Austrian Business Cycles: From Theory to Empirics.

Submitted to RIBM Doctoral Symposium 2012

14th – 15th March

Advanced track.

Richard Whittle
Research Institute for Business and Management
Manchester Metropolitan University Business School
Aytoun Street
Aytoun Building
Manchester
M1 3GH

Tel: +44(0) 161 247 3897
Skype: Richard.Whittle4

Fax: +44 (0) 161 247 6854
E-Mail: R.Whittle@mmu.ac.uk

Abstract

The Austrian School of Economic Thought is examined in detail regarding its ability to provide understanding of the UK Business Cycles measured by GDP fluctuations (1990-2006). Austrian theories of money, banking and credit are broken down into their theoretical base, termed in this paper Austrian Malinvestment Theory. This theoretical base is further reduced to a collection of testable hypotheses which are examined by correlation analysis and a simple Multivariate Linear Regression Model. Initial results suggest that there is understanding to be gained from a study of UK Business Cycles from an Austrian Economic Framework. Testable hypotheses themselves are considered in the light of Austrian ideology and the New School of Austrian Economic Thought is given consideration, a macro economic framework is used to present the theory clearly prior to its empirical examination.

Keywords: Austrian Economics, Austrian Business Cycle Theory, UK Business Cycles, New Austrian School.

Introduction

In the post crisis UK economy Austrian Economics are gaining renewed attention in both policy and academia. Mr Douglas Carswell MP (2010) stated in the House of Commons that it is now time to pay serious attention to the ideas of de Soto, a prominent Austrian academic, as well as following the prescriptions of the Mises Institute and the Cobden Centre, two leading institutions of the Austrian School of Economic Thought. Evans and Baxendale (2008) query if it is now time to utilise Austrian economic ideas at the highest levels of global economic policy. McCluskey (2010) considers Austrian Economics with its emphasis on a verbal rather than mathematical formalism, to be in a uniquely advantageous position to ride the wave of language based economics arising from the calls for an economic pluralism voiced by amongst many others Stiglitz (2010) in his call for a new economic paradigm. Recent economic events have once again caused a reassessment of neoclassical analysis and the Keynesian approach to monetary policy. Fundamentally critics of the neoclassical system query whether the application of a positivist empirically based economic approach can be used for the study of human action, Hayek (1979) terms this approach as *Scientism*, used to describe his view of the inappropriate use of a formalist natural science and mathematical approach to the study of economics, Chick (1998) argues that a formalist approach is unsuitable to the study of a subject so complex and interwoven as economics. Carl Menger, the acknowledged father of the Austrian school took the position that a mathematical language cannot describe the fundamentals of a dynamic economic position and thus only a verbal approach is justified. Menger questions the mathematical approach to the study of land, labour and value (Walras 1884).
This paper aims to consider the relevance of Austrian theories of Money, Banking and Credit and specifically Austrian Business Cycle Theory with regard to the UK economy, in particular the business cycle culminating in the recent (and continuing) financial crisis.

New Generation Austrians

Subrick & Beaulier (2010) consider that Austrian failure to penetrate the mainstream despite the initial promise of the revival of Austrian Economics in 1974; is due to the failure of the Old Austrian School to present their ideas in a format where a key statement or hypothesis can be examined against the data. Austrian Economists predominantly use narratives, anecdotal or pseudo-empirical methods which whilst clearly appropriate to some but inaccessible to the Neoclassical Orthodoxy. Without a clear hypothesis the work of many Austrians may leave readers confused as to the evidential basis of the theory (Subrick & Beaulier 2010). A stated hypothesis would address this issue and reduce the costs to the mainstream in engaging in discussion of Austrian Theory.

Of course they very principle of hypothesis production is sure to raise alarm and criticism within the Old Austrian School. However the aim of the New School is not to abandon Austrian Methodology and turn to the methodology of the orthodox, but to relax the primary methodological structure of Austrianism being purely praxeological. Instead the New School wishes to acknowledge the need for focussed arguments addressing specific aspects of the theory. With specific regard to empirical research, the Austrian School has tended (though not in entirety) to adhere to the Misean view of the impracticability of measurement due to the absence of constant relations, the view of statistics as pure non-repeatable economic history and the view of the futility of the quantitative economist. The New School of Austrian Economic Thought consider that in light of the current evolution of the econometric method, perhaps then this Misesan position is outdated or a little naïve (Subrick & Beaulier 2010).

The New School consider that quantitative economists do not search for absolute constants but instead for relationships and address the critique of measurement error. Ordinary Least Squares is a standard component on the vast majority of university economic programmes and two stage least squares and Monte Carlo Simulations are now standard methods in empirical research.

Austrian economic frameworks, particularly those produced by the New Austrian School concentrated at George Mason are not dissimilar to the standard and familiar analytical models of orthodox economics.

