors:	39
15.2 Cumulative Abnormal Contribution to GDP of other Economic Variables:	41
15.3 Cumulative Abnormal Contribution of other employment sectors to Total Employment.....	46

List of Figures and Tables:

List of Figures:

Figure 1: Real GDP v HP Trend of Real GDP

Figure 2: Business Cycle

Figure 3: GDP Cycle v Volume Cycle

Figure 4: Cyclical Graph of Constant GDP

Figure 5 (a) Smoothed Contribution to Growth

Figure 5 (b) Smoothed Contribution to Growth

Figure 6: Normal Contribution v Actual Housing Contribution to GDP Growth

Figure 7: Abnormal Contribution of Housing Investment to GDP Growth

Figure 8: Cumulative level of abnormal Cyclical Contribution

Figure 9: Weakness or Strength of Residential Investment Before and During Recession

Figure 10: Cumulative Abnormal Contribution of Building & Construction

Figure 11: Cumulative Abnormal Contribution of Computers and Instrument Engineering

Figure 12: Volume Cycle v Price Cycle

Figure 13: GDP Cycle v Price Cycle

Figure 14: Business Cycle v Volume Cycle

Figure 15: Monthly Standardised House Prices in Ireland

Figure 16: Dwellings Completed v Employment Numbers

Figure 17: Housing Volume Cycle v Construction Employment Cycle

Figure 18: Smoothed Normal Employment Growth and Contribution of Construction Sector to Employment Growth

Figure 19: Cumulative Abnormal Contribution of Construction Employment to Total Employment

Figure 20: Normal Contribution v Contribution of Non-Durable Goods to GDP Growth

Figure 21: Normal Contribution v Contribution of Building & Construction to GDP Growth

Figure 22: Normal Contribution v Contribution of Instrument Engineering to GDP Growth

Figure 23: Cumulative Abnormal Contribution of Public Admin & Defence

Figure 24: Cumulative Abnormal Contribution of Electrical Machinery & Equipment

Figure 25: Cumulative Abnormal Contribution of Agriculture, Forestry & Fishing

Figure 26: Cumulative Abnormal Contribution of durable Goods

Figure 27: Cumulative Abnormal Contribution of Non-Durable Goods

Figure 28: Cumulative Abnormal Contribution of Services

Figure 29: Cumulative Abnormal Contribution of Imports to GDP Growth in € millions

Figure 30: Cumulative Abnormal Contribution of Exports to GDP Growth in € millions

Figure 31: House purchase loans - average interest rate

Figure 32: Cumulative Abnormal Contribution of Manufacturing

Figure 33: Cumulative Abnormal Contribution of Agriculture

Figure 34: Cumulative Abnormal Contribution to GDP Growth of Trade

Figure 35: Cumulative Abnormal Contribution Public Admin & Defence

Figure 36: Cumulative Abnormal Contribution of Real estate, Renting and Business Activities

Figure 37: Cumulative Abnormal Distribution of Health and Social Work Employment

List of Tables:

Table 1: Housing and Mortgage Market Characteristics

Table 2: Average Contribution to Irish GDP Growth

Table 3: Regression of GDP Growth as a Function of Lagged Contributions

Table 4: Contribution to Irish Employment Growth

Table 5: Regression of Employment Growth as a Function of Lagged Contributions

Section 1: Introduction

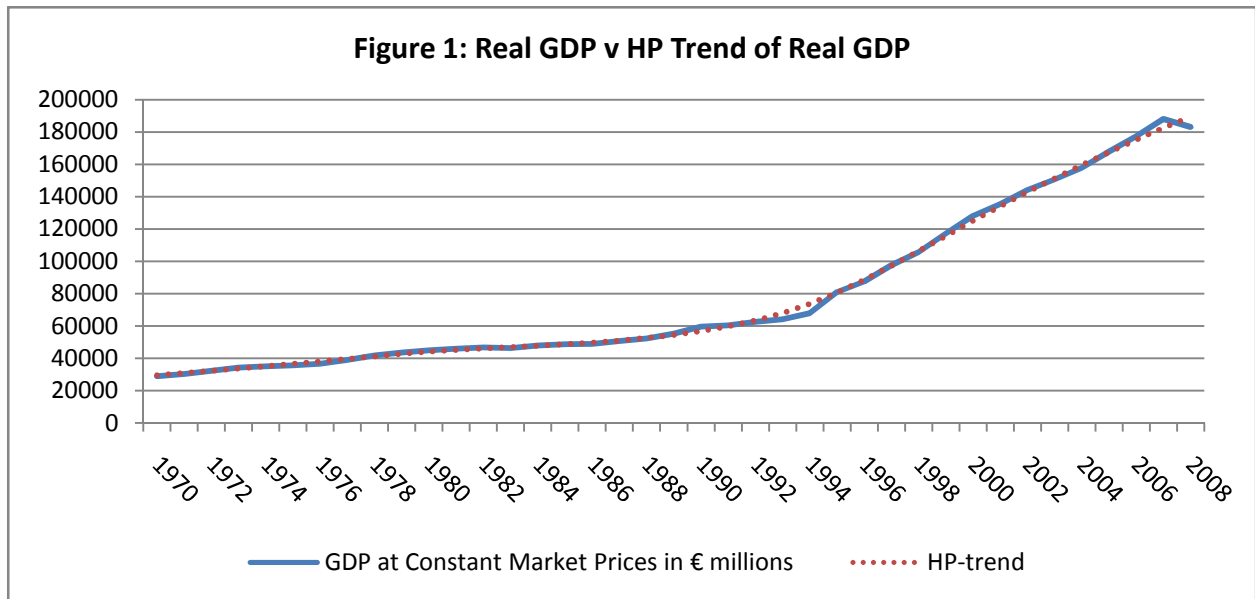
It is every government's desire to be able to predict the business cycle as accurately as possible in order to minimise the impact of oncoming recessions by implementing appropriate policy. Hoeller and Rae (2007) note that the housing market is particularly sensitive to monetary policy due to its interest rate sensitivity. If properly applied, monetary policy can effectively dampen the effects of the business cycle through the housing market.¹ Edward Leamer (2007) noted in his paper that declines in construction have been precursors to six out of ten of the last recessions.²

Many studies have been done in the US regarding the influence of the housing market on the business cycle and on employment. This paper's aim is to analyse the Irish housing cycle using filtering and regression models developed by Leamer. The paper finds that residential investment and the construction sectors have been key contributors to economic growth, and can be used in predicting the business and employment cycle. This paper focuses on the boom years of the Irish property market and its eventual cooling off, which covers a period from 1995 to 2008. There is already much literature available on the boom years of the economy, this paper takes up from where they left off and aims to reassess conclusions drawn from previous papers in light of more recent economic developments.

A comparison of Figures 1 and 2 makes it clear from the start why the focus is on business cycles rather than raw data. We see despite continued GDP growth, the rate at which the economy grew differs greatly.

¹ Hoeller and Rae (2007), p.15

² Leamer (2007), p.16

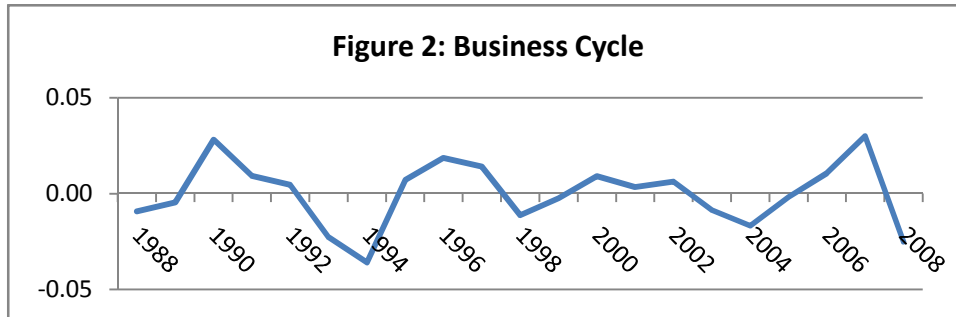


We use Sorensen and Whitta-Jacobsen’s definition of a business cycle, namely: a large number of co-movements of economic activities.³ More specifically, a cycle is composed of expansions occurring more or less simultaneously in many economic activities, followed by similarly defined recessions. Upon reaching the trough of a recession, the revival forms part of the next cycle’s expansion phase. A business cycle lasts a minimum of one year.⁴

Looking at Figure 2, which depicts the GDP gap (relative deviation from the trend) we see the graph begins by emerging from the recession of the 1980s followed by the boom of the Celtic Tiger, which began in 1990 (a name given to the period of high GDP growth achieved during the 1990s). Other events such as the bursting of the dot com bubble in 2000 can be seen, this event resulted in a comparatively milder cyclical trough. Finally, the impact of the sub-prime mortgage crisis and the ensuing recession is also represented by the steep downturn from 2007 onwards.

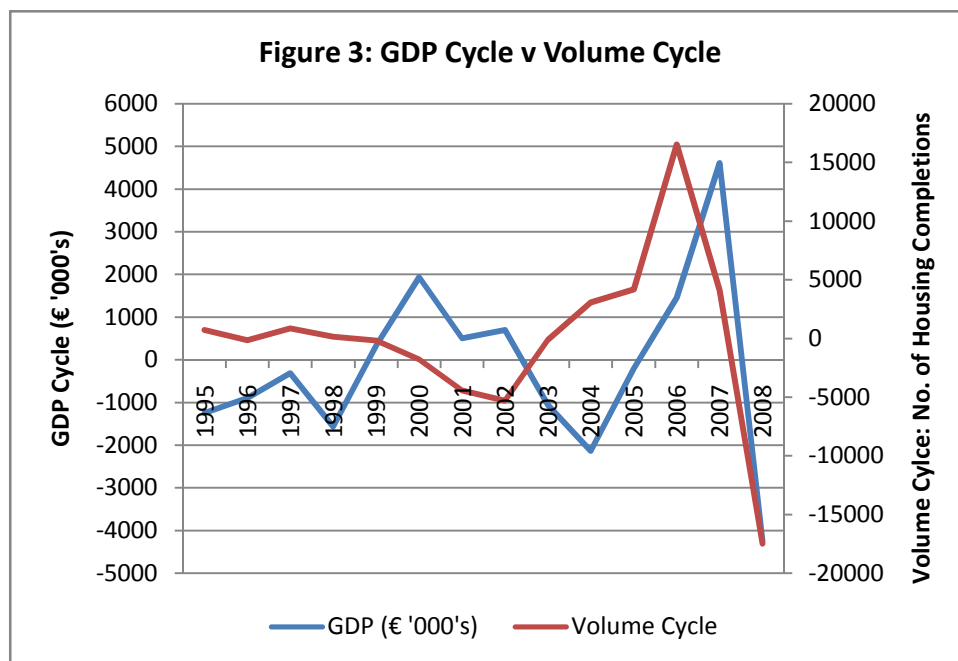
³ Sorensen & Whitta-Jacobsen, p. 400

⁴ Burns & Mitchell (1946), p.1



We now turn to discuss the relevance of the housing volume cycle (which for the purposes of the thesis is measured by the volume of new house completions). Figure 3, plots what amounts to the beginning and conclusion of the thesis. From this graph, two things may already be noted, which will be developed later on. Firstly, the movements in housing volume precede movements in GDP by one year (this is particularly visible from the 2006-07 periods). Secondly, movements in the volume cycle tend to be more extreme and adjust faster to the current economic situation as they represent the direct response of consumers to economic conditions. This is particularly clear in the 2006 to 2008 period, where the number of new house completions fell from 93,419 to 51,724, a drop of 45%.

The aim of this thesis is thus to analyse the Irish housing market using the method laid out in Leamer (2007) and see whether his finding that the housing cycle is consumer driven and that the volume cycle is the best way of showing this.



This thesis is divided into the following sections. The next section shall review relevant literature, section three shall discuss the data used and section four shall outline the methodology of the paper. The extent to which housing drives the business cycle shall be presented in section five and in section six the paper shall argue that the housing cycle is driven by volume rather than prices. The latter part of the paper looks at whether the employment sector follows the housing cycle (in particular the housing volume cycle). Comparisons are made between housing volume and the construction sector employment cycle. After this, the importance of the construction employment sector in predicting future total employment is assessed. The final section concludes and draws an overall picture of the relevance of housing and housing-related employment in the overall business cycle.

Section 2: Review of Literature

The key starting point for this thesis has been Edward Leamer's *Housing is the Business Cycle* (2007). This paper summarises much of his past research on housing and business cycles. Covering a wide range of topics, he uses a combination of multi-variate regression analysis coupled with trend filtering to build his argument that the housing cycle predicts the business cycle and that the housing volume cycle is the main driver in determining the future course of the housing cycle.

Other US papers on the topic build on Leamer and come to a similar conclusion. Heathcote and Davis (2005) find that residential investment leads the business cycle whilst business investment tends to lag. Furthermore, residential investment is found to be much more volatile than business investment. The authors use a neoclassical multi-sector stochastic growth model to analyse residential investment.⁵

Another US paper by Ghent and Owyang (2009)⁶ seeks to build on Leamer's 2007 paper (on which this paper's model is based). Their paper seeks to explain the movement of house prices by regional factors rather than national factors. Building on the results of this paper by applying Ghent and Owyang's methodology to Irish national data could be a possibility for future research, especially given the wide discrepancy between house prices in Dublin versus the rest of the country.

Del Negro and Otrok (2007) also distinguish between national and regional housing bubbles by using vector autoregressive regressions, noting that prices can vary greatly depending on local factors. One can argue this would be particularly relevant for a large country such as the US but less relevant for a small country such as Ireland. However, the Irish housing market is particular given that there is such a stark contrast between house prices in Dublin and the rest of the country. Their paper aims to distinguish between idiosyncratic contributions to growth and contributions common to all states. They also conclude that the degree to which a region is affected by the national housing cycle varies considerably.⁷

A relatively recent Irish study by Fitzpatrick and McQuinn (2004) investigates the relationship between house prices and bank credit. Their hypothesis states that the dramatic rise in house prices during the Celtic Tiger years was primarily fuelled by easily obtainable bank credit.⁸ Given its prolongation of the housing cycle, one could also make the connection that it also contributed significantly to the business cycle.

