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DISCUSSION PAPERS

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An Error-Correction Model for Finnish Consumption

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Abstract[*]

The permanent income hypothesis asserts that consumption depends on current labour income, expected present value of earnings and cumulated net wealth. Based on this idea, a three variable cointegration system, including consumption, income and net wealth, is tested and approved. Net wealth is included into the system in market values to allow capital gains in real estate wealth, which means that wealth is not simply accumulated savings. Wealth is also disaggregated into financial assets, real estate wealth and debt, in order to confirm the existence of one cointegration relationship and to test the proper wealth concept for the consumption function. The tests suggest that a broad concept of net wealth is preferred for the consumption function. It is also found that the average propensities to consume are different for financial wealth and real estate wealth.

The results from the cointegration system show that neither disposable income nor net wealth can be regarded as weakly exogenous in the system nor can either one be excluded from the system of endogenous variables. So, in fact, there does not exist a separate statistically meaningful consumption function. Despite this, effort was made to explain which variables in the past had the greatest effect on consumption, and a so-called error-correction consumption function was estimated. In addition to the I(1) core of the consumption model including income, net wealth, few weakly exogenous stationary variables; the real interest rate, inflation, unemployment rate and relative prices of consumption subgroups were found to be significant.

Tiivistelmä

Pysyväistulohypoteesin mukaan kulutus riippuu inhimillisestä pääomasta (odotetut ansiotulot) ja varallisuudesta. Selvityksessä muotoillaan ja testataan pysyväistuloteoriaan perustuva virheenkorjausmalli, joka perustuu kulutuksen, tulojen ja varallisuuden yhteisintegroituvuuteen. Näiden muuttujien väliltä löytyy vain yksi yhteisintegroituvuusriippuvuus, jonka lisäksi kulutus osoittautui yksikköjoustoiseksi pysyväistulomuuttujaan nähden. Selvityksessä käytetään konstruoitua varallisuusaineistoa kulutusfunktion varallisuusmuuttujan valintaa silmällä pitäen. Tarkastelujen perusteella laaja nettovarallisuus sopii parhaiten kulutuksen ennakointiin ja selittämiseen.

Systeemitarkastelujen perusteella näyttää siltä, että tulot ja nettovarallisuus ovat molemmat endogeenisia kulutukseen nähden, joten tilastollisesti erillistä kulutusfunktiota ei varsinaisesti ole olemassa. Selvityksessä muotoillaan kuitenkin ns. virheenkorjausmalli ei-kestävälle kulutukselle. Kulutuksen, tulojen ja varojen yhteisintegroituneen ytimen lisäksi kulutuksen ennakoinnissa voidaan käyttää reaalikorkoja, inflaatiota, työttömyysastetta sekä kestokulutushyödykkeiden ja ei-kestävien tavaroiden suhteellista hintaa.

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Contents

1 Introduction

The relationship between consumption and income has long been one of the most important issues in macroeconomic model building and forecasting. Although much of this attention is due to the large share of private consumption in GDP, the relationship has been the subject also of profound theoretical consideration since Hall's (1978) Euler equation formulation using rational expectations. It is quite clear that the simpliest formulations of the permanent income hypothesis (PIH) with exogenous income, constant interest rates and additive utility functions, cannot explain all the stylized facts about consumption. Yet the usual starting point, with consumption smoothing as a consequence of optimization over some time horizon, has not been subjected to much scruting. However, it is clear that all the stringent restrictions that have been placed on the consumption function cannot be adequate or harmless. But when it comes to the relaxing assumptions to offer a better theory, opinions differ. Some writers think that **consumers cannot strictly speaking form their expectations rationally** or that subjective expectations are poorly specified. This has led to the conclusion that aggregate expectations may be rational, but there are aggregation problems in the representative agent consumer theory. In this respect individuals may have myopic expectations because of uncertainty as to the future earnings (Flavin, 1981, Hall & Mishkin 1982, Muellbauer & Murphy, 1993). Another relaxation of restrictions has emerged through the error-correction model, where rationality is maintained only in the long-run, and agents are allowed to make mistakes in the short run (Hendry 1993, p. 179).

Few others think that **the representative consumer** approach has reached its limits in describing the variety of phenomena that determine consumption and savings (eg. Attanasio & Browning 1993). Savings is motivated by numerous factors that cannot be presented within a single framework. Consumers can therefore be classified into different groups with respect to age, socio-economical status and prosperity, which affect consumption eg. through liquidity constraints (Campbell & Mankiw 1990, Sefton & Veld, 1994).

Quite recently many of the stylized facts about consumption and the role of the life-cycle model in explaining them have been challanged in the light of international time series and cross-section evidence (Carroll & Summers 1989). They emphasize the role of the perfect capital market assumption as a major obstacle to household consumption smoothing over lifetime. **Capital markets are not efficient enough** to discount the value of future earnings, social security etc. (see also King 1986). For example, borrowing against pensions is usually limited, partly because of the uncertainty of the time of death. Constraints on capital markets have also been proposed to be responsible for the excess sensitivity of consumption to current income. However, in many ways this explanation too is not sufficient. For instance consumption exhibits excess smoothness with respect to permanent income, whereas consumption is too sensitive to current disposable income. In fact, this tells that the optimization horizon may be much shorter than remaining lifetime. In the PIH consumption is proportional to physical non-human wealth and expected value of earnings. As consumers are trying to ensure themselves against variation in earnings (eg. due to unemployment), they could retain stable (liquid) asset income ratios.

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This idea has been formulated in the buffer-stock view to savings (Carroll 1992).

This paper starts by reviewing shortly the basic LC-PIH theory and empirical problems concerning the determinants of private consumption and the problem of predicting it (chapter 2). This paper concentrates on the role of wealth in the consumption function. The starting point is a three variable cointegration relationship between consumption, real disposable income and broadly-defined net wealth, based on the LC-PIH formulation of the consumption function. Recent applications of this framework include Brodin & Nymoen (1992) for Norway, Berg & Bergström (1993) for Sweden and Patterson (1994), Hendry (1994) for United Kingdom.

Empirically, the choice between consumption and saving may also have been subject to change, since in Finland savings have only recently carried a strongly positive real return. During a long period of liquidity constraints and restricted capital movements, the major share of household saving was closely tied to the requirements for obtaining housing loans and was under-compensated due to the regulation of deposit rates. During the past 5—7 years the situation has changed radically. The wealth effects associated with financial liberalization and thereafter the consumption function have also raised questions about their role in the large forecasting errors of the late 1980s (chapter 3). Financial deregulation produced first large potential capital gains to owners of housing wealth. The house price bubble bursted in early 1990s and since household indebtedness had almost doubled, the collapse in consumption emerged.

However, the main purpose of this paper is to provide a better specification of the consumption function for forecasting and conditioning for dynamic simulations. As an introduction we review the unit root properties of consumption, income and wealth (chapter 4). This is essential for the specification of the error-correction consumption function. Forecasting consumption requires also strong exogeneity of the explanatory variables, which entails Granger non-causality and weak exogeneity. Therefore we look at, whether a consumption function exists in Finland. This task includes testing **what is the precise form of the cointegration system of consumption** and what variables could be used as weakly exogenous variables (chapter 5). This paper emphasizes the role of capital market restrictions by disaggregating net wealth into financial wealth, real estate wealth and debt. The liquidity of these assets is found to be different in financing consumption. Although the emphasis is on the empirical model, the model should be based on a theoretically adequate description of the stylized facts of consumption in Finland, so that it can produce reliable long-run forecasts.

Attention is also paid to the problem of finding structural breaks and outliers during the period of **financial market deregulation** in the 1980s and to the effects of the easing of liquidity constraints (chapter 6). For the present period, the credit crunch might have to be taken into account, as it might have reversed or offset the effects of deregulation with respect to liquidity constraints.

2 The life-cycle/permanent income hypothesis

According to the life-cycle/permanent income hypothesis (LC-PIH) consumption depends on current labour income, net wealth and the present value of expected earnings. If the capital market is perfect, consumers can smooth their consumption by lending or borrowing at the same interest rate even with respect to their expected labour income. In practice it is quite clear that capital markets are not perfect in two respects. First there is an interest margin between lending and borrowing rates and secondly, more or less binding liquidity constraints weaken the ability to borrow against uncertain future earnings. Information and transaction costs reflect an important part of this uncertainty. The close relationship between aggregate disposable income and consumption indicating liquidity constraints has been seen one of the most important empirical arguments against the LC-PIH (Deaton 1992).

Here, we present only the canonical model of the permanent income hypothesis (PIH). In this model the following restrictions are made

i)   the (real) interest rate is constant
ii) tastes do not change intertemporally (constant time preference)
iii) there is no transitory consumption
iv) the utility function is additively separable over time and between consumption, leisure and other goods
v)   households live infinitely long

With these assumptions we can write

$$c_t = (r/1+r)[A_t + H_t] = (r/1+r)[A_t + \sum_{i=0}^{\infty} (1+r)^{-i} E_t y_{t+i}],$$

where
r   = real interest rate
A_t = nonhuman wealth at the end of the period t
H_t = human wealth
y_t = labour income at time t

Denoting R = 1/1+r, we can write the present value of the future earnings at period t as

$$H_t = \sum_{i=0}^{\infty} r^i E_t y_{t+i}$$

and capital income becomes [r/(1+r)] A_t = rR A_t. If we try to assess, what assumptions are not realistic or harmless, we may conclude that from the viewpoint of short-run consumption function, the constant real interest rate and weak exogeneity of disposable income could be suspected. The existence of noise in consumption, constant time preference or length of the economic planning horizon may not introduce that large biases.

Since the future path of income is uncertain, consumption plans will be revised as new information about future labour income becomes available, ie.

$$\Delta c_t = \frac{r}{(1+r)} \left[\Delta E_t\, y_t + \sum_{i=1}^{\infty} (1+r)^{-i}\, \Delta E_t\, y_{t+i} \right]$$

$$= \frac{r}{(1+r)} \sum_{i=0}^{\infty} (1+r)^{-i}\, \Delta E_t\, y_{t+i}$$

Therefore the revisions in expected earnings are reflected in the changes of consumption. If real interest rate is constant and therefore no capital gains exist, nonhuman wealth affects only the level of consumption (Flavin, 1993). We can easily see that nonhuman wealth evolves by recursion as

$$A_{t+1} = (1+r)[A_t + y_t - c_t].$$

If we substitute the basic consumption equation into this equation, we get the equation for a change in nonhuman wealth

$$\Delta A_{t+1} = (1+r)\, [y_t - (1-R)H_t].$$

If real interest rate is constant, nonhuman wealth depends only on income and human wealth. If we allow unexpected capital gains in PIH, we relax the assumption of constant real interest rate. Capital gains mean also that wealth cannot be regarded as accumulated savings. With respect to the consumption function collapse in late 1980s, the exclusion of the capital gains has been surely crucial. If unexpected capital gains are defined as the present value of revision in the expected capital income, it can be shown that unanticipated capital gains will affect consumption similarly as revisions in labour income (Flavin 1981).

However, PIH is not that explicit about the definition of nonhuman wealth. The best guess would be to use some broad Hicksian definition of 'permanent' income. In PIH the flow of capital return should include capital income from financial assets and capital services received from real estate wealth. We may argue that REPIH is very restrictive in excluding capital gains, since a major part of variance in housing wealth is related to valuation changes, that correlate with interest rates and income expectations. Capital gains due to real estate wealth prices contain important forward-looking aspects. Net wealth can be accumulated through financial saving, amortization of loans or by capital gains. With finite lifetime the principal capital could be consumed also. Even if in the long run real interest rate is constant, interest rate variation affects the consumption-saving choice in the short run through intertemporal price effect.

In the simple national income and product account (NIPA) identity $s_t = y_t - c_t$ savings could be viewed as a change in net wealth, ie. $s_t = \Delta w_t$, only if capital gains are excluded.

