

INFLATION AND THE TAX SYSTEM

In this article, prepared by David Carey, some of the major costs which result from the interaction of inflation and a nominal-based income tax system are examined.

Executive Summary

Possibly some of the most serious costs of inflation result from the interaction of inflation and a nominal-based income tax system. With such a tax system, inflation significantly alters tax burdens and thereby distorts economic decisions and causes possibly inequitable redistributions of wealth to occur.

The major economic decisions distorted by the interaction of inflation and the tax system relate to savings and investment. Domestic residents are discouraged from saving by the low after-tax real returns available when there is inflation. Businesses, on the other hand, are encouraged by the relatively low real after-tax cost of borrowing to increase the capital stock of real assets other than inventories and, in particular, to invest in long-lived real assets (such as commercial buildings). The combination of increased business demand for investment finance and a reduced willingness of domestic residents to provide that finance results in businesses funding the expansion in the capital stock by borrowing from foreigners. In addition, the reduced willingness of domestic residents to fund business means that a greater proportion of the capital stock which would exist even in the absence of inflation will also have to be refinanced with loans from foreigners.

The debt-financed expansion in the capital stock encouraged by inflation is harmful from a national economic perspective for two main reasons. First, taxpayers are being called upon to subsidise investment (i.e. to make it commercially viable) which has a lower real yield than the real cost of funding that investment (i.e. the world real interest rate). Secondly, an increase in the gearing, and therefore riskiness of the business sector results.

Domestic residents are further harmed by the reduction in post-tax real interest rates. This decline, which is caused by higher taxation, reduces the levels of consumption which individuals can afford over their life-times. Tragically, any extra tax revenue gained from savers is wasted through the subsidisation of uneconomic investment.

The inflation and tax system interaction also produces some arbitrary and unlegislated redistributions of wealth. Even when inflation is fully anticipated, groups in society which need to hold financial assets rather than real assets are disadvantaged; the elderly and first-home buyers fall into this category. When a previously unanticipated inflation is acknowledged and is thereafter expected to persist, real asset prices change and produce windfall gains for those whose portfolios happen to be more suitable in the new environment. Because the poor and unsophisticated members of society tend to be slower to appreciate the significance of the changes taking place, the emergence of a previously unanticipated but sustained inflation, such as New Zealand experienced in the 1970s and 1980s, is likely to interact with the tax system to make the distribution of wealth more unequal.

Fiscal drag and the non-indexation of some government benefit payments also causes unlegislated redistributions of wealth.

There are two main ways in which the economic distortions and wealth redistributions which result from the interaction and the nominal income tax system can be avoided. First, the income tax system could be converted to a real base, or secondly, government could ensure that there is no inflation. There may, however, be considerable administrative difficulties associated with converting the income tax system to a real base. If these difficulties are insurmountable, the main option left for avoiding the economic distortions and wealth redistributions caused by inflation is not to have inflation. This course is the one which has been pursued by Government.

Since March 1988, the Government has reiterated on a number of occasions that it aims to eliminate inflation by the early 1990s; the attainment of this goal will involve holding annual increases in the CPI to the 0-2 per cent range.¹ While the community generally recognises that price stability is preferable to inflation, the benefits are not well understood and have tended to be discounted in relation to the more

obvious costs involved in the process of reducing inflation. As a result of this short-term focus, inflationary policies have frequently been adopted in the past.

Inflation causes a variety of distortions in economic decision-making which reduce the ability of the community to make best use of the available resources and opportunities. In addition, redistributions of wealth result which are

unlikely to accord with the community's concept of equity.

Possibly the most serious costs of inflation² result from the interaction of inflation and a nominal-based³ income tax system. Because the income tax system makes no allowance for inflation, the tax burden on different economic activities alters significantly with inflation. As a result, economic decisions are distorted and possibly inequitable re-

distributions of wealth occur.

