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## *THE DYNAMICS OF CONSUMPTION AND INVESTMENT IN THE VICTORIAN ECONOMY*

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# The Dynamics of Consumption and Investment in the Victorian Economy

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## Abstract

In the late 19th century Britain accumulated substantial overseas assets. It has been generally accepted that overseas investment displaced domestic investment. This paper questions this assumption by pointing to the rise in the savings ratio, which enabled high capital exports to be combined without reducing the rate of domestic investment. The determinants of consumption and savings are examined and it is argued that the rise in savings can be attributed to the fall in the dependency ratio. This phenomenon is familiar from modern studies of economic development and also from US experience in the 19th century. The determinants of business investment are analysed and the results indicate the importance of both real profits and accelerator effects for investment, but there is no evidence of crowding out of home investment by overseas issues. House building then is examined and demographic factors are found to be important. Crowding out effects may have been present, but this is not the only hypothesis, which is consistent with the data. The collapse in house building could also be attributed to the massive boom and bust in the property market in the period 1890-1914.

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In the late 19th century Britain accumulated substantial overseas assets. It has been generally accepted that overseas investment displaced domestic investment. This paper questions this assumption by pointing to the rise in the savings ratio, which enabled a high level of capital exports to be maintained a without reducing the rate of domestic investment. The determinants of consumption and savings are examined and it is argued that the rise in savings can be attributed to the fall in the dependency ratio. This phenomenon is familiar from modern studies of economic development and also from US experience in the 19th century. The determinants of business investment are analysed and the results indicate the importance of both real share prices and accelerator effects for investment, but there is no evidence of crowding out of home investment by overseas issues.  House building then is examined and demographic factors are found to be important. Crowding out effects may have been present, but this is not the only hypothesis, which is consistent with the data. The collapse in house building could also be attributed to the massive boom and bust in the property market in the period 1890-1914.

# The Dynamics of Consumption and Investment in the Victorian Economy

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## Introduction

Britain accumulated overseas assets at a rapid rate from the third quarter of the nineteenth century until the outbreak of the First World War. According to Matthews, Feinstein and Odling Smee (1982), British overseas assets rose by 390 per cent from 1873 to 1913 at constant prices, while domestic assets increased by only 120%.[1] They also show that the rate of growth of the domestic capital stock was at 2.0 per cent per annum from 1873-1914, which was the same rate achieved in the previous phase from 1956-1873.[2] Thus the growth rate of the domestic capital stock after 1870 does not appear to have been reduced by the high level of capital exports. Contrary to this, it has been argued by Cairncross (1953) that overseas investment was at the expense of home investment. The inverse pattern of home versus foreign investment has been emphasized by Ford (1962), who pointed to an inverse cycle with a periodicity longer than the 7 year trade cycle.

It has also been argued that distortions in the capital market led to excessive concentration of investment on overseas issues with adverse effects on domestic capital formation. This view has been contested by McCloskey (1971)[3] and Edelstein (1982).

A feature of the controversy over home versus foreign investment has been the lack of attention given to the determinants of home savings. If the savings ratio were constant the rapid growth of overseas assets would have been at the expense of home investment, but this need not apply if the savings ratio was rising. It is the aim of the paper to examine the factors explaining the course of domestic savings. The question of the determinants of domestic savings has been raised most recently by Edelstein (2004), but he does not test his hypothesis that declining fertility was an important factor behind the rise in thrift.[4]

This paper explores the hypothesis that demographic change, namely a fall in the average size of families, contributed to a rise in the savings ratio in the period 1870-1913.This approach provides an evaluation of the hypothesis which Edelstein has proposed. Studies of the US economy in the nineteenth century and evidence from development economics suggest that there is a strong relationship between fertility and savings decisions. Taylor and Williamson find that capital importing

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[1] Matthews et al. (1982) p129.

[2] Matthews et al. p133.

[3] The main papers in this controversy are reprinted in McCloskey (1981)

[4] Edelstein(1977),(1982).

countries in the New World generally had high fertility. This paper argues that declining fertility in Britain enabled it to increase savings and so to export more capital in the late $19^{th}$ century.

A consumption function is estimated based on the consumption to income ratio, which is the complement of the savings ratio. The estimation is carried out using the error correction approach, first proposed by Davidson et al (1978) and now standard in macroeconomic model. It is used to examine the impact on consumption of a reduction in the proportion of young people in the population. The resulting consumption function suggests that decline in fertility reduced the propensity to consume and so raised the savings ratio.

In the second part of the paper the determinants of home investment are analysed. The aim is to test whether there is evidence that overseas issues displaced home investment and also to improve on previous studies of investment, notably by Eichengreen (1983). An approach is adopted which also uses the general to specific methodology developed by Hendry and associates to estimate investment functions. It is found that it is desirable to estimate separate equations for investment in plant and machinery and investment in structures. Neither component of investment shows signs of being crowded out by overseas capital issues.

While the paper does not attempt a full analysis of building activity, it includes an equation for house building. There is a large literature on this topic to which many economic historians have contributed. The approach used here draws on an insight of Feinstein, noted by Parry Lewis, on the influence of age structure on house building. It is then possible to test whether investment in housing was displaced by overseas investment. There is some evidence that this may have occurred. However there is stronger evidence that the sharp fall in house building which occurred after 1900 was due to overbuilding in the previous boom rather than the revival of foreign investment.

The Equations to be Estimated

The relationships to be estimated are set out in Table 1. First there is the consumption function, followed by three equations for non housing investment. These are for investment in plant and machinery, investment in structures and works and inventory investment. Finally there is an equation for house building.

**Table 1 The Equations to be estimated**:

1. Consumption Function

   C/Y =f1 (KIDR, PERUN, CBR)

   C ,consumption, Y ,GNP Expenditure net of taxes at constant prices, KIDR ,Proportion of the population aged 14 or less, PERUN, Unemployment %, CBR, Commercial bill rate%.

2. Fixed Investment in Plant and Machinery

   PINV=f2 (GDPO, DGDPO, RSP, CBR , LR)

PINV, Investment in plant and machinery, GDPO, GDP Output, RSP, Industrial share price index/GDP deflator, CBR, Commercial bill rate %, LR, Long term interest rate%.

3. Investment in Building and Works WINV=f3 (RSP, CBR, LR)

   WINV, Investment in buildings and works, RSP, Industrial Share Price Index/GDP Deflator, CBR, Commercial bill rate %. LR, Long term Interest rate %.

4. Inventory Investment

   STK=f4 (DGDPO, CBR)

   STK, Investment in inventories, GDPO, GDP output, CBR, Commercial bill rate %

5. Housing Investment

   HINV=f5 (DPOPQ, HR, CBR, RCAPEX, HCAP, GDPO)

   HINV, Investment in housing, DPOPQ, Average change in size of population aged 20-40 in 5 year period, HR, Return on investment in housing, RCAPEX, Overseas capital Issues/GDP deflator, HCAP, Housing capital stock, GDPO, GDP output.

