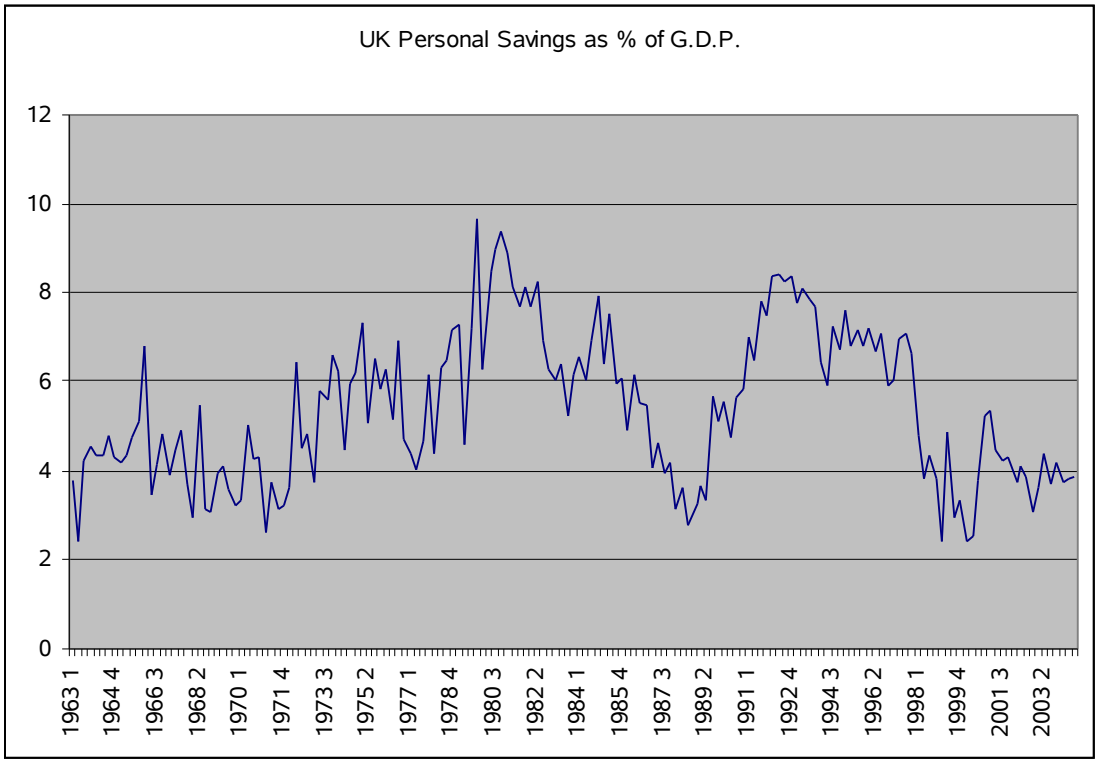
Topic 2: Aggregate consumption; Ricardian Equivalence

1. What is wrong with the traditional Keynesian consumption function, if anything?

The traditional Keynesian consumption function is of the form $C=C_0+cY$, where $c=(1-t)(1-s)$ is the marginal propensity to consume out of pre-tax income. Saving can either be by households (e.g. in bank accounts or through purchases of financial wealth such as bonds), or directly by firms, by ploughing their profits back into further capital formation. However, we can think of investment by firms as being on behalf of households, who ultimately own the firms. The **(private) savings ratio** is the proportion of G.D.P. which is saved by households and firms. This will be given by $(Y-C-tY)/Y=(1-c-t)-C_0/Y$. This expression suggests that if autonomous consumption is positive, the savings rate (which simply expresses the above ratio as a %) should increase as output increases. This means that as G.D.P. grows over time, according to this model the savings rate should increase.

This prediction does not fit the empirical evidence. The graph below shows the average household savings rate in the UK over the last forty years. There is no long run trend either up or down. Although the corporate savings rate is not shown for the UK, it is shown in the second diagram, which illustrates the US savings rate, as part of total saving (= personal saving + corporate saving + government saving). Here we can again see that there is no upward long run trend in either the household or the corporate savings rate. We can also see that during economic booms, such as in the late 1980s and early 2000s for the UK, the savings rate goes below average, and in recessions, such as the mid 1970s and the early 1980s for the US and the UK, it goes above average. This contradicts the Keynesian model, which predicts that the savings rate should go above average when Y is above average.