This article identifies some of the major costs which result from the interaction of inflation and a nominal-based income tax system; the other major costs of inflation will be examined in a forthcoming Bulletin article. The discussion is divided into two parts: first, the economic efficiency costs of this interaction; secondly, equity effects.

EFFICIENCY COSTS

The Concept of Efficiency

Economic efficiency is said to exist when it is not possible to re-allocate resources so that one person is made better off without making anyone else worse off. If a number of restrictive assumptions are made⁴, it can be shown that a free market environment will generate an efficient allocation of resources.

A government intervention which

directly changes the relative prices of various goods will generally reduce economic efficiency.⁵ For example, if Government imposes a tax on good A and uses the funds to subsidise good B, the after-tax price of A relative to B will rise from the free market level. Consumers will be encouraged to reduce consumption of A and increase consumption of B, even though they judged themselves to be better off consuming more A and less B in the absence of Government intervention. The Government intervention imposes an efficiency cost on the economy equal to the loss of welfare from over-consumption of B and under-consumption of A.

A nominal-based income tax will, even in the absence of inflation, distort economic decisions and thereby impose an efficiency cost on society. The focus in this section of the article is on the further distortion of some of the key economic decisions made by individuals as a result of the interaction of inflation with the nominal tax system.

Assumptions

A detailed list of the assumptions underlying the following analysis appears in Appendix 1. The most important of these assumptions are the following: a competitive economy in which information is costless and economic agents are rational; inflation is fully anticipated and ongoing; perfect international capital mobility; and a nominal-based income tax system which reflects relevant features of New Zealand's tax legislation.

The analysis compares the outcomes in an environment of ongoing fully anticipated inflation with the outcomes under price stability; there are also two boxes in which respective outcomes with a nominal capital gains tax and a real income tax base are examined to see whether the distortions which otherwise result from the inflation-tax-system interaction can be avoided.

Partial Equilibrium Effects

Pre-tax Interest Rates

The assumption of perfect capital mobility ensures that, in equilibrium, a higher return cannot be obtained by switching between domestic and foreign capital markets. In turn, this situation means that domestic nominal interest rates are internationally determined and will differ from foreign nominal interest rates by an amount which reflects the expected rate of currency depreciation or appreciation.

Because tax laws in most countries make foreign exchange gains (losses) taxable (deductible), an increase in domestic interest rates which is in line with the rise in inflation (from zero) will leave foreigners indifferent between investing in the inflationary country or in their own countries. The inflation premium component of nominal interest in the inflationary country will be offset by expected currency losses from investing in the inflationary country, with the result that foreigners will only be taxed on the real component of interest. Consequently, foreigners will continue to receive the same real after-tax return whether they invest in the inflationary country or in their own countries.

As domestic inflation does not alter the after-tax real return to foreigners investing in the home country and given that the home country is assumed to be small, there will be no change in pre-tax real interest rates as a result of inflation – nominal interest rates will simply rise in line with inflation.

Impact on Savings

An unchanged real interest rate will, however, leave savers worse off after tax. The nominal base for income tax means that savers will pay tax on both the real interest income (as before) and the inflation premium component of interest. Taxation of the inflation premium component of interest is effectively a tax on a capital repayment and it is this new ele-

¹ Increases in the CPI of 0.2 per cent annually have been judged to be consistent with price stability for three main reasons. First, as the Laspeyres index technique used for constructing the CPI uses weights which are based on historical consumption patterns, undue emphasis is given to goods for which the relative price has risen and consumption declined since the weights were last revised. Overseas evidence suggests that this factor alone can overstate the 'true' inflation rate by up to 0.5 percentage points. Secondly, quality improvements in goods are difficult to capture in prices. Thirdly, one-off factors, which may be expected to reverse over time, can occur – e.g. climatic effects on fresh food prices. In the Bank's view, the first two of these factors suggest that price stability may centre on annual increases in the CPI of 1 per cent. The third factor suggests that a range of 1 per cent on either side of this central rate of increase would still be consistent with price stability.