Within the literature there is a myriad of discussion concerning the various microeconomic effects, de Soto (2006) collects this discussion and weaves the strands into an accessible step by step process within the temporal subjectivism of Austrian Economics.

- **Micro effect 1**: with an artificial excess of money at end stage consumption preventing any decrease in demand or prices, resources will initially concentrate here. Quite simply this results in a shortage of supply of resources at production stages away from consumption and thus an increase in price of these resources, financed by artificial excess money.

- **Micro effect 2**: an excess of money at end stage consumption will cause an even greater increase in price at end stage consumption than the scarcity of resources at more distant consumption will cause there, assuming that the time preference of individuals remains unchanged.

- **Micro effect 3**: the accounting profits of end stage consumption firms will greatly exceed those of the firms at distant consumption whose profits will reduce or stagnate due to the rise in the costs of production of effect 1.

- **Micro effect 4**: Hayek's (1975) Ricardo effect where the rise in the price of goods at end stage consumption will drive down real wages. This will encourage firms producing at end stage consumption to substitute where possible labour for capital in the production process. This will further decrease the profitability of capital producing firms away from consumption due to a reduction in demand with a reduction in price of a substitute.

- **Micro effect 5**: Eventually the animal spirit of the market will emerge and in a cyclical nature of the market will reduce the willingness to lend and result in an increasing interest rate on loaned funds. The rise in the interest rate is self-exacerbating with firms reliant on a supply of loaned funds exhausting that supply.

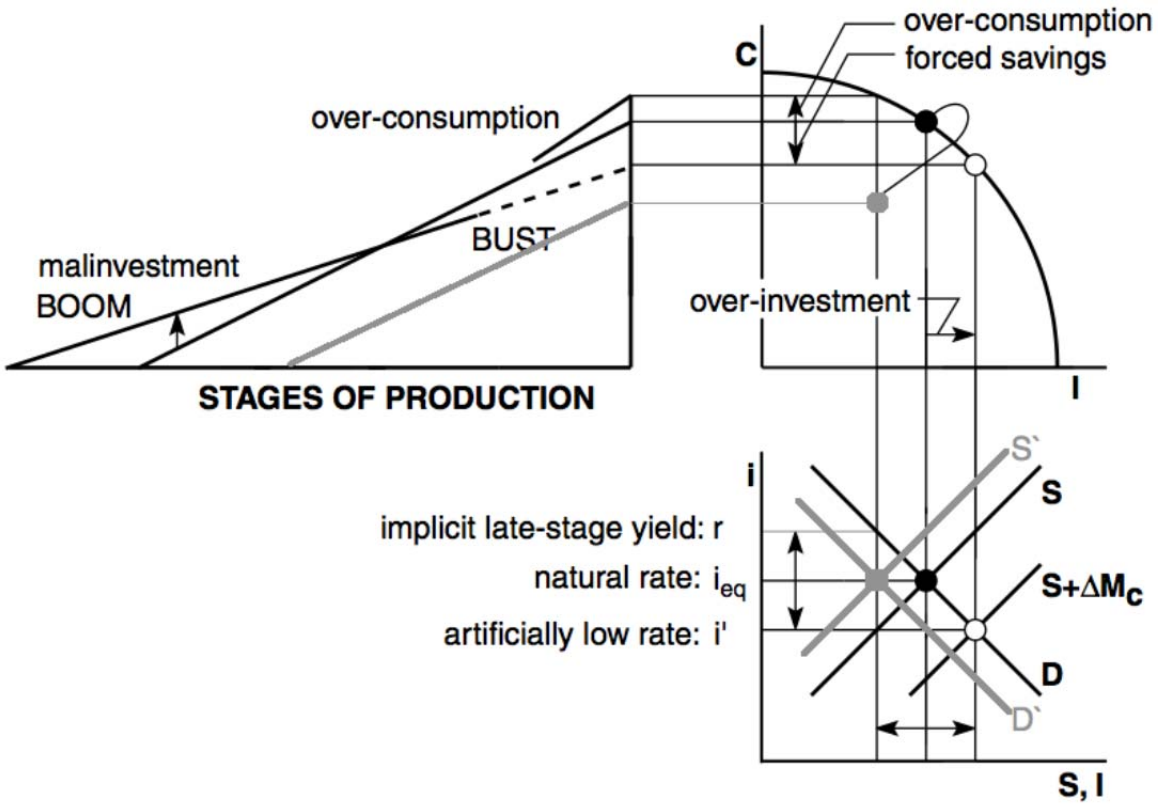
- **Micro effect 6**: the product of the previous effects; the losses or stagnation of profit faced by firms more distant from consumption demonstrate to the individuals concerned that the market is not mature enough to support widespread activity so far from consumption. In this case the most apt course of action is to correct this *temporal malinvestment* by ceasing activity at the distant stage of consumption.