Research in this field in Ireland has focused mostly on prices rather than volumes when analysing the housing cycle.

⁵ Davis and Heathcote (2005). p.751

⁶ Ghent & Owyang (2009), p.1

⁷ Del Negro & Otrok (2007), p.1963

⁸ Fitzpatrick and McQuinn (2004), p.1

Section 3: Data

The major limitation in the research carried out has been the data available. The Irish Central Statistics Office (CSO) served as the principal source, however it only had suitable yearly data available from 1995 to 2007. My initial hope for this thesis was to demonstrate the role of the housing cycle in predicting the business cycle over a longer period, demonstrating the contrast between the pre and the post Celtic Tiger economy as well as analysing the current situation. Leamer also had quarterly data to analyse, thus leading to more detailed results, Irish data is presented in a yearly format, resulting in slightly broader results with less detailed graphs. However a general picture of the importance of the housing cycle can still be gleaned from this data. Furthermore, the lack of pan-Eurozone residential investment data has been another impediment in my research as the original intention was to compare Ireland's property market with a Eurozone average as well as several .

Data after 2007 has been primarily taken from private sources such as Lisney auctioneers, Permanent TSB/ ESRI and from organisations such as the OECD, all of which publish quarterly economic outlooks in different fields. Thus most graphs spanning beyond 2007 are compiled from a combination of sources.

Section 4: Methodology

A broad overview of the methodology of this paper is now presented. Due to the number of calculations and graphs, more detailed explanations shall be presented at the beginning of each section so that they may be more easily followed.

The overall method of analysis used in this paper was predominantly borrowed from Leamer (2007); the aim being to apply his method to Irish data. However, the method used here differs fundamentally in several places. In Leamer (2007), it is stated that the preferred method of filtering (i.e. separating the trend from the cycle) is the Kernel regression. He prefers this because his analysis is performed over five decades and aimed to 'uncover the long-term moving trend'⁹. However, given that my analysis was performed on a shorter time frame, the Hodrick-Prescott filter (HP filter) lends itself to being more suitable. Leamer himself states that the HP

⁹ Leamer (2007), p. 9n

filter tracks short-term movements a lot more closely, therefore, given the chosen timeframe of analysis for this thesis, it was found to be the most suitable method.¹⁰

Section 5: A brief Introduction to the Irish Housing Market:

In this section a brief background to the Irish housing market is presented. #the aim being to differentiate it from other housing markets and better set the motivation behind this thesis in context.

According to Hoeller and Rae, the housing cycle may have adverse effects on other cycles (such as the consumer cycle), depending on the extent to which housing wealth can be tapped into.¹¹

The major factor, which has made the Irish economy stand out over the last twenty years was the Celtic Tiger, a period from 1990 to 2001 where the Irish economy played catch-up with the rest of Europe. During this decade, spectacular real growth rates in GDP were witnessed, averaging 7.51% and at times exceeding 10% per annum. The subsequent years saw a slowing down of economic growth and a return to more normal growth levels around the 3% mark. According to Garciamartin et al (2008), this economic growth could be attributed to several factors. Firstly, the government adopted an outward-focused economic policy. By looking at the openness rate (defined as exports plus imports divided by GDP), one saw a rate of 112% in 1990 and 195% in 2001. The growth was further driven by a huge influx of foreign direct investment, with a total of 1,200 multinationals currently operating in Ireland. These firms account for 45% of total employment and 69% of total output.¹² These figures, coupled with low interest rates and a housing boom produced an incredibly prosperous economic situation.

¹⁰ Ibid., p.9n

¹¹ Hoeller & Rse (2007), p.17

¹² Garciamartin et al. (2008), p. 410

Table 1: Housing and Mortgage Market Characteristics¹³

	Residential mortgage debt (% of disposable income, 2003) ¹	Typical loan-to-value ratios of new loans (%)	Typical loan term (years)	Variable interest rates (% of new loans, 2005) ²	Securitisation of mortgages	Home ownership rate (% , 2002) ²
Australia	120	90-100	25	84	Yes	70
Austria	..	..	20-30	..	..	56
Canada	77	70-80	25	29	Yes	66
Denmark	188	80	30	30	Yes	51
Finland	71	75-80	15-18	93	Limited	58
France	40	80	15	32	Limited	55
Germany	83	70-80	25-30	16	Limited	42
Ireland	106	70-100	20	85	Limited	77
Italy	20	50	15	78	No	80
Japan	58	80	25-30	22	No	60
Netherlands	208	87	30	36	Yes	53
New Zealand	129	..	..	33	..	65
Norway	24	70	15-20	..	No	77
Portugal	33	..	15	95	..	64
Spain	67	..	15	93	Yes	85
Sweden	98	80-90	<30	50	Limited	61
United Kingdom	105	75	25	35	Yes	69
United States	78	80	30	35	Yes	68

1. 2002 for Norway and Portugal, 2005 estimate for Ireland.

2. Or latest year available.

Table 1 outlines certain key characteristics of the Irish housing market relative to other OECD countries. Statistics which stand out are house ownership, which at a rate of 77% is above OECD average. An average of 106% residential mortgage debt as well as 85% of new loans being issued subject to variable interest rates indicates that the Irish property market is highly sensitive to changes in interest rates. This is further compounded by the fact that mortgages are on average negotiated for the relatively short period of twenty years. Furthermore, over the last twenty years, due to lax regulation of the credit market, it has become increasingly easy to obtain ever larger mortgages.¹⁴

¹³ Source: OECD (2004, 2005, 2006), OECD Economic Outlook, Nos. 75, 78 and 80, Paris.

¹⁴ Fitzpatrick & McQuinn (2004), p.2

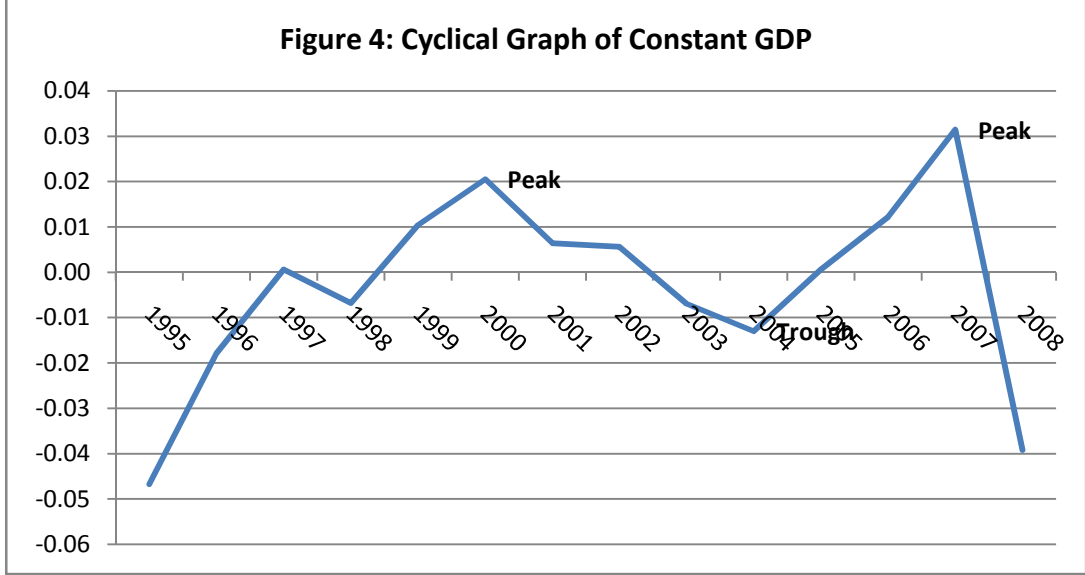
Thus a general picture of the Irish housing market emerges with a high rate of land ownership, high sensitivity to interest rate changes and a rapidly expanding economy to fuel growth in the housing and construction sector.

Section 6: Components of GDP Growth

This section aims to identify the cause of recessions by looking at the timing of what economic sectors precede and which lag the business cycle. Here we look to demonstrate the importance of the housing cycle by confirming that in Ireland, the business cycle is primarily driven by private consumption rather than business consumption. The housing sector’s influence over GDP growth as well as its usefulness for predicting the business cycle is also addressed.

6.1: Contribution to GDP Growth

A brief description of the methodology used now follows. Firstly, from studying Figure 4 (which is a magnified version of Figure 2 and depicts the relative deviation from the trend of real GDP), the local peaks of the business cycle could be pinpointed, namely 2000 and 2007. 2004, the centre of the trough was chosen in order to provide contrast with the peaks during the analysis.



The next stage consisted of finding GDP growth and the growth of each component (x) from year to year. Having found this, the contribution of each GDP component could be calculated by using the following formula:

$$\text{Contribution of } x_i \text{ to GDP growth} = \frac{\text{Real value of } x}{\text{Real GDP}} * (\ln x_t - \ln x_{t-1}) \quad (\text{where } t \text{ is time})$$

The first expression on the right hand side represents x 's share of GDP whilst the second expression represents the growth of the component x .

This leads to the following equation:

$$\sum \text{Contributions of } x_i \text{ to GDP Growth} = \text{GDP growth}$$

From these calculations we can construct, Table 2, which depicts the average normal contributions of several key economic variables during the entire time period.

Table 2: Average Contribution to Irish GDP Growth

	1996-2007
GDP	6.76%
Computers & Instrument Eng.	0.29%
Housing Investment	1.07%
Public Admin & Defence	0.08%
Building & Construction	0.64%
Electrical Mach. & Equip.	0.08%
Agriculture	0.06%
Non-durables	0.99%
Durables	0.73%
Services	0.69%
Imports	-2.32%
Exports	4.02%

The results here indicate that housing investment¹⁵ is the largest contributor to GDP growth at 1.07%. Non-durables (0.99%), durables (0.73%) and services (0.69%) follow close behind giving early support to Leamer's hypothesis that GDP growth is driven by consumer spending rather than business spending, which tends to follow consumer patterns.¹⁶ Including exports in our analysis of GDP in this last decade changes the situation and implies growth has been driven mainly by exports according to the above table with a growth rate of 4.02%. Exports have no

¹⁵ Housing investment is the capital formation of housing.

¹⁶ Leamer (2007), p. 23

doubt been a significant contributor to economic growth. The reason imports and exports are so large here, however is because they overlap with other variables. This means they include the exports and imports of goods and services, which may have also been included in calculating the contribution of other sectors, unfortunately separating precisely what was exported and imported from each industry would be an incredibly meticulous and time consuming process, so for the purposes of this thesis, the focus remains on national production in each industry sector. Ideally, the total of the contributions ought to add up to the total percentage growth in GDP, however two key reasons may be cited as to why it does not in this case. Firstly, several less significant variables were omitted and secondly, the fact that each independently calculated average cannot be expected to sum up perfectly to another variable's average means we can only expect a close approximation. In this case, the actual sum of the GDP components sum up to 6.33%, leaving a further 0.43% to be explained by overlapping of variables and the contribution of smaller economic sectors.

However, bearing this in mind, we can still make some valuable observations. Building and construction¹⁷ follows closely behind residential investment, durable, non-durable production and services at 0.64%. The overall contribution of the building and construction sector as well as the housing investment sector are thus significant contributors to GDP growth on average. However the paper aims to show how they are also useful in predicting future movements of the business cycle.

6.2 Normalising Contributions and Analysing Recessions:

We now turn to investigate the influence of housing investment around peaks and recessions. We do this by normalising contributions to GDP growth, our main tool in doing so is the Hodrick-Prescott Filter, the section will begin by outlining this method. After that the cumulative abnormal contribution will be calculated in order to show the different levels of contribution various variables have on GDP growth around recessions. This is done in order to determine the key contributors to GDP growth over the last two business cycles.

¹⁷ In which both domestic and commercial structures are included.

A filter allows the growth component of GDP to be separated from its cyclical component.¹ The HP trend normalises the data and allows us to calculate the normal contribution of a variable to GDP growth.

The formula used in this paper appears in the form:

$$HP = \sum(y_t - g_t)^2 + \lambda \sum[(g_{t+1} - g_t) - (g_t - g_{t-1})]^2$$

Where y represents the log of the economic time series being analysed, g is referred to as the growth component and is calculated by minimising the total sum with respect to the growth path. The expression $y_t - g_t$ is the cyclical component and when graphed appears as a series of peaks and troughs as in Figure 2. λ is a constant, which determines how smooth the filter will be, the higher the number the more closely it follows the actual time series, in this case it was set to a value of 5 throughout the calculations. The expressions in the right-hand bracket represent the approximate percentage growth rate of the variable y in periods $t+1$ and t , respectively. Looking at them together, the right-hand bracket represents the change in the estimated trend growth rate from one period to another.¹

Upon running the HP filter, a graph such as the one below could be created comparing the HP trend to the actual contribution of the variable. The graphs in Figures 5 (a) and (b) were compiled using the HP trends generated in this way.

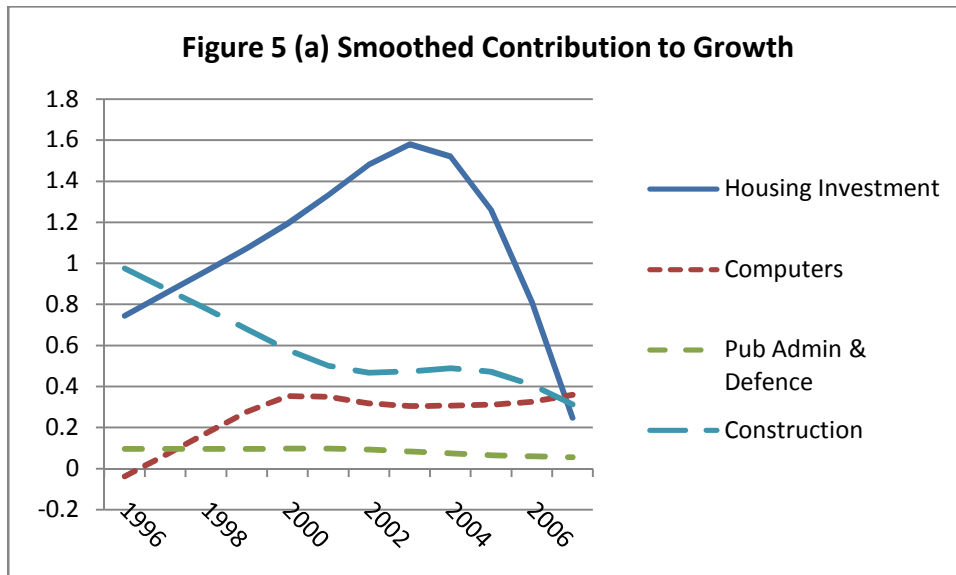
One drawback of this model is that the first and last three results on the time series have a tendency to be inaccurate. This is an underlying issue when the dataset is as limited as the one here (12 observations) and ought to be taken into consideration. However, viewing the findings along with other calculations performed in this paper, the HP filter can help build a picture of the extent of the role that the housing cycle plays in the overall business cycle.