² Major non-tax-related costs of inflation are caused by a variety of factors, including: the difficulty of judging whether individual price movements are relative or part of the general rise in prices (prices are not all increased at the same time during the year); the distortion in transactions payments technology arising from the inflation tax on cash holdings; arbitrary redistributions of wealth between contractual parties when inflation is unanticipated; the expense of having to write complex contracts and make institutional arrangements which allow for inflation.

³ A nominal-based income tax system makes no allowance for inflation; nominal as opposed to real (i.e. inflation adjusted) income is taxed.

⁴ These assumptions generally include: the existence of complete contingent markets for all goods and all dates; full information; non-increasing returns to scale; and every individual being a price-taker.

⁵ Except if the intervention offsets some form of market failure.

A Nominal Capital Gains Tax Solution

A solution sometimes suggested to reduce the economic distortions which result from inflation and the present tax system is to introduce a nominal capital gains tax. This solution is examined here.

The changes to the tax system assumed in the analysis are the following: introduction of a comprehensive nominal capital gains tax; the use of current instead of historic cost depreciation; LIFO instead of FIFO inventory valuation; and interest deductibility for private borrowers in respect of the inflation component of interest on assets subject to the capital gains tax (this assumption amounts to taxing only capital gains on the equity in assets).

Current instead of historic cost depreciation allowances are assumed because in the presence of a capital gains tax, there can be no justification for attempting to claw back businesses' inflation-related gains through the use of historic cost depreciation. To continue to allow only historic cost depreciation in the presence of a nominal capital gains tax would unambiguously increase taxation on businesses with real assets (other than inventories) when there is inflation and so would create a new and unwarranted distortion.

LIFO instead of FIFO inventory valuation is assumed so as to ensure that the capital gains on inventories are not taxed twice.

Provided that the capital gains tax applies to houses and consumer durables, households will no longer have an incentive to shift wealth into these assets when there is inflation. Hence, a distortion in the choice of assets used for saving purposes is avoided.

In reality, however, a capital gains tax is unlikely to be levied on consumer durables and houses. Consequently, the household sector will still be encouraged to shift wealth from shares and loans into houses and consumer durables when there is inflation.

The capital gains tax does not alter the disincentive to save of low after-tax real interest rates when there is inflation. Thus, this major distortion remains.

Businesses with real assets other than inventories will no longer gain from inflation. The taxation of nominal capital gains on real assets will ensure that the real after-tax return on these assets falls in line with the real after-tax cost of debt finance. There will be no change in the capital stock of such assets, no rise in profits for businesses which use these assets and no windfall capital gains for the owners of these businesses.

It is ambiguous whether the rise in business gearing caused by the interaction of inflation and the tax system will be smaller or greater when there is a capital gains tax. On the one hand, there will be no debt-financed expansion in the capital stock to increase business gearing. On the other hand, however, there will be a new incentive for businesses to fund a greater proportion of their assets with debt. This incentive arises because equity-financed business assets will be subject to the capital-gains tax twice – first at the business level and secondly, at the individual level, when the inflationary rise in share values is taxed again. As it is not possible to know a priori which of these two influences on gearing is greatest, no conclusion can be drawn about whether the increase in gearing caused by inflation will be greater or smaller when there is a capital gains tax.

It may be noted, however, that application of a capital gains tax to both companies and to shares is similar in principle to taxation of both company income and dividends. If the principle of imputation in respect of dividend taxation were also applied to a capital gains tax, gains on shares would be tax-exempt (given a common rate of business and personal taxation) and the increase in gearing resulting from the double taxation of equity capital gains would be avoided. Consequently, there would be a smaller increase in gearing caused by the interaction of inflation and the tax system. The only factor contributing to this increase in gearing would be the substitution of foreign debt finance for domestic equity finance; because domestic residents as a group can't reduce their shareholdings, the adjustment towards a lower desired stock of shares would take place through less participation in new issues.