Given an acceptance of these effects, the market can be seen to be actively correcting the *temporal malinvestment* of the boom of artificial credit rather than to be in crisis. The 'financial crisis' will take effect when the market, which is exceptionally dynamically

efficient, realises that the real value of the financial activity of the artificial boom is considerably less than was thought or calculated (de Soto 2010). The banks' assets, (the loans created during the boom) are revalued by the market as a fraction of their initial amount. Whereas the banks' liabilities (the deposits of currency) retain a constant value and now outweigh the assets, the bank resorts to survival mode restricts credit and calls in loans to protect against its increasing liabilities, perhaps in the boom a mere 10% of its capital and after the market revaluation considerably more. Following a severe boom and corresponding significant *temporal malinvestment*, the banks' position may continue to be untenable, and the only resort left is governmental aid; the recent state bailouts of financial institutions 'too big to fail'.
This can be demonstrated in the New Austrian Macro-Economic Framework as follows:

Figure 1

The New Austrian Macro-Economic Framework



Source Garrison (2001) with additions from Bjerkenes *et al* (2010). Malinvestment leading to market correction.

An inflation in the money supply provides the malinvestment signal to economic agents, an economy invested in initial stage production cannot meet the increased demand at end stage consumption and thus prices at consumption increase. The increase in prices creates a fall in the real money supply which thus increases the market interest rate (Trautwein 1996, provides a detailed explanation of this process). The increase in the market rate of interest

causes a revaluation of investment projects in initial stage production as they face a significantly higher discount rate considerably reducing their accounting profit (de Soto 2010). This precipitates the liquidation process. Liquidation involves reducing labour forces and reducing investment, thus affecting household income and spending, prompting movements within the loanable funds market (S→S', D→D'), as we can see this returns the rate of interest to its true (i_{eq}) level. A movement (as shown) within the PPF at this point is termed Secondary deflation (Hayek 1970) and is not seen as part of the correction process which seeks to return the economy to its PPF from a point outside which it reached via inflation of the money supply allowing for the suspension of the law of scarcity (de Soto 2010). The movement within the PPF is a combination of flawed government policy and reduction in household and business spending due to lack of confidence and is seen as extremely damaging to an economy, in fact Hayek expressed some appreciation of Keynesian expansionary techniques to avoid this situation once the market had corrected itself.

From the general to the specific

Austrian Malinvestment Theory has rarely been considered via an econometric method, notable exceptions which provide significant insight are Wainhouse (1984), Hughes (1997), Cwik (1998), Keeler (2001), Mulligan (2002), and Bjerkenes *et al* (2010). For an empirical analysis the Austrian Malinvestment Theory can be further summarised to:

1. An artificial increase in the money supply drives the market interest rate below the true rate of interest.

2. With the interest rate lower than the true rate firms begin projects that they would not do if the interest rate was an actual representation of the economy's time preference.

3. This results in the misallocation of resources to areas of production that would not attract them under the true rate of interest.

4. This misallocation will result in a shortage of supply at end stage consumption, increasing prices. With this increase in prices and money expansion unable to follow suit the real supply of credit dwindles forcing the market rate of interest back to its true rate position.

5. The market responds by liquidating the malinvestment and reallocating resources appropriately, back to the time preference of the economy. Any perceived financial crisis matches this process, for instance the greater the misallocation and malinvestment the greater the requirement for liquidation and the greater the crisis appears (de Soto 2010).

This step by step process highlights the signalling effect of the interest rate in investment decisions. In Austrian theory there is no need of an exogenous monetary (or otherwise) shock to tip the market into recession. The boom sows the seeds of its own destruction (Hayek 1989).

The following hypotheses are formulated from the key aspects and discussion of Austrian Malinvestment Theory and are in accordance with the approach of the New School of Austrian Economics.

Hypothesis 1 – An increase in the money supply forces the interest rate of the market below its true rate.

Hypothesis 2 – The ratio of investment to consumption affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 3 – The ratio of late stage production to initial stage consumption resource use affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 4 – The market rate of interest being below the true rate (measured by YIELD) affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 5 – The increase in M0 affects the business cycle in accordance with Austrian Malinvestment Theory.

Together these hypotheses demonstrate key components of Austrian Malinvestment Theory and their empirical examination will determine the understanding Austrian Theory can provide to UK business cycles[1].

Data

A data set has been carefully constructed from a variety of well-established and highly reliable sources. In order to further improve the reliability and validity of the data, wherever possible data has been triangulated against similar obtained from equally reputable sources.

Data has been gathered from the Bank of England statistical services, the Office of National Statistics (ONS) and the Economic and Social Data Service run between the University of Manchester and the University of Exeter. These standard sources are well known for their reliability and accuracy and are virtually the norm for UK statistical data for economic research.