6.3 Analysing the Normal Contribution:

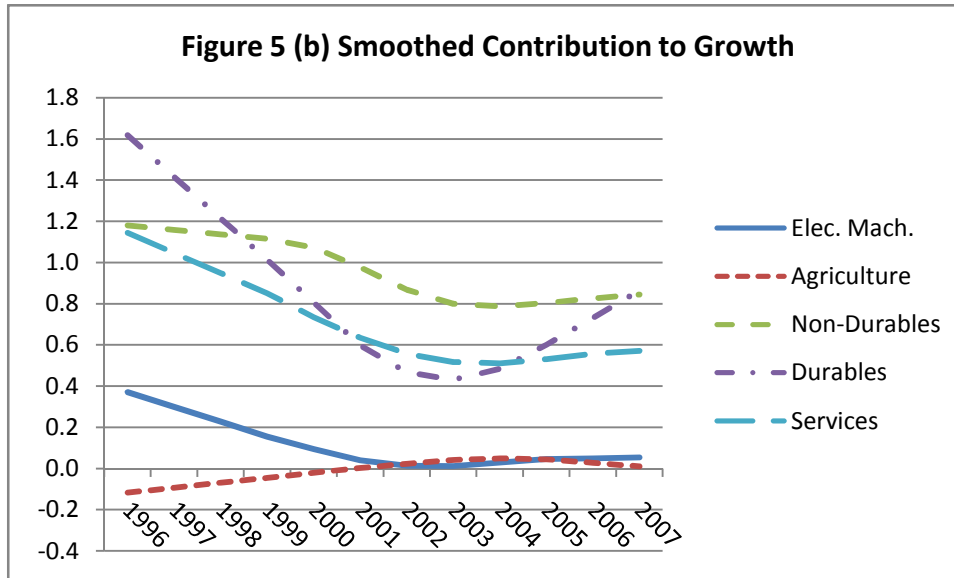
The below graphs depict the normal contribution to growth of some of the main components using the HP filter. The most striking feature is the continued growth of housing investment in Figure 5(a) right into 2004, and then sharply turning into decline straight after. This is interesting given that the housing market actually peaked in 2006 according to Figure 8, which simply uses

raw data. Thus the contribution to housing to GDP growth had already begun declining well before its peak, giving signals of a slowdown in the housing market.

The building and construction sector (also seen in Figure 5(a)) had been in steady decline throughout, slowing its rate of descent in 2001 and resuming its decline in 2006, one year before the generally acknowledged peak of the business cycle. Orna Mulcahy explains this by stating that at the time there was an oversupply of new homes on the property market along with a large amount of overpriced second hand houses, leaving little scope for further profitable building projects.¹⁸ Hence the market changed from being a sellers' market to a buyers' market. The official data series end at 2007 for these variables, however, during 2008 investment in housing also took a sharp fall. This is discussed in more detail later on in Section 7.



¹⁸ Mulcahy, Irish Times, 04/06/08



6.4 The Abnormal Contribution

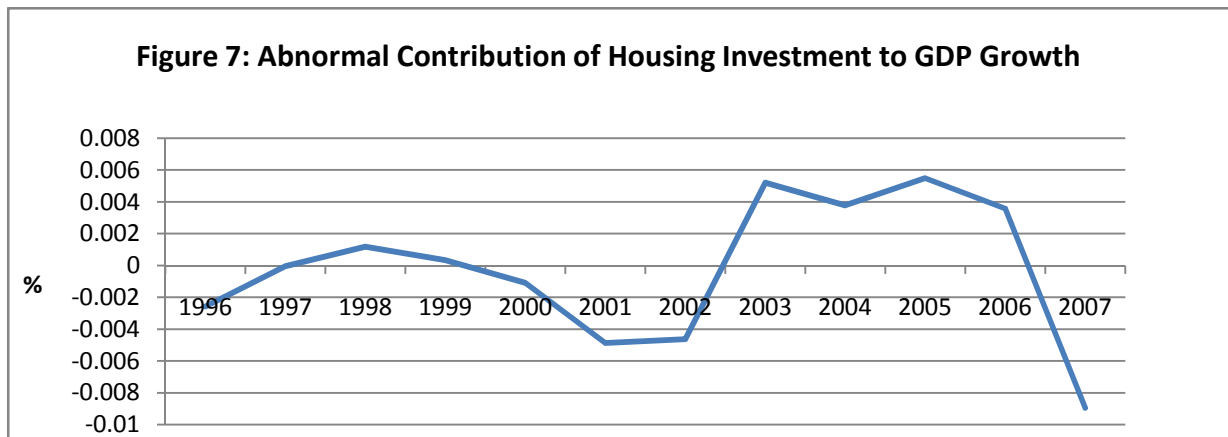
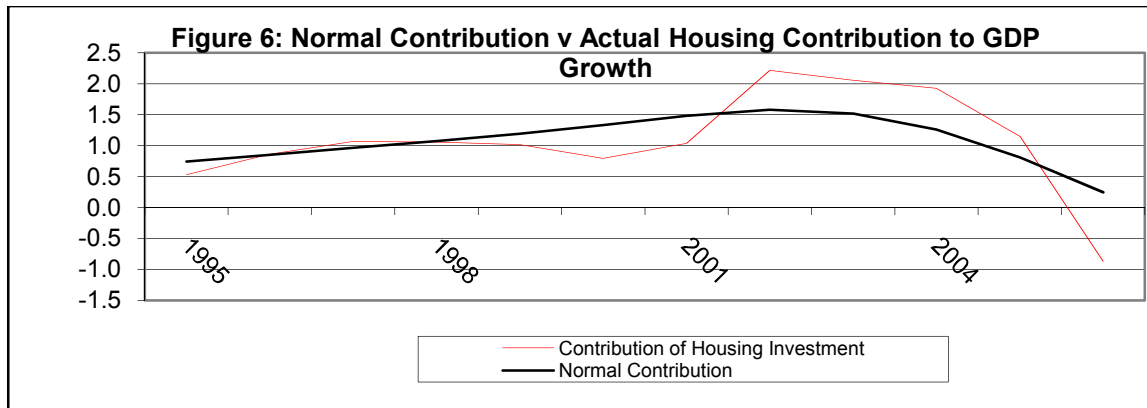
After calculating the cumulative normal contribution of each of the key sectors to GDP, the abnormal contribution was calculated following Leamer's three-step process.¹⁹ The abnormal contribution is the level of extra contribution above or below the average of the normal contribution. This gives us a clearer picture on exactly how strongly a sector is performing relative to previous years. This section will begin by explaining the three key steps in constructing the graphs depicting each component's abnormal contribution to GDP growth.

Step 1: To begin with, the normal contribution was found using the HP filter, which produced a graph as in Figure 6. The normal contribution was then subtracted from its actual value in order to find the abnormal contribution (presented in Figure 7).

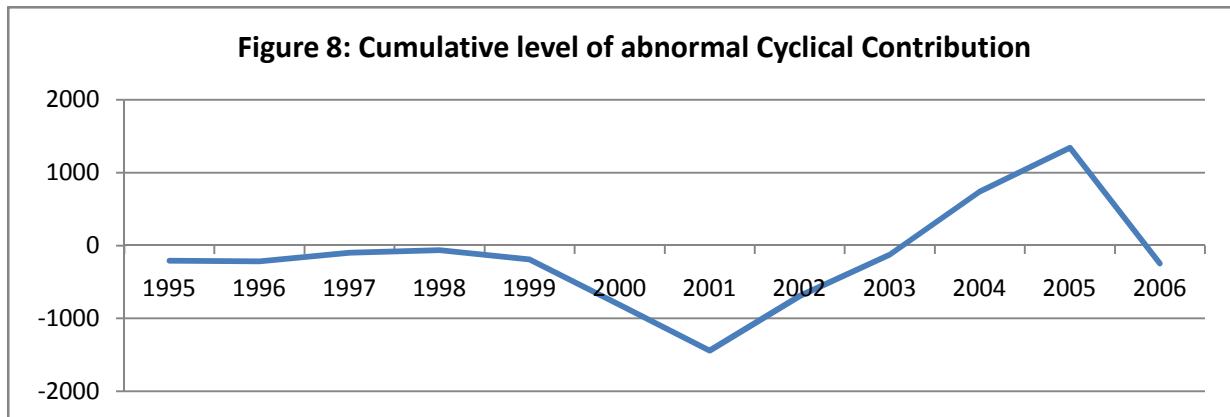
Step 2: The abnormal contributions were then transformed into levels by multiplying the abnormal contribution by GDP of that year. These were then cumulated to give the cumulative abnormal contribution. The results of doing so are presented in Figure 8. The graph depicts the cumulative levels of abnormal contribution to GDP growth.

¹⁹ Leamer (2007), p. 10 (However, it is broken into four steps here so as to explain it more thoroughly).

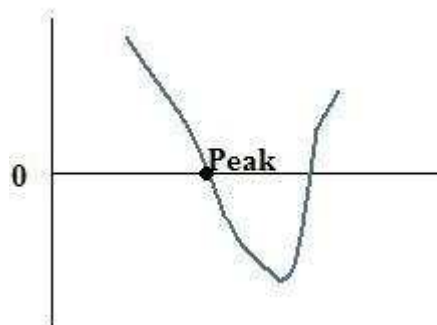
Step 3: Recessions were then pinpointed by identifying peaks on a graph of GDP (Figure 4).²⁰ To illustrate the effect of a component of GDP around a recession, data from one year prior to the peak and two years after the peak were taken. This data was normalised by subtracting the value of the cycle peak from the cumulative abnormal contribution of a given year. Hence in the year of the peak subtracting in this manner will always give zero. The value for the year prior to the peak and for two years after were subtracted in this way, these resulted in graphs such as Figure 9.



²⁰ Given that the data used was divided into a yearly timeframe, identifying peaks manually was found to be a sufficiently unambiguous method, this would not be recommended, however if the data were more detailed.



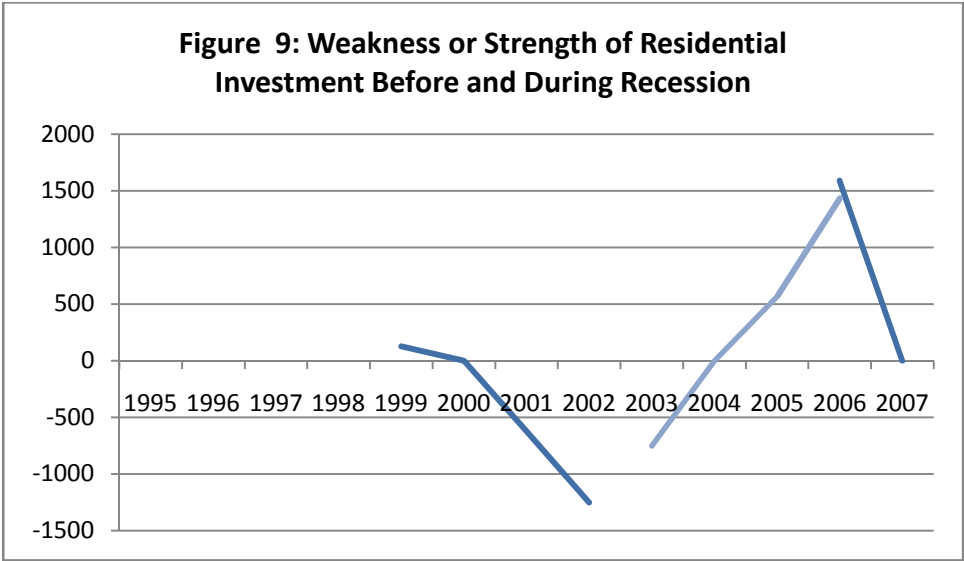
Step 4: The resulting graphs represent the cumulative abnormal contribution to GDP growth, to interpret them, one must bear certain things in mind. If the line is flat, this means the contribution from one year to the next is normal. When the line has a negative slope, the contribution is less than its normal value and is a contributing factor to weakness in GDP growth. The fact that the contribution is falling prior to the peak (the intercept) signals that a recession may be ahead. The trough of the recession occurs at the bottom of the u-curve, after which abnormal contributions to GDP growth would start heading towards positive figures once again. Leamer's results generally took the form of tick-shaped graphs, such as that depicted below: They showed housing investment's abnormal contribution to GDP growth declining before the peak of the business cycle is reached, upon passing zero (the peak) the abnormal contribution continues to fall during the recession and eventually begins to turn upward, signalling an increasing abnormal contribution, which leads to the next peak.