On balance, a nominal capital gains tax would reduce some of the distortions caused by inflation. However, perhaps the most fundamental distortion, viz. the disincentive to save, would remain. Moreover, unless capital gains on shares are tax exempt, it is not clear whether inflation will encourage businesses to raise their gearing ratios to a greater or lesser extent than in the absence of a capital gains tax.

ment of taxation which reduces savers' real after-tax interest rates.

The effect on after-tax real interest rates of the taxation of the inflation component of interest can be demonstrated with a numerical example. Suppose that the pre-tax real interest rate is 10 per cent and the tax rate is 40 per cent. In the absence of inflation, a saver's after-tax real interest rate is 6 per cent. If there is 10 per cent inflation, however, the nominal interest rate rises to 21 per cent while his after-tax real return falls to 2.4 per cent.⁶

An increase in the inflation rate to 20 per cent would raise the nominal interest rate to 32 per cent but would lower the after-tax real interest rate to -0.7 per cent. Inflation clearly has a major effect on after-tax real interest rates.

The decline in after-tax real interest rates will discourage people from saving through the accumulation of interest-bearing assets. Instead, people will be encouraged to save through the accumulation of assets such as houses, antiques and shares, which are not subject to a tax on inflation-related gains. As these assets impose additional liquidity and transaction costs on savers, avoidance of the inflation tax is costly.

Because the inflation tax cannot be costlessly avoided, the overall return to saving will be reduced by inflation. Consequently, not only will the pattern of savings be distorted, but also the level of savings as a whole will be reduced by inflation.

⁶ The after-tax real interest rate is given by:

$$r_a = \frac{1+i(1-t)}{(1+I)} - 1$$

$$\text{and } i = I + r(1+I)$$

where r = (pre-tax) real interest rate
 i = nominal interest rate
 I = inflation rate
 t = marginal tax rate
 subscript 'a' signifies after tax.

Substituting in $r = 10$ per cent and $t = 40$ per cent gives r_a of 6 per cent when there is no inflation and 2.4 per cent when there is 10 per cent inflation.

Impact on Business Sector

As nominal interest payments are tax deductible for businesses, inflation reduces their real after-tax cost of debt finance. This reduction occurs because the tax deductibility of the inflation premium component of interest effectively means that businesses are able to claim a capital repayment as a tax-deductible expense. The reduction in the after-tax real cost of debt finance to businesses exactly mirrors the reduction in the after-tax real interest rate to savers.

The real after-tax return on some business assets also declines in line with the real after-tax cost of debt finance. Specifically, the real after-tax returns on financial assets and on inventories decline to the same extent as the real after-tax cost of debt finance. The returns on these assets decline because the inflation related incomes which they generate – namely, the inflation premium interest income and the nominal capital gain respectively – are taxed.

For other business assets (such as buildings, plant and machinery – i.e. real assets other than inventories), however, real after-tax returns will not decline as much as the real after-tax cost of debt finance. As inflation-related capital gains on these assets are not taxed, the only way in which their tax burden rises when there is inflation is through the use of historic cost instead of current cost depreciation for tax purposes. This additional tax burden, however, is not as great as that imposed on financial assets and on inventories. Moreover, the longer-lived is a non-inventory real asset, the smaller will be the reduction in its real after-tax return when there is inflation. (For a proof of these propositions, see Appendix II.) Thus, assets such as commercial buildings will suffer amongst the smallest declines in after-tax returns of any assets when there is inflation.

To maximise profits, businesses with assets which do not suffer the same decline in after-tax real returns as the after-tax real interest rate will

expand investment in these assets until the marginal after-tax product of capital falls to equate with the after-tax real interest rate. Businesses with these assets will enjoy increased profits on their existing capital stock and will make further profits from all the intra-marginal units of additional investment.

The increase in profits for businesses with non-inventory real assets will boost the share prices of these businesses. Share values will rise until the yield on the expected flow of profits falls to equate with the lower after-tax real interest rate.