For the purposes of examining Austrian Malinvestment Theory with regard to UK business cycles, quarterly data from 1990 to 2006 were used, in accordance with the aforementioned studies some observations from either side were omitted to reduce data revision issues. Furthermore the use of a Hodrick-Prescott (HP) filter addresses any ending issues of the time series.

Burns & Mitchell (1946) consider a business cycle to be an increase in economic activity in many areas around the same time period, followed by a contraction of economic activity which in turn leads to the expansion phase of the next cycle. With economic activity generally measured in GDP, this is itself an appropriate measure of business cycles and the standard measure in the aforementioned Austrian econometric studies.

The Money Supply

For Austrian Theory the money supply most closely aligned to the activity of the central bank M_0 should be used (Bjerkenes *et al* 2010). The UK M_0 measure is thus considered and obtained from the Bank of England Statistical Service.

[1] Bjerkenes *et al*. (2010), test similar hypotheses with regard to Norwegian Business Cycles and their work helps provide a framework here.

Interest Rates

A key component of Austrian Malinvestment Theory examined in the first research question is that the state interference in the money supply pushes the market rate of interest below the true rate.

For the purposes of this paper and in accordance with Keeler (2001) the true rate of interest is assumed to be the long term rate on government bonds (here 10 years). For the market rate a proxy is taken using the 3 month interbank loan rate, this is an accordance with Bernanke (1990). Following the advice of Bjerkenes *et al* (2010) the slope of the yield curve will serve as the relationship between the market and the true rate of interest.

Therefore the variable YIELD is calculated:

$YIELD_t = ln\left(\frac{1+3mthIBR_t}{1+10yrGov_t}\right)$

Investment and Consumption

Private consumption figures for the relevant time periods were obtained from the Office of National Statistics.

In accordance with the Austrian view that all income not used for consumption comprises the loanable funds market and is thus investment rather than taking investment figures calculated with various saving / hording caveats. A simple calculation of $I_t=GDP_t-C_t$ was used.

Furthermore for this study the changing pattern between investment and consumption is of key importance, this variable, termed INVCON is calculated thusly:

$INVCON_t=ln\left(\frac{INVESTMENT_t}{CONSUMPTION_t}\right)$

Resources

As discussed in the first research question a key component of the Austrian malinvestment theory is the effect the market rate of interest below the true rate has on the allocation of resources. For the theory a below true rate of interest leads to a production process centred on end stage consumption.

In accordance with Mulligan (2002) the distribution of resources will be measured by the output of initial production and end stage consumption. Using data obtained from the Economic and Social Data Service a ratio of output at end stage consumption over output at initial stage production is constructed. At end stage consumption is retail and services whereas at initial stage production is mining and extracting and the variable (termed RESOURCES) is calculated as:

$RESOURCES_t = \frac{output_t^{Initial}}{output_t^{end}}$

Empirical Evaluation of the data

For the initial expansion of the business cycle, Austrian Malinvestment Theory considers that an increase in artificial media through an inflation of the money supply forces the market rate of interest below the true rate. Very simply according to Austrian Theory as M0 (this paper's proxy to the money supply most closely aligned to government action) increases then YIELD ($ln\left(\frac{1+3mthIBR_t}{1+10yrGov_t}\right)$)should decrease. In Austrian Theory the market rate (this paper's proxy is the three month interbank loan rate) should decrease at a faster rate than the true rate (proxy = 10yr Government bond). A simple correlation analysis can be used to test this relationship.