The graphs that resulted from the above calculations are in general variations of this shape. However not all resemble this, the reasons behind this are discussed below. The graphs that follow are housing investment, building and construction, and computer and instrument

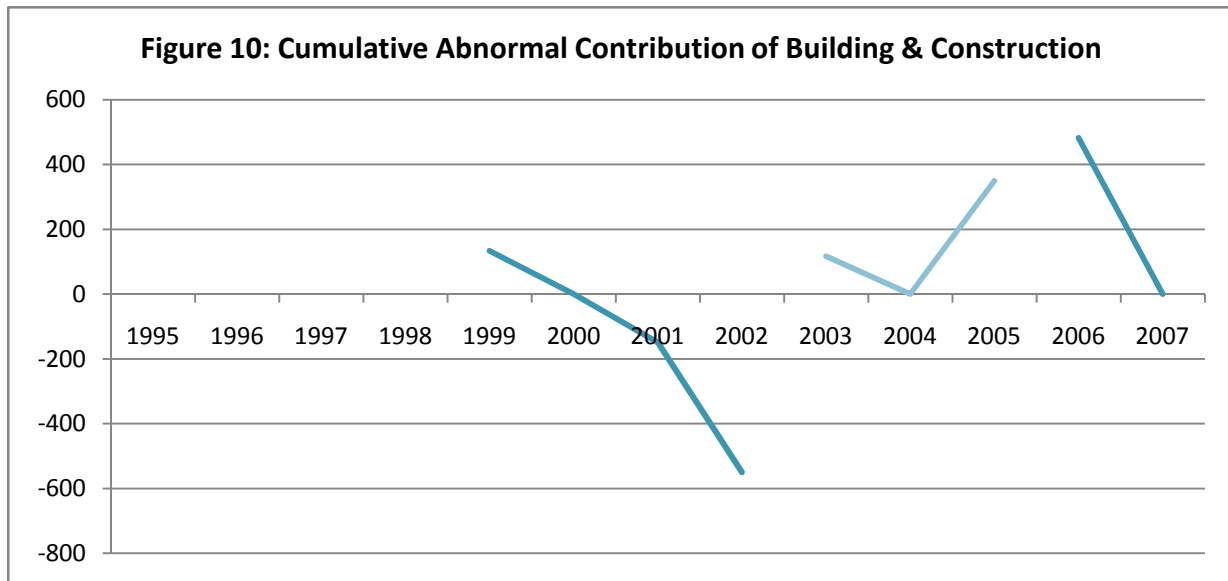
engineering (see the Appendix, graphs 23-30 for the other key GDP components), these are discussed in detail as they are the components cited by Leamer (2007) as having been the key drivers behind the last two recessions.

Looking firstly at housing investment’s contribution to GDP growth in the 1996-99 period, it appears insignificant, hovering around zero, indicating it remained around its normal level of contribution to GDP growth. The next line coincides with the trough of the GDP cycle and we see an overall rise in abnormal contribution to GDP growth, indicating the emergence out of the cyclical trough of the cycle. The last observation demonstrates the drop in contribution of housing investment to GDP growth from 2006 onwards. This fall coincides with the peak of the housing market in 2006 and preceded the sub-prime mortgage crisis by one year.



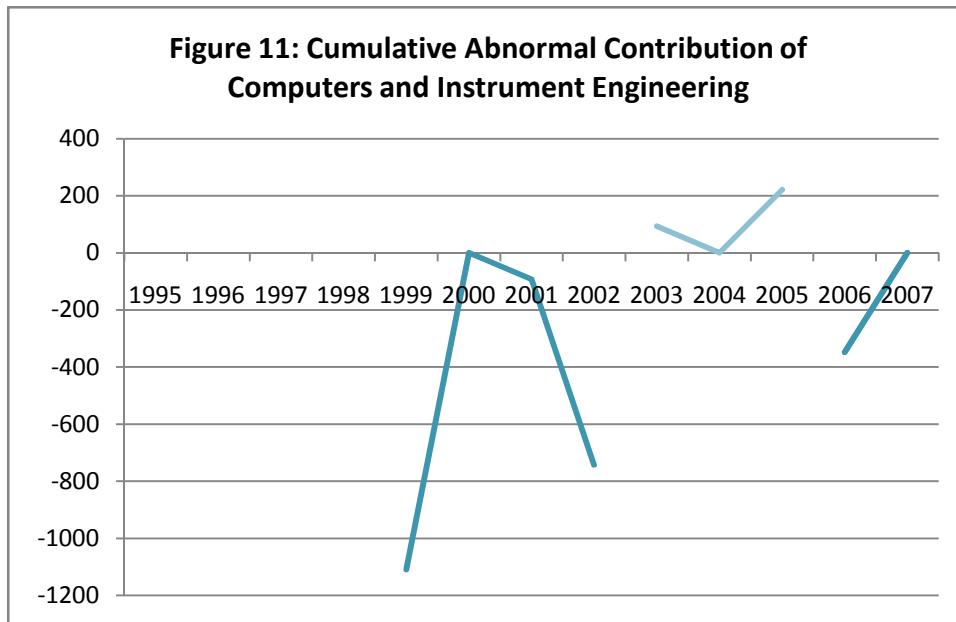
The cumulative abnormal contribution of building and construction seen in Figure 10 mirrors housing investment’s abnormal contribution, this is hardly surprising given the similarity of the sectors. However, evidence that housing investment precedes the entire construction sector may be seen by comparing the graphs. The downturn from 1999 to 2001 for housing investment becomes steeper in 2001, whilst it takes construction an entire year to follow this change in decrease in abnormal contribution. The same may be seen in the 2003-05 period, where housing had already begun increasing its abnormal contribution to GDP growth in 2003, while it took construction another year to follow suit. The two sectors do, however, peak together in 2006 and the rate of decline heading into 2007 is of a roughly similar slope. Thus some element of

forecasting the business and even overall construction cycle becomes apparent at this stage.



The reason the contribution to GDP growth of computers and instrument engineering has been included is that Leamer cites this recession as being one of the two key recessions not induced by the housing market,²¹ but rather could be explained by the bursting of the dot com bubble. This is clearly visible in this graph. However, in contrast to housing investment and construction, the abnormal contribution only began to fall one year after the bursting of the bubble, implying a counter-cyclical movement with the business cycle. This can be explained by manufacturers taking more time to adjust their output in accordance with the financial crisis.

²¹ Leamer (2007), p.16



By studying the cumulative abnormal contribution of particular economic variables, it is possible to understand what variables were the key drivers of booms and recessions. Comparing these graphs with others in the appendix, it becomes increasingly clear that the above three variables were the key economic drivers in the last decade since the movements of other variables on average were less extreme.

Section 7: What drives the Business Cycle

We now aim to investigate what the main components are in shaping the business cycle. In Leamer's 2007 paper, he ran a regression with the aim of analysing the most significant variables driving the business cycle by their coefficients (which represent the rate of change of a variable from one period to the next). By looking for the most significant t-stats, he found that the most significant variables were residential investment, services, durables and non-durables. From this, he concluded that the business cycle was consumer-driven.²²

Table 2 represents a multivariate real GDP growth regression on one year lagged contributions to GDP growth. Looking at the t-stats and the p-values of the variables, it becomes evident that there is a problem of multi-collinearity between variables. That is, the variables moved too closely together and the regression could not properly distinguish between variables. Such an

²² Leamer (2007), p.23

event may occur due to the range of the data being too small. The high p-value and low t-stat (one looks for the opposite of this to confirm the accuracy of results) indicate an inaccuracy in the coefficients. The t-stat measures the independent contribution of the component of GDP, whilst simultaneously controlling for all other variables. The p-value measures the probability of obtaining a result at least as extreme as the one actually observed.

Therefore, the following table holds little significance to our analysis and we must rely on other analysis to test Leamer's above finding in relation to the Irish business cycle.

Table 2: Regression of GDP Growth as a Function of Lagged Contributions

R Square	0.863065
Standard Error	0.018408
Observations	12

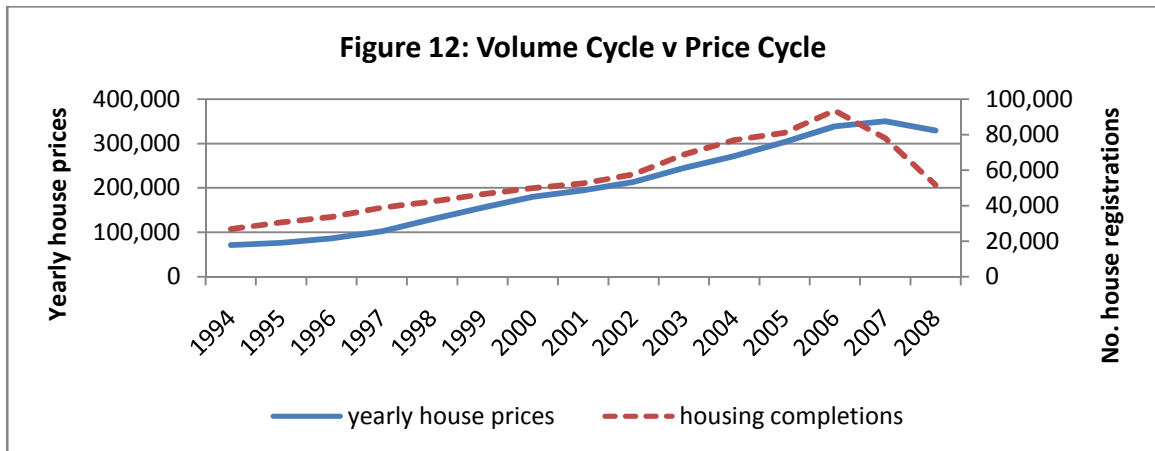
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	-0.00151	0.054534	-0.02767	0.980438
Software	0.693221	3.019432	0.229586	0.839756
Public Admin	0.802425	1.390646	0.577016	0.622223
Electrical	5.568493	5.49684	1.013035	0.417665
Agriculture	4.538863	8.878147	0.51124	0.660031
Non-Durable Goods	-0.22457	4.158399	-0.054	0.961841
Durable Goods	0.924725	2.567058	0.360228	0.753162
Services	6.817861	4.712596	1.446731	0.284902
Construction	-0.95372	5.38166	-0.17722	0.875662
Housing	-0.02845	1.221622	-0.02329	0.983532

Section 8: Volume Cycle v Price Cycle

Having established that the residential investment and construction are significant predictors of the business cycle, the paper now turns to assess what data best forecasts a future business cycle movement. Put differently, what variable moves first in a particular direction, giving economists clues as to the direction other variables will take in the coming months.

Much of the literature on the Irish housing market focuses on house prices, however Leamer makes the argument that housing volumes are the more influential variable.²³

Figure 12 shows the contrast between the price of houses and the volume of houses. The volume of houses for these purposes is calculated using new house registrations data. The Central Statistics Office defines this as being the number of houses connected to the electrical grid each year. What becomes abundantly clear is that in identifying a recession, it is far easier to precede one looking at the volume cycle. From looking at the graph, the cooling off of the housing market can be seen quite clearly from 2006 onwards, with the amount of house completions falling dramatically whilst prices simply level off. However, prices do not begin to fall until one year later.



Generally, house prices are a lot less flexible than the volume. If demand falls we see the prices adjust only a small amount. This relative inflexibility of prices led to people simply buying fewer houses thus reducing demand for new ones. Prices can be seen to have peaked in 2007 whilst volume had already begun dropping dramatically by 2006, which was the peak of the housing market. To compare between 2006 and 2008, new house registrations fell from 93,419 to 51,724, a drop of 45%. In comparison, prices fell from a national average of €338,542 in 2006 to €329,691 in 2008, a drop of only 3%. Speculators initially interpreted the inflexibility of house prices as a sign of a gentle cooling off of the housing market. However, a series of interest rate rises²⁴ and the unfolding of the sub-prime mortgage crisis made home buyers a lot more cautious.

²³ Leamer (2007), p.25

²⁴ Figure 31 in the Appendix

A fall in the number of buyers led to the market being swamped by second hand homes. Newly completed homes were also heavily discounted, however according to Mulcahy, properties had to be continuously re-valued downward in response to weak demand. This has been exacerbated now by astute buyers holding out for the trough of the housing market.²⁵ This contrasts starkly with the prior 1996 to 2002 period, where according to Fitzpatrick and McQuinn (2004), the housing market was characterised by the dangerous formula of rapidly inflating house prices (an average of 12% rise in real terms) coupled with easily obtainable low nominal interest rate mortgages.²⁶

Another contributing factor to the fall in house prices is that there is general consensus that property prices were inflated. Estate agents are cited as the main source of this price distortion, providing over-optimistic estimates.²⁷ However, since the fall in price was not enough to woo investors, the graph illustrates the investors' response, a massive fall in the volume of housing.

The final factor that explains this dramatic fall in new house registrations was the credit crunch, which hit in 2007. Following a series of banks posting record losses being traced back to sub-prime mortgages and ultimately overly accessible mortgages for people who couldn't afford them, banks' credit lending conditions became much more stringent. This contributed to a fall in consumer investment in the housing market.