In general the change in net nonhuman wealth can be written as the following

$$\Delta A_t = A_t - A_{t-1} = P_t Q_t - P_{t-1} Q_{t-1} =$$
$$P_t Q_t - P_t Q_{t-1} - P_{t-1} Q_{t-1} + P_t Q_{t-1} =$$
$$P_t \Delta Q_t + \Delta P_t Q_{t-1} \approx$$
$$s_t + \Delta G_t$$

where s_t is net savings and ΔG capital gains. The first term in the equation reflects the accumulation of wealth through net savings. The second term describes the change in the value of assets due to price changes. NIPA concept of property income in principle includes the imputed rental income from owner-occupied housing but not capital gains on illiquid assets.

If there are no capital gains, the change in net wealth is equal to net savings. It may be assumed that in nominal terms financial wealth and debt are not subject to depreciation; in real terms depreciation due to expected inflation is taken into account in interest rate premiums, as the nominal interest rate consists of the real rate of interest and the expected inflation rate. Real estate wealth is subject to depletion and technical depreciation even when it is not a consequence of asset consumption. The total return on an asset comprises of capital income and capital gain due to changes in relative prices.

The life-cycle framework retains the important long-run cointegration between consumption and lifetime disposable income. It is useful to separate the long-term effects from the short-run variation. For example it can be said that the real interest rates affects consumption in the short run but that the effect will diminishing in the long run if the real interest rate is weakly stationary. Therefore the **interest rate** is needed as a stationary explanatory factor in the consumption function, but it is **not essential for the I(1) core of the long-run cointegration relationship**. The real interest rate affects the intertemporal distribution of consumption, but it is not a resource that can be consumed. Long-run forecasts are therefore unaffected by stationary interest rates, whereas short-run predictions of course gain from adding them. Various factors — in fact too many to list — affect consumption in the short-run, some of these are changes in social security, tax reform, capital gains, deregulation of financial markets and changes in inflation expectations (see Berg and Bergström 1993).

In the short run disposable income could be used either for consumption or saved as net wealth. Accumulated savings consist of real estate investment and net financial (financial wealth – debt) assets, which are also available for financing consumption. Therefore, it is not surprising that wealth affects consumption, since it carries information about past savings and the ability to borrow and gain capital income. However, it is fair to say that the most difficult part to model in the life-cycle framework is the present value of human capital. Income expectations are not observable and there exists no true market that evaluates the present value of earnings.[1] Uncertainty about the value of human wealth could easily be a multiple of other potential sources of uncertainty.

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[1] One may however speculate that eg. a slave market could to some extent measure the present value of human capital, although there are certain moral hazard problems involved.

So far it was assumed that in the PIH income is **exogenously determined**. If income and nonhuman wealth are not exogenous, the consumption function does not exist as such. It is very likely that there exists an endogenous feedback between real estate wealth and income expectations, since eg. housing prices correlate with expected income, being as they represent present values of housing services. In the end these are empirical matters. Muellbauer & Murphy (1993) argue that if there is anything to be gained from the rational expectations hypothesis, there should be a gain in modelling income as well as consumption. There are many stylized empirical facts that contradict the strict versions of LC-PIH consumption models. It was already refuted by Friedman (1957) himself, who argued that consumer optimization takes place over a period of three years or slightly longer rather than over a lifetime. Although nobody has truly contradicted the core idea that consumers try to smooth consumption, empirical tests have not been completely successful.[2] Most of the formulations lack empirically meaningful and testable implications for situations where liquidity constraints exist for large groups of consumers. One important exception is Campbell and Mankiw (1990). Uncertainty of labour income varies over time, and savings is largely based on the behaviour of a limited number of wealthy consumer-investors. These stylized facts are not satisfactory incorporated into life-cycle models. In some studies uncertainty in earnings has been taken into account by including unemployment rate or the change in unemployment rate into the consumption function (eg. Carroll 1992). The topic in this paper is to show how inclusion of net wealth into consumption function will improve the results. In particular we present that disaggregating net wealth will reveal few important features in the PIH framework.

Asset price changes could lead to capital gains and the amount of financial saving is also more sensitive to changes in real interest rates among the "true savers". Therefore the **distribution of an asset portfolio** will matter for the **choice between saving and consumption**. These effect will surely be present in the short run, but may vanish in long run considerations. Anyway these propositions tell that changes in saving behaviour cannot be understood without taking into account changes in the wealth portfolio. Since wealth is owned in unequal shares among the wealthy and ordinary savers, there is a need for different models for ordinary liquidity-constrained consumers and rich savers.

The riskiness of earnings is related to macroeconomic income risks eg. through changes in unemployment. People often save during their pension years because of probable health expences. However, this savings motive is related rather to attempts to smooth consumption than to prepare for income risk.[3] Skinner (1988, p. 248) emphasizes the effect of earnings uncertainty for the precautionary motive of savings. Skinner also remarks that the closer earnings are to a random walk the more important is precautionary savings.

Empirical studies from as far back as the 1950s have found significant differences in the savings rates of different occupation groups. In Finland the savings and accumulation of wealth has differed profoundly between different age and socio-economical groups (eg. Vilmunen & Viren 1991). There is direct

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[2] For Finnish empirical evidence, see Takala (1995).

[3] According to Skinner (1988) precautionary savings could account about 56 percent of aggregate life-cycle savings.

evidence that the riskiness of earnings affects the willingness to save. This emphasizes the fact that aggregate savings is also related to overall changes in income risk.[4] The discussion above shows that there exists various stylized facts in actual behaviour, which are difficult to incorporate into PIH. Even though basic PIH captures the important long-run features, it requires some tuning concerning the short-run behaviour. As a summary it could be said that different assets have somewhat different role with respect to consumption. Real estate wealth is held mainly for service flow. Only if income expectations are favourable they could be used as collateral for consumer credits. Liquid assets are held for transaction servoces and as buffer-stock for consumption smoothing. Long-term financial wealth like time deposits and bonds are invested to produce capital income. Debt is used to acquire housing wealth or durables.

3 The data and recent history

The data used is largely based on the seasonally adjusted series constructed for the Bank of Finland BOF4 model. In addition, we use more recent measures of net wealth in our calculations. From the theoretical point of view, using seasonally adjusted data is unfortunate, since causal and dynamic relations could be seriously affected.[5]

Other limitations are present as well. In Finnish national accounting, consumer durables are included in total consumption based on purchases. This means that the depletion of these investment commodities is exaggerated and the services flow from durables is underestimated. Therefore also the share of durables in total consumption is underestimated. We expect that durables may be more sensitive to changes in user costs and therefore real interest rates than non-durable consumption. This is another reason why durables were separated from the consumption of non-durables and the final **consumption function was estimated with non-durables.**[6] It could be argued that it is not proper to

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[4] Against plausible theoretical considerations Skinner (1988) finds that precautionary savings is less important among those occupational groups that face the largest variance in earnings, eg. among the self-employed and salesmen. With Finnish cross-section questionaire data it was found that surpricingly those who did not expect unemployment increased saving most due to growth in unemployment. Most households indicated an increased motive for saving due to income uncertainty, but only those that did not expect unemployment were able to save (Takala 1995).

[5] In addition, in testing a consumption function hypothesis, the data should be in per capita form to avoid unnecessary complications due to demographic effects caused by eg. a growing population. However, since we are interested in providing a useful macroeconomic forecasting equation, the data was not deflated for population.

[6] Patterson (1985) emphasizes that a proper treatment of durables requires changes to definition of income. If durables are added into consumption, their depreciation have to be taken into account as well. An alternative way to handle durables is to define income net of depreciation (and value losses) of the stock of durables. Consumer behaviour may be based on some Hicksian type of 'permanent income', which keeps the net wealth constant, but durables purchases are paid from saving left over from non-durable consumption out of disposable income or financial portfolio reallocation.

exclude durables only, since income has to be adjusted as well eg. by reducing the expenditure on durables from income. The LC-PIH applies to the consumption of non-durables and the service flow from durables. Unfortunately no official measure of the service flow from durables exists. It may be worthwhile to try also how a moving average of durable purchases added to non-durables will alter the results.

Although the time series for total private consumption and for consumption excluding durables do not differ greatly, this is merely because of the relatively small volume of durables than to a similarity of behaviour (figure 1). The consumption of services and non-durable goods are however closely related (figure 2). Another likely reason for the distinct behaviour of durables is that liquidity constraints reduce durables spending disproportionately when income declines (Carroll & Summers 1989).

The very first variable that has been used to explain consumption is, of course, **disposable income**, which represents readily spendable funds. Other resources that could be used to finance consumption are gross wealth and debt. However, one might expect that real estate wealth and debt have lower spendability than eg. deposits, bonds or stocks. With slightly myopic and impatient borrowing-constrained consumers it would be expected that wealth and debt are not regarded as homogenous with respect to consumption possibilities.

The close relation between consumption and real disposable income is apparent both in levels and differences (figures 3—4). In fact, this observation has been used in various applications as an example of a cointegration relationship. Cointegration between consumption and real disposable income would imply that **the saving rate is stationary** and closely related to the error-correction term between these level variables (Engle and Granger 1987, Campbell 1987).

In early consumption function specifications, it was already noted that net wealth could be used as additional variable. Instead of just using real disposable income, one could construct a proxy for permanent income by using disposable income and real net wealth. This approach has been used eg. by Brodin and Nymoen (1989, 1992), although it did not prove to be totally successful in Norway.

The only problem with this type of approach is that there are no proper official statistics for sectoral or household wealth. Sectoral debt classifications also have deficiencies. In this study we compare two separate net wealth concepts and their appropriatedness for the task at hand. A more proper and broader concept of household net wealth on a quarterly basis is available only from 1979 onwards. This data is constructed from various sources of information and could be regarded as the best available disaggregated market valued asset portfolio data.[7] However, a relatively good narrow approximation

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[7] The constructed financial wealth includes cash, bonds and different types of deposits (tax-free, taxable, withhold-taxed deposits, time and currency deposits). Only relatively minor assets like life insurance and pension saving funds are excluded at the moment. Real estate wealth includes agricultural wealth (fields, real estates and equipment and cattle), forest estates, durables (cars, boats etc.), entrepreneurial wealth, summer cottages, housing wealth and stocks. Only stocks in firms outside the stock market are excluded. The debt measures, disaggregated into housing loans, consumer credit and other debt, were taken from the Statistics Finland accounts. The evolvement of disaggregated net wealth assets is shown in the Appendix.

could be constructed based on data from the Bank of Finland (BOF4) model including cash, deposits, housing wealth and bank lending and covering 1960 onwards (figure 5).

Already at this point it is necessary to discuss the particular difficulties concerning the sample period, especially the late 1980s'. If we compare savings as measured in the national accounts (disposable income – consumption expenditure) and the change in household financial wealth, we see a strong negative correlation from about 1985 onwards. Financial wealth (cash, deposits, bonds) does not include any asset that is subjected to capital gains except through inflation, since stocks were included in real wealth. Expected inflation is included as a premium in nominal interest rates. Even though the relationship between savings and changes in financial wealth would be expected to be positive in normal conditions, the availability of foreign lending accelerated the growth of indebtedness. In fact household indebtedness almost doubled between 1985–1991 (see Brunila & Takala 1993). Savings declined as households turned to investment in housing (house purchases) and loan amortizations rather than financial deposits have increased (figure 6).

The peak in financial asset accumulation at the end of 1988 is related to foreign lending used in real wealth and private business and corporate purchases, which returned back to the banks as deposits. Business sales were introduced by the expected new tax on capital gains as from the beginning of 1989. In a closed economy with capital movements, such a change in financial assets would not have been possible, since rising interest rates would have balanced such an investment and borrowing boom. Foreign lending was fuelled also by the banks' competition for market share and the restructuring of bank ownership.

The opening up of the financing sector to foreign borrowing can also be seen from the difference between the national accounts savings rate and the Hicksian wide savings rate measure, which measures the change in potential consumption resources. However, the main consequence for savers has been the positive return on financial saving after 1990. Financial deregulation has also affected household spending and increased debt service costs, at least temporarily. Households' gross debt servicing peaked at almost 30 percent of disposable income. When the overspending had ended, the saving rate recovered quickly. Increasing real returns on financial assets followed because of rising international interest rates and the onset of the withholding tax on capital income in 1991. This, together with and uncertainty about future earnings due to high unemployment, can be regarded as the main reasons for the increased saving rate.