Thus, non-inventory investment will expand in aggregate and the proportion of such investment represented by long-lived assets, such as commercial buildings, will increase. Profits and share prices will rise for companies with non-inventory real assets, with the increases being greatest for companies which have the highest proportions of their assets in long-lived assets.

General Equilibrium Effects

Impact on Savings

The partial equilibrium analysis showed that savers could be expected to respond to the lower after-tax real interest rates available when there is inflation by saving less and by substituting in their portfolios assets earning tax-free capital gains, such as houses, shares, antiques, etc.

When an allowance for feedback effects from other markets is made, most of these conclusions still stand. In particular, the return to savings is lower and less is saved when there is inflation. Moreover, more wealth is invested in consumer durable assets, such as houses and antiques, because their capital gains are tax-free.

Shares do not, however, give savers an avoidance mechanism. The tax on foreign exchange gains ensures that the after-tax real yield on overseas shares held by domestic residents declines in line with after-tax real interest rates. With the after-tax real yields on both overseas shares and loans declining, domestic

Box 2

Real Income Tax Base Solution

To transform the existing tax system into a real-based system, the following modifications would be required: non-taxation or deductibility of the inflation compensation component of interest; inventory valuation on a LIFO basis (to ensure that inflation-related rises in inventory values are not taxed); current cost depreciation. Note that a nominal capital gains tax is not part of this package and indeed, such a tax would create distortions if it were also introduced.

With these modifications to the income tax system, there are no distortions resulting from the interaction of inflation and the income tax system. Savers' real after-tax returns are unaffected by inflation and businesses are unable to borrow at lower after-tax real interest rates. There is no expansion in business investment or in business gearing.

Moreover, most of the arbitrary wealth redistributions except those associated with fiscal drag and non-indexed benefit payments are avoided. Those who need to hold financial assets are not penalised and there are no windfall gains for individuals holding assets appropriate to an inflationary environment. If tax rates and benefits were also indexed, there would be no tax or benefit related redistributions at all as a result of inflation.

Although a real-based income tax system would, as expected, avoid the distortions presently caused by the interaction of inflation and the tax system, this solution may not be administratively feasible. Nominal rates of return on all assets and rates of interest on all liabilities during the tax period would have to be calculated; by contrast, it is not necessary to know what the rates of return on assets and liabilities are under current tax laws. Because this task may be difficult, a real tax-base solution could entail significant administrative problems. If these problems are insurmountable, the only practicable way of avoiding the distortions caused by the interaction of inflation and the tax system is to maintain zero inflation!

residents will seek to shift their wealth into shares in domestic companies. However, this action will bid up the price of domestic shares until their after-tax yield is as low as that which domestic residents can receive on overseas shares and on loans. Hence, domestic savers cannot escape the reduction in after-tax real yields by buying shares.

Even though shares are not an avoidance mechanism, domestic savers will nevertheless increase their shareholdings relative to their loans. This increase will occur because, at lower real after-tax yield on shares, domestic savers will be valuing domestic shares more highly than foreigners. Consequently, domestic savers will buy out foreigners' total shareholdings in domestic companies. To finance these share purchases, domestic residents will reduce their loans to business.

The reduction in after-tax real yields on shares and loans will encourage domestic savers to reduce their combined holdings of shares

and loans. As loans to businesses mature, they will not be renewed and domestic residents will not subscribe to new equity issues. Once the new equilibrium stock of funding for business is attained, the flow of domestic savings will rise to its new and lower equilibrium level.

Impact on Business Sector

As discussed in the partial equilibrium analysis, business investment in non-inventory real assets, and especially in slowly depreciating real assets, will expand when there is inflation. Investment in inventories and financial assets, however, will not change. Thus, aggregate investment will rise and a greater proportion of investment will be in real assets other than inventories. None of these conclusions is affected by an allowance for feedback effects from other markets.