## The Determinants of Consumption

There has been little research on the factors explaining consumption in the late nineteenth century[5]. The most recent discussion is in Edelstein (2004). He notes the possibility that the rise in the savings ratio may have been related to the reduction in the fertility which occurred after 1870. This is a hypothesis which can be tested. In this paper we estimate an error correction consumption function for the post 1870 period. Our basic equation relates the average propensity to consume to the proportion of the population aged 14 or less, which is interpolated from Census data.[6] It is suggested that as the proportion of young people in the population declined, there was more scope for families to invest in education of their children and to build up their savings for retirement. This argument applies more readily to the middle class rather than to the working class, whose savings behaviour had more short term objectives ,as discussed in Johnson (1985). The hypothesis proposed is that the reduction in fertility caused the propensity to consume to decline and the savings ratio to rise from 1870 to 1913 The average propensity to consume (CER or C/Y) and the proportion of the population aged 14 or less (KIDR) are shown in Chart 2. It will be seen that there was a declining trend in the proportion of young people in the population, or dependency ratio, and also a decline in the propensity to consume (APC), particularly after 1875. The average propensity consume falls from 0.88 in 1871 to 0.83 in 1911. The APC is defined here as the ratio of consumer spending to GNP at factor cost excluding direct taxes, Its

[5] Consumption/savings functions are estimated in Tinbergen (1956), Edelstein (1977) (1982) and Blake (1992).

[6] Feinstein (1972).

complement is one measure of the savings ratio. The main explanatory variable is the dependency ratio measured by the proportion of the population aged 14 years or less. It is assumed that this demographic variable is exogenous with causation running from aged structure to the propensity to consume. This is confirmed by Granger causality tests .The equation also includes the unemployment rate (PERUN), since a rise in unemployment might be expected to increase precautionary saving. We also test whether the interest rate, measured by the commercial Bill rate (CBR), had an effect on savings decisions as postulated in economic theory. An alternative consumption function has also been estimated in which the short term interest rate is replaced by the ratio of M3 to nominal GDP.

The results of estimating the consumption function are reported in Table 2. Equation 1 shows that the average propensity to consume is positively related to the proportion of the population aged 16 or less. The error correction term is statistically significant and its coefficient of -0.24 is relatively large, indicating that the speed of adjustment is rapid. As expected, the percentage of unemployment and the change in unemployment enter with negative signs, confirming that rising unemployment dampened consumer spending for precautionary reasons. The short term interest rate enters with a negative sign as might be expected, although the size of the impact on consumer spending is relatively small. The long run solution for the consumption to income ratio shows that the impact of the demographic variable on consumption is substantial.

The long relationship for consumption is given by:

LCONS-LGNPNT=0.395+0.361LKIDR-0.0099PERUN-0.022CBR

This is a convenient way of summarizing the results for consumption. There is some evidence of co-integration of the consumption function. In addition there is Granger Causality[7] between the average propensity to consume and the demographic variable with causation running from the dependency ratio to the average propensity to consume.

These results point to the decline in the proportion of young people having a major effect on the savings ratio, as suggested by Edelstein (2004). It would appear that demographic change had important economic effects via the decline in fertility. The reasons for that decline have long been debated by economic historians. A balanced assessment of the issues involved has been given by Woods (1987), (1996) and Anderson (1990). Three general hypotheses have been advanced[8]. The first explanation is demographic. Families reduced the number of children conceived as the probability of a child surviving to adulthood improved. The hypothesis links the decline in fertility to the declining trend in child mortality and the later fall in infant mortality. The second explanation is economic. It focuses on the increasing costs of raising children. The costs of providing private education were rising which led the

[7] Granger (1969).

[8] These explanations are examined in Woods (1987).

middle classes to opt for a smaller number of higher quality children. For the working class, larger families became more costly as the age at which children could enter the labour force was raised by the introduction of compulsory state education. This argument supposes that the substitution effect due to the increasing cost of having children was stronger than the income effect, which might have led to larger families.  The third explanation is sociological. It suggests that the growth of secularization and decline in religion made decisions to control family size more acceptable. The growing influence of women in family decision taking may also have strengthened the pressure for limiting family size. This effect has been observed in developing countries and may well have been relevant to Victorian Britain. It is generally agreed that the introduction of contraceptives was not an important factor in explaining the fall in fertility. Contraceptives were expensive before 1914 and only became affordable for the majority of families in the interwar period. It should also be emphasized that this trend in fertility was a European phenomenon and was not confined to Great Britain. In their concise survey Woods and Baines (2004) conclude that we do not know which of the three hypotheses is correct. The results reported in this paper suggest that the consequences of the fertility decline need to be examined, even though the explanation for the demographic change remains uncertain.

The relationship between fertility and the savings behaviour has been widely discussed in the literature on economic development.[9] The view that high fertility is associated with a low savings ratio was advanced by Leff (1969) and has been subject to intense scrutiny. This literature is reviewed and evaluated in Mason (1998), who supports the basic hypothesis with qualifications about growth rate effects. In particular, it has been observed that in modern Asian economies   the savings ratio has risen rapidly as fertility has declined.

In the United States during the nineteenth century, Gallman and Davis (1978) argue that the reduction in the proportion of young people in the population or dependency ratio contributed to a rise in the savings ratio. A formal model based on the life cycle theory of consumption of Ando and Modigliani (1963) , which includes the cost of raising children, has been presented by Lewes (1983). In Lewes' model investing in children is treated as an alternative to saving. He shows that a rise in fertility in the United States would have resulted in a substantial fall in the savings ratio in 1900.

A more general approach to this issue has been adopted by Taylor and Williamson (1994).They provide evidence that in the period 1870-1914 capital importing countries, such as Argentina, Australia and Canada ,had high dependency ratios. They argue that capital exporting countries, such as the UK and other European economies, had older populations and higher savings ratios, which enabled them to export capital. In their empirical work Taylor and Williamson concentrate on the capital importing countries and emphasize the intergenerational transfer involved in the pattern of foreign investment before 1914. The implications for UK savings resulting from the consumption function estimated here are highly relevant for their analysis. Their thesis can only be sustained if the reduced dependency ratio in  the UK resulted in a rise in the savings ratio, so  facilitating capital exports. The consumption function

[9] This is discussed in detail by Taylor and Williamson (1994).

which has been estimated here is in effect a mirror image of the results of Taylor and Williamson. In the British case a fall in the dependency ratio was associated with a rise in the savings ratio and in overseas investment. This is the opposite of what was taking place in Argentina, Australia and Canada, which had high dependency ratios and heavy reliance upon capital imports.

Time Series Evidence on the Relationship between Domestic Saving and Investment

The rise in the UK savings ratio is relevant to the debate about the effects of British overseas investment on domestic investment. If there was a sufficient increase in the savings ratio, this could provide funding for higher capital exports without reducing the pace of domestic investment. Chart 1 shows the ratio of domestic capital formation to GDP expenditure at factor cost as well as the ratio of the real volume of overseas investment to GDP. Real overseas investment is derived from the surplus on the current account of the balance of payments deflated by the GDP deflator. Inspection of Chart 1 suggests that the ratio of home investment to GDP was fairly stable over the full period 1855-1913, while the ratio of real overseas investment to GDP shows signs of a rising trend. The series are tested for stationarity using the Augmented Dickey Fuller (ADF) test.[10] The test indicates that the home investment ratio is stationary with an ADF statistic of -2.27. By contrast the ratio of the real current account surplus to GDP is not stationarity. It has an ADF statistic of -1.14, which rejects stationarity. The sum of ratio of home investment to GDP and the ratio of the real current account surplus gives the amount savings required to finance home and foreign investment. It therefore provides an alternative measure of the savings ratio to that previously discussed in relation to the consumption function. This overall ratio of savings to GDP follows a fluctuating path rising from about 10% in 1855-60 to about 15% in 1913-13. The rise in the ratio is interrupted by a massive spike in the savings ratio in the early 1870s after which there is a relapse. An ADF test confirms that the combined series for overall savings is non stationary.