4 Univariate properties of consumption and income

Prior to cointegration analysis, the relevant series are typically pretested for order of integration. A rough rule for a feasible regression is that the integration orders of both the left and right sides should be the same. There is no way in which a nonstationary variable can be explained successfully with nothing but stationary variables. The same applies in most cases in the opposite direction, unless some of the right-hand side variables are cointegrated. For example if

one cannot reject the hypothesis that logs of consumption and income are cointegrated, it is not possible to reject the hypothesis that the saving rate is stationary.

The random walk behaviour of non-durable consumption is quite apparent. This could be confirmed already from the autocorrelation function of the residuals of differences of the basic variables. Serious autocorrelation is present in real disposable income and particularly in real net wealth, but the first **differences of log consumption are relatively free of autocorrelation** (table 1). Table 1 presents unit root tests for the basic logaritmic series. Although the evidence for unit root is not always unambiguous, the presence of unit root for the levels of series is not rejected in most cases.

The permanent income hypothesis is based on the idea that consumption depends only on permanent income. Since permanent income is unobservable, it has been proxied by different functions of current and lagged earnings that measure expected labour income plus some function of wealth indicating expected capital income. In many applications a proxy for wealth has been used as part of permanent income, since it is always possible to exhaust the capital itself in order to finance consumption. This was also the main argument in the early formulations of the life-cycle hypothesis. Several empirical studies have subsequently taken into account the role of imperfect capital markets and emphasized the distinction between the spendability of different types of wealth. Cash and other forms of financial wealth are readily available for consumption, but there are limits in the spendability of real estate wealth and debt at least in the short run.

From the viewpoint of cointegration, it is reasonable to assume that the log of consumption and log of real disposable income are integrated of order one. If these variables are also cointegrated, this means that the savings rate is stationary.[8] However, if we consider real savings to be integrated of order one, it could happen that the cumulative of it, namely real net wealth, could be even I(2) (Hendry 1993 p. 211). So far our unit root tests have shown no indication of real net wealth to be anything more than I(1).[9] According to performed test saving rate was weakly stationary ie. integrated of order zero. Inflation and real interest rate should be weakly exogenous variables in the consumption equation. The evidence on their stationarity is however not that convincing for this relatively short period. In a steady-state solution consumption and income would have the same long-run growth rates, but there is no obvious restriction to the growth of real net wealth in logs. If the saving rate is stationary white noise, the cumulant of savings, ie. net wealth, would be only I(1). Therefore it seems that in the long run we may not be able to rule out the possibility that log real net wealth could not be I(1). To account for this possibility, we have tried different functions of wealth in the consumption function. Disaggregated net wealth, real return of net wealth and the ratio of net wealth to disposable income were compared as potential proxies for the wealth concept.

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[8] From the decomposition of disposable income, we have $Y = C + S \iff C/Y + S/Y = Y/Y \iff S/Y = 1 - C/Y$, which implies the following; $\log(S/Y) = \log(1) - \log(C/Y) = -\log(C/Y)$.

[9] Consumption functions are formulated in real terms. By deflating consumption expenditure and other variables with prices we assume zero-degree homogeneity in prices.
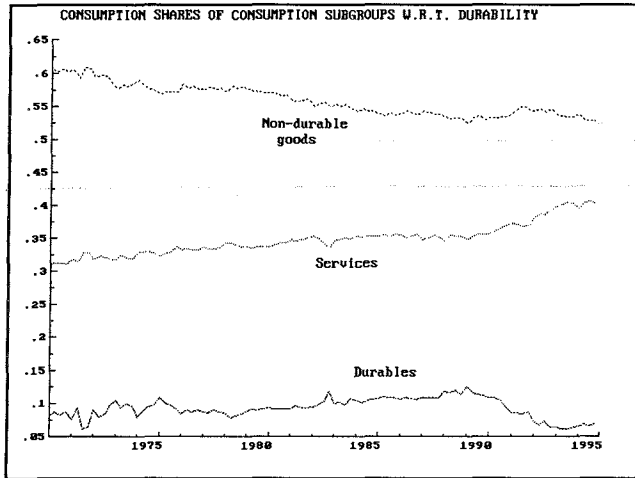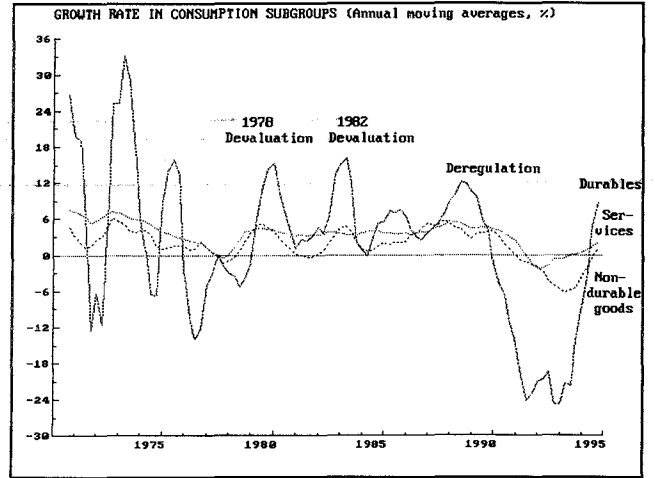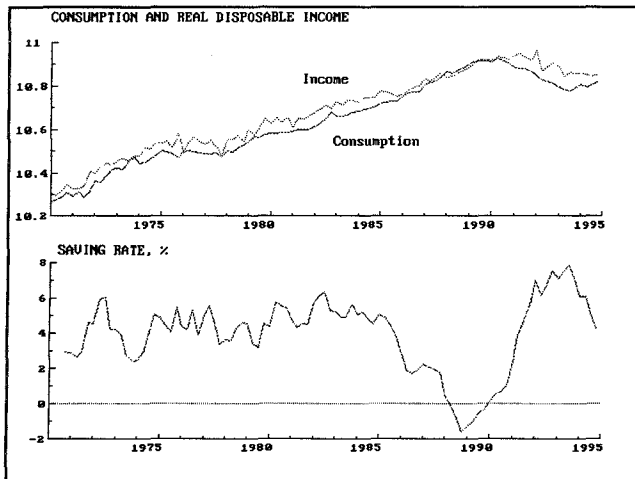
Figure 1.

CONSUMPTION SHARES OF CONSUMPTION SUBGROUPS W.R.T. DURABILITY

Figure 2.

GROWTH RATE IN CONSUMPTION SUBGROUPS (Annual moving averages, %)

Figure 3.

CONSUMPTION AND REAL DISPOSABLE INCOME

Figure 4.

CONSUMPTION AND REAL DISPOSABLE INCOME (moving annual changes, %)

Figure 5.

COMPARISON OF TWO NET WEALTH CONCEPTS, 1979/Q1 - 1993/Q4

Figure 6.

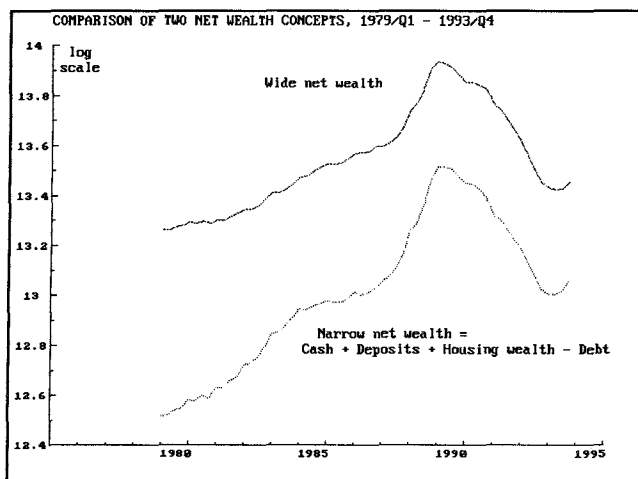ANNUAL HOUSEHOLD SAVINGS (INCOME - CONSUMPTION) AND ANNUAL CHANGE IN HOUSEHOLD FINANCIAL WEALTH, Billion FIM
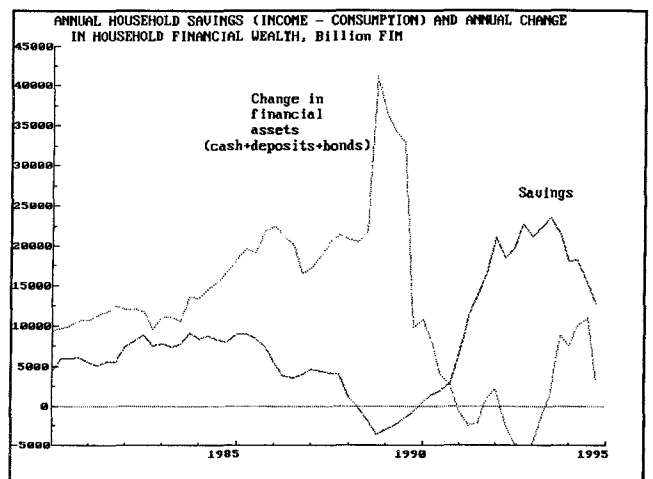
17
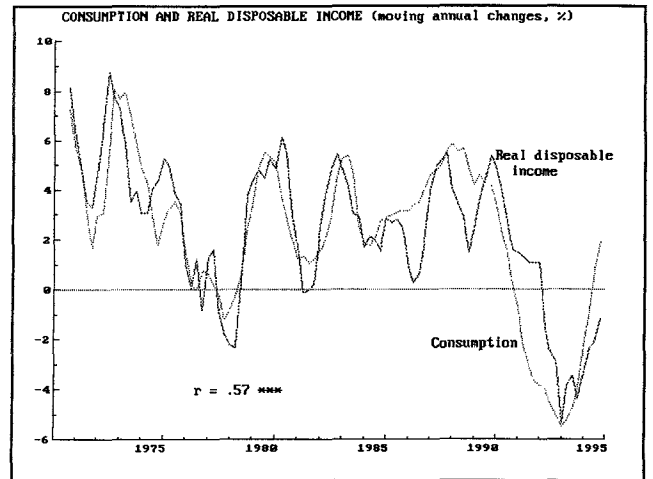
Table 1.   **Testing for the order of integration**, Augmented
Dickey-Fuller unit root and time trend tests
Non-durable consumption, real disposable income
and real net wealth, 1970/Q1—1993/Q4

Autocorrelations from differences, lags 1—6,

Lag	1	2	3	4	5	6
LC:	.101	.065	.246 *	.130	.206	.100
LNONCD:	.191	.054	.216 *	.296 **	.203	.099
LRYD:	−.443 **	.065	.070	.137	−.259 **	.132
LRNW:	.626 **	.548 **	.452 **	.482 **	.227 *	.186

Critical value at 5 % significance level: ± 2/SQR(84)   = ± 0.213
                   1 % significance level: ± 2.3/SQR(84) = ± 0.252

DICKEY-FULLER AND AUGMENTED DICKEY-FULLER TESTS WITH LAGS 1 AND 4
(McKinnon's 95 % critical values)

Variable	DF-statistic		ADF(1)-statistic		ADF(4)-statistic	
	Without trend	With trend	Without trend	With trend	Without trend	With trend
LNONCD	−2.422	.069	−2.298	−.508	−1.840	−1.931
LRYD	−1.709	−3.164	−2.173	−1.547	−2.057	−1.594
LRNW	−1.678	.335	−1.316	−1.699	−1.748	−4.212
DLNONCD	−7.933	−8.407	−5.894	−6.326	−2.144	−2.540
DLRYD	−15.404	−15.741	−9.504	−9.999	−3.764	−4.336
DLRNW	−4.470	−4.495	−3.039	−3.032	−2.953	−3.017
SAVRATE	−7.617	−7.590	−4.686	−4.650	−2.991	−2.949
D4LCPI	−1.071	−2.608	−1.644	−2.805	−1.473	−2.445
RRLBN	−0.848	−2.738	−1.217	−2.833	−1.264	−2.729
95 % Crit. values	−2.892	−3.457	−2.892	−3.458	−2.893	−3.459

Variables:

LC	= Log of consumption
LNONCD	= Log of non-durable consumption
LRYD	= Log of real disposable income
LRNW	= Log of real net wealth

DLNONCD	= Log difference of non-durable private consumption
DLRYD	= Log difference of real disposable income
DLRNW	= Log difference of real net wealth
SAVRATE	= Saving rate
D4LCPI	= Annual log difference of consumer price index, %
RRLBN	= Real (deflated by CPI) lending rate for new loans, %

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5 Testing for cointegration hypothesis

We use Johansen's (1988) VAR cointegration procedure in testing linear relationships between consumption, income and net wealth, since it has several advantages over the original two-step Engle-Granger (1987) method. First, VAR modelling allows us to look for the number of cointegration vectors, whereas the Engle-Granger procedure for testing cointegration applies only to the case of one cointegration vector. Secondly, in a VAR system it is easier to separate long-run cointegration relations from short-run dynamic responses. Statistically, the VAR method combined with ML estimation is also more efficient. In the Engle-Granger procedure, inference about the cointegration vector depends upon nuisance parameters and is sensitive to finite-sample bias. Therefore two-step procedures lack power in comparison to the modified VAR approach. Analysing the full VAR system of equations eliminates the possible single equation bias that would likely disturb the two-stage results. Therefore also the Engle-Granger two-stage regression method and multivariate VAR method will produce different results. Johansen's reduced rank regression framework is also more suitable for system tests concerning the full conditioned model, such as the weak exogeneity and exclusion tests.

