Introduction

Agenda

Last time

- Exchange rate theories: PPP/UIP/CIP
- Simple Multiplier-Accelerator systems (Linear & Non Linear)
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- You’ll see some BC data
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  - Goodwin’s Growth Cycle
- Minsky’s Financial Fragility Model
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- You’ll see 2 cool models
  1. Goodwin’s Growth Cycle
  2. Minsky’s Financial Fragility Model
- I’ll show you why they are cool as we go.
Part I

Data
Ireland’s Real Output has been all over the place since 1970

Figure: Ireland’s Year on Year Percentage Real GDP Growth, 1970-2007.
Large decline in Output in 2009

The first estimates of Gross Domestic Product (GDP) and Gross National Product (GNP) for the year 2009 as a whole indicate that GDP was 7.1 per cent lower than in 2008 while GNP was 11.3 per cent lower than in 2008. This is the largest decline in output ever recorded in a single year.

Initial estimates for the fourth quarter of 2009 show a decline, on a seasonally adjusted basis, of 2.3 per cent in both GDP and GNP compared with the previous quarter. In comparison with the corresponding quarter of 2008, GDP at constant prices was 5.1 per cent lower while GNP was 10.4 per cent lower.

Some of the main features of the results are:

- Consumer spending (personal consumption of goods and services) in volume terms was 5.2 per cent lower in Q4 2009 compared with the same period of the previous year.
- Capital investment, in constant prices, declined by 28.2 per cent in Q4 2009 compared with Q4 2008.
- Net Exports (exports minus imports) in constant prices were €2,042 million higher in Q4 2009 compared with Q4 2008.
- The volume of output of Industry (incl. Construction) decreased by 6 per cent in Q4 2009 compared with Q4 2008. Within this the output of the Construction sector fell by 32.3 per cent over the same period. Output of Distribution, Transport and Communications was down 7.0 per cent, while Output of Other Services was 2.3 per cent lower in the fourth quarter of 2009 compared with the same period of last year.

GNP

The estimate of GNP is derived by adjusting GDP for income flows between residents and non-residents. The timing of these flows can be variable. They include, in particular, the profits of foreign owned enterprises which increased by €858m between Q4 2008 and Q4 2009. The increase, in this quarter, in the net factor income flows is also affected by (a) reduced credits (inward flows), compared to Q4 2008, to Irish outward direct investment enterprises and (b) increased interest payments on government debt. As a result, the decline in GNP was more severe than that in GDP.

The calculation methods for quarterly accounts are similar to those used in the annual National Income and Expenditure. As some of the available sources are of lesser reliability than those used for the annual national accounts, the quarterly estimates are subject to a greater margin of error than the annual figures.

These preliminary estimates will therefore be revised when the next detailed annual results are published.

For more information contact Gordon Cavanagh at 01 498 4307 or Andrew McManus at 01 498 4368.
But Look at Fixed Investment

Figure: Logged Fixed Investment in Ireland, 1970–2008.
Figure: Logged Government consumption in Ireland, 1970–2008.
Figure: Logged changes in inventory for Ireland, 1970–2008. Missing data is a reporting error.
Figure: Logged total consumption in the Irish economy, 1970-2008.
Different Explanations for these changes.
Real Business Cycle People Say

(2, pg. 1):

*the economy is viewed as being in continuous equilibrium in the sense that, given the information available, people make decisions that appear optimal for them, and so do not make persistent mistakes. This is also the sense in which behaviour is said to be rational. Errors, when the occur, are said to be information gaps, such as unanticipated shocks to the economy.*
Different Explanations for these changes.

Non mainstream People Say

(1, pg. 199):

The financing of investment by means of new techniques means the generation of demand in excess of that allowed for by the existing tranquil state. The rise in spending upon investment leads to an increase in profits, which feeds back and raises the price of capital assets and thus the demand price of investment. Thus, any full-employment equilibrium leads to an expansion of debt-financing—weak at first because of the memory of preceding financial difficulties—that moves the economy to expand beyond full employment. Full employment is a transitory state because speculation upon and experimentation with liability structures and novel financial assets will lead the economy to an investment boom. An investment boom leads to inflation, and, by processes still to be described, an inflationary boom leads to a financial structure that is conducive to financial crises.
Parts of the Cycle: 1 Quest for Profits

1. Prices: business receipts
2. Prices: business expenses
Parts of the Cycle: 1 Quest for Profits

1. Prices: business receipts
2. Prices: business expenses
3. Volumes of sales
Parts of the Cycle: 1 Quest for Profits

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4. Currency availability
Parts of the Cycle: 1 Quest for Profits

1 Prices: business receipts
2 Prices: business expenses
3 Volumes of sales
4 Currency availability
5 Credit
Parts of the Cycle: 2 Revival

1. Reduction of Costs
2. Reduction of inventories
Parts of the Cycle: 2 Revival

1. Reduction of Costs
2. Reduction of inventories
3. Lowering of interest rates
Parts of the Cycle: 2 Revival

1. Reduction of Costs
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4. Strong Bank lending positions
Parts of the Cycle: 2 Revival