These results suggest that the consequences of a rising savings ratio need to be taken into account in assessing the debate over home versus overseas investment. The existing literature concentrates on the pronounced inverse relationship between home and overseas investment, which is feature of Chart 1, but ignores the rise in the savings ratio. The increased savings ratio raises doubts about home investment being displaced by overseas investment. It explains the stability in the rate of growth of the domestic capital stock reported by Matthews et al. (1982), despite the rapid rate of accumulation of overseas assets. The stationarity of the home investment ratio is consistent with their findings. The rapid growth of foreign assets, which they find is consistent with the ratio of the real current account surplus to GDP being non stationary. In the next part of the paper the impact of foreign investment on domestic investment is tested. The issue is explored by estimating equations for the main components of investment and then testing whether home investment was being displaced by overseas capital issues.

The swings between home and foreign investment can be related to relative rates of return. This is shown in Table 3 which is based on Edelstein (1982).Rates of return were generally higher on overseas

[10] See Enders (2004) for a discussion of the ADF test.

investment than on home investment, but the years 1887-96 were an exception. This period saw an upsurge in domestic investment. The vigorous home boom of the 1890s has been described in Sigsworth and Blackman (1965). It sets the background for the analysis of home investment, which follows.

## Industrial Investment

The impact of overseas investment is tested by first estimating equations for domestic investment. We then test whether investment was affected by the level of new overseas issues.[11] This requires that a satisfactory equation is estimated for each of the main components of investment. There are few recent studies in this area but an exception is Eichengreen (1982)(1983).[12] He seeks to explain British home investment relying upon a capital market approach. He uses a rational expectations version of the Tobin 'q' model of investment, Tobin (1979), as extended by Abel (1980)[13] . The estimation procedure used by Eichengreen requires the imposition of restrictions on the estimated statistical model to bring it into line with the requirements of Tobin's model of investment. The estimated equations exhibit serial correlation which indicates mis-specification. This is 'remedied 'by using a Cochrane Orcutt transformation. The approach used here is different .We start with an Auto Regressive Distributed Lag (ADL) model. This is simplified to obtain a parsimonious equation, which is consistent with the data set. The approach used here is similar to that used by Bean (1981). It has also been influenced by more recent work on investment, such as Ellis and Price (2001). The starting point is the plot of the data which is shown in Chart 4. This shows the different course of investment in plant and machinery (PINVF) compared with investment in buildings and works (WINVF). The former was influenced by both movements in GDP and in the real value of the industrial share price index, whereas the latter was more strongly affected by the behaviour of real industrial share prices. This suggests that it would be useful to estimate separate equations for these two components of fixed investment rather than to combine them into a single aggregate, which is the procedure followed by Eichengreen (1982), (1983).

The basic hypothesis is that investment depends on the level of output, the level of real share prices and the cost of capital. The indicator of output is (GDPO). Real share prices (RSP) are a measure of the expected profitability of investment. The share price series used is the Smith and Horne Index of Industrial Share Prices (1934), which is deflated by the GDP deflator. While it is not a good measure of shares quoted on the London Stock Exchange, it provides a good indication of the prices of British industrial securities, which are most relevant to industrial investment. Grossman (2001) has provided a general index of shares quoted on the London Stock exchange (RSPG), which is much wider than the Smith and Horne Index, but it is less suitable for explaining the prices of British industrial securities with

[11]Investment data are from Feinstein (1988).

[12] For early studies of investment, see Tinbergen (1939)(1956), Pezmazoglu, (1951).

[13] The rational expectations model of investment is discussed in Begg (1982).

which we are concerned.[14] The two series for real share prices are shown in Chart 5.If the Grossman index replaces the Smith and Horne index in the investment equations, the ability of real share prices to explain the course of investment is greatly reduced as a comparison of the series shown in Chart 5 suggests. There are problems with the Smith and Horne index, such as an inadequate weighting procedure and a restricted sample size. At present, it is the most suitable index for our purposes, even though it suffers from these shortcomings. Investment also depended on the cost of capital, which is measured by the commercial bill rate or the yield on Consols.

The main variables which enter into the equations for industrial investment are shown in Chart 4.Both investment in plant (PINV) and investment in structures (WINV) are related to the massive upsurge in real industrial share prices in Chart 4. It may be seen in Chart 5 that the general index of shares quoted on the London Stock Exchange does not show the same vigorous boom as British industrial stocks during the 1890s.

The results of the estimation of the equations for fixed industrial investment are shown in Tables 3 and 4. It will be seen from Equations 2 and 3 that investment in plant and machinery (PINV) is strongly influenced by both the change in output and the level of output. This points to the importance of accelerator effects in this component of investment. In addition real industrial share prices, that is the share price index deflated by the GDP deflator, had a powerful effect on investment with a lag of two years. The importance of the two year lag comes out strongly. The lag of investment behind the rapid movement of share prices is feature of rational expectations models of investment, such as Begg (1982)[15]. In these models share prices jump to the equilibrium path, whereas investment moves only slowly in response to economic incentives. There is some evidence for this type of behaviour in industrial investment. Rate of interest variables are present, but the short term and long term rates are not included in the same equation, because of the high degree of collinearity between them. Equation 3 shows that the change in the Consol rate makes a useful contribution to explaining the buoyancy of investment in the 1890s. The major factor explaining the strength of investment in this decade was the high level of real industrial shares prices, indicating a high degree of investor confidence in the prospects for the British economy.

The equations for investment in buildings and works (WINV) are reported in Table 4. Both Equations 4 and 5 are dominated by the strength of real shares prices in the 1890s.This was followed by their relapse after 1900, when share prices weakened after 1900, By contrast with investment in plant and machinery there are no signs of strong accelerator effects. A small contribution is made by interest rates with stronger effects coming out for the change in the Consol rate than for the commercial bill rate.

[14] Home companies were about 19% of the total value of securities quoted on the London market in 1913,Edelstein (1982) p48.

[15] This model is set out in Begg (1982) pp185-200.

The results of estimating equations for fixed industrial investment can be summarized by looking at the long solutions for the two equations. It is notable that, while real share prices are important in both equations, the level of output only enters into the equation for plant and machinery.

Long Run Solution for Equations 2 and 3 for investment in plant and machinery (PINV) and investment in buildings and works (WINV) respectively:

LPINV=-9.12+1.043LGDPO+1.183LRSP-0.047CBR

LWINV=1.416+1.007LRSP-0.053CBR

For completeness an equation has been estimated for investment in inventories in Table 5. The variables included in the equation are shown in Chart 6. The quality of the data is not as good as for fixed investment, which should be borne in mind when assessing the results. Stock building is shown to depend on the change in GDP, pointing to accelerator effect, and it is negatively related to the short term interest rate. The fit of the equation for stock building is not close, but this not surprising in view of the doubtful quality of the data for this component of investment. The upsurge in the prices of British industrial stocks had an impact on fixed investment, which was stronger for investment in structures than in plant and machinery.