From Figure 12 it seems we have established that housing volume captures the housing cycle most effectively from the raw data, this finding is in line with Leamer's findings in his investigation of what best predicted the Los Angeles housing market. However this thesis takes the investigation a step further and looks at cyclical data of both variables. We now turn to compare the GDP cycle with the volume and the price cycle in order to see what forecasts it best. From looking at Figures 13 and 14 we see cyclical data tells us a slightly different story. Studying both graphs closely, it becomes evident that both the volume cycle and the price cycle precede the movements of the business cycle by one year. This is most clearly seen in 2006 where both housing volumes and prices peak whilst GDP peaks one year later. This may be also seen at the

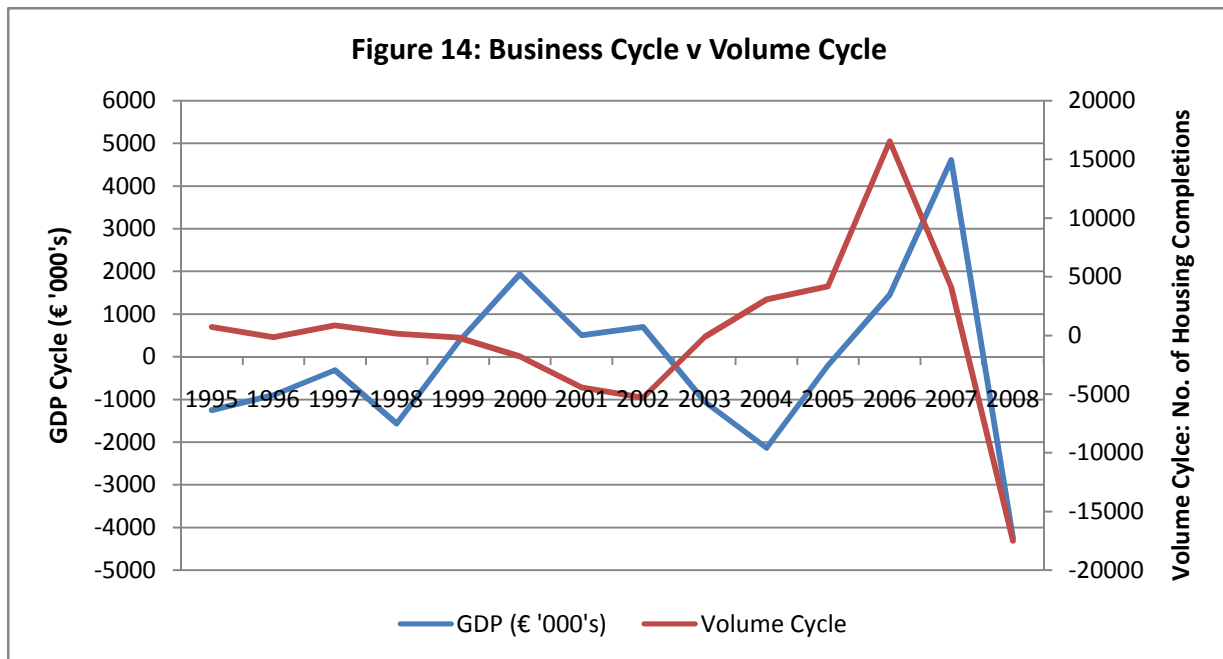
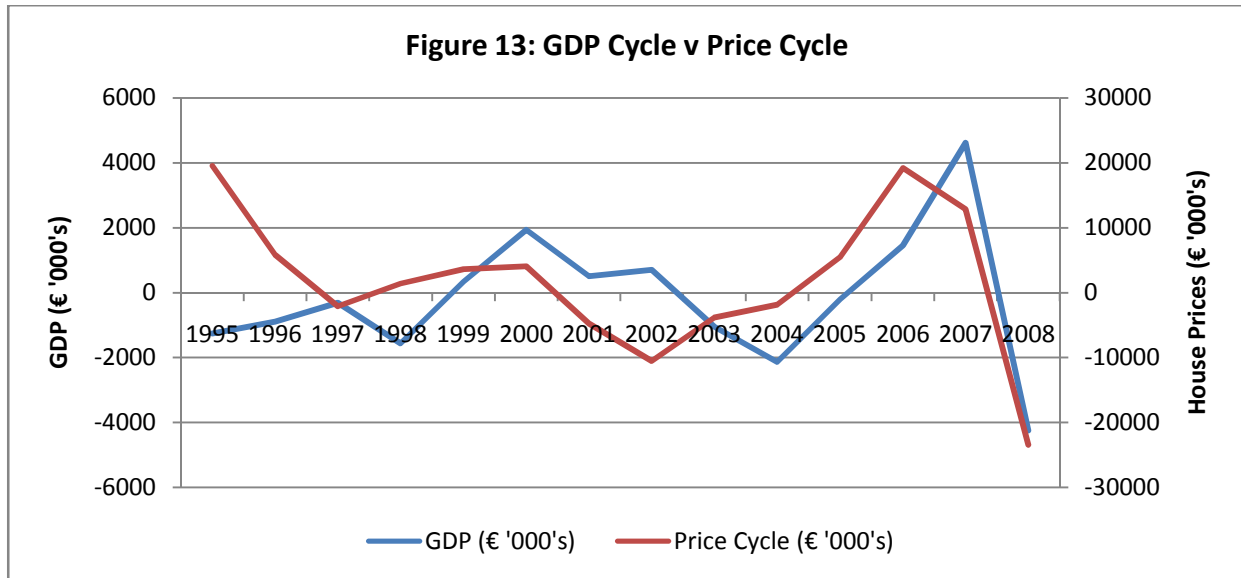
²⁵ Mulcahy, Irish Times, 04/06/08

²⁶ Fitzpatrick & McQuinn (2004), p.1

²⁷ Irish Times 03/07/08

preceding trough, which bottomed-out in 2002 for housing volume but took until 2004 to reach the business cycle trough.

However, one must always bear in mind the relative inaccuracy of results at the beginning of a time series when running the HP filter.



Therefore, I must conclude from this graphical comparison that indeed from raw data, the volume cycle precedes the price cycle, however from looking at cyclical data this becomes a lot

more difficult to distinguish. For the rest of the paper I shall use the volume cycle since it manages to forecast the business cycle from both raw and cyclical data.

However, prices should not be dismissed entirely, for they can still give us useful information about the housing market.

According to Kenny (1998) shocks to the growth rate of real house prices have a larger effect on the level of consumption²⁸, thus confirming the findings in the paper thus far that the volume cycle is more volatile than the price cycle. Another notable finding from this paper is that the shocks to price growth rates are not permanent ones and are only moderately persistent. He notes that after the 1988-90 price rise, prices had returned to their pre-1988 normal levels.²⁹

Fitzpatrick and McQuinn (2004) also focus on the effect of housing prices in their paper, written during the final boom years of the economy, they partially predict potential causes of a decline in house prices. They note that were the market subject to a notable income or interest rate shock, this would induce credit institutions to revise their credit to income ratio downward and a significant price decline would ensue as a direct consequence.³⁰ The restrictions on credit placed by banking institutions, coupled with high interest rates, reduced the number of house buyers. However, the market also became saturated with houses and it was this combination, which forced sellers to start cutting housing prices. Volumes fell dramatically as speculative builders either completed existing projects and did not begin new ones or even went so far as to abandon current projects, both of which contributed to the sharp drop in housing volumes. This reinforces Leamer's (2007) hypothesis that it's a consumer cycle and not a business cycle. For it was individuals and not businesses hardest hit by these two shocks.

Figure 15 is an updated chart comparing national to Dublin house prices, it serves not only to illustrate the latest steep decline in house prices but also serves to reinforce the ideas set forth by Ghent and Owyang as well as Del Negro and Otrok regarding regional influences on house prices. Figure 15 illustrates the difference between Dublin, regional and national house prices, it becomes clear that additional local factors have pushed the Dublin house prices considerably higher than the average nationwide prices. A future avenue of research would be investigating

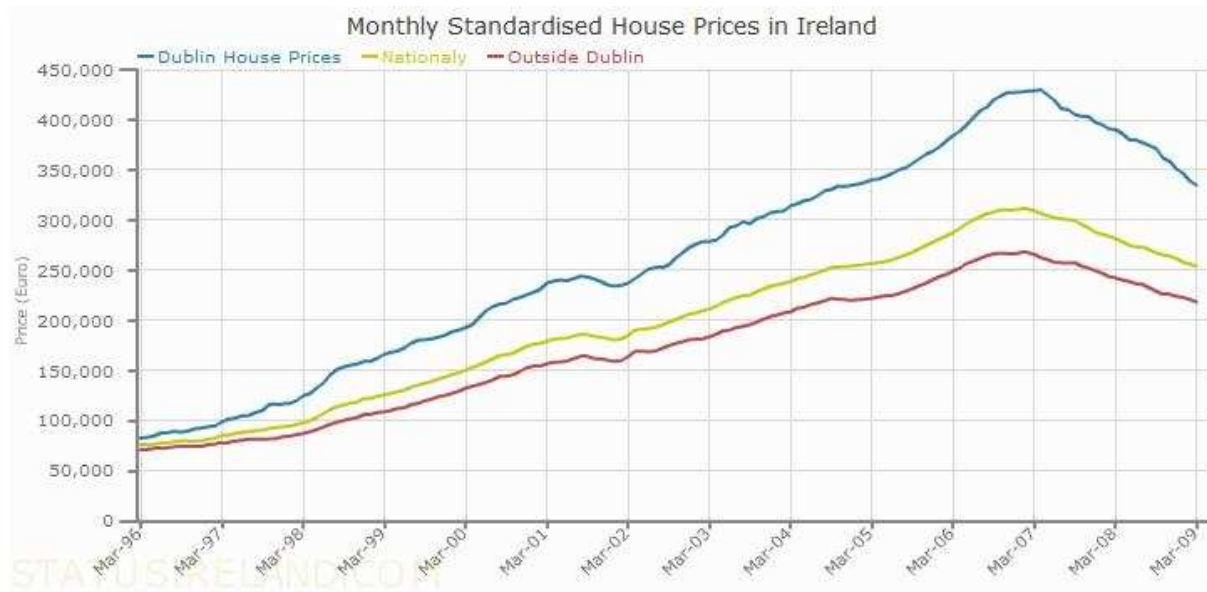
²⁸ Kenny (1998), p.11

²⁹ Ibid., p.11n

³⁰ Fitzpatrick & McQuinn (2004), p.17

further the particular causes of the increasing gap between Dublin prices and those in the rest of the country.

Figure 15³¹



Section 9: The Construction Sector’s influence on Total Employment as an Economic Indicator

The second part of the thesis now moves on to look at the effect movements in the housing volume have on the construction sector and on total employment. We analyse the results obtained from using the same methodology as in the previous sections in conjunction with employment growth figures.

Table 3 depicts the normal contribution of key sectors to employment growth. Again, several minor sectors were omitted so the growth figures of each sector included in the table do not add up to total employment growth but to 2.9% leaving 1.05% to be explained by a variety of small sectors. Looking at the figures, what jumps out immediately is that construction is the largest contributor to employment growth at an average of 0.89% over the years 1996-2007. It is followed by real estate employment (0.63%) and Trade (0.6%). Combining the growth rates of

³¹ Source: Status Ireland

real estate and construction gives us a growth rate of 1.52% thus making the property business the fastest growing employment sector in the country.

Table 3: Contribution to Irish Employment Growth

	1996-2007
Total Employment	3.95%
Construction	0.89%
Manufacturing	0.25%
Agriculture	-0.16%
Trade	0.60%
Public Admin & Defence	0.17%
Real Estate	0.63%
Health	0.52%

These figures are made all the more significant when put into a global context, where on average Ireland had the largest employment growth between the years 1980-2000 averaging 1.92% per annum according to Mauro and Garibaldi (2002).³²

9.1 Can Housing Volume predict Employment Growth?

We now turn to look at the significance of predicting the construction employment sector using the housing volume cycle. Figure 16 shows that the housing volume, construction employment and real estate employment graphs are similar in shape and that housing volume is the first of the three to begin falling.

³² Garibaldi et al. (2002), p. 73

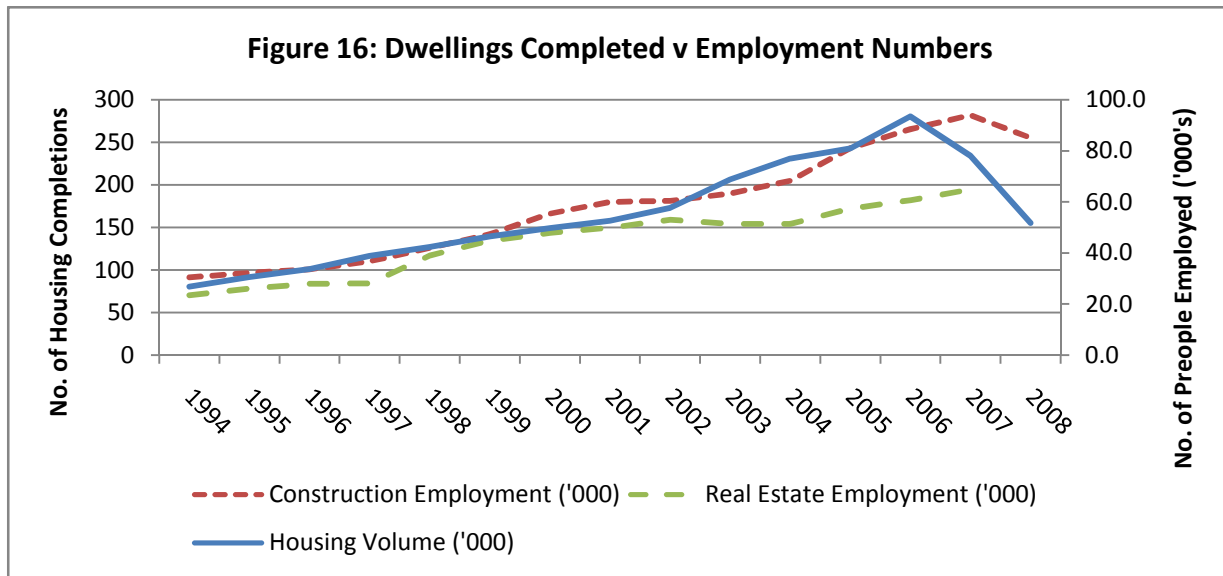
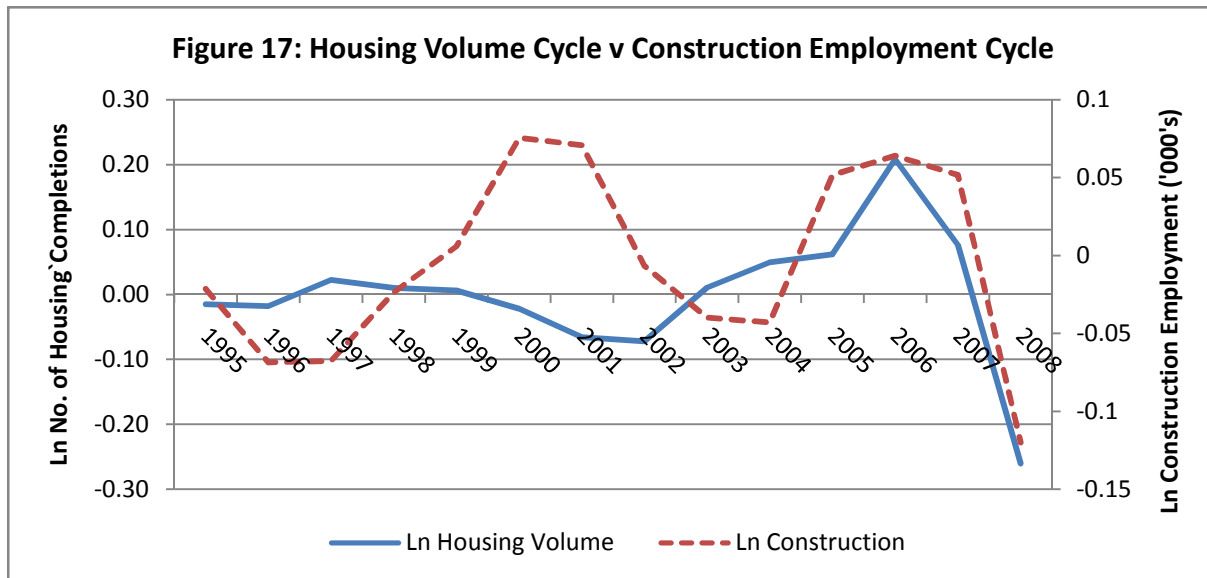
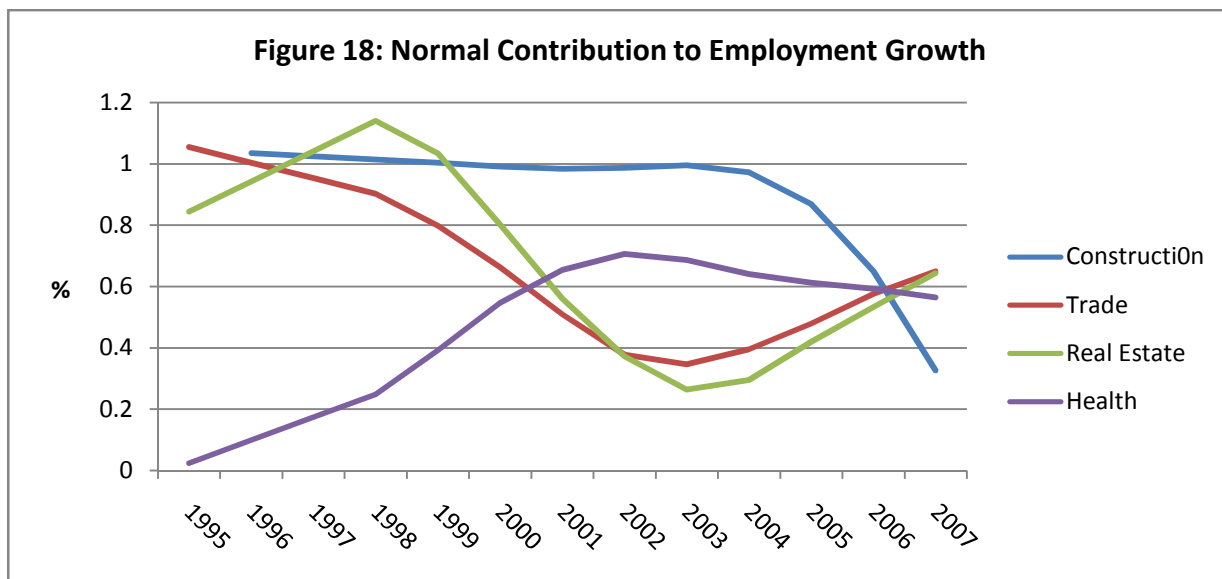