1. Reduction of Costs
2. Reduction of inventories
3. Lowering of interest rates
4. Strong Bank lending positions
5. Growth of investment-seeking funds
Parts of the Cycle 3: Accumulation of Stresses

1. “Unfortunate events”
2. Slow increases in $K, L$ costs
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Parts of the Cycle 4: Peak

1. Errors of optimism lead of overstock in certain markets
2. Rising Interest rates/construction costs/capital outlays
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2. Rising interest rates/construction costs/capital outlays
3. Decline in demand reverses expectations dramatically, economy contracts rapidly through ‘damaged’ sectors.
Parts of the Cycle 5: Depression/Recession

1. Unfavourable expectations collapse aggregate demand
2. Marginal efficiency of capital goes very low
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1. Unfavourable expectations collapse aggregate demand
2. Marginal efficiency of capital goes very low
3. Costs drop, Unemployment rises, stocks drop, new processes are developed, off we go again.
Theories/Metaphors

1. Pendulum/Rocking Horse: Cycles, yes, but with decreasing amplitude

2. Snooker table: nonlinear processes, “saturation effects” force the snooker ball to hit a wall, bounce back, continue rolling.
Part III

Goodwin’s Growth Model
Setup

- Predator Prey Interaction
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- The capital-output ratio $k = Y/L$ is assumed constant and the real wage rises *in the neighbourhood* of full employment
- The workers accrue to themselves a portion of the output of the economy, $u$ and the capitalists receive $v$ for their efforts
Model

\[
\dot{v} = \left\{ \left[ \frac{1}{k} - (\alpha + \beta) \right] - \frac{1}{k} u \right\} v \quad (1)
\]

\[
\dot{u} = - [ (\alpha + \gamma) + \rho v ] u \quad (2)
\]
Goodwin on his cycle:

When profit is greatest, \( u = u \), employment is average, . . . , and the high growth rate pushes employment to its maximum \( v_2 \), which squeezes the profit rate to its average value. . . . the deceleration in the growth employment (relative) to its average value again, where profit and growth are again at their nadir \( u_2 \). This low growth rate leads to a fall in output and employment to well below full employment, thus restoring profitability to its average value because productivity is now rising faster than wage rates . . . . The improved profitability carries the seed of its own destruction by engendering a too vigorous expansion of output and employment, thus destroying the reserve army of labour and strengthening labour’s bargaining power.
Figure: Evolution of capitalist/Worker interactions as they share the products of the economy. We see here that the motion is cyclical and bounded, implying the dynamics of the system exhibit limit cycle behaviour.
Why is this cool?

This is a cool model for three reasons.

1. The model generates a feedback-driven limit cycle, showing workers dependent on capitalists and vice versa.
2. It shows Marxian macrodynamics in an interesting light.
3. The model can be extended to include search and selection, endogenising the values of the parameters used in the model, see www.stephenkinsella.net/research for details.
Part IV

Minsky
Minsky Setup

- Debt structure of firms matters.
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- Presence of Big Bank and Big Government dampen cycles
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Model

A constant markup $\tau$ over the wage bill $w$, and the labour/output ratio is $b$. The price level $P$ is determined by

$$P = (1 + \tau)wb.$$ (3)

The profit rate, $r$, is given by adding up the contributions to profit from the various sectors of the economy:

$$r = \frac{PX - wbX}{PK} = \frac{\tau wbX}{(1 + \tau) wbX} = \frac{\tau X}{1 + \tau K},$$ (4)

**Big Idea**

The core of Minsky’s theory revolves around how expected returns relate to the capital stock, $K$. 
Investment Decision

\[ P_k = (r + \rho)P/i, \]  
\[ P_k - P = (r + \rho - i)P/i. \]  

Investment Demand = \( PI = [g_0 + h(r + \rho - i)]PK. \)  

Saving Supply = \( srPK = s\tau wbX. \)
Equilibrium Conditions

\[ g_0 + h(r + \rho - i) - sr = 0. \]  \hspace{1cm} (9)

Solve equation 9 for \( r \), plug it into the investment demand function, and we get an expression for the capital stock growth rate, \( g(= I/K) \).

\[ g = = s[g_0 + h(\rho - i)]s - h. \]  \hspace{1cm} (10)

Cool equation

Equation 10 is very cool: a fall in the interest rate, or an increase in anticipated profits leads to higher growth, since \( g = sr \) from the saving function, so the profit rate and capacity utilization go up as well.
Financial Side of the Economy

Fiscal debt: $F$. Can be converted into money, $M$, or short term bonds $B$, bond is held by rentiers. Value of all plant and equipment is $P_kK = (r + \rho)PK/i$. Firms have equity, $E$, which has a market price at $P_e$. The difference between capital stock and equity is firms’ net worth, $N$. The differential of the firms’ balance sheets is

$$P_kI + \dot{P}_k = \dot{P}_kK = P_e\dot{E} + \dot{P}_eE + \dot{N}. \tag{11}$$
The total wealth of all rentiers is

$$W = P_e E + M + B = P_e E + F. \quad (12)$$

The rentiers’ wealth changes over time according to

$$\dot{W} = \dot{P}_e E + P_e \dot{E} + \dot{M} + \dot{B} = \dot{P}_e E + srPK. \quad (13)$$

Which says...