The main advantage of the ECM representation is the explicit separation of the long-run relationship between the modelled variables and the short-run variation around equilibrium paths. The economically most meaningful part is included in the long-run equilibrium relations, which usually reflect some sort of optimizing bahaviour. The optimization is based on the long-run relationship, but also the short-run dynamics must be modelled, if a proper description of the process is to be obtained.

Another advantage of the Johansen method is related to the rapid convergence of the OLS-parameter estimates, which enables more reliable forecasts based on cointegrating vectors. With economic time series, sample sizes are often limited and superconsistent parameter estimates are most welcome. Despite the small sample bias present in parameter estimates, long-run asymptotic relationships dominate the sources of bias. The VAR procedure also takes into account the short-run dynamics of the endogenous variables while estimating the cointegration vector. This is the main reason for more reliable estimation results (Muscatelli & Hurn 1992). The VAR procedure allows testing of various other hypothesis concerning the cointegration vector ß, since the coefficients include the long-run equilibrium conditions.[10]

If cointegration exist among the system variables, the consumption function would need to be modelled in an error-correction form. Interpretation of the cointegration relation between consumption and real permanent income seems to be that outside forces or fundamentals drive the stochastic common trends in both variables. Cointegration is usually thought to be a long-run relationship between levels, but it can also emerge eg. at seasonal frequencies. There are also other short-term shocks from real interest rates, taxation and the stock market, which

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[10] The Johansen procedure was performed to test cointegration with the VAR -system estimation available on Microfit 3.0 and a RATS subprogram CATS written by Johansen and Juselius (1991) and improved by Hansen (1993). Regression models were spesified and estimated with PcGive 8.0 by Doornik and Hendry (1994).

divert consumption and income from their planned time paths. From the viewpoint of efficient forecasting, these stationary variables could be added to the ECM specification to improve predictions.

The starting point in cointegration analysis is the static long-run equation. The first question is whether we should include net wealth in the cointegration specification. Estimation problems emerge already at this stage. We should not forget that the parameters of the static equation may not be stable. The next question concerns the number of cointegration relationships.

The simpliest case is the consumption-income relationship introduced in Engle and Granger (1987) as an example of cointegration dependence

$$\Delta c_t = \mu + \beta_1 \Delta y_t + \beta_2 z_t - \gamma(c-y)_{t-1} + \varepsilon_t, \quad \gamma \geq 0$$

where c is consumption, y is income and z are stationary weakly exogenous variables. Hendry and von Ungern-Sternberg (hereafter HUS, 1981) already used the difference between income and liquid wealth as another error-correction term affecting consumption

$$\Delta c_t = \mu + \beta_1 \Delta y_t + \beta_2 z_t - \gamma_1(c-y)_{t-1} - \gamma_2(w-y)_{t-1} + \varepsilon_t, \quad \gamma_1 \geq 0, \gamma_2 \leq 0.$$

where c is consumption, y is income, w is (liquid) wealth. In addition the specification may include weakly exogenous stationary variables (z) like real interest rate, inflation etc. to improve the short-run dynamics of the model.

In HUS consumers try to maintain long-run proportionality between both consumption and income, and in addition between wealth and income. It should be noted that ECM terms have different signs, since accumulation of saving will be reflected in the wealth-income ratio. Even though HUS and Hendry (1994) uses liquid assets instead of total net wealth, it could be argued that the stock-flow integral correction mechanism (ICM) due to disequilibria in the consumption-income ratio is more understandable if a broader concept of accumulated purchasing power is used (Patterson, 1991). Of course, we may assume that liquid assets are used more directly in smoothing consumption and that real estate wealth or time deposits regarded as investment. The HUS approach pays special attention to the dimensionality problem of net wealth being a stock variable and income and consumption being flow variables.

Savings should at least correspond closely to changes in financial wealth, but as we have seen this does not seem to be the case with empirical data. Savings and changes in net wealth have been also loosely related. Real wealth measured in market values varies with demand, which affects consumption through prices and is therefore related to net saving only in the long run.

Consumption can be financed through income, financial wealth or borrowing. The role of real estate wealth is a bit complicated, since owning eg. a house means that one gets either imputed income or can get rental income. If real estate wealth is used for non-durable consumption it must first be transformed into financial form by being sold. Limiting wealth to liquid assets is connected to spendability and accumulation of savings. Consumers usually want to consume housing in some proportion to their income, in fact many empirical studies show that housing consumption has unit elasticity. Consumers may therefore want to preserve some constant relationship between housing wealth and income. This

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raises another important viewpoint on real estate wealth. It was noted already in Muellbauer and Murphy (1990, p. 364) and King (1990) that asset prices can proxy income expectations. As the market price for a house reflects the present value of housing services, it carries information about future labour income. This argument emphasizes the role of real estate wealth in the consumption function from the point of view of forward-looking consumers. Therefore the role of net wealth and real estate wealth is bit obscure in the context of consumption function. The inclusion of real estate wealth can be motivated by their role in producing services and their ability to predict future earning. Another variable that can be used in consumption functions is indebtedness as it predicts changes in income expectations as well (see Takala, 1995).

In HUS and Hendry (1994) net liquid assets were found to be significant, therefore we must ask, does the fungibility, liquidity and the form of capital yield affect the consumption behaviour in the short run and even in the long-run.

In a sense net wealth is merely cumulated savings, which could be consumed almost alike disposable income. Therefore, it is not only labour (or disposable) income that forms a proper measure for permanent income. Net wealth could be used as a buffer stock to smooth variations in disposable income. Therefore, a straightforward rival to this specification is the following formulation were only one cointegration vector and thereafter one equilibrium error emerges.

$$\Delta c_t = \mu + \beta_1 \Delta y_t + \beta_2 \Delta w_t + \beta_3 z_t - \gamma (c - y - w)_{t-1} + \varepsilon_t, \ \gamma \geq 0.$$

This ECM specification can be derived directly from a first-order autoregressive-distributed lag model (see Banerjee et. al. 1993, p. 48–49). The inclusion of net wealth stock into the equation as such could be interpreted as a flow variable, if capital return is proportional to the wealth stock. Choosing between these specifications is an empirical matter. The error-correction term is used in the equation to keep a record of the divergence from the long-run proportionality between consumption, income and wealth. The latter alternative, is theoretically consistent with the REPIH, but HUS is also consistent with this specification if $c_t = \beta_1 y_t + \beta_2 w_t$ satisfies homogeneity restriction $\beta_1 + \beta_2 = 1$, which implies existence of one cointegrating vector (Brodin & Nymoen, 1992). Even if consumption and income are flow variables and REPIH presents consumption smoothing in terms of yield for human wealth (earnings) and nonhuman wealth (capital income and imputed services) with infinite horizon, in practice the real capital stock could be consumed as well.

If adding net wealth to the consumption function leads to better parameter constancy, we may expect a more stable cointegration system to be found among consumption, income and net wealth. The insight in PIH is to give a theoretical basis for the long-run solution, which does not generally hold to liquid assets only. Since binding liquidity constraints were removed only recently in Finland, we can also test whether a proxy for liquid financial assets or net wealth performs best during the pre-liberalization period.[11]

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[11] Brodin and Nymoen (1989, 1992) found that net wealth, including housing wealth at market value, is an essential part of a household's lifetime income and life-cycle budget constraint. However, according to cointegration tests homogeneity restriction of consumption proportional to income and wealth was rejected. Unfortunately their wealth measure was somewhat indeficient eg. by excluding illiquid financial assets and few real estate assets.

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6 Empirical results

6.1 Consumption and the liquidity of different assets

Traditional consumption maximizing life-cycle theory is often regarded as being indifferent to the composition of the net wealth. Liquidity or other aspects of financing do not enter explicitly into the consumption-saving decision. This is natural only if capital markets are assumed to be perfect, and real riskless after-tax returns for different assets are equal.

Berg and Bergström (1993) emphasize that the elasticities of different types of assets may not be the same in the consumption function and analyse the cointegration relationship with disaggregated net wealth. It has been proposed that since the spendability of different assets varies, liquidity constraints on borrowing and transaction costs in real estate markets will increase the elasticity of financial wealth in consumption.[12]

In practice we are faced with transaction and information costs, and as a consequence it is cheaper to finance consumption by using liquid financial assets than fixed-size (indivisible) real estate wealth. Borrowing using real estate wealth as collateral is also somewhat restricted. These considerations also reflect the basic assumption of Friedman's permanent income hypothesis. Therefore the liquidity composition of the asset portfolio will affect optimal consumption. The proper measure of consumption used in the consumption function will also depend on the structure of the asset markets. The optimal individual portfolio — regarding net wealth as accumulated savings — will depend on the interest margin between borrowing and lending, the collateral ratio of real estate holdings etc. As a consequence of financial deregulation, it has been argued that illiquid assets may have become more spendable during the 1980s (eg. Muellbauer & Murphy 1993).

The effect of **different asset structures** on the consumption-wealth ratio is studied in Pissarides (1978). Pissarides formulated a special form of transaction costs, where illiquid assets cannot be sold for full value until held for a certain number of periods. On the other hand, no transaction costs are assumed in the case of consumer goods. This formulation has a few advantages. First, the timing of income payments will affect the timing of consumption. This may explain to some extent the higher correlation observed between current income and consumption as compared to what is predicted by the permanent income hypothesis. This also means that restrictions in the asset market impose restrictions on consumption too (Pissarides 1978, p. 292).[13] Secondly this formulation is in accordance with the buffer stock theory of savings as it explains why the short-run marginal propensity to consume (MPC) is smaller than MPC out of permanent income (Carroll 1992).

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[12] In fact Berg and Bergström (1993) present evidence that net financial wealth and debt were not significant predictors of consumption in Sweden prior to mid-1980, probably because of financial regulation.

[13] With few assumptions, Pissarides formulates a model in which consumption is a linear-homogenous function of lifetime wealth. Liquidity differences in assets affect consumption through future discount factors, which depend on transaction costs, maturity of illiquid assets and, of course, rates of return.

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In fact the effect of the portfolio implies a hump-shaped consumption-wealth ratio against age. This form is familiar from several studies of income and savings profiles.[14] Pissarides also argues that the **liquidity aspect of assets** is not an exogenous effect with respect to consumption, but rather an **endogenous property of net wealth**. The liquidity of a portfolio is chosen together with the consumption-savings decision. In practice the liquidity structure of the portfolio should tell something about the subjective time preference of the investor-consumer. The testable implication of this theory is that the composition of the portfolio could be used as a predictor in the consumption function.