Figure 17 depicts the housing volume cycle v the construction employment sector cycle. The two graphs do not follow each other all that closely and neither seems to predict the other between 1995 and 2001, having almost a countercyclical pattern to their movements. However, the volume cycle begins to precede the construction sector graph from 2001 onwards. Furthermore, the oscillations became larger during this time period compared to the previous half of the data range. Jumps in the housing volume graph may be attributed to the erratic variation of housing completions from year to year.³³ However, studying the graph closely reveals that housing volumes may also predict how the construction sector will be affected. Construction is seen to be counter-cyclical, drops in housing volume precede drops in employment during the first half of the graph, however, both variables peak together in 2006, before beginning to decline. Again one must bear in mind that the final three results after running the HP filter are often inaccurate, however they remain included as they give a good rough indicator as to the direction of the housing volume.

³³ The Central Statistics Office also notes that the 2006 spike is also due to a backlog of houses from previous years being connected to the electrical grid.

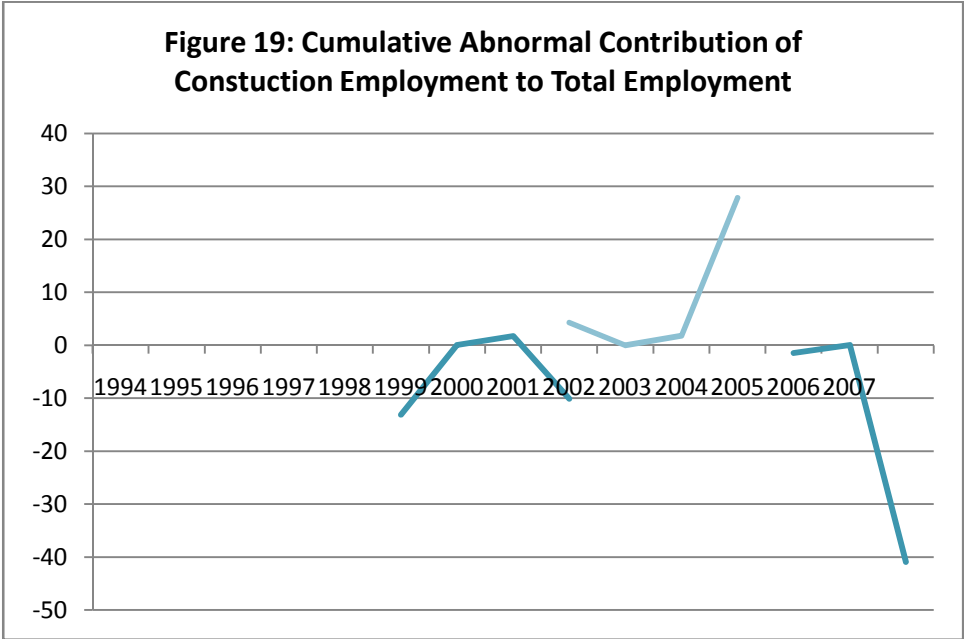


The below graph shows the normal contribution to total employment of the top four contributors to Employment growth. What is particularly notable about this graph is the steep decline of Construction, falling 0.8% between 2003 and 2007 while real estate was still on the rise right into 2007. The construction employment sector also remained steady throughout the dot com bubble, thus further enforcing Leamer's (2007) claim that this was one of the few recessions not triggered by the housing market.



Finally the cumulative abnormal contribution of the construction sector to total employment was calculated. Results are largely similar to the cumulative abnormal contribution graphs of housing

investment discussed earlier. The first line shows no extreme movements in the construction employment sector from 1999 to 2002, further confirming that that recession was not induced by a downturn in the housing cycle. The next line depicts the rise in construction employment as the housing cycle reaches its peak in 2006, after which the line takes a sharp downturn in line with the fall in housing volume.



What has been demonstrated until now by comparing the dot com recession at the beginning of our data series with the current recession in the latter part of our series is the contrast between when housing is a key driver behind a recession and when it is not. Comparing both graphs of normal contributions to growth and cyclical graphs, we see both total employment and GDP tend to move more closely in the run up to and during a recession induced by the housing market than one that is not. Housing investment and construction employment’s cumulative abnormal contributions both remained around the zero between 1999 and 2001, however from 2003 onwards, their contributions became much more extreme, indicating they became much more significant in influencing the direction of business and employment cycles.

9.2 What Drives the Employment Cycle

By looking at the t-stats and p-values in table 4, we see the problem of multi-collinearity does not plague the results as it did in Table 2. This can be seen by the high t-stats and low p-values on

most variables. Looking at table 4, we see agriculture, construction, trade and real estate employment are the most significant variables. Interpreting the results, an abnormal contribution to the growth of an employment sector in one period will lead to an abnormal contribution the value of the coefficient in the next quarter. Thus, an abnormal change in construction in one quarter will lead to a change of 0.12018 in the next quarter. Added together with real estate, it will lead to a change of 0.227061 in the next period.

Table 4: Regression of Employment Growth as a Function of Lagged Contributions

<i>Regression Statistics</i>				
Multiple R	0.99			
R Square	0.98			
Adjusted R Square	0.95			
Standard Error	0.0036			
Observations	13			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.01	0.0054	1.856878	0.122461
Construction	0.12	0.0346	3.470934	0.017831
Manufacturing	0.10	0.0799	1.283991	0.255422
Agriculture	0.17	0.0495	3.482952	0.017603
Trade	0.23	0.0875	2.595812	0.048494
Public Admin	0.02	0.0509	0.399433	0.706065
Real Estate	0.10	0.0418	2.419385	0.060163
Health	0.09	0.0827	1.159574	0.298583

9.3 Other Factors Affecting Employment

It must be born in mind that there are many complex reasons for the sustained employment growth over the past two decades. One of the main factors cited by Garibaldi and Mauro (2002) was the reversal of migration flows,³⁴ workers of Irish descent were the key driver behind this reversal. More recent immigration flows can be largely attributed to UK and eastern European citizens. It is this final group that is most relevant.

With these shifts in population there also came shifts with the workforce. According to the OECD Economic Outlook 2008, there was a shift of Irish and foreign workers towards the construction sector amounting to a percentage change in the sector of 29.1% and 19.5%

³⁴ Garibaldi et al. (2002), p.74

respectively. However after the downturn in housing volumes, the construction sector clearly contracted as was seen in Figure 17 with a 9.5% drop between 2007 and 2008.

Section 12: Conclusion

The aim of this thesis was two-fold, to build a general picture of the importance of the housing cycle in predicting the overall business cycle and its role in predicting future employment. This was done by employing a method devised by Leamer (2007). The analysis was divided into two main parts. The normal and abnormal contributions of GDP components were compared in order to determine which components were most influential in driving the business cycle. Having found that housing investment and construction were among the most influential GDP components, the thesis moved on to investigating whether the business cycle was consumer driven. Given that the regression performed was plagued by multi-collinearity due to an insufficient data range, the coefficient results were of little value.

The next section sought to investigate what factors best predicted the housing cycle. A comparative study was performed between the yearly average house prices and the volume of new house completions to see which better predicted the business cycle. It was found that the volume cycle movements preceded the business cycle movements but moved in tandem with the price cycle. This result, although interesting had to be treated with some caution given that the first and last results after running a HP filter are somewhat inaccurate. However, movements in house prices were found to adjust more slowly and movements were less extreme than housing volume movements. Given that the raw data indicated that housing volume moved before prices, it was decided to continue the study using housing volumes.

Having established that the volume cycle was the preferred method of analysing the housing cycle and given the housing market's influence over the business cycle, the volume cycle could be used to analyse the business cycle's future movements.

It was also utilised in the following section to analyse its influence over the construction employment sector. Here it was found that movements in construction employment also tended to follow housing volume and that total employment was significantly influenced by the construction sector.

Overall, it has become apparent that the current recession has been influenced and driven by a recession in the housing cycle, which has had dramatic negative effects both on GDP growth and total employment growth. We saw that despite the housing market peaking in 2006, it took the business cycle another year before it peaked and entered recession also. This has been in sharp contrast to the recession beginning in 2000 that was analysed, where the housing cycle played a comparatively small role in the recession but was instead induced by the bursting of the dot com bubble. This was reflected in the movements of the computer and instrument engineering sector.

The focus of this thesis has been on the recession currently unfolding, figures released by the Permanent TSB/ ESRI index on the 27/05/09 show a further fall in national house prices in 2009, a fall of 1.9% was recorded in April alone. Predictions about the future remain bleak, with prices expected to fall an extra 10%.³⁵ Given that there is a general consensus that housing prices were over-inflated, an avenue for future research in this area would be to revisit Leamer's methodology when the current business cycle has run its course and see whether the housing cycle responsible for starting the recession was the factor that forecasted economic recovery or whether this amounts to a permanent downward readjustment of house prices.

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³⁵ Taylor, Irish Times 27/05/09

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Sectio 14: Data Appendix

This section lists out the sources of data used in this thesis by variable. The data range of several variables have been compiled from several sources since Central Statistics Office data tends mostly to finish at 2007.

GDP Components (Agriculture, Public Admin & Defence, Computers & Instrument Eng. Building & Construction, Electrical Machinery & Equipment, Central Statistics Office, Gross Domestic Product at Constant Factor Cost (chain linked annually and referenced to 2006) by Quarter, Sector and Statistic.

All Employment Statistics: Source OECD Employment and Labour Market statistics: Employment by Activities and Status Vol. 2008 release 01

Constant GDP in € millions: Department of Finance, *Budgetary and Economic Statistics*, September 2008 and Department of Finance, *Reporting of Government Deficits and Debt Levels*, Maastricht Returns, March 2009.

Durables and Non-Durables: Central Statistics Office,
[http://www.cso.ie/px/pxeirestat/Dialog/varval.asp?ma=N0714&ti=T14.+Consumption+of+Personal+Income\(except+Taxes+on+Personal+Income+and+Wealth\)+at+Constant+Market+Prices+by+Item+and+Year&path=../DATABASE/Eirestat/National%20Income%20and%20Expenditure%20Annual%20Results%202007/&lang=1](http://www.cso.ie/px/pxeirestat/Dialog/varval.asp?ma=N0714&ti=T14.+Consumption+of+Personal+Income(except+Taxes+on+Personal+Income+and+Wealth)+at+Constant+Market+Prices+by+Item+and+Year&path=../DATABASE/Eirestat/National%20Income%20and%20Expenditure%20Annual%20Results%202007/&lang=1) (Accessed on 25/05/09)

Housing Completions: Department of Environment, Heritage and Local Government,
<http://www.environ.ie/en/Publications/StatisticsandRegularPublications/HousingStatistics/>
(Accessed on 25/05/09)

Housing Investment: Department of Environment, Heritage and Local Government, *Housing Statistics Excel Workbook*,
<http://www.environ.ie/en/Publications/StatisticsandRegularPublications/HousingStatistics/>
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Housing and Mortgage Market Characteristics: Source: OECD (2004, 2005, 2006), OECD Economic Outlook, Nos. 75, 78 and 80, Paris.