It might seem attractive to get rid of autonomous consumption and simply have that $C=cY$, resulting in a savings rate of $(1-c-t)$. However, this then still leaves us with no explanation of the cyclical behaviour of the savings rate. A more fruitful line of enquiry is to recognize that autonomous consumption C_0 must itself change over time. It must grow roughly in line with Y in the long run, and it must increase above average trend when there is an economic boom, in order to produce the drop in the savings rate we observe empirically. This allows us to open the door to a deeper explanation of long run consumption behaviour. However, it also underlines the limitations of the traditional Keynesian model. We need another model (such as the life/cycle permanent income hypothesis) to explain *why* C_0 changes in this manner in both the short and long run.

2. Focussing on the predictions of the life cycle/permanent income hypothesis models (which are based on inter-temporal consumer choice at the micro level), explain the effect on aggregate consumption of the following events:

Since these models are based on microeconomic models of consumer choice, some of the events examined will cause both substitution and income effects. However, the simplest way to set up the models is to assume that consumption levels in all periods are perfect complements for each other. This will mean that there will be no substitution effects, only income effects. In the simplest permanent income model, we assume that the consumers' preferences are such that they always consume the same in every period (i.e. their utility function is $U=min\{C_1 \ldots C_n\}$ where life lasts n periods). We model the behaviour of the entire private sector by treating it as a single **representative consumer** with the above utility function. The permanent income hypothesis is related to the life cycle model in that once we take into account that people have different needs at different points in their life cycle, we can alter the above utility function so that, for example, a family gets the same utility from 1.5 times as much consumption when it has 2 children as compared to a lone couple. This will lead to a bulge in people's consumption level during the middle of their lives when they are bringing up families.

We will first look at the events when consumption levels in different periods are perfect complements, and then relax this assumption to look at substitution effects, where they are relevant. We will use the simplest perfect complements utility function described above ($U=min\{C_0 \ldots C_n\}$). We will also assume that consumers can freely save and borrow from future income at the market interest rate. We will also ignore people's desire to leave an inheritance for their children (i.e. we assume everyone aims to die with 0 assets). This means that a rational consumer will take their remaining lifetime wealth A_P, which is equal to the present discounted value of the sum of their lifetime income plus their current assets, and split it evenly between every period from now until they die. So, $A_P=\sum_{i=0}^{N}(1+r)^{-i}Y_i+A_0$ where r is the current market interest rate (which is expected to say the same in the future), Y_i is income in period i and A_0 is current wealth/assets saved from the past. We define permanent income Y_P so that $(\sum_{i=0}^{N}(1+r)^{-i})Y^P+A_0 = A_P = (\sum_{i=0}^{N}(1+r)^{-i}Y_i)+A_0$. Y_P is therefore a kind of weighted average of future Y_is. Splitting A_P evenly between consumption in all periods will involve planning to borrow at times when income is low and to save at times when income is high. If we call the constant level of permanent consumption C_P then we have that $A_P=\sum_{i=0}^{N}(1+r)^{-i}C_P$ and so $C_P=A_P/(\sum_{i=0}^{N}(1+r)^{-i})$. Assuming for simplicity that expected income is identical (and therefore = Y_P) in all future periods, and using the formulas for A_P and C_P above, we have that $C_P=Y_P+(\sum_{i=0}^{N}(1+r)^{-i})^{-1}A_0$. If

there were a changing pattern of Y_i in the future, then this expression would still hold, except that Y_P would be a weighted average as described above.