Rentiers get rich from increases in capital gains and financial saving.
At each point in time, rentiers have to decide to allocate their wealth across assets according to these balancing rules:

\[ \mu(i, r + \rho)W = M = 0, \]  \(14\)
\[ \frac{\epsilon(i, r + \rho)}{P_e} W - E = 0, \]  \(15\)
\[ - \beta(i, r + \rho)W + B = 0. \]  \(16\)

Here \( \mu + \epsilon + \beta = 1 \). The asset demand equations given above determine the interest rate and the anticipated rate of profit on physical capital, \( r + \rho \).
We can think of \( r + \rho \) as representing returns to equity. Higher returns will bid up the value of firm’s capital stock in this economy.

Combining 12 and 15, we have

\[
W = \frac{F}{1 - \epsilon(i, r + \rho)}. \tag{17}
\]

Equation 17 says that increasing \( r \) or \( \rho \) will drive up \( \epsilon \), and so share prices and financial prices will rise.
Macro policies determine micro net worth

Rentier’s net worth is determined macroeconomically by their valuation of anticipated profits, which feeds demand for asset supplies and demands in the current period.

\[ P_e = \left( \frac{\varepsilon}{1 - \varepsilon} \right) \left( \frac{F}{E} \right); \]  

(18)

In turn \( P_e \) will determine the changes in firms’ net worth, given their investment levels and issuance of new equity, and excess demand in the money markets will be the sum of

\[ \mu(i, r + \rho) = \frac{M}{F} [1 - \varepsilon(i, r + \rho)], \]  

(19)
Equations 19 and 10 pick out an ISLM relation which looks like this:

Figure: Response of Interest and Profit rates to an increase in expected profit rate $\rho$. 
Adjustment Dynamics

Let the change in expected profits be given by

$$\dot{\rho} = -\beta(i - \bar{i}).$$  \hspace{1cm} (20)

When the rate of interest exceeds its normal long run level, $\bar{i}$, expected profits will begin to fall, and fall sharply.
Call the money debt ratio $\alpha$, and write

$$
\alpha = \frac{M}{F} = \frac{M}{PK} \frac{PK}{F} = \frac{M}{PK} \left( \frac{1}{f} \right),
$$

(21)

where $f$ is the ratio of outstanding fiscal debt to the capital stock. Fix government expenditure as a proportion of the capital stock (and taxes of expenditures). Now $f$ is fixed. The money debt ratio evolves according to

$$
\hat{\alpha} = \hat{M} - g.
$$

(22)

This says as money grows, $\hat{\alpha}$ falls as $g$ increases.
Stability Check

We can check for stability close to an equilibrium point \((i = \bar{i}, g = \hat{M})\) using the Jacobian:

\[
\begin{bmatrix}
-\beta i_\rho & -\beta i_\alpha \\
-(g_i i_\rho + g_\rho) & -g_i i_\alpha \\
\end{bmatrix}
\]  \hspace{1cm} (23)

Idea

Any increase in \(\rho\), investor confidence, will lower the interest rate, and raise the derivative of \(\rho\) in equation 20. This is positive feedback. There can of course be negative feedback. Crises can come at any moment.
Adjustment Dynamics

When a fall in the expected incremental profit rate $p$ from an initial equilibrium at A leads finally to a return to steady state where the subscripts on $i$ stand for derivatives through the IS/LM system, (7) and (18), and the growth rate derivatives come from (8). Equations (20) and (21) are potentially unstable. From Figure I, an increase in $p$ lowers the interest rate and thus raises the derivative $p$ in (20). This positive feedback does not necessarily dominate the system, since the Jacobian determinant $\lambda_{f_g}$ is easily seen to be positive (signaling possible stability).

The phase diagram appears in Figure II, with arrows showing directions of adjustment in the different quadrants. To explore the possibilities, assume that the economy is initially in a complete steady state equilibrium at point A. A momentary lapse of confidence would cause $p$ to jump down from A to a point like B. Equally, a one-shot market operation to reduce the money supply would cause $\alpha$ to rise. For a newly set (lower) value of $\alpha$, (20) shows that $p$ would start to fall from A, setting off a dynamic process like the one beginning to B. If the authorities hold to a constant money supply growth $M$ when the economy is away from steady state, then a below-equilibrium value of $p$ is associated with slow capital stock growth and a rising money-debt ratio $\alpha$ from (21). This increase would

Figure: Adjustment Dynamics
Debt Deflation Dynamics

The economy starts at point A. Any drop in investor confidence will move it to point B, where authorities will try, through policy, to increase $M$ and hence the money debt ratio, $\hat{\alpha}$. This would move the economy to point C, and back to equilibrium. If the economy does not turn the corner at C, then the economy enters a debt-deflation scenario.
References