Overseas capital issues are taken from the revised series of Stone (1999). This is deflated by the GDP deflator to give a measure of real capital issues. The series is shown in Chart 6. When this variable is included in the equations for each of the three components of industrial investment, it is found to be insignificant. In all cases the t-ratio is less than 0.850 in absolute value. The commercial bill rate can be excluded from the equation on the grounds that the crowding -out effects may work through the interest rate as well through direct displacement in the capital market. The omission of the interest rate made little difference to the lack of significance of real capital exports. These results suggest that displacement of home industrial investment by overseas issues did not take place. There is, however, evidence that both components of fixed industrial investment were sensitive to the rate of interest rate, whether represented by the commercial bill rate or the change in the yield on Consols. The short term interest also enters into the equation for stock building.

## Investment in House Building

It is necessary to estimate an equation for investment in house building, since this is a component of investment which may have been sensitive to both migration and capital exports. This was the view advanced by Cairncross (1953) and Brinley Thomas (1954, which needs to be tested. The building blocks for our equation for house building are drawn from Parry Lewis (1965)[16]. He draws attention to an insight of Feinstein on the possible effects of demographic factors on house building in this period.

[16] Parry Lewis (1965) Chapter 7.

Feinstein noticed that housing building activity was related to increases in the family forming group aged 20-44 years.[17] He compared the estimated quinquennial increase in population in this age range with the level of house construction. Parry Lewis points out that the fit is closer if a one period lag, that is a lag of 5 years, is introduced. We make use of this suggestion in constructing a demographic variable, which is the average annual increase in the 20-44 year old age grouping in each quinquennium and it enters with a five year lag. This variable DPOPQ (-5) is shown in Chart 5 together with investment in house building (HINV). Increases in the 20-44 age group were high immediately before the marked rise in building in the 1890s.There was then a falling away of growth in the age group, which was reduced by emigration after 1900 as well as the lagged effects of declining fertility. A reduction in the annual increase in the size of the age group was associated with a sharp slowdown in the rate of house construction after 1900. The demographic variable also allows the impact of emigration on house building to be assessed.

A further variable, which is included, is a measure of the return on investment in new housing (HR). This is calculated as the present value of current house rents, that is the index of house rents/divided by the long term interest rate, which is then divided by an index of the cost of house construction. The variable is shown in Chart 5 labelled HRWR. The Consol rate is used in this calculation as the long term rate since it is appropriate for computing returns on a long lived asset. This is only a crude indicator of the profitability of building new houses for rent, which ignores regional variations. Measures of rent tend to be sticky in the face of changing market conditions, but the Webber index of house rents used here is the most flexible measure available.[18] The short term interest rate (CBR) is included in the equation as a measure of short term credit conditions. The presence of crowding out effects is tested by including the real value of overseas new issues (RCAPEX), plotted in Chart 6 as RSTONECAL. This also shows the ratio of the housing stock to GDPO, labelled HCAPFR.

The results of estimating the equations for house building are shown in Table 7. These indicate that the quinquennial average annual change in the 20-44 age-group was a powerful explanatory variable. The computed return on investment in housing has a positive effect on house building. It enters the equation in difference form, while the short term rate of interest has an expected negative effect. There is evidence of crowding -out effects as real capital exports tend to reduce housing investment. This effect is strengthened if the short term interest rate is omitted. This allows a more general form of crowding- out to occur, since the impact of capital issues can include effects through changes in short term interest rates as well as direct displacement in the capital market. In Equation 7 in Table 7 LCAPEX enters with a negative sign and is statistically significant, supporting the view that overseas investment displaced investment in housing. This would have applied particularly to the period after 1900, when overseas issues were buoyant and house building was depressed.

[17] Feinstein, Home and Foreign Investment 1870-1939, DPhil Thesis,1959.

[18] Parry Lewis, Chapter 6.

There is an additional factor which needs to be considered, which Offer (1981) [19]and Daunton (1990)[20] have noted. It is based on data from the property market. The slump in the housing market and fall in house building in the Edwardian decade could be attributed to the massive boom, which preceded it. There was overbuilding of houses in the boom of the 1890s, which was followed by a severe setback with rising numbers of vacant properties. According to this view, what deterred house building after 1900 was the rise in the number of empty properties rather than a shortage of finance for new housing because of the attractions of foreign investment.This hypothesis can be tested by including the lagged housing stock in the equation, where it is entered as a ratio of the housing stock to GDP (HCAP/GDPO).This variable is found to be statistically significant in Equation 8 in Table 7,while the real capital exports variable (RCAPEX) ceases to be significant.

The results of estimating the equation for house building are summarized by the long run solutions:

EQN 5 LHINVF=4.480+0.011 DPOPQ (-5) -0.191 LCAPEX

EQN 6 LHINVF=2.512+0.014 DPOPQ (-5)-0.079 LCAPEX-0.167 CBR-3.321 (LHCAP-LGDPO).

Since LCAPEX is not statistically significant (t=-0.68) in Equation 8, it could be omitted from the long run solution.

The conclusion which emerges from this estimation is that house building responded chiefly to demographic factors .While crowding-out effects due to the high level of overseas investment after 1900 may have been present , these effects cannot be firmly established. By contract, explaining the property downturn by the ratio of houses to GDP looks more promising. The decline in house building can then be attributed to overbuilding in the boom of the 1890s. Housing is the only component of investment where it has been possible to find evidence of displacement of home investment by overseas capital issues, but this is not fully convincing as there a more plausible alternative explanation.

## Conclusion

The rise in the British savings ratio can be attributed to the decline in fertility after 1870.There is evidence for this view based on an error- correction consumption function in which the proportion of young people in the population is an important variable. This conclusion accords with the results observed in the US in the nineteenth century and also in modern studies of economic development. It is also consistent with the results of Taylor and Williamson (1994) on the intergenerational transfers involved in nineteenth century capital movements. As a capital exporter Britain had declining fertility and a rising propensity to save, which enabled it to acquire overseas assets. The results found here strongly support their hypothesis.

[19] Offer (1981) pp280-2.

[20] Daunton (1990) p226.

The growth in savings enabled Britain to accumulate foreign assets without impeding the rate of growth of the domestic capital stock. When examining the factors determining industrial investment, no evidence was found of domestic investment being displaced by overseas capital issues. The results reported here for industrial investment extend the work of Eichengreen (1982), (1983). It was found to be important to distinguish between investment in plant and machinery and investment in structures. Accelerator effects were important for investment in plant and machinery as found in early work on investment by Tinbergen (1938). Real share prices had a major impact in both types of industrial investment. Accelerator effects provide the main explanation for investment in inventories.

Demographic factors are found to be important in explaining the rate of house building. This result supports the hypothesis of Parry Lewis (1965), drawing on the previous work of Feinstein. There may have been a role for crowding-out effects in this sector due to foreign investment, but this cannot be established in a convincing way. Overbuilding of houses in the boom of the 1890s provides a more convincing explanation for the subsequent decline rather the recovery in overseas lending after 1900.