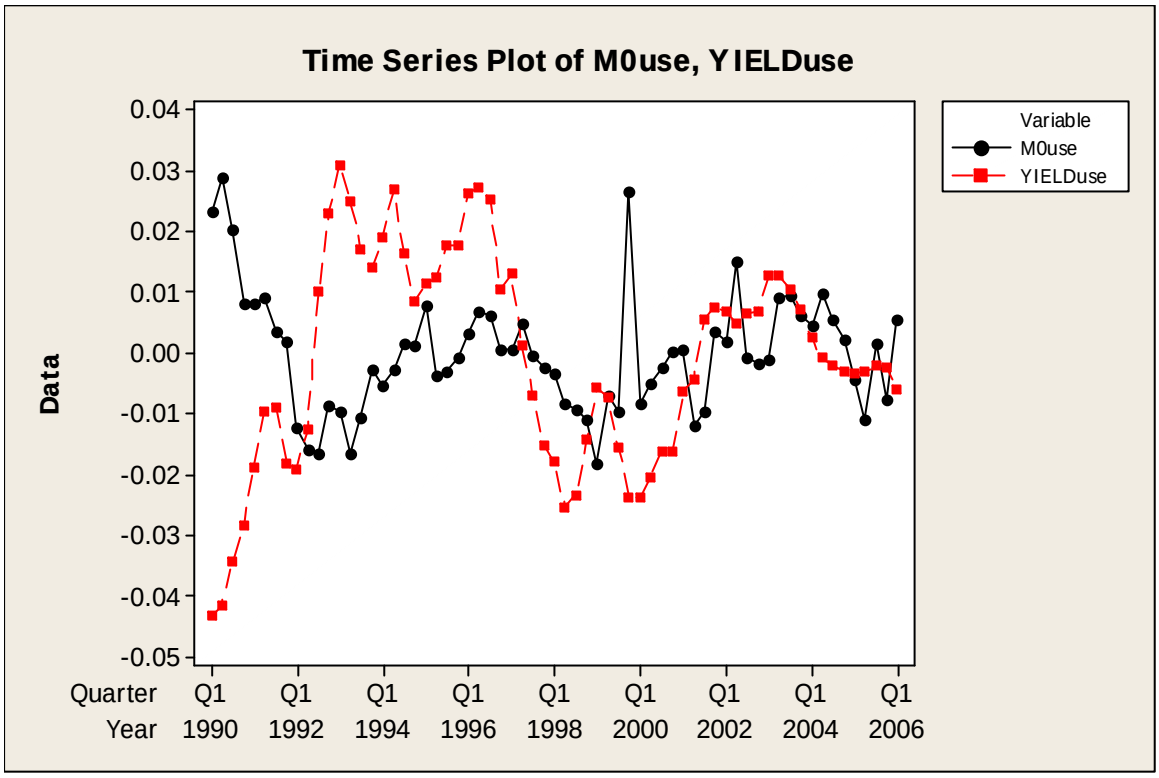
Correlations: M0use, YIELDuse

Pearson correlation of M0use and YIELDuse = -0.272
P-Value = 0.029

The correlation analysis revealed the expected inverse relationship and Pallent (2010) judges the .272 value to be small-medium strength. This relationship is statistically significant at the $p<0.05$ level.
This relationship can be demonstrated via the following time series plot of M0 and YIELD.

Figure 2

Time Series Plot of M0 and YIELD



Source Author.

Whilst the inverse relationship is classed as a small-medium strength one, a visual examination of the time series plot reveals a discernible inverse pattern, particularly in the early periods of the time series (Q1 1990- Q1 1996).

A simple correlation analysis of this period:

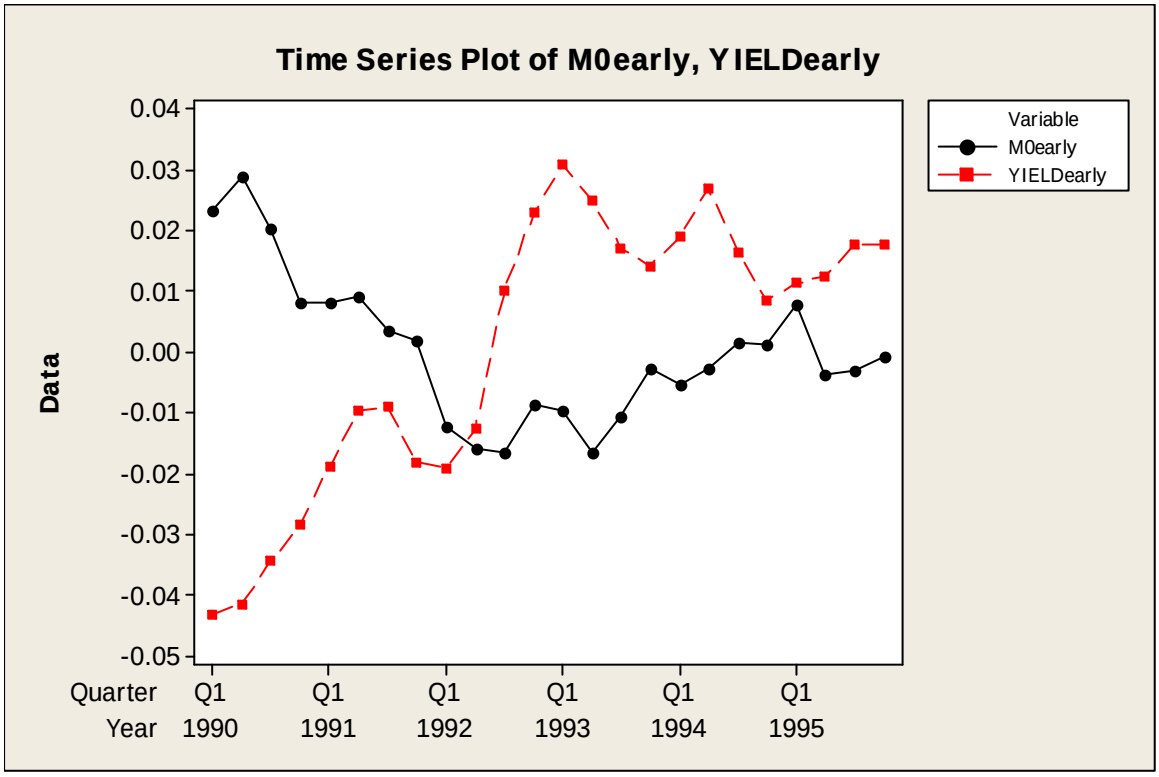
Correlations: M0early, YIELDearly

Pearson correlation of M0early and YIELDearly = -0.703
P-Value = 0.000

Reveals a large strength inverse relationship between the two variables statistically significant at the $p<0.001$ level.
This can be clearly seen in the following graphical display:

Figure 3

Time Series Plot of M0 and YIELD in the early period



Source: Author.

Thus with regard to hypothesis 1, we can reject the null hypothesis that there is no relationship between M0 and YIELD and reject the alternative hypothesis that there is a positive relationship between these variables in favour of the hypothesis that an increase in the money supply forces the interest rate of the market below its true rate.

If we now consider the business cycle (as measured by GDP) itself, hypotheses 2, 3, 4 and 5:

Hypothesis 2 – The ratio of investment to consumption affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 3 – The ratio of late stage production to initial stage consumption resource use affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 4 – The market rate of interest being below the true rate (measured by YIELD) affects the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 5 – The increase in M0 affects the business cycle in accordance with Austrian Malinvestment Theory.

Previously a correlation analysis to examine the relationship between M0 and YIELD, however for the next subset of hypotheses which concern the business cycle itself a multi-variate linear regression analysis will be used to determine the effect a variable has on another. In this case the effects that INVCON, RESOURCES, M0 and YIELD have on GDP.

The Multivariate Linear Regression Model

In a standard Multivariate Linear Regression Model, the dependant variable (y) can be seen as a function of a series of independent explanatory variables and is modelled as:

$$y_t = \beta_0 + \beta_1 x_{i1} + \beta_{2xi2} + \beta_{3xi3} + \ldots\ldots + \beta_{nxin} + e_i$$

The coefficients β_0, $\beta_1 x_{i1}$, β_{2xi2}, β_{3xi3} etc represent the marginal effects on y.

A regression analysis of the effects of INVCON, M0, RESOURCE and YIELD (explanatory variables) on GDP (dependant variable) is shown below[2]:

Regression analysis

Response variate: GDPuse
Fitted terms: Constant, INVCONuse, M0use, YIELDuse, RESOURCESuse

Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	4	0.003330	0.00083260	30.47	<.001
Residual	60	0.001639	0.00002732		
Total	64	0.004970	0.00007765		

Percentage variance accounted for 64.8

[2] The Multivariate Linear Regression Model is a standard model in economics and as such its workings are relatively widely known, it will not be of benefit to the reader to recap them here but for further reading please see Dougherty (2002) an introduction to econometrics. A discussion of the assumptions of the Multivariate Regression Model and this data set can be found in the appendices.

Standard error of observations is estimated to be 0.00523.

Estimates of parameters

Parameter	estimate	s.e.	t(60)	t pr.
Constant	0.00089	0.00647	0.14	0.891
INVCONuse	0.0017	0.0102	0.17	0.867
M0use	0.3498	0.0722	4.84	<.001
YIELDuse	-0.1727	0.0388	-4.45	<.001
RESOURCESuse	0.4212	0.0745	5.65	<.001

Correlations between parameter estimates

Parameter	ref	correlations				
Constant	1	1.000				
INVCONuse	2	0.995	1.000			
M0use	3	0.103	0.102	1.000		
YIELDuse	4	-0.011	-0.017	0.256	1.000	
RESOURCESuse	5	-0.204	-0.206	-0.288	0.012	1.000
		1	2	3	4	5

The MVLR model has a statistical significance of $p<0.01$ and has a Adjusted R^2 value of 64.8% (this shows that 64.8% of the variance of the dependant variable is explained by the explanatory factors[3]).
If we now compare the above output to the remaining hypotheses:

Hypothesis 2 – The ratio of investment to consumption affects the business cycle in accordance with Austrian Malinvestment Theory.

The estimate of parameters suggests that this is statistically insignificant within the MVLR model, as such if we rerun the model[4] without the explanatory factor INVCON, then the AR^2 of the model increases slightly to 65.4%. As a result we accept the null hypothesis that the ratio of investment to consumption does not affect the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 3 – The ratio of late stage production to initial stage consumption resource use affects the business cycle in accordance with Austrian Malinvestment Theory.