Table 2 presents several static consumption functions which test the choice of the wealth concept in the equation and decompose the asset portfolio and thereby improve the forecasting performance. Testing with two proxies for net wealth shows that including wealth increases explanatory power and improves the diagnostics of the equation. Decomposition of net wealth indicates that the **influence of growth of financial wealth on consumption is also greater than that of real wealth**. The marginal propensity to consume by borrowing is also significantly different from zero, although we must not forget that financial wealth and debt are highly multicollinear. Regressions therefore show that the composition of the asset portfolio could certainly be used as an additional regressor in the consumption function. Models 6 and 7 indicate that the ratio of financial wealth to net wealth (FW/NW) or to real wealth (FW/RW) could also be used as regressors.

These static model estimates propose that including real net wealth improves the explanatory power, stability and residual diagnostics of the consumption equation. Disaggregation of net wealth into financial assets, real wealth and debt also give us some idea about the relative importance of these assets in financing consumption. Since the equation is estimated in logs, the parameters are also the elasticities.

Like Berg and Bergström (1993), we note that the elasticities of different assets do vary significantly. The average propensity to consume out of financial wealth is much higher than that out of real wealth. The stability of the static equation parameters was also tested. It is also useful to look at the rolling regression estimates of the static equation. According to figure 7 there have been significant changes in the parameters. The most important observation is the increased sensitivity of consumption to real income during 1986—1987, and the gradual decline after 1989. This may reflect the increasing importance of income expectations and the easing of liquidity constraints for expected labour income. The importance of net wealth in determining consumption has increased from the beginning of 1980s, but the effect does not appear to be strong because of financial liberalization. This is surpricing, since the effect of financial deregulation should reduce the relative importance of current income for consumption and increase the significance of net wealth (see Bayoumi 1992).

Recursive estimation of the long-run static equation showed also that the significance of the composition of the asset portfolio has increased during the 1980s. This observation coincides closely with additional UK evidence by King (1990), who emphasises the role of wealth as a means to finance the observed

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[14] Finnish panel data also reveals a similar shape for the consumption profile in cross-sections (Sullström and Riihelä 1993).

over-spending. In Finland there is also evidence about over-spending, which could be found eg. from consumption-income ratios (figure 8). This indicate that monetary deregulation did affect purchases of durables. The decline in the household saving rate can be found in the deterioration of the current account balance as well.

From the static equations in table 2, we get the cointegrating regression Durbin-Watson (CRDW) test for the presence of cointegration. These tests already propose that cointegration could be found. Table 3 presents a cointegration analysis of a five-variable VAR system, where net wealth is disaggregated into financial assets, real estate wealth and debt. Disaggregated quarterly data on wealth was available from only 1979 onwards. In the multivariate framework, the exclusion of system variables can be tested as well. Exogeneity of the regressor with respect to a particular parametrization assumes Granger non-causality in the feedback relation.[15] Among these variables only one cointegration relationship could be found. Recursive trace and maximum eigenvalue tests are plotted in figures 9—10. The variables in the system are not stationary and **none of them could be excluded from the system** without breaking it. If we assume that there exists two cointegrating vectors, the common zero degree homogeneity for both vectors ie. unit elasticity of consumption was rejected.

In addition the parameter homogeneity tests performed on the ß-vector suggest that although the cointegrating relationship is strongest between consumption and real income, wealth variables should not be forgotten. According to LR-tests a broad definition of net wealth should be used in the analysis, and if this is not available net financial wealth (financial assets – debt) should be used. Comparing different wealth concepts in three variable settings, however, we could not reject the null hypothesis of one cointegration relationship in any of the three variable VAR systems. Adding durable consumption to the system does not change the result of single cointegration relationship either. Replacing real net wealth with either real financial wealth or real wealth is irrelevant, perhaps because of a common trend in all the wealth variables. According to **the eigenvector homogeneity test, financial wealth, net financial wealth and net wealth all satisfy the condition**. These results are however somewhat sensitive to the period chosen and the lag length of the VAR system.

With assumption of one rank (one ci-vector), the tests on ß-vector confirmed that the long-run elasticity of consumption with income and wealth is unity. This result holds even if we replace consumption with non-durable consumption.[16] The stability of the ß-vector is almost amazing (figure 11). The break down during

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[15] Prediction of a particular variable assumes only weak exogeneity, but for behavioural equations strong exogeneity is needed (Engle, Hendry & Richard 1983). However, Granger causality is a property of the data generating process, whereas exogeneity is a property imposed for the model specification and parametrization. Regressors in a model are said to be super-exogenous, if the parameters in interest are weakly exogenous and invariant to changes in the marginal densities of the weakly exogenous variables. Super-exogeneity is needed to ensure that ECM representation is a reduced form of a forward-looking intertemporal optimization.

[16] The zero-degree homogeneity of the static equation was found only for the wider measure of net wealth. Replacing non-durable consumption with total consumption including durable purchases the homegeneity is rejected for 1979/Q1—1993/Q4. The homogeneity property betwen total consumption, disposable income and net wealth may not be accidental, since the system corresponds the aggregate budget constraint of the household sector.

1988—1989 matches with the peak in financial wealth and debt due to foreign borrowing. Even if we found only one cointegration relationship from the system including disaggregated wealth components, we may think eg. that financial asset and bank lending (household debt) could be cointegrated in the long-run. In addition it may be that consumers may try to keep on relatively constant ratio between housing debt and real estate wealth as a target. Therefore we tested also a couple of other parameter restrictions on ß.

It turned out that ratios of different assets to income were clearly non-stationary. According to portfolio theory, it is also quite unlikely that separate asset-income ratios would be stationary, since the relative return on assets varies in time. Changes in rates of return would affect the portfolio allocation and we may rather expect that the whole net wealth is kept constant with respect to income.

However, according to ADF tests there was no indication for net weath-income ratio to be stationary. This is quite obvious if we simply plot the ratio (figure 12).

In addition to homogeneity tests and exclusion tests for individual asset, the exclusion of net wealth could be tested in the system context. The restriction test for exclusion of net wealth ie. $ß_3 + ß_4 + ß_5 = 0$ was rejected with probability level 0.003. In table 2 we tested and rejected the equality of financial wealth and real estate wealth coefficient. The same restriction $ß_3 = ß_4$ posed on the system confirmed the same result with probability level 0.002. However, as well as before in table 2 the tested long-run proportionality of real estate wealth and real debt $ß_4 + ß_5 = 0$ was not rejected. This may reflect two phenomenon. Firstly debt is mostly used for financing purchases of real estate wealth like housing. In addition real wealth is used as collateral for bank loans. As we have seen not only inclusion of wealth but also disaggregation of wealth seems to increase our insight about consumption changes. These observations correspond to some extent those in Patterson (1984). Even with disaggregated wealth, we got a very close long-run unit 'permanent' income elasticity.

Table 2.   **Consumption function with different wealth variables,**
Dependent variable: Logaritmic consumption

	Long period: 1970/Q1–93/Q4		Short period: 1979/Q1–1993/Q4				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
LRYD	.996 (400.83)	.886 (50.72)	.706 (32.88)	.65 (28.24)	.67 (31.38)	1.05 (322.51)	1.00 (318.97)
LRNW		.092 (6.31)	.231 (13.53)			.004 (2.66)	.004 (2.83)
LRFW				.28 (6.12)	.27 (6.27)		
LRRW				.15 (7.93)	.14 (7.16)		
–LRDEBT				–.14 (–5.88)			
–LRDEBT(–1)					–.12 (–6.07)		
FW/NW						–0.37 (–2.11)	
FW/RW						–.43 (–2.51)	
R²	.999	.999	.999	.999	.999	.999	.999
CRDW	1.10	1.30	1.41	1.88	1.87	0.76	0.79

P-values for residual diagnostics:

AR(5)	.000	.000	.119	.922	.904	.000	.000
ARCH(4)	.020	.168	.328	.986	.955	.516	.866
HETERO.	.001	.000	.628	.219	.070	.019	.018

ADDITIONAL WALD TESTS FOR DISAGGREGATED WEALTH COEFFICIENTS

Exclusion	Model 4		Model 5	
	F(1,56)	P-val.	F(1,56)	P-val.
LRFW	37.45	.000	39.35	.000
LRRW	62.90	.000	51.19	.000
LRDEBT	34.53	.000	36.84	.000
All together	208.16	.000	223.09	.000

Proportionality between wealth effects

	Model 4		Model 5	
	F(1,56)	P-val.	F(1,56)	P-val.
LRFW = LRRW	5.64	.021 *	5.46	.023 *
LRRW = LRDEBT	0.07	.798	0.18	.673
LRFW + LRDEBT = LRRW	0.01	.951	0.06	.807

Table 3.   Testing the number of cointegration vectors

(VAR model with 2 lags, a trend, no seasonal terms)
Estimation period: 1979/Q1–1993/Q4, 58 observations
System variables: (LC, LRYD, LRFW, LRRW and LRDEBT)
ie consumption, income, financial and real wealth and debt

Hypothesis		Eigen-	Maximum Eigenvalue test		Matrix Trace test	
Null	Alt.	value	Test Stat.	95% Cr.v.	Test stat.	95% Cr.v.
r = 0	r = 1	.5321	41.014	33.461	79.584	68.524
r ≤ 1	r = 2	.3073	19.822	27.067	38.569	47.210
r ≤ 2	r = 3	.2247	13.739	20.967	18.747	29.680
r ≤ 3	r = 4	.0785	4.414	14.069	5.008	15.410
r ≤ 4	r = 5	.0109	.593	3.762	.593	3.762

ß eigenvectors and α adjustment coefficients (chosen r = 1)

Variable	ß-coeff.	Normalized ß	α-coeff.	Normalized α
LC	13.61	−1.00	−.021	.296
LRYD	−9.07	.67	.046	−.629
LRFW	−5.20	.38	.036	−.491
LRRW	−1.81	.13	.042	−.596
LRDEBT	2.73	−.20	−.006	.086

Estimated Long Run Matrix (π)

	LC	LRYD	LRFW	LRRW	LRDEBT
LC	−.2961	.1973	.1130	.0393	−.0594
LRYD	.6294	−.4195	−.2402	−.0835	.1263
LRFW	.4913	−.3274	−.1875	−.0652	.0986
LRRW	.5764	−.3842	−.2200	−.0765	.1157
LRDEBT	−.0859	.0573	.0328	.0114	−.0173

LR-TESTS FOR STATIONARITY, EXCLUSION AND WEAK EXOGENEITY
Critical values presented at 95 % significance level

Variable	STATIONARITY (DF = p − r = 4)		EXCLUSION (DF = r = 1)		WEAK-EXOGENEITY (DF = r = 1)	
	$\chi^2(4)$	CR.Value	$\chi^2(1)$	CR.Value	$\chi^2(1)$	CR.Value
LC	34.67	9.49	20.15	3.84	3.30	3.84
LRYD	33.10	9.49	17.92	3.84	3.71	3.84
LRFW	35.05	9.49	13.70	3.84	2.26	3.84
LRRW	34.71	9.49	13.85	3.84	4.36	3.84
LRDEBT	34.68	9.49	8.00	3.84	0.04	3.84

TESTING HOMOGENEITY RESTRICTIONS:

Changes in consumption proportional to income changes
H_0: $ß_1 + ß_2 = 0$, i.e. $ß_1 = -ß_2$
LR-test statistic for H_0:$\chi^2(1) = 3.832$, (P = 0.050)

Changes in consumption proportional to income and financial wealth changes
H_0: $ß_1 + ß_2 + ß_3 = 0$, i.e. $ß_1 = -(ß_2 + ß_3)$
LR-test statistic for H_0:$\chi^2(1) = 0.096$, (P = 0.757)

Changes in consumption proportional to income and **net financial wealth** changes
H_0: $ß_1 + ß_2 + ß_3 + ß_5 = 0$, i.e. $ß_1 = -(ß_2 + ß_3 + ß_5)$
LR-test statistic for H_0:$\chi^2(1) = 1.640$, (P = 0.200)

Changes in consumption proportional to income and **net wealth** changes
H_0: $ß_1 + ß_2 + ß_3 + ß_4 + ß_5 = 0$, i.e. $ß_1 = -(ß_2 + ß_3 + ß_4 + ß_5)$
LR-test statistic for H_0:$\chi^2(1) = 0.039$, (P = 0.843)

Figure 7.