So, permanent consumption depends on permanent income and a fraction of current assets (with the overall planned amount consumed each period leading to 0 assets at the end of life). This introduces the idea that agents have *expectations* of their future income (as influenced by overall macroeconomic conditions) which influence their current behaviour. Even if we drop the assumption that consumption levels in all periods are perfect complements, when there is no substitution effect from a change in future expected macroeconomic conditions, the effects of changes in economic conditions on consumption in the current period (and all future periods) can be measured entirely by changes in permanent consumption via permanent income, as described in the above expressions.

a) **An increase in unemployment** – An increase in unemployment indicates a reduction in period-specific incomes Y_i in the immediate future (i.e. low values of i). The effect that this will have on permanent income Y_P will depend on the expected future course of income and employment over the whole lifetime of the representative consumer. However, let us suppose that the increase in unemployment/decrease in Y_i is purely cyclical, so that there will be a future period of time where unemployment is below average and output above average by the same amount as they are currently below trend. In this case, we can still see that the increase in unemployment results in a decrease in permanent income Y_P because the higher than average income in more distant future periods is discounted by more than the lower than average income in more immediate periods (due to the positive interest rate). However, although current income will fall sharply with the increase in unemployment, the decrease in permanent income will be less because it is an average and therefore spread over many future periods. So, current consumption will decline by less than current income. This will result in a decrease in the savings rate.

Note that this prediction of the simple permanent income hypothesis model is not borne out by the empirical evidence introduced in question 1, where we illustrated that the savings rate generally *increases* in a recession. There are a number of factors which would make the model more realistic and reduce this anomaly. Firstly, an increase in unemployment may increase consumers' uncertainty about the future, leading to greater precautionary saving. Secondly, consumers are in reality likely to be *credit constrained* (the unemployed are not likely to get bank loans). This prevents people from borrowing sufficiently to maintain smoothed out consumption during a recession. Thirdly, if we move away from the unrealistic assumption that consumption in different periods are perfect complements, the opportunity cost of borrowing out of future income will tend to reduce the optimal amount of consumption smoothing (i.e. borrowing) that people choose (once we have standard, well behaved indifference curves, we no longer get the complete consumption smoothing which occurs with perfect complements). Although changing the utility function will change the magnitude of the effect of a decrease in current income, there is no substitution effect because changes in expected income in this and future periods do not alter the marginal opportunity cost of consuming now relative to the future.

(b) As we saw in the expressions we derived on the previous page, if income is expected to be the same in all future periods, then an increase in the interest rate does not affect permanent income. However, if incomes are growing over time then a decrease in the interest rate will cause future incomes to be weighted more heavily than before relative to present income in the constitution of permanent income, and so permanent income would rise, leading to a rise in permanent consumption. The drop

in interest rates also decreases the coefficient on A_0 in the expression for permanent consumption. This is because a lower interest rate reduces the overall amount that can be spent out of assets in each period in order to leave 0 assets at the end of life. So, these two effects act in opposite directions, and we cannot predict a priori which will dominate. As cautioned earlier, this analysis has also so far ignored the substitution effect of the decrease in interest rates. This would make the opportunity cost of consuming in the present less relative to consuming in the future. If consumption in different periods were imperfect complements (i.e. standard well-behaved indifference curves), then this would again lead to more being consumed earlier than later, and so to an additional rise in current consumption.

In light of the above analysis, the overall effect on consumption of a drop in interest rates remains theoretically ambiguous. Evidence from most economies suggests that, usually, a drop in the real interest rate does increase consumption, but there are big differences between different national economies, depending on different institutional structures (for example, UK aggregate demand is more sensitive to interest rate changes than most EU countries, due to differences in its financial and banking system). Another thing worth noting is that if the private sector had negative net wealth then the effect of the reduction in the coefficient on A_0 would work in the same direction as the other two effects, and so consumption would unambiguously increase in this simple model.

(c) A collapse in house prices leads to a big drop in A_0. This will therefore lead to a big drop in lifetime wealth and therefore in permanent consumption. This would also result in a big increase in the savings ratio (this is borne out in the evidence for the UK where there is a big rise in the savings rate after the housing market crashed in the late 1980s). There is no substitution effect from this change because it does not alter the marginal opportunity costs of consuming in different periods.

(d) An increase in the expected rate of economic growth will lead to an increase in permanent income and therefore an increase in consumption. This will also lead to a decrease in the savings ratio. There is no substitution effect.