Table 2 Consumption Function

| Sample 1873 -1913 | 41 Obs | OLS Estimation |
|---|---|---|
| Dep Var. DLCE | EQ 1 | |
| Variable | Coefficient | t-Ratio |
| Constant | 0.096 | 3.49 |
| DLGNPNT | 0.353 | 6.91 |
| L[CE/GNPNT](-1) | -0.242 | -2.74 |
| LKIDR | 0.087 | 2.70 |
| PERUN | -0.0024 | -3.36 |
| DPERUN | -0.0026 | -2.95 |
| CBR(-1) | -0.0052 | -3.04 |
| | | |
| Rsq(Adj) | 0.768 | |
| SE | 0.0074 | |
| DW | 2.27 | |
| LM(1) F | 0.795 | |
| LM(2) | 0.726 | |
| Chow Break 1900 F | 1.398 | |

Definition of Variables: CE, Consumers Expenditure, GNPNT, GNP Exp. excl taxes, KIDR , Prop. Pop aged 14 or less, PERUN, Unemployment %, CBR, Commercial Bill Rate,%, L ,Variable in logs.

Table 3 Realized Rates of Return on Home and Foreign Investment 1870-1913

| Annual Return % | 1870-1913 | 1870-6 | 1877-86 | 1887-96 | 1897-1909 | 1910-13 |
|---|---|---|---|---|---|---|
| **Home** | | | | | | |
| Equity | 6.37 | 11.94 | 7.19 | 8.93 | 0.92 | 6.64 |
| Total | 4.60 | 7.62 | 5.37 | 6.42 | 1.35 | 3.60 |
| **Foreign** | | | | | | |
| Equity | 8.28 | 7.34 | 13.77 | 5.34 | 9.54 | 1.37 |
| Total | 5.72 | 6.60 | 8.06 | 5.23 | 5.20 | 1.79 |

Source: Edelstein (1982)

| Table 4 | Fixed Investment: | Plant and Machinery | Equations 2 & 3 | Ref/PINVF 59,62 |
|---|---|---|---|---|
| Sample 1873-1913 | Obs 41 | OLS Estimation | | |
| Dependent Variable | DLPINV EQ2 | | DLPINV EQ3 | |
| Variable | Coefficient | t-ratio | Coefficient | t-ratio |
| Constant | -4.278 | -4.83 | -5.013 | -5.83 |
| LPINV(-1) | -0.469 | -4.90 | -0.506 | -5.62 |
| DLPINV(-2) | 0.331 | 2.58 | 0.333 | 2.77 |
| DLGDPO | 1.693 | 4.09 | 1.554 | 3.97 |
| DLGDPO(-2) | -0.656 | -1.40 | -0.931 | -2.12 |
| LGDPO(-1) | 0.489 | 3.76 | 0.564 | 4.67 |
| LRSP(-2) | 0.555 | 4.33 | 0.614 | 4.98 |
| CBR(-1) | -0.022 | -1.76 | | |
| DLR(-1) | | | -0.388 | -2.85 |
| | | | | |
| RSQ (adj) | 0.544 | | 0.560 | |
| SE | 0.058 | | 0.054 | |
| DW | 1.69 | | 1.61 | |
| LM (1) | 1.022 | | 1.452 | |
| LM(2) | 0.522 | | 0.746 | |
| Chow 1900 F | 1.213 | | 1.024 | |

Definition of Variables: PINV, Investment in Plant and Machinery, , RSP, Real Price Industrial Shares ,CBR, Commercial Bill Rate %,LR, Consol Yield %, GDPO, GDP Output, L Variable in logs.

| Table 5 | Fixed Investment | Buildings and Works | Equations 4& 5 | Ref/WINVF 18,20 |
|---|---|---|---|---|
| Sample 1872-1913 | OBS 42 | OLS Estimation | | |
| Dependent Variable | DLWINV EQ4 | | DLWINV EQ5 | |
| Variable | Coefficient | t-ratio | Coefficient | t-ratio |
| Constant | -0.198 | -0.96 | -0.354 | -1.52 |
| LWINV(-2) | -0.341 | -5.43 | -0.355 | -5.61 |
| LRSP(-2) | 0.343 | 4.83 | 0.377 | 4.93 |
| CBR(-1) | -0.018 | -1.89 | | |
| DLR(-1) | | | -0.233 | -2.03 |
| | | | | |
| RSQ(adj) | 0.411 | | 0.461 | |
| SE | 0.048 | | 0.048 | |
| DW | 2.095 | | 2.060 | |
| LM(1) | 0.250 | | 0.188 | |
| LM(2) | 0.153 | | 0.357 | |
| Chow B 1895 | 1.440 | | 0.097 | |
| 1900 | 1.926 | | 0.774 | |

Definition of Variables: As for Table 3, plus WINV, Investment in Buildings and Works

Table 6 Investment in Stock Building

| Stock Building | Sample 1871-1913 | Obs 43 |
|---|---|---|
| Dep. Var. | STK EQ6 | STKB/1 2 |
| Variable | Coefficient | t-ratio |
| Constant | 21.650 | 2.40 |
| STK(-1) | -0.327 | -2.77 |
| DLGDP | 534.70 | 4.71 |
| CBR | -6.645 | -2.22 |
| | | |
| Rsq(Adj) | 0.443 | |
| SE | 16.63 | |
| DW | 1.98 | |
| LM(1) | 0.004 | |
| LM(2) | 0.085 | |
| Chow B 1900 F | 0.269 | |

Definition of Variables: STK, Stock Building, Other variables as Table3

Table 7 Investment in House Building

Housing Investment , Sample 1876-1913 , Obs 38

| Dep. Var. | DLHINV | Ref/HINVF40 | DLHINV | Ref/HINVF 51 |
|---|---|---|---|---|
| | EQ7 | | EQ8 | |
| Variable | Coefficient | t-Ratio | Coefficient | t-Ratio |
| Constant | 1.644 | 5.18 | 0.604 | 1.29 |
| LHINV(-2) | -0.367 | -6.15 | -0.240 | -3.67 |
| DPOPQ(-5) | 0.0041 | 6.62 | 0.0034 | 5.81 |
| DLHR | 0.408 | 1.95 | 0.424 | 2.28 |
| LRCAPEX | -0.070 | -3.65 | -0.019 | -0.68 |
| CBR(-1) | | | -0.040 | -3.06 |
| L(HCAP/GDPO)(-1) | | | -0.797 | -2.29 |
| | | | | |
| Rsq (Adj) | 0.596 | | 0.684 | |
| SE | 0.062 | | 0.055 | |
| DW | 1.78 | | 1.93 | |
| LM (1) | 0.0428 | | 0.009 | |
| LM(2) | 0.0955 | | 0.054 | |
| Chow B 1900 F | 1.918 | | 0.009 | |

Definition of Variables: LHINV, Investment in Housing, DPOPQ(-5) Average annual change in pop aged 20-44 in each quinquennium lagged one period of 5 years, HR, return on investment in new housing, RCAPEX, Real Capital Exports, Capital exports/PGDP, HCAP, Housing Stock.