ROLLING REGRESSION COEFFICIENTS OF THE STATIC CONSUMPTION FUNCTION

Figure 8.

CONSUMPTION - INCOME RATIOS (moving annual averages)

Figure 9.

The Trace tests

Figure 10.

THE I-MAX-TESTS

Figure 11.

Test of known beta eq. to beta(t)

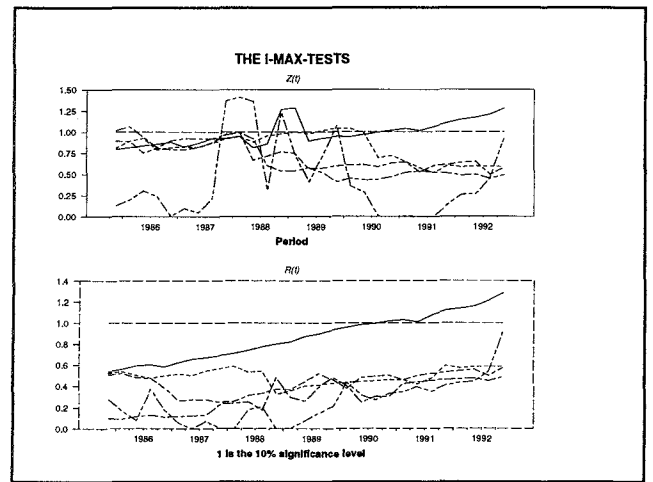Figure 12.

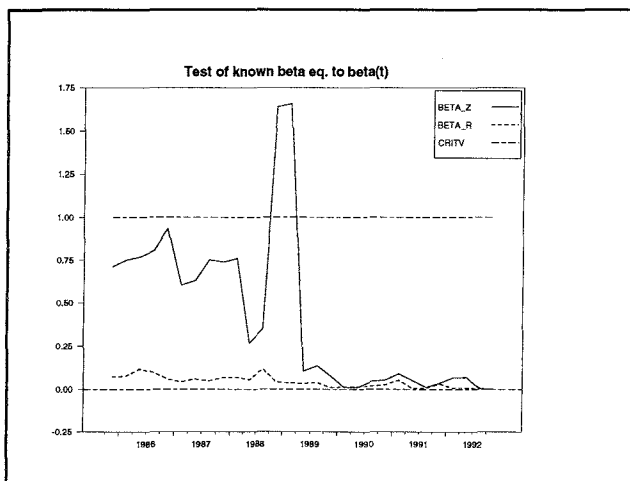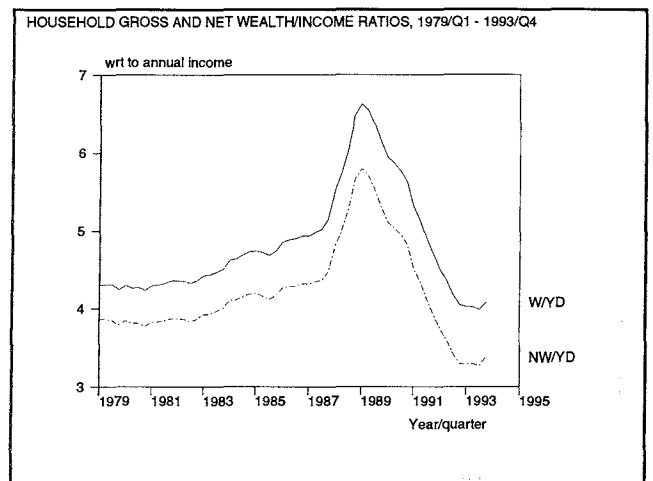HOUSEHOLD GROSS AND NET WEALTH/INCOME RATIOS, 1979/Q1 - 1993/Q4

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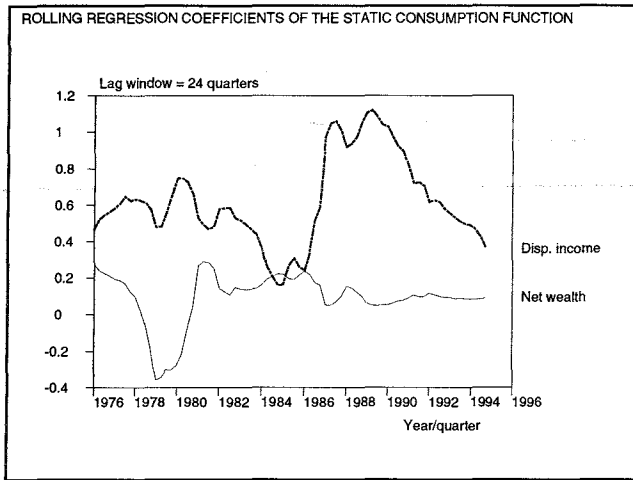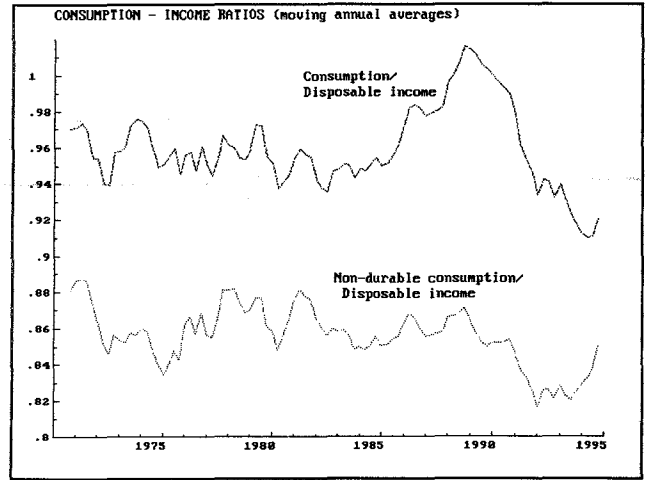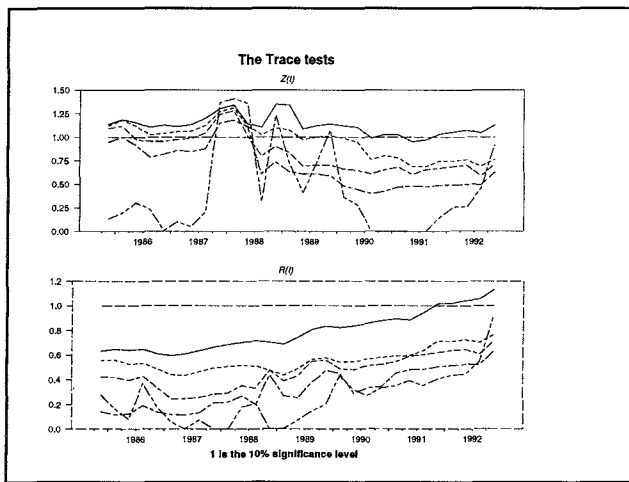
6.2 Cointegration system estimations

A closer look at cointegration was started with a two-variable (total consumption and real disposable income) model. According to trace and maximal eigenvalue tests, no conclusion about cointegration could be drawn at the 5 % significance level. Although the normalized ß coefficients were relatively close to each other, proportionality between parameters is rejected at 2.2 percent probability level. Table 4 presents the results from a more successful estimation between **three integrated variables** (now non-durable consumption, real income and the narrow proxy for real net wealth). In Finland durable consumption is measured on the basis of purchases. The accounting procedure exaggerates the depletion of durables, by which consumption is overestimated and the stock of durables is underestimated. We expect that the consumption of durables is more sensitive to interest rates and income expectations than non-durable consumption. The consequence is that durable consumption is much more volatile and has reacted strongly eg. to devaluations and financial deregulation.

Tests and plots show quite unambiguously that there is only one stationary cointegrating vector between the variables. However, it is always possible that this relation is a part of an even larger system. For example we could include the real market interest rate in the system, but still just one cointegration vector appears. The real interest rate should be stationary and therefore not included in the core of the cointegration system for consumption. The appearance of the interest rate can be motivated by its role as a measure of the opportunity cost of net wealth. Including the real interest rate as an additional explanatory variable in the system makes net wealth less significant, as might be expected according to the present value formulae of real estate wealth.

In order to test for exclusion, LR-tests were performed to see whether any of the endogenous system variables could be eliminated from the long-run relations. The exclusion of a certain variable from the cointegration vector was again tested by setting the particular ß vector relating to the variable in the system zero. Table 4 indicates also that aggregated real net wealth cannot be excluded from a proper specification of the consumption function. The proportionality test between ß's shows that we cannot reject proportionality between consumption, income and wealth. Therefore it is quite clear that the assumption of a cointegration relation between consumption, real disposable income and real net wealth holds. The parameter restriction of a zero homogeneous system cannot be rejected at the 5 percent significance level.

We have emphasized the necessity of including net wealth in the consumption equation. Therefore we must discuss the role of wealth in this context. It was mentioned already earlier that net wealth is time-aggregated widely defined Hicksian savings. According to the REPIH, saving (and borrowing) is used to smooth consumption with respect to changes in expected labour income. The buffer-stock view of savings gives another interpretation of wealth in the model by considering wealth as a means to prepare against the uncertainty of varying income.

There are also other reasons for having wealth in the consumption function. We have seen eg. that the average propensity to consume out of different types of wealth differs between financial wealth and real estate wealth.

Table 4. Testing the number of cointegration vectors

(VAR model with 2 lags, a trend, no seasonal terms)
Estimation period: 1970/Q1—1993/Q4, 94 observations
System variables: (LNONCD, LRYD, LRNW, i.e. Non-durable consumption, real income and 'narrow' real net wealth)

H(rank)	Eigenvalue	Maximum Eigenvalue test $-T.Ln(1-\lambda_i)$		Matrix Trace test $-T.\Sigma Ln(1-\lambda_i)$	
		Test Stat.	Crit.value $\lambda_{max}(.95)$	Test stat.	Crit. value $\lambda_{trace}(.95)$
r ≤ 2	.026	2.463	3.76	2.463	3.76
r ≤ 1	.074	6.990	14.06	9.453	15.41
r = 0	.235	24.140	20.97	33.593	29.68

STANDARDIZED ß' EIGENVECTOR (chosen r = 1)

Variable	ß-coeff.	Normalized ß
LNONCD	6.67	−1.00
LRYD	−5.99	0.90
LRNW	−0.40	0.06

STANDARDIZED α Coefficients (Error-correction loadings)

Variable	α-coeff.	Normalized α
LNONCD	.0003	−.002
LRYD	.107	−.714
LRNW	.042	−.281

Estimated Long Run Matrix (π)

	LNONCD	LRYD	LRNW
LNONCD	.002	−.002	−.000
LRYD	.715	−.642	−.043
LRNW	.281	−.253	−.017

LR-TESTS FOR STATIONARITY, EXCLUSION AND WEAK EXOGENEITY
Critical values presented at 95 % significance level

	STATIONARITY (DF = p − r)		EXCLUSION (DF = r = 1)		WEAK-EXOGENEITY (DF = r = 1)	
Variable	$\chi^2(2)$	CR.Value	$\chi^2(1)$	CR.Value	$\chi^2(1)$	CR.Value
LNONCD	20.65	5.99	11.41	3.84	1.81	3.84
LRYD	19.63	5.99	11.12	3.84	13.73	3.84
LRNW	21.87	5.99	3.92	3.84	4.69	3.84

TESTING STRUCTURAL PARAMETER RESTRICTIONS:

Proportionality tests:
Changes in non-durable consumption proportional to income and net wealth
H_0: $ß_1 + ß_2 + ß_3 = 0$, i.e. $ß_1 = -(ß_2 + ß_3)$
LR-test statistic for H_0:$\chi^2(1) = 0.887$, (P = 0.346), $\chi^2_{.95}(1) = 3.84$
Changes in non-durable consumption proportional to changes in real income
LR-test statistic for H_0:$\chi^2(1) = 1.479$, (P = 0.224), $\chi^2_{.95}(1) = 3.84$

6.3 Recursive VAR estimations

Recursive analysis of long-run parameters relaxes the assumption of parameter constancy. Following Hansen and Johansen (1992) it is possible to fix the short-run parameters and consider changes in the long-run parameters recursively. Parameter constancy can then be tested by means of recursive estimation. Since our estimation period might include large structural changes due to financial liberalization and deep recession, this is crucial for the existence of a stable consumption function.