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Yearly house prices: Department of Environment, Heritage and Local Government, *House Prices, Loans and Profile of Borrowers*, 24 March 2009 and Status Ireland

<http://www.statusireland.com/statistics/property-house-price-statistics-for-ireland/3/Irish-House-Prices-Since-1996.html> (Accessed on 25/05/09)

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(Accessed on 25/05/09)

Section 15: Appendix

15.1 HP filter vs Actual Normal Contribution to GDP Growth of selected sectors:

Figure 20: Normal Contribution v Contribution of Non-Durable Goods to GDP Growth

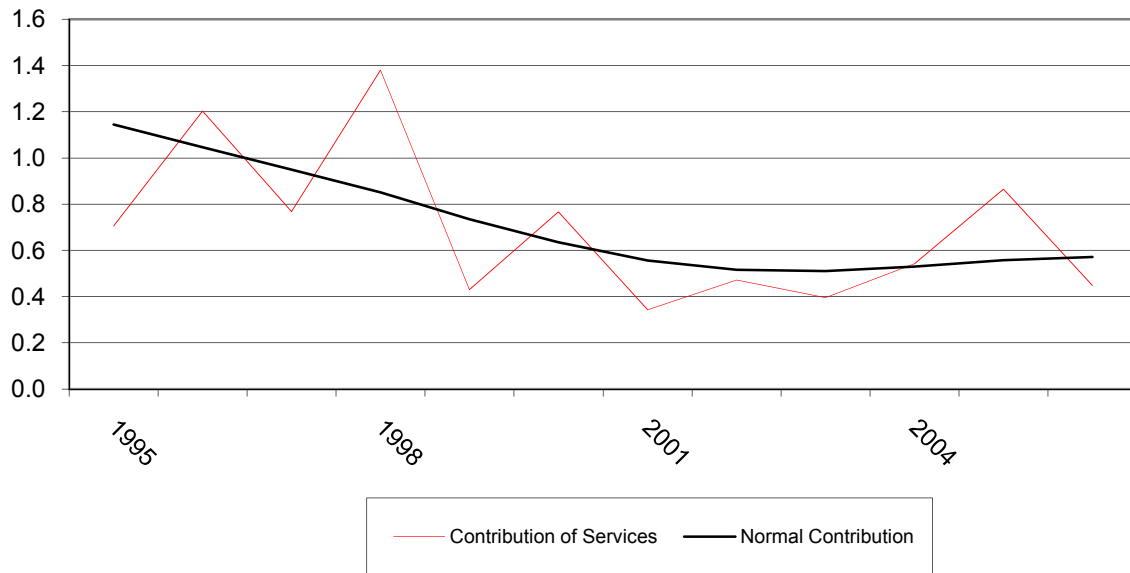


Figure 21: Normal Contribution v Contribution of Building & Construction to GDP Growth

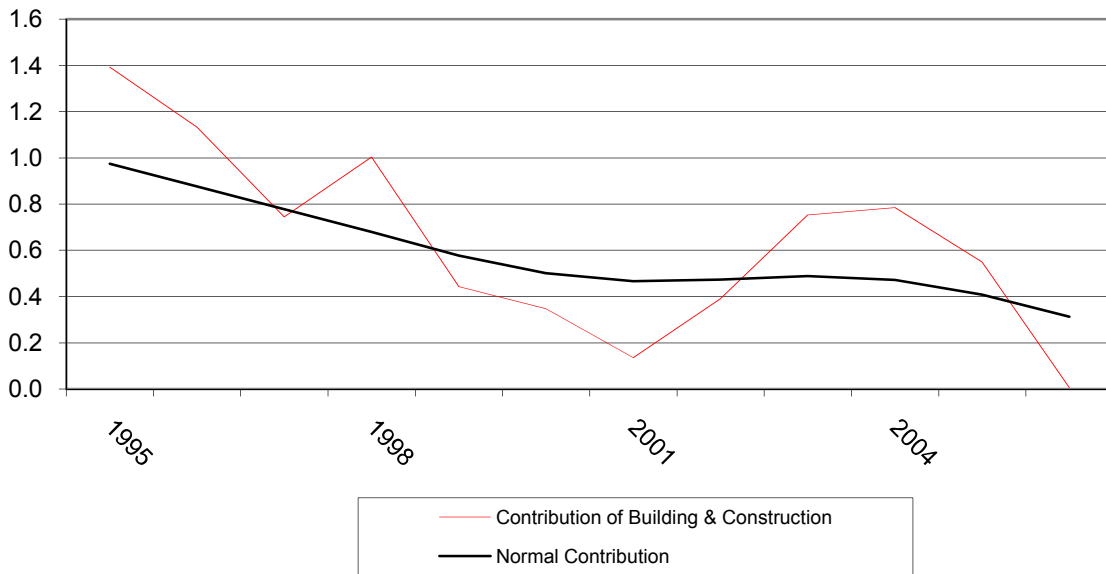
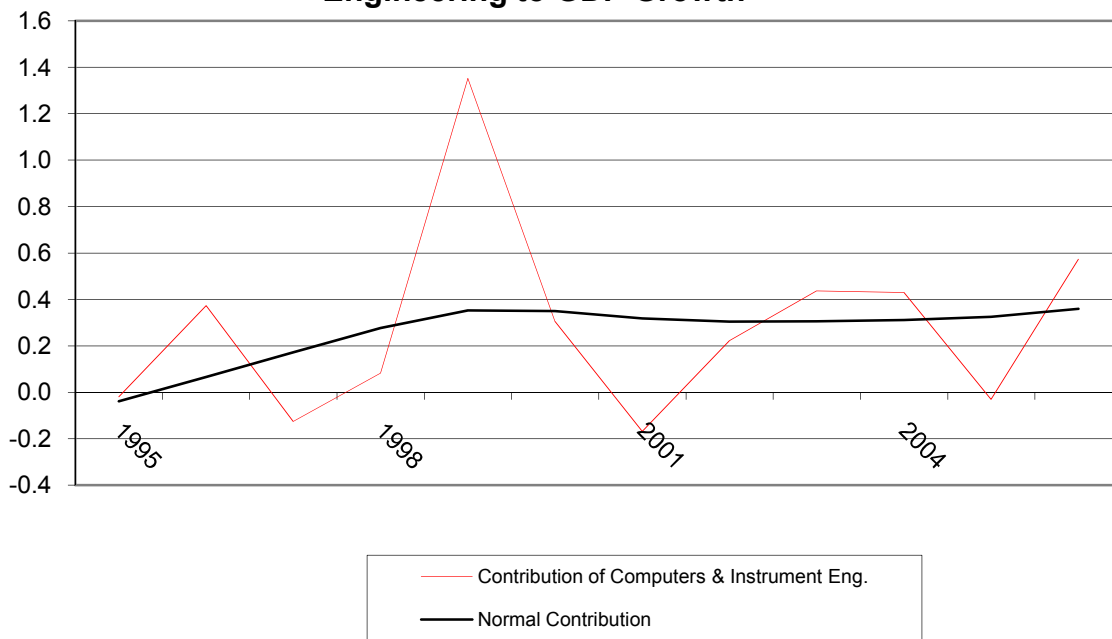


Figure 22: Normal Contribution v Contribution of Instrument Engineering to GDP Growth



15.2 Cumulative Abnormal Contribution to GDP of other Economic Variables:

Figure 23: Cumulative Abnormal Contribution of Public Admin & Defence

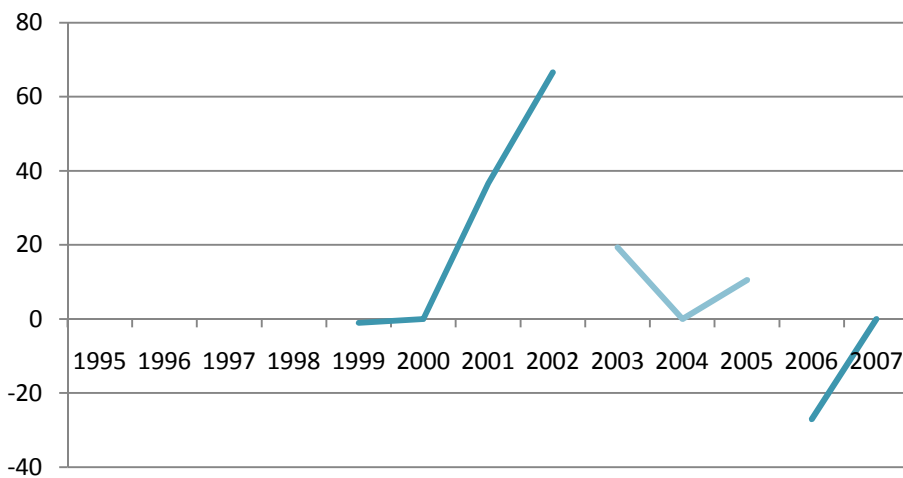


Figure 24: Cumulative Abnormal Contribution of Electrical Machinery & Equipment

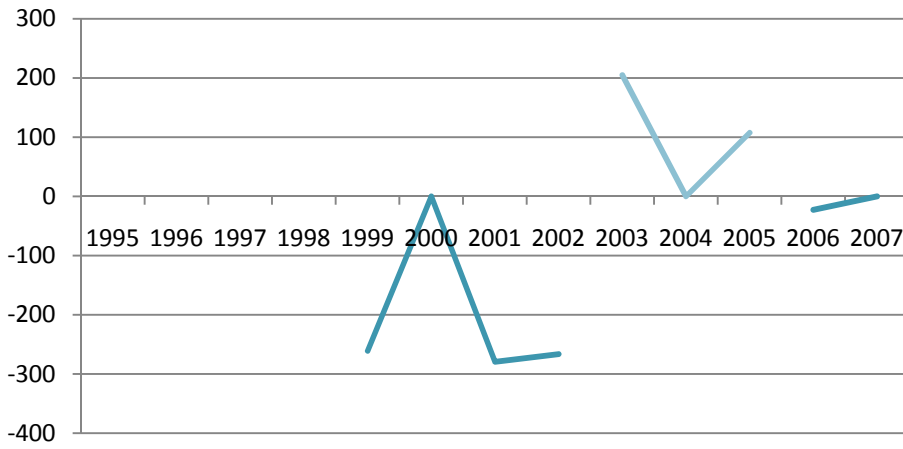


Figure 25: Cumulative Abnormal Contribution of Agriculture, Forestry & Fishing

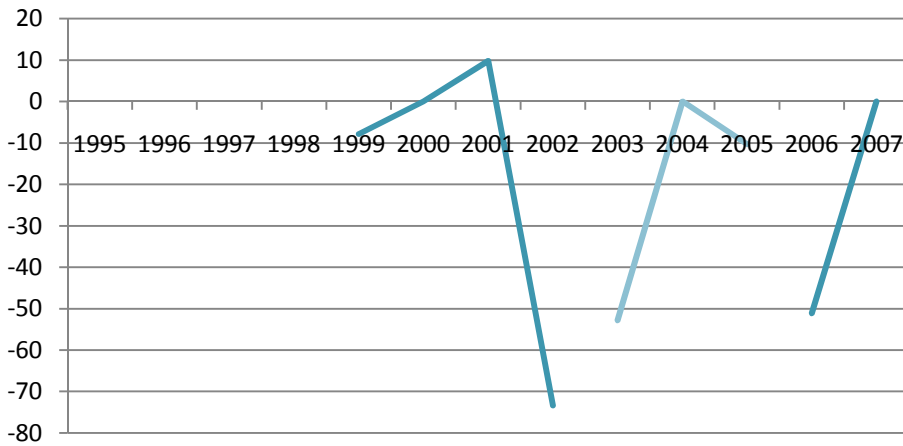


Figure 26: Cumulative Abnormal Contribution of durable Goods

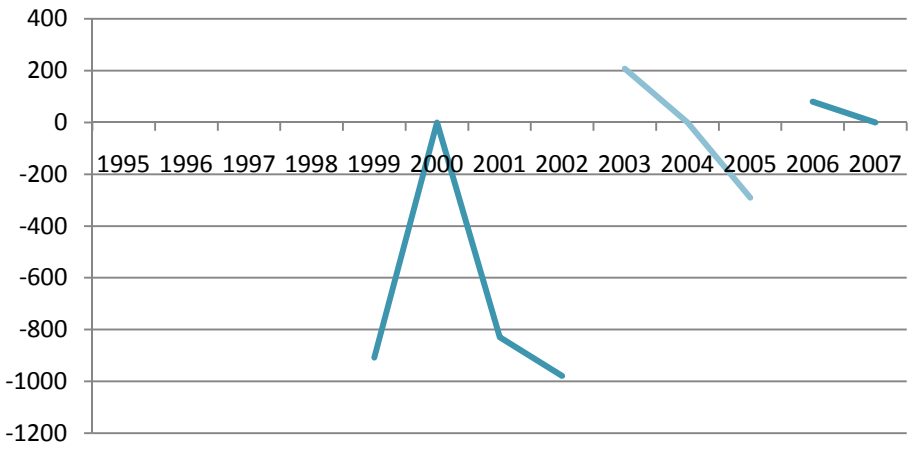


Figure 27: Cumulative Abnormal Contribution of Non-Durable Goods

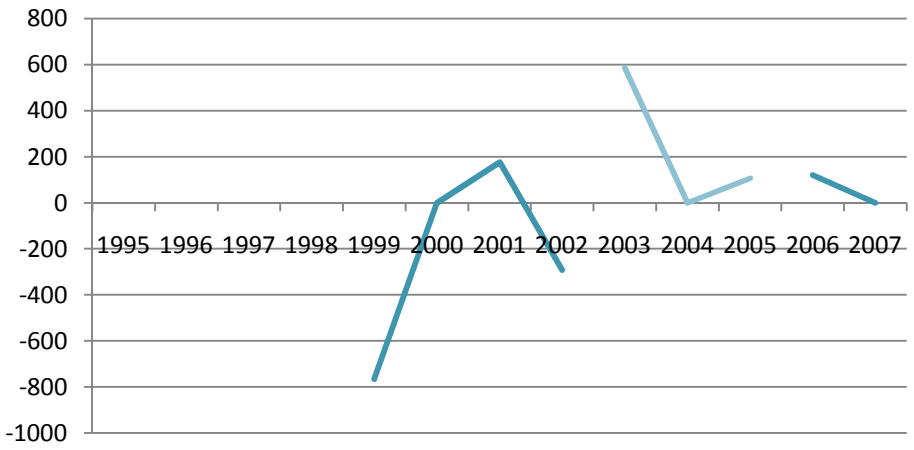


Figure 28: Cumulative Abnormal Contribution of Services

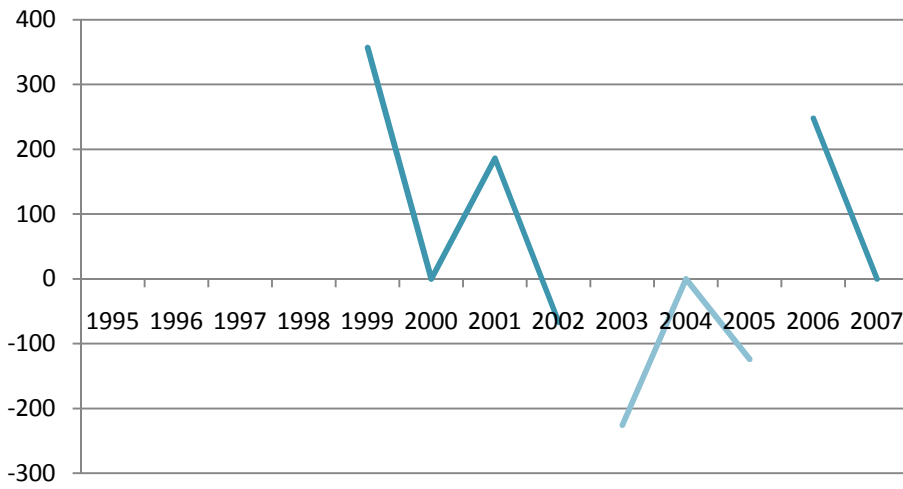


Figure 29: Cumulative Abnormal Contribution of Imports to GDP Growth in € millions