Table 8

Long Run Solutions for Consumption and Investment:

1. Consumption

L CONS – L GNPNT = 0.395 + 0.361 LKIDR- 0.0099 PERUN – 0.022 CBR

2. Investment in Plant and Machinery

LPINV = -9.122 + 1.043 LGDPO + 1.183 LRSP – 0.047 CBR

3. Investment in Plant and Machinery

LWINV = - 0.581 + 1.0069 LRSP – 0.053 CBR

4. Investment in Housing:

(a) LHINV = 4.480 + 0.0112 DPOPQ (-5) – 0.191 LRCAPEX

(b) LHINV = 2.512 + 0.014 DPOPQ (-5) – 3.32 L(HCAP/GDPO) – 0.167 CBR

Since LRCAPEX is not statistically significant (t=-0.68), it is omitted from the long run solution reported here.

**List of Variables used in Charts and Sources**

Chart 1 Investment Ratios

GINVMPFMR=Domestic Investment/GDP, Mitchell (1988)

CBFCPR=Real Current Balance/GDP, Mitchell (1988)

Chart 2 Consumption

CER=Consumer Spending/GNP factor cost less direct taxes , Mitchell (1988)

KIDR=Proportion of Population aged 14 or less, Feinstein (1972)

PERUN=Unemployment %, Boyer and Hatton (2002)

CBR=Short Term Interest Rate, Capie and Webber (1985)

Chart 3 Industrial Fixed Investment

PINVF= Investment in Plant and Machinery, Feinstein (1988)

WINVF=Investment in Buildings and Works, Feinstein (1988)

RSP=Real Industrial Share Prices, British Industrial Share Prices, Smith and Horn (1934).GDP Deflator, Mitchell (1988).

CBR=Short Term Interest Rate, LR=Consol Yield, Capie and Webber (1985)

Chart 4 Real Share Prices

RSP=Real Industrial Share Prices, RSPG=Real Price Equities Quoted on London Market, Grossman (2001).

Chart 5 Stock Building

INVF=Investment in Inventories Mitchell (1988). Other variables, as for Chart 4.

Charts 6 and 7

HINVF=Investment in Housing, Feinstein (1988)

DPOPQ=Change in Population Aged 20-44, Feinstein (1972)

HRWR (HR) =Return on Investment in New Housing =Rent/LR*Price Index for New Houses, House Rent Index (Webber), Parry Lewis (1965), Yield on Consols, Capie and Webber (1985), Cost of Construction of New Houses, Mitchell (1988).

RSTONECAL (RCAPEX)= Real Capital Exports, Capital Exports, Stone(1999)/GDP Deflator

LR=Yield on Consols ,

HCAPR/ (HCAP/GDPO) =Housing Stock/GDPO, Housing Stock, Feinstein (1988) ,GDPO, Mitchell (1988).

Chart 1: Investment ratios     Ratio of Domestic Investment /GDP  (Ref GINVMPFMR)