Figures 13 and 14 present the recursive estimates of the trace and maximum eigenvalue test statistics. The tests confirm once again that only one cointegration relation could be found between variables, since the test values are above the scaled critical values for only one eigenvalue for most of the time. The test statistic graphs are generally upward sloping toward the end of the 1980s. However, the stability of the test statistics is not perfect. The assumption of one cointegration rank is not seriously under dispute. According to the Z-representation the cointegration relationship for the largest eigenvalue is somewhat stronger, but in the R-representation both test statistics are more stable. The Z-representation presents the stability of the rank in a recursion where the sample size increases from t to T, while the R-representation answers the question of cointegration rank constancy when the short-run parameter estimates are fixed over the process of estimating the long-run parameters recursively.[17]

Figures 15—16, which show the one-step prediction error test and prediction error tests for the three series (in order consumption, income and wealth), which identify a few outliers in the series. The most extreme outliers could be found in the first quarter of 1988. This observation agrees with other studies dealing with the boom in bank lending, consumer debt and housing loans (Brunila and Takala 1993). Housing loans were allowed to be tied to long-term market interest rates from the beginning of 1988. In the residual series we also see that the beginning of 1992/Q2 has significant outliers in income and wealth equations perhaps due to postponed tax refunds.

The constancy of the ß parameter can be seen from figure 17, which presents evidence on the question of whether the ß(T) at the end of the sample period could be considered to be spanned by ß(t).[18] Figure shows that the ß-vector based on level autoregressions (R-representation) is always below the 5 % critical value and therefore constant. Z-representation based on difference autoregressions does violate ß-constancy for same time during 1982—85, but after that constancy is preserved.

Hansen and Johansen (1992) argue that structural changes in the loadings (α) and cointegration vectors (ß) will be reflected in the time paths of the estimated recursive eigenvalues. The plotted eigenvalues are shown in figure 18. In the largest eigenvalue, signs of structural breaks are not obvious and we could accept the hypothesis of a constant cointegration relation.

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[17] Hansen and Johansen (1992) emphasize that from the point of view of the stability of the cointegration relation, the stability in the tests of the R-representation is more relevant. The Z-representation is based on an estimation of VAR model, where all the parameters are updated recursively, whereas in R-representation the short-run parameters are fixed.

[18] The selection of ß(t) is arbitrary, but if there is no particular period of interest, it is useful to select ß(T) since it is the estimate with the smallest sample variation (Hansen and Johansen 1992).
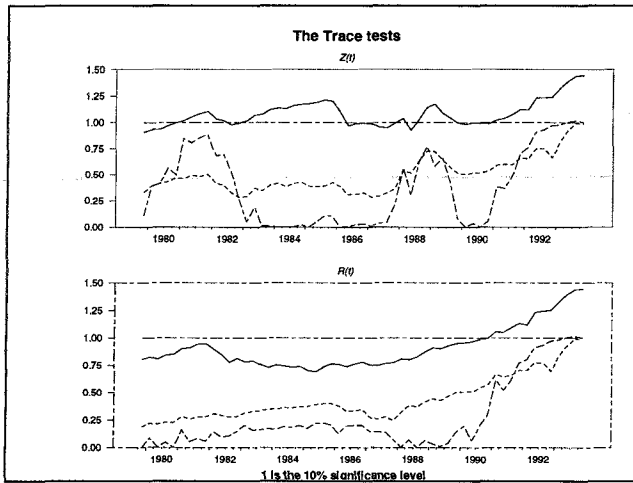
Figure 13.

The Trace tests

Z(t)

R(t)

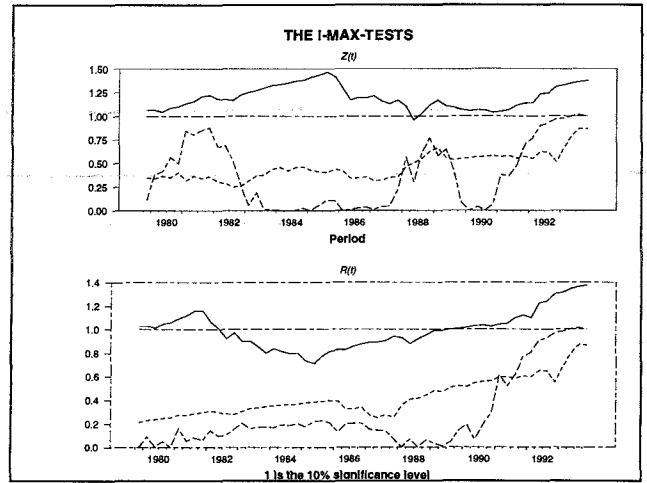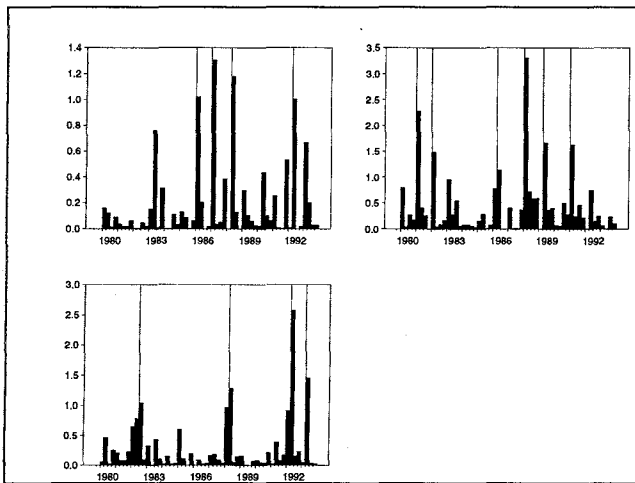1 is the 10% significance level

Figure 14.

THE I-MAX-TESTS

Z(t)

Period

R(t)

1 is the 10% significance level

Figure 15.

Figure 16.

Figure 17.

Test of known beta eq. to beta(t)

BETA_Z
BETA_R
CRITV

Figure 18.

lambda1

lambda3

lambda2

32

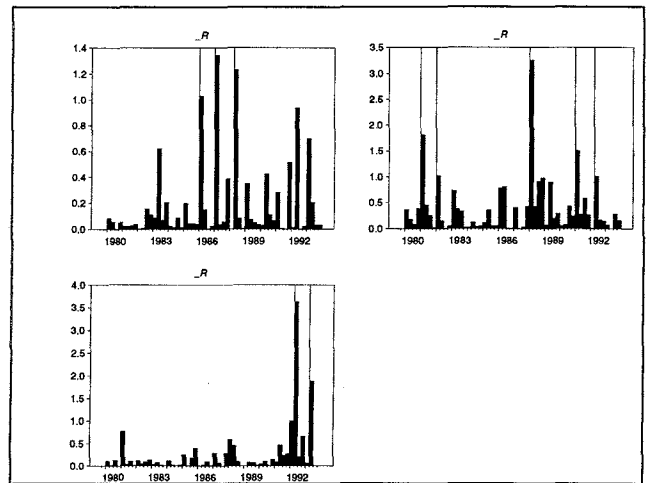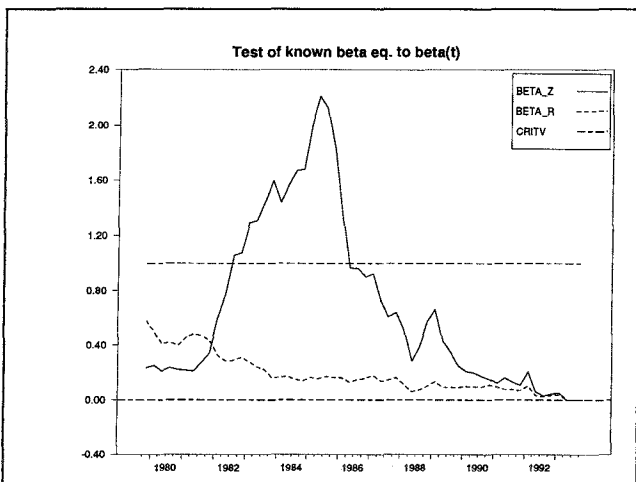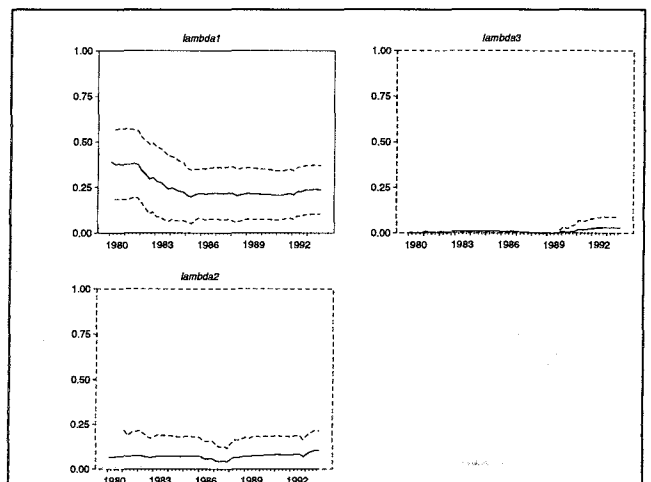## 6.4 Specification of the consumption function

In table 5 we finally present a specification of an error-correction consumption function for differences of non-durable consumption. The variables included in the core of the cointegration vector and the error correction term are all highly significant. Because of the endogeneity of disposable income and net wealth, the model was estimated using instrumental estimation with lagged values of income as the instruments.

Figure 19 compares the savings rate and the estimated error-correction term (ECT) of the cointegration relation. Since non-durable consumption is almost proportional to the proxy for permanent income and therefore highly correlated with real disposable income, the correlation between ECT and the savings rate is not a surprise.[19] This gives us motivation to interpret savings as a proxy for equilibrium error in the adjustment of consumption. Campbell and Mankiw (1991, p. 729) argue, however, that ECT (lagged savings) cannot be seen to represent any kind of disequilibrium. This is mostly a matter of semantics, since as income dominates the consumption determination it causes the error-correction term to correlate strongly with the saving rate, as mentioned. In practice we do not observe the error-correction term directly, but we surely have some idea about savings behaviour. Stabilizing feedback effects coming through ECT may also reflect changes in assets that affect consumption, ie. when consumption and income are not equal, there is saving, which affects cumulative savings. It must be remembered that a pure difference equation without ECT has no equilibrium solution, but it could still be consistent with a steady state solution.

According to Granger causality tests, the saving rate anticipates strongly and negatively changes in expected income with lags 1—3 quarters. This conclusion agrees closely with Campbell's (1987) results, which follow directly from the cointegration relationship between consumption and income. One implication of the cointegration relationship is that the equilibrium-error term Granger causes at least one of the cointegrated variables. Savings Granger causes both consumption and especially income growth. In this sense, savings has an anticipatory role a predicting a decline in income, which is in accordance with the precautionary motive for savings. The dependent variable and model fit are compared in figure 20.

The specification also includes a few stationary variables which are supposed to explain the short-run adjustment in consumption. At first inflation was included, and it turned out to be highly significant. In the regressions, inflation was also separated into expected and unexpected inflation with an AR(5) model, but both components turned to be significant and realized inflation was left in the equation.

The relationship between consumption and inflation also demands a closer look. Inflation may affect consumption in several ways. One explanation tells us that when prices rise rapidly consumers cannot distinguish between changes in relative prices and changes in the overall price level. In order to safeguard themselves from inflation and falling purchasing power, consumers accelerate consumption (especially of durables). Another way to maintain purchasing power is

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[19] The ECT was calculated from the unrestricted static long-run equation, which did not impose the homogeneity retsriction. The reason for this that homogeneity did not quite hold with the narrow net wealth for period 1970—93.

to demand a higher inflation premium for saving. Therefore as expected inflation increases, so do nominal interest rates. This also affects gross interest income. As households are net lenders to other sectors, their interest income will rise because of inflation.