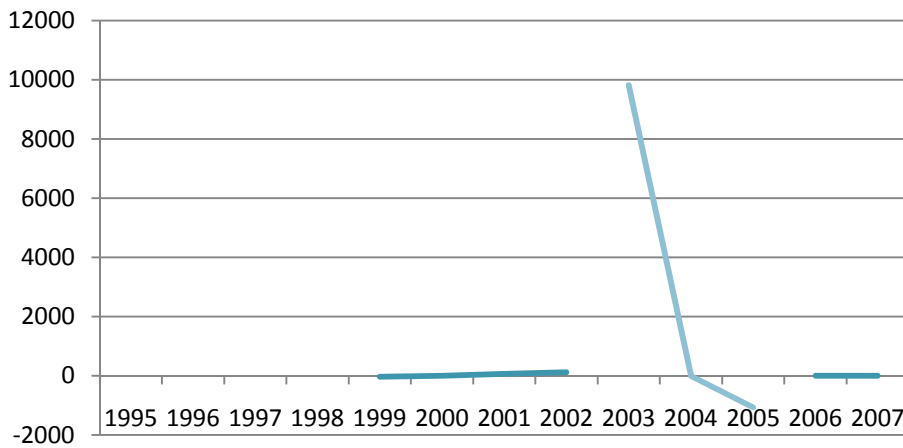


Figure 30: Cumulative Abnormal Contribution of Exports to GDP Growth in € millions

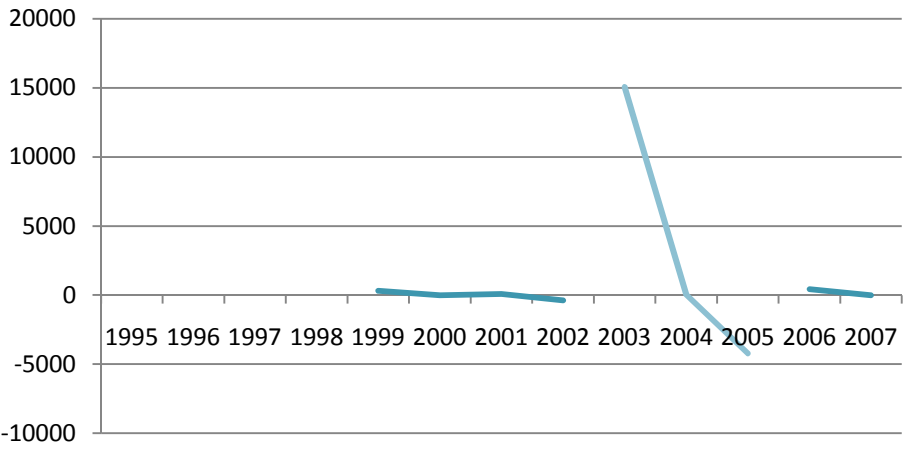
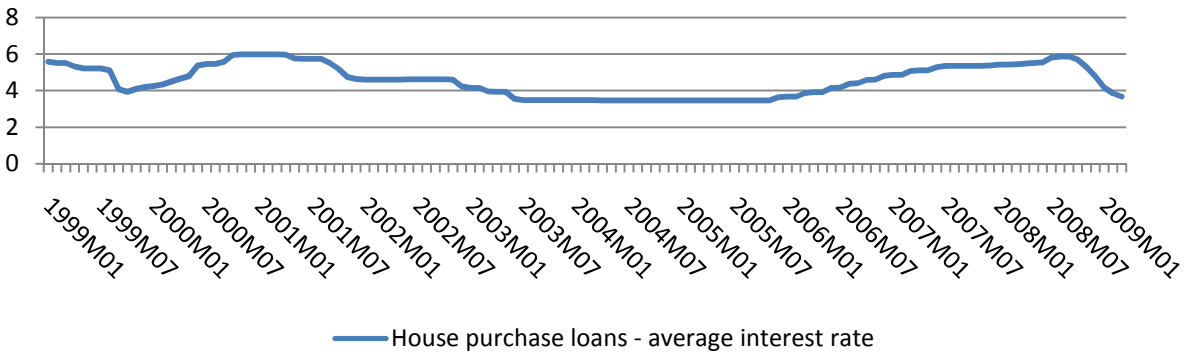


Figure 31: House purchase loans - average interest rate



15.3 Cumulative Abnormal Contribution of other employment sectors to Total Employment

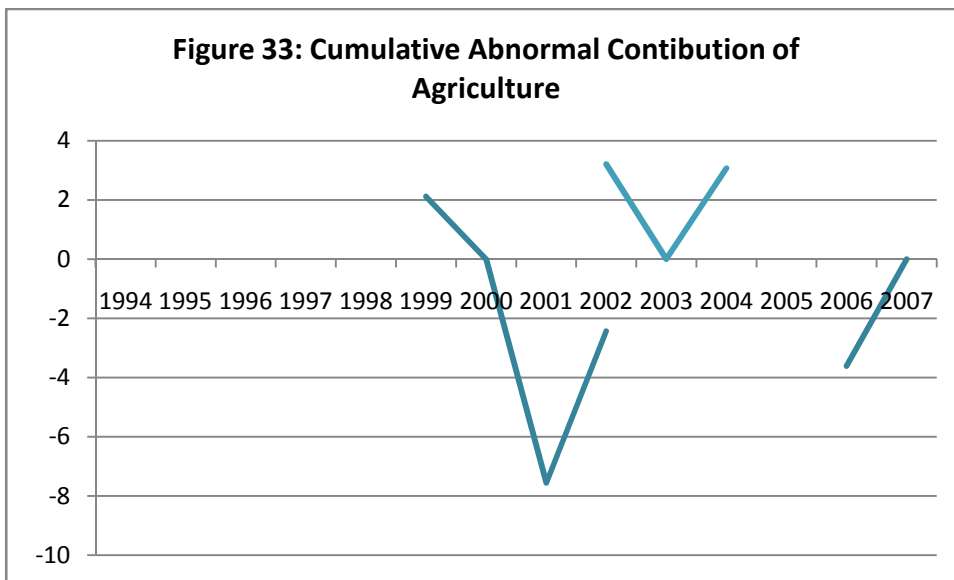
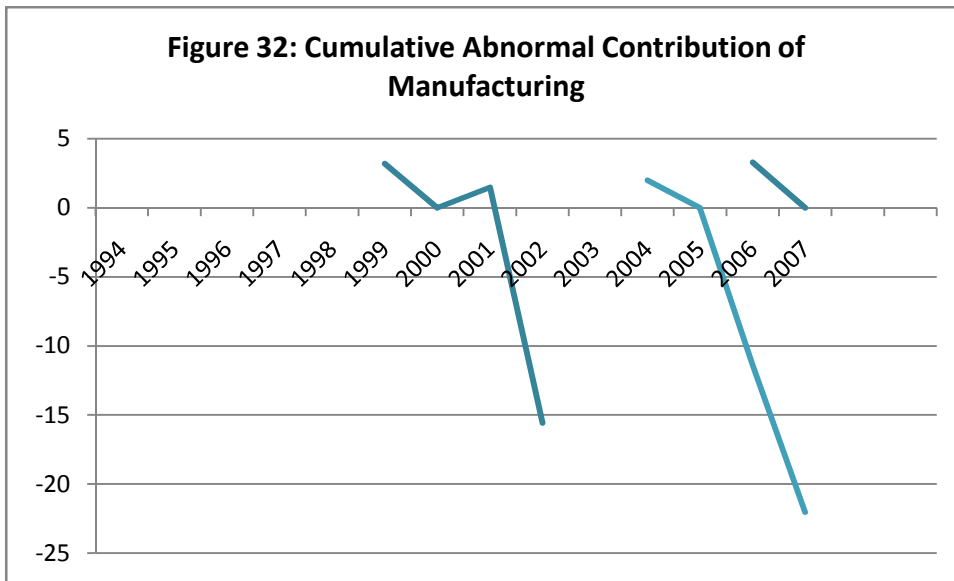


Figure 34: Cumulative Abnormal Contribution of Trade

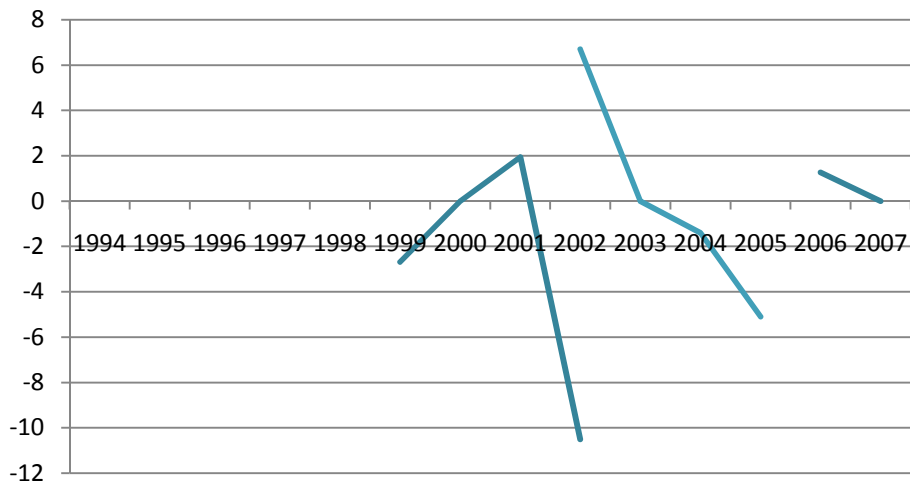


Figure 35: Cumulative Abnormal Contribution Public Admin & Defence

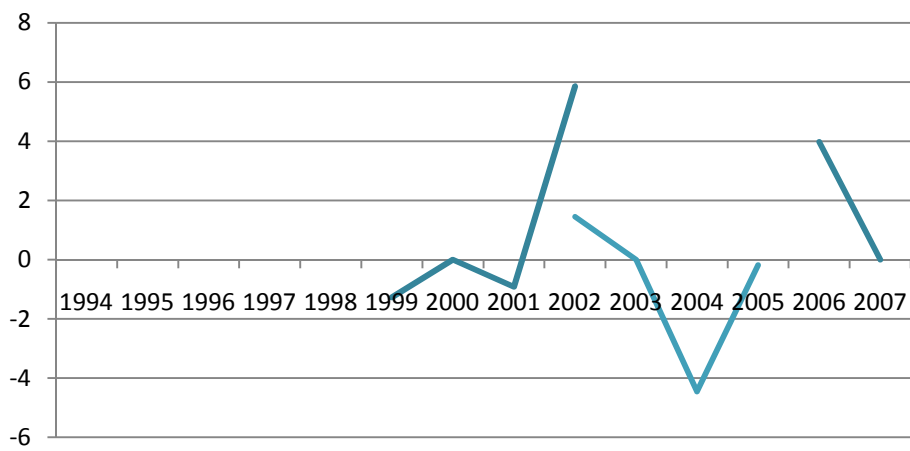


Figure 36: Cumulative Abnormal Contribution of Real estate, Renting and Business Activities

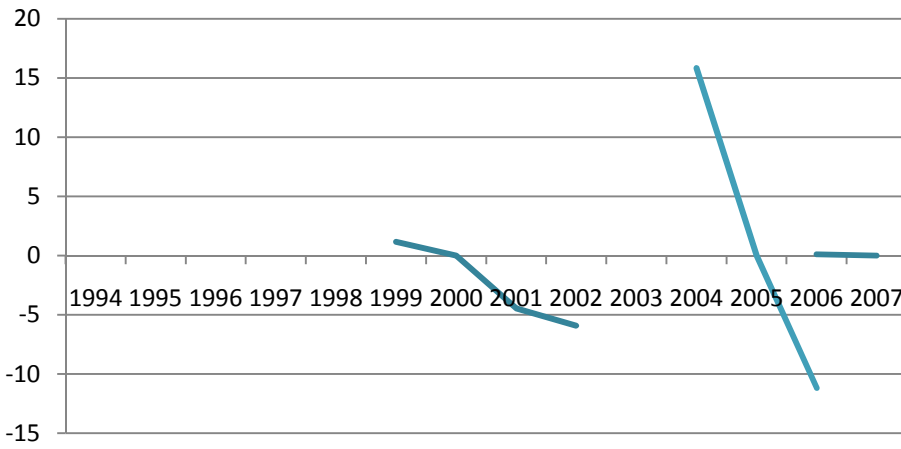


Figure 37: Cumulative Abnormal Distribution of Health and Social Work Employment