The decline in after-tax real returns available to domestic savers on loans and shares will make domestic

residents unwilling to finance any expansion in the capital stock. Indeed, domestic savers will seek to reduce the stock of finance which they have made available for business investment. Consequently, business will have to rely on foreigners for additional finance both to fund the capital stock expansion and to make up for a reduced flow of finance from domestic residents.

Foreigners will not supply additional equity finance at the lower after-tax real yield; indeed, they will sell all of their shareholdings in the high inflation country. They will, however, supply additional debt finance because there has been no change in the after-tax real interest rate which they receive; the pre-tax real interest rate is unchanged as is foreign savers' tax burden on loans (the inflation premium component of nominal interest is exactly offset by tax deductible foreign exchange losses).

This expansion in investment is harmful from a national economic

perspective. Funds are being borrowed from foreigners at world real interest rates to finance domestic investments which yield a lower real return. Businesses are prepared to borrow at world real interest rates to finance investment with a lower real yield because the inflation premium component of interest payments is tax deductible but the inflation premium component of real asset returns is essentially untaxed; as previously discussed, there is some clawback of tax through historic cost depreciation. Government effectively provides a subsidy for businesses to undertake uneconomic investment when there is inflation.⁷

The borrowing from foreigners which is required both to finance the expansion in the capital stock and to make good the reduced supply of domestic savings increases businesses' gearing and, consequently, the risk of business failure. The increase in gearing will be most pronounced in businesses which gain the most from inflation and hence, undertake the greatest capital stock expansion. Specifically, businesses with long-lived real assets (such as commercial buildings) will expand more than other businesses and will increase their gearing to a greater extent.

EQUITY CONSIDERATIONS

The interaction of inflation and a nominal-based income tax system results in unlegislated redistributions of wealth. The nature of some of the more important of these redistributions depends upon whether or not the inflation is anticipated. These redistributions are discussed in the next two sub-sections.

⁷ It might also be noted that the refinancing of business loans from domestic savers with loans from foreigners imposes a further fiscal cost on Government because the tax revenue on these interest receipts is instead received by foreign governments.

Anticipated Inflation

In general, groups in society which need to hold financial assets rather than real assets are disadvantaged by the interaction of inflation and the nominal-based tax system.

One such group is first home buyers. The lower after-tax real yields on financial assets clearly make the task of accumulating enough wealth to place a deposit on a house more difficult. A further impediment faced by potential first home owners is that inflation drives up real house prices. Inflation has this effect because wealth-owners are prepared to accept a lower real yield on house equity in an inflationary environment owing to the lower real post-tax yields on other forms of investment. In a society such as New Zealand, where house ownership is accorded a high social priority, wealth redistribution away from this group is likely to be regarded by society as undesirable.

Another group especially harmed by the inflation and tax system interaction is the elderly. This group requires a relatively large reserve of financial assets so that cash can easily be obtained to meet living costs. Consequently, the elderly may be unable to hold as much of their wealth in real assets as other sections of the community and so face a higher inflation tax than other sectors.

Inflation can also interact with a nominal-based income tax system to redistribute wealth if Government allows inflation to push income earners into higher tax brackets (i.e. if tax brackets are not indexed) and if Government benefit payments are not indexed. New Zealand Governments have certainly used inflation to gain large unlegislated increases in tax revenue during the 1970s and 1980s and, at times, have also allowed inflation to diminish the real value of benefit payments.

Unanticipated Inflation

When a previously unanticipated inflation is acknowledged and is thereafter expected to persist, asset

prices change and produce arbitrary redistributions of wealth – assets not taxed on a nominal basis will tend to rise in value relative to other asset prices. In particular, the real price of houses will rise. Consequently, individuals who have already purchased houses will gain at the expense of the rest of the community. Similarly, owners of shares in companies which employ a high proportion of non-inventory real assets, especially long-lived real assets, will make windfall capital gains.