The estimate of parameters suggests that this is a highly statistically significant explanatory variable ($p<0.001$), if the model is rerun[5] without the variable RESOURCE, the AR^2 falls to 46.9%. As a result we reject the null hypothesis that the ratio of late stage production to initial stage consumption resource use does not affect the business cycle in accordance with Austrian Malinvestment Theory.

[3] Above 60% is classed as a strong result Pallent (2010).
[4] See appendix
[5] See appendix

Hypothesis 4 – The market rate of interest being below the true rate (measured by YIELD) affects the business cycle in accordance with Austrian Malinvestment Theory.

The estimate of parameters suggests that this is a statistically significant explanatory variable ($p<0.001$), if the model is as above rerun[6] without the variable YIELD, the AR^2 falls to 53.9%. Similarly then we reject the null hypothesis that The market rate of interest being below the true rate (measured by YIELD) does not affect the business cycle in accordance with Austrian Malinvestment Theory.

Hypothesis 5 – The increase in M0 affects the business cycle in accordance with Austrian Malinvestment Theory.

The estimate of parameters also suggest that this is a statistically significant explanatory variable ($p<0.001$). If we follow the same approach as the previous hypotheses and rerun[7] the model without the variable M0, then the AR^2 falls to 51.9%. As a result we can also reject the null hypothesis that the increase in M0 does not affect the business cycle in accordance with Austrian Malinvestment Theory.

Conclusion

As we have seen traditional Austrian Theories call for a removal of the state and a free market approach to money within the strictures of a fully backed money supply. Zimmerman (2003) argues that this is highly unrealistic and the wealth of material both in the academic and popular presses calling for an increased regulation and state involvement furthers this case. In the style of the methodological pluralist approach and embracing the conciliatory ethos of the New School of Austrian Economics, Austrian Theory has been dissected into what has been termed in this paper the Austrian Malinvestment Theory. The approach taken intends to not advocate the more extreme positions of Austrian Theory, but to consider what understanding the theoretical basis of the Austrian position can offer to the study of UK business cycles. Indeed Carswell's (2010) proposed Austrian style reforms to the UK banking system do not seek for less state involvement, but more in the form of regulation inspired by the basis of Austrian theory, the malinvestment process. In this respect they are New Austrian, accepting that the strict edicts of Misean Austrianism are perhaps unrealistic and instead concentrating on policy inspired through Austrian Theory.

This paper presents firstly; a thorough research review of the fundamentals of Austrian Macro-Economics and Austrian Theory and successfully answers research question one in this manner, Austrian Theory is formed into a series of testable step by step processes and the understanding of said theory is increased. The reader is also introduced to the frameworks of Austrian Economics essential for the further PhD work and understanding the position of Austrian macro-economics. Similarities are also noted with the economic orthodoxy at many stages which allow for Caldwell's (1982) bridging process. Secondly this paper considers the key components of Austrian Theory by correlation and multivariate linear regression analyses to further examine the understanding Austrian Malinvestment Theory can provide to the UK Business cycles (1990-2006).

Empirical evidence shows that the expansion of the money supply has a small-medium yet statistically significant relationship with the movement of the market rate of interest below the true rate. This relationship is particularly strong in the early period, and a separate

[6] See appendix
[7] See appendix

correlation test demonstrate a strong relationship which is highly statistically significant. The construction of a simple multivariate linear regression model further supports Austrian ideas in many respects, suggesting that the changing ratio of output from initial stage production to end stage consumption is a key factor in GDP variance, along with the interest rate movement around the true rate and the money supply. There was no evidence in this time series that the changing ratio of investment to consumption affects UK business cycles. However the model explains over sixty per cent of the variance in GDP and thus the UK business cycle, this coupled with the confirmation of the 'starting pistol' of Austrian Malinvestment Theory, the relationship between the money supply and the market rate of interest falling below the true rate allows for a view that Austrian Theories of Money, Banking and Credit do provide an understanding of UK Business Cycles.

However Austrian Economics remains outside the orthodoxy and so far (Subrick & Beaulier 2010) do not appear to be making any headway into mainstream economics despite Thornton's (2008) claim of the triumph of Austrianism over the Orthodoxy.
The New Austrian's consider this to be in part due to an almost religious adherence to the more extreme prescriptions of Austrian Ideology and the refusal (on the most part) to consider their ideas via a hypothesis testing approach. This paper has attempted to address this and in this manner has accepted that Austrian Theories of Money, Banking and Credit can provide some understanding to the UK economy.

References

Bjerkenes *et al*. (2010). Austrian Economics: Application on Norwegian Business Cycles. Master Thesis in Financial Economics. The Norwegian School of Economics and Business Administration.

Burns & Mitchell. (1946). *Measuring Business Cycles*. NBER

Caldwell, B. (1982). *Beyond Positivism: Economic Methodology in the Twentieth Century.* London: George Allen & Unwin.