(e) (i) An announcement by the state that it will not provide pensions in future for those currently in work will reduce permanent income for those currently in work. It will therefore lead to a decrease in consumption and an increase in the savings ratio. However, this effect must be offset against the effect of a reduction in expected future taxes. Suppose that none of those currently working will still be working when the pension system changes come in, and that none of those who will then be paying taxes are yet alive (or yet in the labour market). Assuming people are self interested (e.g. no intergenerational altruism), this would imply that the effect outlined above will be the only effect. Assume on the other hand that those currently working believe that taxes in their lifetime will be lowered by the amount that will be saved by not spending on their pensions. Their net lifetime wealth would be unchanged, as would their permanent income and consumption (this is assuming they can freely borrow at the same interest rate as the government, as explained in question 3). The true effect is likely to be somewhere in between these two extremes, since generations overlap, and savings in one area which benefits certain individuals are unlikely to be spent so as to benefit the same individuals (e.g. some of the savings from the pension system may be spent on things other than tax cuts). This problem could be analysed within the same framework as will be used in question 3. The question would then be whether or not the government must balance its budget over the lifetime of the representative

consumer and whether or not government spending on pensions fully crowds out private spending (see question 3). Again, there is no substitution effect.

(ii) An announcement that the government will cancel third world debt would presumably lower the value of domestic private assets A_0 (because the domestic private sector owns third world debt). This would lead to the same effect as a collapse of house prices. However, this would have to be offset against the possible benefits; increased economic growth from being able to trade with more rapidly industrializing nations, and reduced expenditure on aid to and defence against failed states (all of which would raise expected domestic lifetime wealth and therefore current consumption expenditure via an increase in permanent income). There is again no substitution effect.

3. To what extent does the Ricardian equivalence theorem undermine the case for active fiscal policy?

The Ricardian equivalence theorem states that, under certain strong assumptions, changes in government taxation levels (e.g. tax cuts to stimulate the economy, tax rises to reduce inflation) will have no effect on aggregate consumer expenditure. The intuition is that if taxes are lowered in the present, the government budget position will worsen, and this will result in greater government debts, which will require higher taxation in the future. The private sector is rational and can predict this. If the government borrows at the same interest rate as the private sector, then the effect of any change in tax rates on the present discounted value of the representative consumer's lifetime tax bill will be zero. This means that the representative consumer's optimal consumption plan will remain unchanged. We will first demonstrate an extremely strong version of the Ricardian equivalence theorem using the perfect complements model introduced in the above questions.

Adapting our expression for lifetime wealth to introduce taxation and government expenditure, we now have $\sum_{i=0}^{N}(1+r)^{-i}C_i = A_P = \sum_{i=0}^{N}(1+r)^{-i}(Y_i - T_i) + A_0$ and $U = min\{(C_0+G_0),(C_1+G_1),\ldots,(C_n+G_n)\}$. We require that the government fulfils its budget constraint over the lifetime of the representative consumer so that $\sum_{i=0}^{N}(1+r)^{-i}G_i = \sum_{i=0}^{N}(1+r)^{-i}T_i$. This means that although the government can run a deficit or surplus in any single period, it must balance its budget over the entire lifetime of the representative consumer. If any government debts are run up, they must be fully paid off by period *n*. By substituting the government budget constraint into the formula for the lifetime wealth of the representative consumer, we get: $A_P = \sum_{i=0}^{N}(1+r)^{-i}Y_i - \sum_{i=0}^{N}(1+r)^{-i}G_i + A_0$. This in turn implies that $\sum_{i=0}^{N}(1+r)^{-i}(C_i+G_i) = \sum_{i=0}^{N}(1+r)^{-i}Y_i + A_0$. Since we know from the perfect complements utility function that (C_i+G_i) will be the same in all periods at the optimal chosen consumption plan (because C_i can be freely varied in every period by consumers able to borrow and lend however much they want), we have that $(C_i+G_i) = Y_P + A_0/(\sum_{i=0}^{N}(1+r)^{-i})$. This implies that any change in T_i will have no effect on current expenditure and that any change in G_i will be fully offset by a corresponding change in C_i, again resulting in no effect on overall expenditure. Consequently, the government cannot use fiscal policy to alter aggregate expenditure. This result occurs due to a number of assumptions in them model:

1. The government budget constraint must be fulfilled over the lifetime of the representative consumer. This represents the idea that a greater budget deficit run up by the current generation of tax payers will have to be paid off by higher taxes within their lifetime. Suppose that this assumption does not hold,

and the current generation of tax payers can build up a debt that will have to be paid off by the next generation. This will cause Ricardian equivalence to break down, because taxing less today then raises the lifetime wealth of the representative consumer.

2. Consumers can borrow at the same interest rate, r, as the government. Suppose this were not the case, and the government could borrow at a lower interest rate than the private sector. This would mean that by borrowing today, the government can increase the present discounted value of lifetime wealth for the representative consumer, because the future taxes to pay back the government debt in the future are worth less to the private sector than the equivalent taxes today. This is another plausible explanation why Ricardian equivalence does not hold fully in practice.
3. Consumers are able to freely save and borrow at the market interest rate (i.e. they are not credit constrained). Suppose this does not hold. If there are consumers who would like to borrow in order to boost their current expenditure but are unable to do so (probably because they have no collateral to back up the loan) then by cutting tax, the government can alleviate the credit constraints and allow these consumers to spend more.
4. Private consumption and government expenditure must be "worth the same" in the representative consumer's utility function. Strictly speaking, this is not part of the standard Ricardian equivalence theorem, but the result of the utility function used in the above example. However, this assumption has an important intuitive basis. It represents the idea that government expenditure will fully crowd out the equivalent private expenditure. For example, suppose the government introduces a new government health service. As a first approximation, we would expect private expenditure on healthcare to reduce by the same amount, since the government is now providing the service that was previously being paid for privately. Again, however, we would not expect this assumption to hold fully because it is likely that private expenditure would not have been as high if it were not for government intervention in that sector (this could be because government is inefficient or because there are public goods problems with private provision).

Even if its standard assumptions hold fully, which is unlikely, the Ricardian equivalence theorem on its own does not rule out active fiscal policy because although changes in current taxation do not alter current consumption expenditure, changes in government spending will not necessarily be fully crowded out by reduced consumption spending. However, if crowding out does not occur, it is difficult to avoid the conclusion that the government spending introduced is inefficient from the point of view of maximizing consumer welfare, since it is hard to see how the need for government expenditure in the representative consumers' utility function would change in line with the economic cycle. It is the microeconomic inefficiency of altering government expenditure through the economic cycle (as well as its clumsiness as a policy instrument) which counts against using government spending as an active stabilization tool. It would seem to be more sensible to set government expenditure in line with microeconomic needs, and to use monetary policy as the main stabilization tool so that investment is stimulated as a way out of recession. The existence of some crowding out will also mean that more microeconomic distortion is required to get the same stimulatory effect (e.g. if the government were to try to stimulate the economy by spending more on healthcare or education, there would be to some

degree a reduction in private expenditure on these things, which would work against the government).

Suppose now that the government is able to borrow at a lower interest rate than the private sector, and that some of the debt will be transferred to future generations. This is likely to be a more realistic reflection of reality because government bonds are generally less risky than private investments and so require a lower interest rate. The Ricardian equivalence theorem will no longer fully hold. It is however, likely that changes in current taxation will have a fairly small effect on current consumption expenditure for the same reasons that Ricardian equivalence holds in the extreme case (i.e. that people will take into account the fact that taxes are likely to rise later when they respond to a temporary tax cut, or to put it another way, that changes in current post-tax income only have small effects on permanent post-tax income). So, Ricardian equivalence does provide another argument against using discretionary tax rate changes in an active fiscal policy framework (on top of its clumsiness as a policy tool and the dangers of creating a structural government budget deficit). However, this assessment is not fully conclusive; there is still the potential for tax cuts to the used as part of an active fiscal policy in a more realistic world where Ricardian equivalence does not hold fully.