A group in society which is always harmed by an unanticipated persistent inflation, given a nominal tax system, is the economically uninformed. These individuals are the last to read the signs about the persistence of inflation and so will generally have inaccurate inflation forecasts. Moreover, these individuals take longer than others to learn which portfolio structures are appropriate to the new environment. Because these people are already frequently economically disadvantaged, the emergence of an unanticipated but persistent inflation generally serves to widen the gap between the rich and the poor.

CONCLUSION

Inflation interacts in a number of ways with the nominal-based income tax system to distort economic decisions. The tax deductibility of the inflation premium component of nominal interest payments and tax-free status of the inflation premium on real assets (other than inventories) encourages businesses to borrow and expand the capital stock of real assets, especially long-lived real assets. This expansion in the capital stock of real assets is harmful from a national economic perspective because money is being borrowed at the world real interest rate to fund investments yielding lower real returns; the taxpayer picks up the tab for the difference between real returns and the world real interest rate. In addition, the business sector is encouraged to increase

gearing and thereby become more risky.

The interaction of inflation and the nominal-based tax system also discourages the household sector from saving and encourages it to hold more of its wealth in houses and consumer durables; real house prices are also boosted by this interaction. The reduction in after-tax real interest rates make individuals worse off by reducing the levels of consumption which they can afford over their life-times.

With the household sector less willing to fund business, the finance for an expansion in the real capital stock must come from foreigners. Because pre-tax real interest rates are unchanged but real yields on equity have declined, foreigners will only supply debt finance. Indeed, both the expansion in the capital stock of real assets and the refinancing of loans withdrawn by domestic savers will be financed by borrowing from foreigners.

Inflation and the nominal tax

system also interact to produce some arbitrary and unlegislated redistributions of wealth. Even when inflation is fully anticipated, potential first home buyers and the elderly are often adversely affected. When a previously unanticipated inflation is acknowledged and is thereafter expected to persist, real asset prices change and produce windfall gains for those whose portfolios happen to be more suitable in the new environment. Because the poor and unsophisticated members of society tend to be slower to appreciate the significance of the changes taking place, the emergence of a previously unanticipated, but sustained inflation, such as New Zealand experienced in the 1970s and 1980s, is likely to interact with the tax system to make the distribution of wealth more unequal.

Other mechanisms by which inflation and the tax system interact to produce unlegislated redistributions of wealth are fiscal drag (the process by which Government allows in-

flation to push income-earners into higher tax brackets) and incomplete indexation of Government benefit payments.

There are two main ways in which the economic distortions and wealth redistributions resulting from the interaction of inflation and nominal income tax system can be avoided. First, Government could ensure that there is no inflation, or secondly, the income tax system could be converted to a real base. The option of converting the income tax system to a real base has been considered in Box 2 but may not be viable due to administrative difficulties. If those difficulties cannot be overcome, the maintenance of price stability is the only way to avoid the distortions and arbitrary wealth redistributions which otherwise result from inflation. The avoidance of these distortions and arbitrary wealth redistributions is one of the major reasons why price stability is regarded as an important goal of economic policy.

APPENDIX 1 SPECIFIC ASSUMPTIONS

1. Nominal interest receipts are taxable.
2. Nominal interest payments by business borrowers are tax deductible – interest payments by non-business borrowers are not tax deductible.
3. No general capital gains tax.
4. Other countries have a nominal capital gains tax.
5. No dividends tax; equivalently, there is full imputation.
6. Businesses can claim depreciation on an historic cost basis and must value inventories for tax purposes on a first-in/first-out (FIFO) basis.
7. The home country is small.
8. Perfect international capital mobility holds – consequently, uncovered interest parity (UIP) holds.
9. Purchasing power parity (PPP) holds.
10. Investment occurs over time to the point where the marginal product of capital (after tax) equals the real interest rate (after tax).
11. The marginal product of capital declines as the capital stock increases.
12. Individuals have a positive rate of time preference.
13. The substitution effect on savings of an interest rate change outweighs the income effect.
14. Foreign exchange gains (losses) are taxable (deductible) in both the home country and in foreign countries.
15. With the exception of capital gains taxation, all countries' tax regimes are identical.