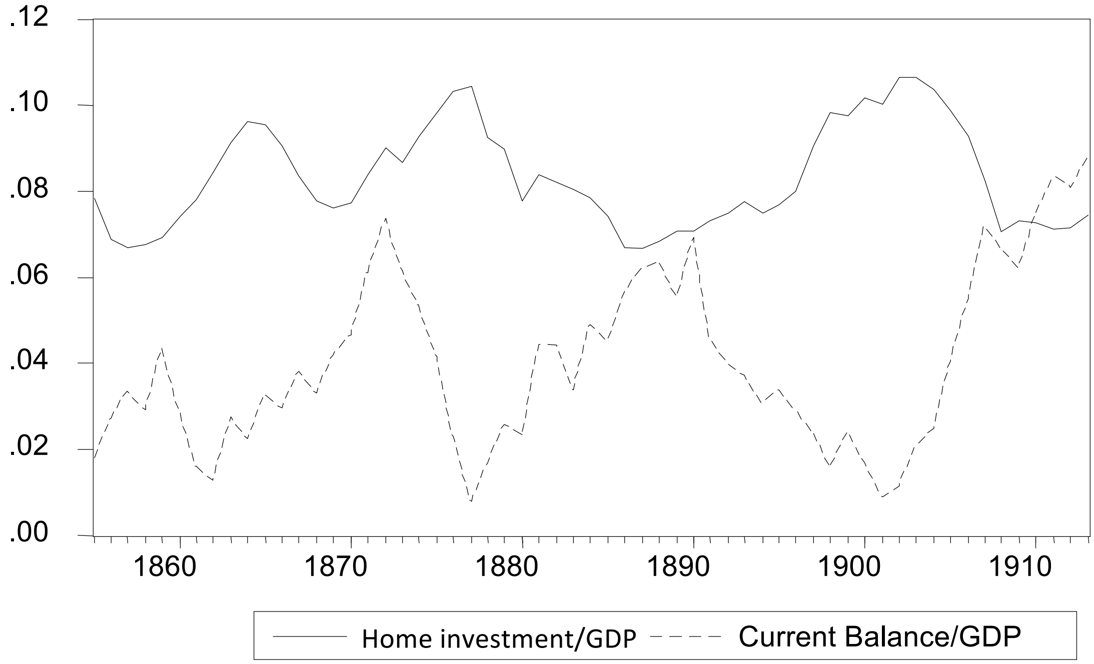


Chart 2: Consumption

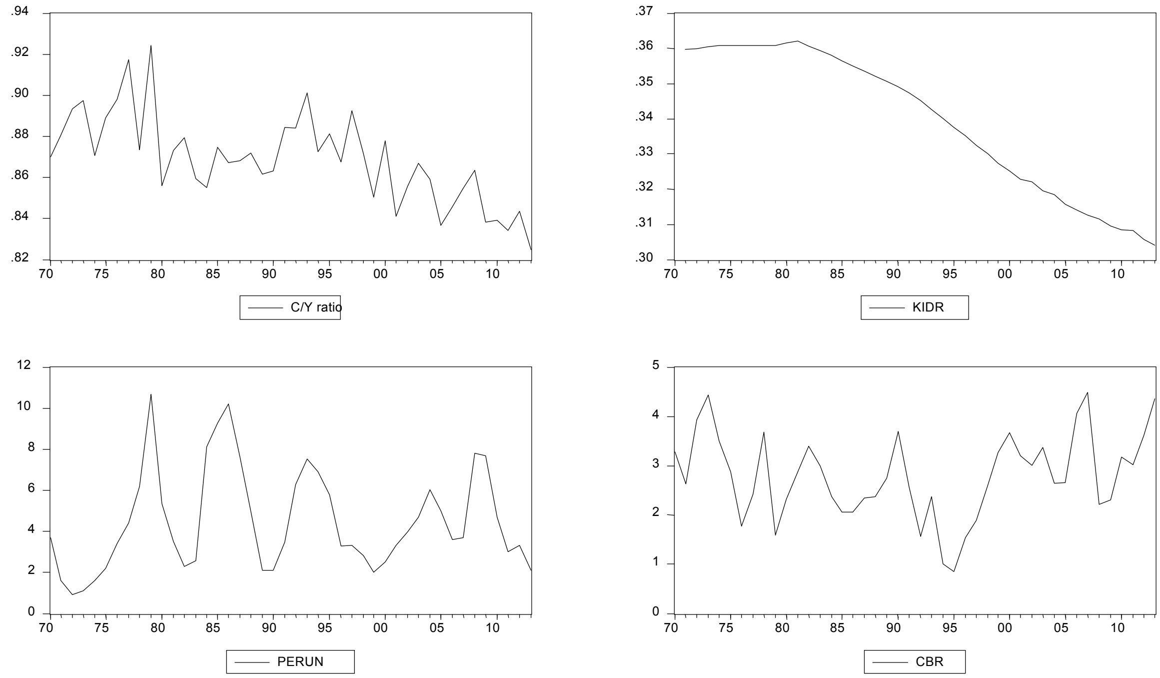



Chart 3: Industrial Fixed Investment

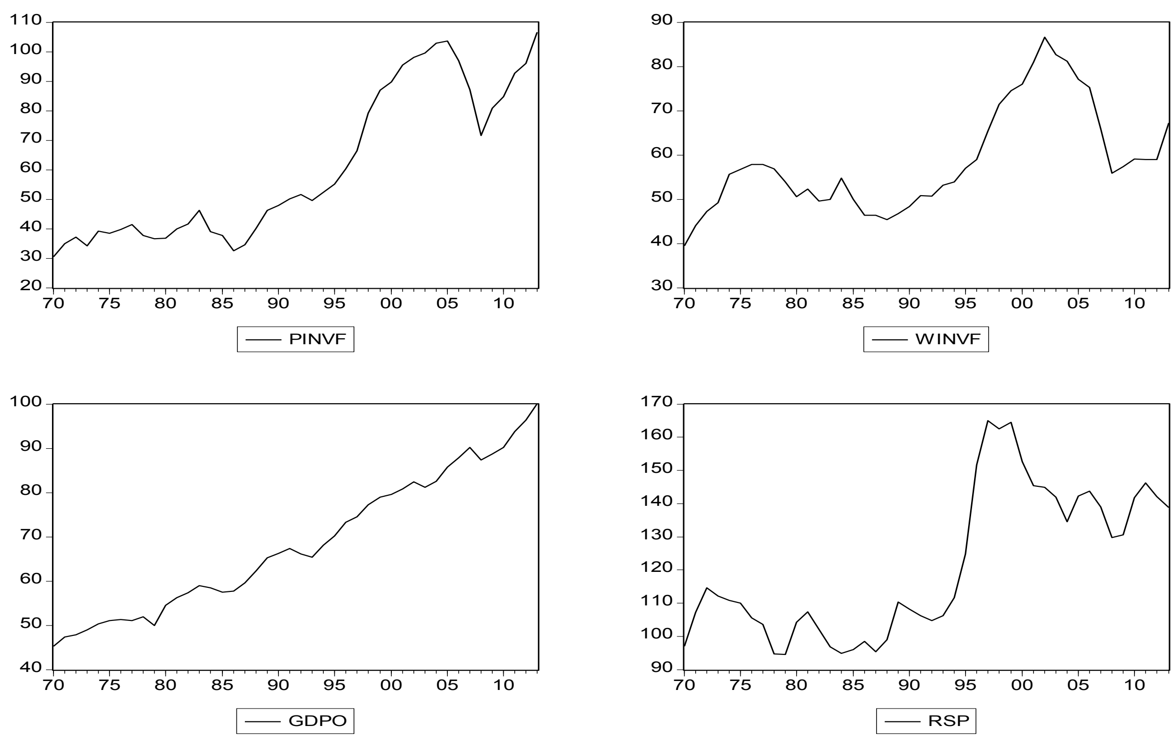
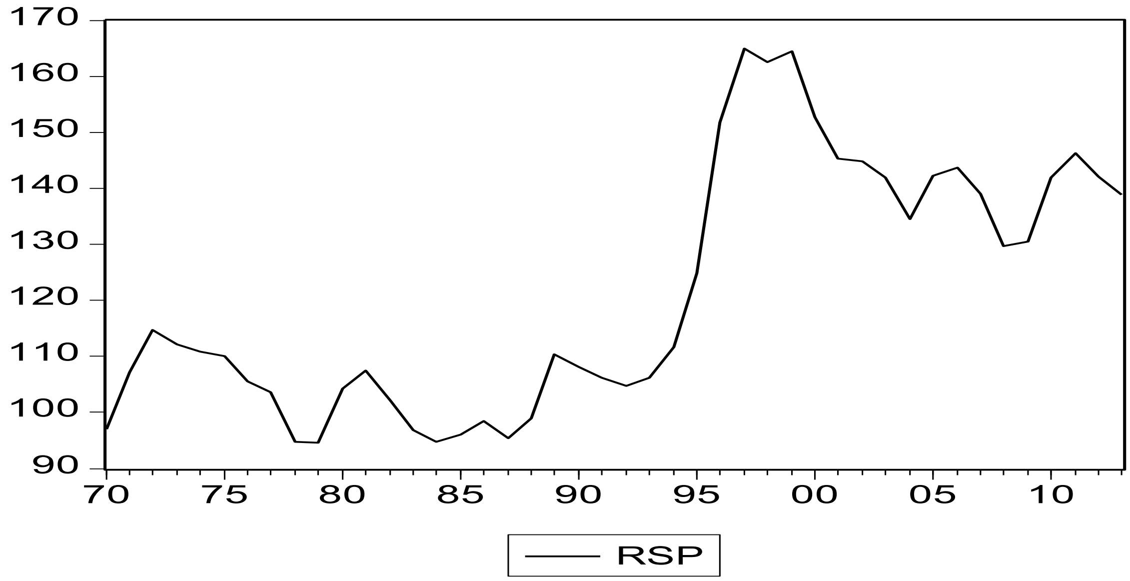