Carswell, D. (2010) Speech to The House of Commons, 15th September. *Parliamentary Debates*, Commons. part 0002. Cols 903-905.

Chick, V. (1998) On Knowing One's Place: The role of Formalism in Economics. *The Economic Journal,* Vol.108. No.451.

Cwik, P.F. (1998). The Recession of 1990: A Comment. *Quarterly Journal of Austrian Economics*.

De Soto, Jesus (2006) *Money, Bank Credit and Economic Cycles.* First English Translation (Melinda A. Stroup). Ludwig von Mises Institute.

De Soto, Jesus. (2009) The Fatal Error of Solvency II. Institute of Economic Affairs Journal Compilation. Oxford: Blackwell Publishing.

De Soto, Jesus. (2010) Economic Recessions, Banking Reform and the future of Capitalism, LSE Hayek Memorial Lecture Transcript provided by the Mises Institute, originally published by the Cobden Centre.

Dougherty, C. (2002). *Introduction to Econometrics*. Oxford: Oxford University Press.

Evans, A & Baxendale, T. (2008) Testing Times for Central Banks – Is there room for Austrian Ideas at the top table? Institute of Economic Affairs Journal Compilation. Oxford: Blackwell Publishing.

Garrison, R. (2001). *Time and Money: The Macroeconomics of Capital Structure*. London: Routledge.

Hayek, F.A. (1975) The Paradox of Saving, in: *Profits, Interest and Investment and other essays on the theory of industrial fluctuations*. Clifton: August M Kelly Publishers.

Hayek, F.A. (1979) *Law, Legislation and Liberty Vol. III – The political will of a free people*: The University of Chicago Press.

Hayek, F.A. (1989) *The fatal conceit: The errors of Socialism*. Chicago: University of Chicago Press.

Keeler, J. (2001). Empirical Evidence on the Austrian Business Cycle Theory. *The Review of Austrian Economics*. Vol. 14. No. 4.

McCloskey, D. (2010). *Bourgeois Dignity: Why Economics Can't Explain The Modern World*. Chicago: The University of Chicago Press.

Mulligan, R.F. (2002) A Hayekian Analysis of the term structure of Production. *Quarterly Journal of Austrian Economics*. Vol.5. No.2.

Mulligan, R.F. (2006) An empirical examination of Austrian Business Cycle Theory. *Quarterly Journal of Austrian Economics*.Vol.9. No.2.

Pallent, J. (2010). *SPSS Survival Manual*. Berkshire: Open University Press.
Subrick, J & Beaulier, S. (2010). An Appeal from New to Old (and middle aged) Austrians. *Mercatus Center*. George Mason University. Working Paper 55.

Stiglitz, J. (2010) Needed: a new economic paradigm.19th August. Financial Times.

Thornton, M. (2008) The Great Depression: Mises vs. Fisher. *Quarterly Journal of Austrian Economics.*

Wainhouse, C. (1984) "Empirical Evidence for Hayek's Theory of Economic Fluctuations." In: Siegel, B. (ed.) *Money in Crisis*, pp. 37–71. San Francisco: Pacific Institute for Public Policy Research.

Walras, L. (1965) *Correspondance of Leon Walras and Related Papers.* Edited by W. Jaffe, North Holland, Amsterdam, Vol.II.

Appendices

0.1 Regression without INVCON

Regression analysis

Response variate: GDPuse
Fitted terms: Constant, M0use, YIELDuse, RESOURCESuse

Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	0.003330	0.00110988	41.28	<.001
Residual	61	0.001640	0.00002689		
Total	64	0.004970	0.00007765		

Percentage variance accounted for 65.4
Standard error of observations is estimated to be 0.00519.

0.2 Regression without RESOURCE

Regression analysis

Response variate: GDPuse
Fitted terms: Constant, M0use, YIELDuse, INVCONuse

Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	0.002457	0.00081895	19.88	<.001
Residual	61	0.002513	0.00004120		
Total	64	0.004970	0.00007765		

Percentage variance accounted for 46.9
Standard error of observations is estimated to be 0.00642.

0.3 Regression without YIELD

Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	0.002788	0.00092943	25.99	<.001
Residual	61	0.002182	0.00003576		
Total	64	0.004970	0.00007765		

Percentage variance accounted for 53.9
Standard error of observations is estimated to be 0.00598.

0.4 Regression without M0

Regression analysis

Response variate: GDPuse
Fitted terms: Constant, YIELDuse, INVCONuse, RESOURCESuse

Summary of analysis

Source	d.f.	s.s.	m.s.	v.r.	F pr.
Regression	3	0.002690	0.00089653	23.98	<.001
Residual	61	0.002280	0.00003738		
Total	64	0.004970	0.00007765		

Percentage variance accounted for 51.9
Standard error of observations is estimated to be 0.00611.