APPENDIX II THE RELATIVE GAIN ON REAL ASSETS

The conclusion that the after-tax real return on real assets does not decline by as much as the after-tax real interest rate can be demonstrated as follows.

Note that if nominal capital gains were taxable and current cost depreciation was allowable, real assets would be taxed in exactly the same way as interest receipts. Consequently, inflation would reduce the real after-tax return on real assets to the same extent as the decline in real after-tax interest rates.

If inflation interacts with the tax system to effect a smaller (impact) decline in real after-tax returns, the difference between reductions in real after-tax returns and real after-tax interest rates can be regarded as a relative gain for real assets.

This gain is the net result of two opposing influences. First, tax free capital gains. Secondly, the use of historic cost instead of current cost depreciation rules. The first influence is positive while the second influence is negative. The net gain relationship can be expressed algebraically, as in equation (1):

$$G = A_{-1} \left[\frac{I[(1-d_e)-d_e(1-HC_{-1})t]}{A_{-1}} \right] \quad (1)$$

where:

- G = net relative gain from inflation
- A_{-1} = current value of the asset one period ago
- I = constant, on-going inflation rate
- d_e = economic (true) depreciation rate
- HC_{-1} = historic cost value of the asset one period ago
- t = company tax rate

Equation (1) says that the net gain from inflation comprises tax free capital gains minus the extra tax payable as a result of allowable depreciation being based on historic cost instead of current cost valuations. Note that the allowable depreciation schedule is assumed to be the same as the true economic depreciation schedule; historic cost depreciation is only less than true economic depreciation when inflation reduces historic cost asset valuations below current cost valuations.

The current value of the asset one period ago is given by equation (2):

$$A_{-1} = [C(1-d_e)^{(a-1)}](1+I)^{(a-1)}, a > 1 \quad (2)$$

where:

- C = purchase cost of the asset
- a = age of asset
- $= \frac{1}{d_e}$

The restriction on a to values greater than 1 is required because only assets which last for more than one year can be depreciated for tax purposes; assets with a shorter life are charged as current expense. In addition, an asset must last for more than one year to earn a capital gain which can be recorded for the tax year.

The identity $a = 1/d_e$ reflects the assumption being made that straight-line depreciation is used.

The one period ago historic cost valuation of the asset (HC_{-1}) is given by equation (3):

$$HC_{-1} = C(1-d_e)^{(a-1)} \quad (3)$$

HC_{-1}/A_{-1} can be obtained by dividing (3) by (2):

$$\frac{HC_{-1}}{A_{-1}} = (1+I)^{-(a-1)} \quad (4)$$

Substituting (4) into (1), simplifying and noting that $d_e = 1/a$ gives (5):

$$G = A_{-1} I \left[1 - \frac{1}{a} (1 + [1 - (1 + I)^{-(a-1)}] t) \right] \quad (5)$$

To find out whether there is a gain or loss to real asset returns as a result of inflation, it is necessary to take the partial derivative of G with respect to inflation (I):

$$\frac{\partial G}{\partial I} = A_{-1} \left[1 - \frac{1}{a} \left(1 + \left[1 - \frac{1}{(1+I)^{(a-1)}} + \frac{I(a-1)}{(1+I)^a} \right] t \right) \right] \quad (6)$$

Recall that $a > 1$. As $a \rightarrow 1$, $\partial G / \partial I \rightarrow 0$. In other words, there are no net gains from inflation on an asset which barely lasts more than a year. As $a \rightarrow \infty$, $\partial G / \partial I \rightarrow A_{-1}$. Depreciation is almost an irrelevant consideration on an asset which almost lasts for ever, with the result that the net gains from inflation are essentially dependent on the current value of the asset one period ago. For $1 < a < \infty$, $0 < \partial G / \partial I < A_{-1}$. The net gain from inflation will always be positive and will be larger the longer lived is the asset.