Chart 4: Real share prices



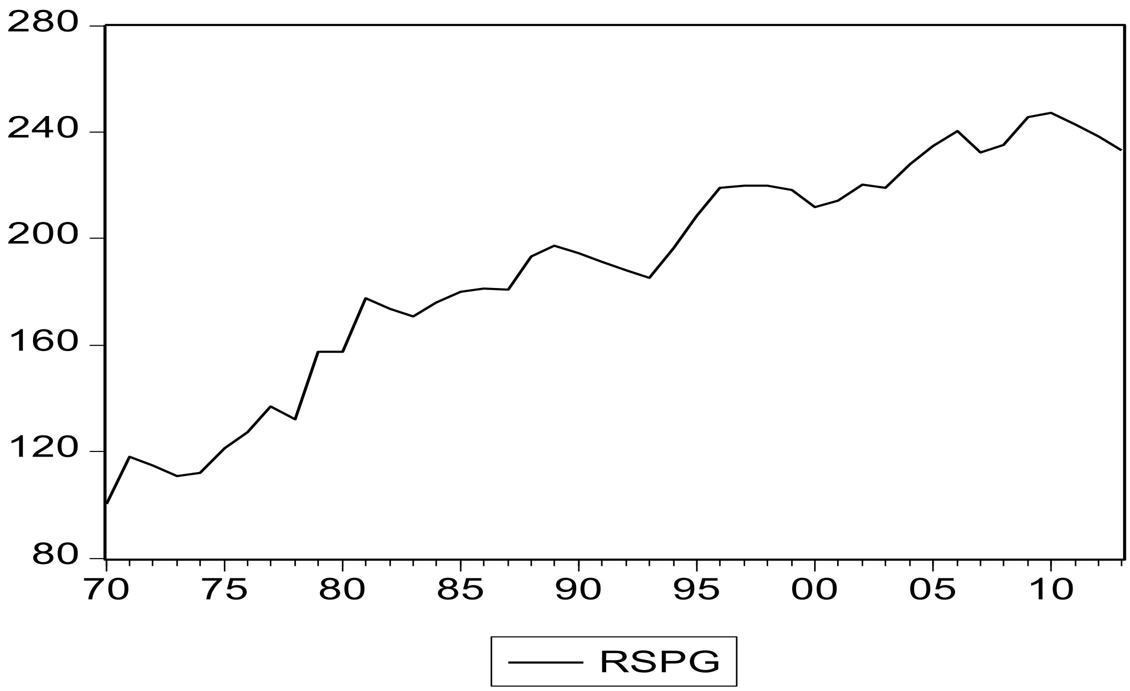



Chart 5: Housing investment I

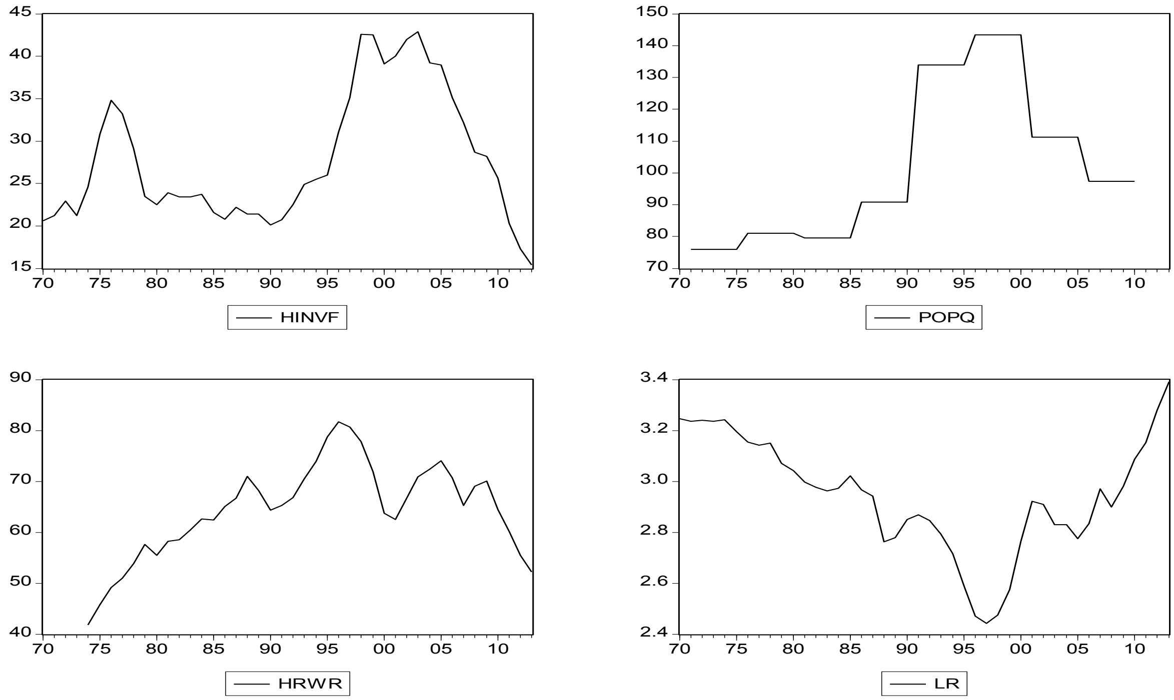
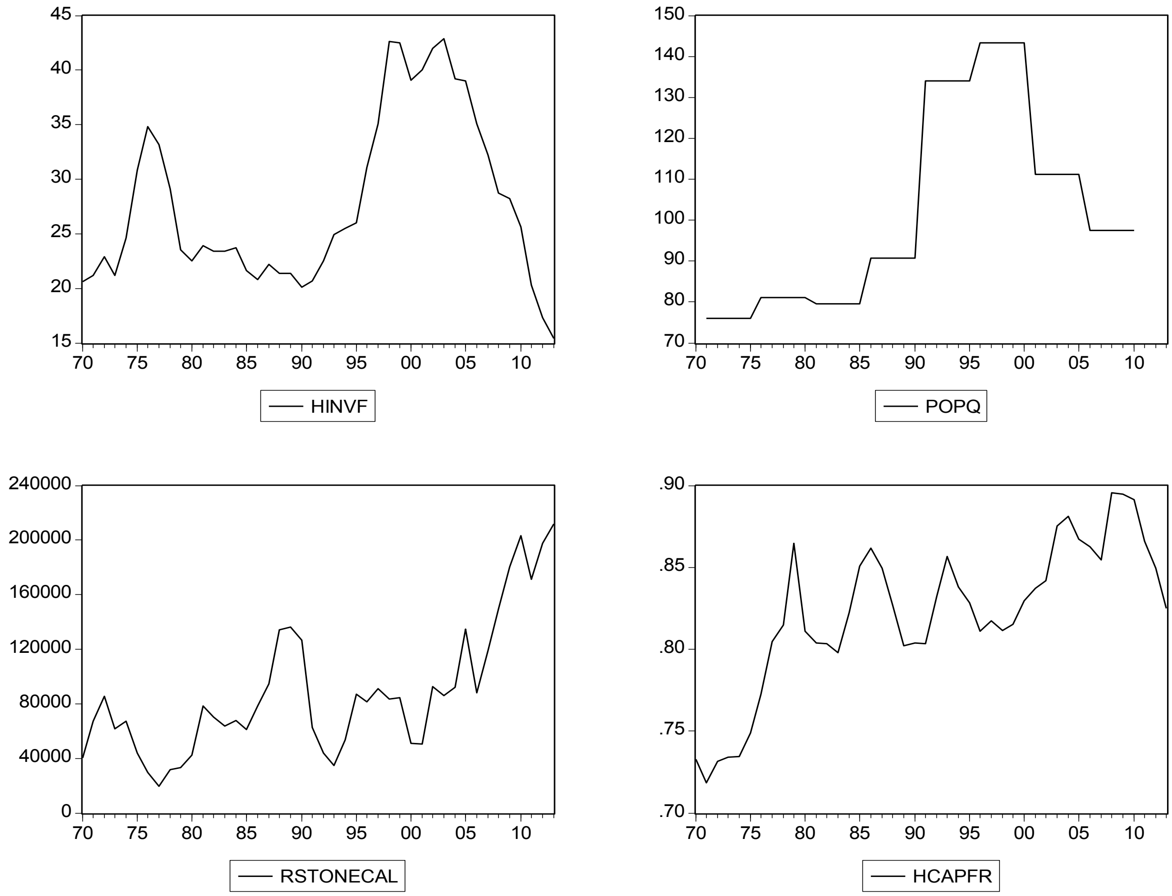


Chart 6: Housing investment II



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