HUS (1981) argued that large increases in nominal interest receipts are balanced by capital losses in financial assets, but whereas gross interest income is included in disposable income, capital losses are not. Therefore the national accounting statistic do not fully reflect the economicly perceived real income.[20] However, it is clear that increasing unexpected inflation could cause major losses to owners of non-indexed financial assets like deposits and on the other hand, capital gains to debtors. In Finland this interpretation does not apply to the latest fall in the saving rate in the late 1980s as inflation has rapidly declined. Rather it is more likely to be due to increased spending in durables and housing. If inflation could be responsible for the decline in the saving rate during financial liberalization, there should be a significant negative correlation between changes in financial assets and inflation. Such a phenomenon could not be found in the late 1980s. Muellbauer & Murphy (1989) argue that consumers who are not liquidity constrained would be affected by changes in real interest rates, which reduces the willingness to borrow. On the other hand, households could be affected by nominal interest rates as well, since the nominal burden from debt will increase the debt service payments and therefore reduce consumption.

In Finland debt service costs have not been very sensitive to interest rates, because prior to 1988 housing loans were tied to the central bank base rate, which has been changed only by political decision. What has affected debt service costs is the increasing indebtedness. Since most consumers must be forward looking in their consumption, we proxied the intertemporal price of consumption with an auxiliary regression for the expected real interest rate. In some specifications a distinctive nominal interest rate effect was found. However, the presented specification in table 5 rejected the equality of real lending rate and inflation coefficients.

As an empirical observation it seemed that the dynamics of income, wealth and stationary variables can be specified in various alternative ways. However, it maybe more helpful to specify the model with 'forcing' exogenous variables than with lagged endogenous, even though they may reflect the slowness in adjustment. The results from the regression equation can be presented in a nice way by presenting the endogenous variable as a decomposition of additive contribution components (regression coefficient times the explanatory variable). From figure 21 it can be seen eg. that the explanatory power of net wealth and real interest rate has substantially increased during 1980s'. The importance of unemployment has emerged merely during the recession of 1990s'. On the other hand the effect of inflation has decreased and the signicance of expected real interest rate increased.

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[20] Hendry and von Ungern-Sternberg conclude that if the income elasticity of consumption is unity in the long run, the fall in the consumption-income ratio during the 1970s must be related to incorrect measurement of income due to inflation effects.

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In the model the relative price between durables and non-durables has an overemphasized power, since it has taken the role of constant as well.[21] It was also found necessary to use few dummy variables to take into account effects of outliers that otherwise would affect parameter estimates. Separate dummies were used for couple of outliers for 1975/Q4—1976/Q1, financial deregulation 1987/Q1—1987/Q4 and the collapse of the Soviet trade during 1991/Q1—1992/Q1.

The consumption of services is included in the consumption of non-durables. Relative price variable is based on price adjustment, which indicates the direction in which consumption will evolve. The purely competitive market story of consumption balancing would indicate that the price of consumption is taken as given and equilibrium in the market is attained by adjusting the volume of consumption. However, it seems clear that to some extent prices adjust as well, and so disaggregating prices should be useful in prediction. Price formation in consumption cannot be just as immediate as supposed. According to Granger causality tests, the prices of durables and non-durable goods will predict the prices of services. This could be caused eg. by nominal wage rigidity and rigid price setting of public services. Lastly the unemployment rate was found to be significant predictor for consumption. Adding unemployment rate into the equation can be interpreted to describe the effect of income uncertainty on consumption (Carroll, 1992).

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[21] Constant was left out of the equation since it did not prove to be significant. Even though the estimate of the relative prices coefficient is 5.77, the contribution is around 4.3. The mean of non-durable consumption was 4.2 %.

Figure 19.

HOUSEHOLD SECTOR SAVING RATE AND ECM-TERM FROM LONG-RUN STATIC
CONSUMPTION FUNCTION (Multiplied by -1)

Saving rate, %

r = .43 **

Error correction
term

Figure 20.

D4LNONCD=____
Fitted=........

Fitted D4LNONCD Cross-plot
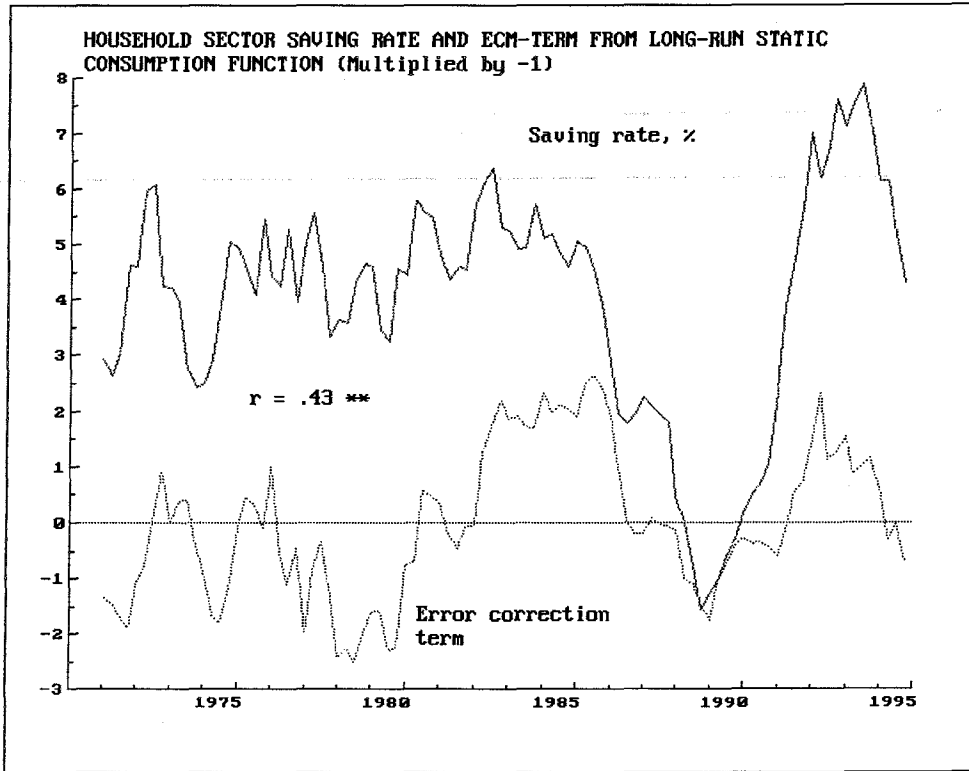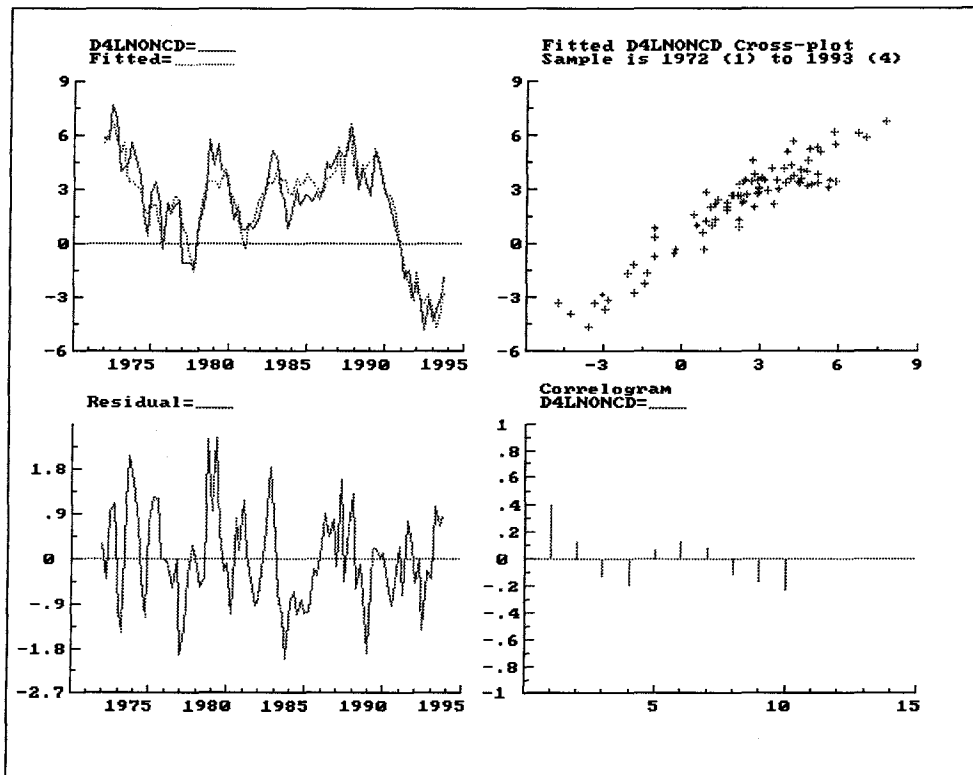Sample is 1972 (1) to 1993 (4)

Residual=____

Correlogram
D4LNONCD=____

Table 5.   The model for non-durable consumption,

Dependent variable: D4LNONCD
OLS- and IV-estimations, 1972/Q1—1993/Q4

	OLS-estimates			IV-estimates Additional Instruments used: D4LRYD_1 D4RLNW_1		
Variable	Coefficient	Std.Error	t-value	Coefficient	Std.Error	t-value
D4LRYD	0.277	0.0493	5.617	0.625	0.1902	3.290
D4LRNW	0.070	0.0140	4.981	0.061	0.0186	3.244
ECT-Lag4	−0.310	0.0740	−4.184	−0.613	0.1826	−3.357
D4LCPI	−0.345	0.0576	−5.990	−0.197	0.1062	−1.855
ERRLBN4	−0.171	0.0594	−2.885	−0.061	0.0947	−0.654
PCDrPCND	5.771	0.7543	7.650	2.581	1.9047	1.355
UR	−0.283	0.0549	−5.168	−0.070	0.1305	−0.539
FINDEREG	1.3986	0.6282	2.226	0.630	0.8987	0.701
SOVTRADE	−1.5678	0.5702	−2.749	−2.153	0.7920	−2.719
i1975p4	−2.5842	1.0716	−2.412	−3.995	1.5560	−2.567
i1976p1	2.2305	1.0901	2.046	4.490	1.8194	2.468

Testing parameter restriction: ß(D4LCPI) = ß(ERRLBN)

OLS: F(1,77)   =   15.960, p = .0000 **
IVE: F(1,77)   =   5.168, p = .0258 *

Model performance and residual diagnostics			OLS-estimation		IV-estimation	
			Test	P-value	Test	P-value
R² =			0.93		0.90	
DW =			1.21		1.50	
σ =			1.01		1.29	
AR;	F(5,72)	=	4.76	.001** χ²(2) =	4.45	.486
ARCH;	F(4,69)	=	0.29	.881	0.45	.772
NORMALITY;	χ²(2)	=	1.38	.503	4.41	.110
HETEROSCED.;	F(18,58)	=	1.31	.215	0.96	.507
RESET;	F(1,76)	=	0.72	.399		

Auxiliary regression:
The estimated model of real lending rate expectations (ERRLBN4)
Modelling RRLBN by OLS, 1970/Q1—1993/Q4

Variable	Coefficient	Std.Error	t-value	t-prob	PartR²
Constant	−4.030	1.2059	−3.342	0.0011	0.0820
RRLBN_4	0.68187	0.060340	11.300	0.0000	0.5053
RLBN_4	0.51501	0.12992	3.964	0.0001	0.1117

R² = 0.630 σ = 2.638 DW = 0434

Variables:

D4LNONCD	= Annual log difference of non-durable private consumption, %
D4LRYD	= Annual log difference of real disposable income, %
D4LRNW	= Annual log difference of real net wealth, %
ECT-Lag4	= Error correction term from static long-run equation between non-durable consumption, real income and net wealth
D4LCPI	= Log annual difference of consumer price index, %
PCDrPCS	= Relative price between durable prices and services
ERRLBN4	= Expected real lending rate for new loans, %
RLBN	= Nominal lending rate for new loans, %
RRLBN	= Real (deflated by CPI) lending rate for new loans, %
UR	= Unemployment rate, %

FINDEREG, SOVTRADE, i1975p1, i1976p4 = Impulse dummy variables

Figure 21.

EXPLANATORY VARIABLE CONTRIBUTIONS TO NON-DURABLE CONSUMPTION
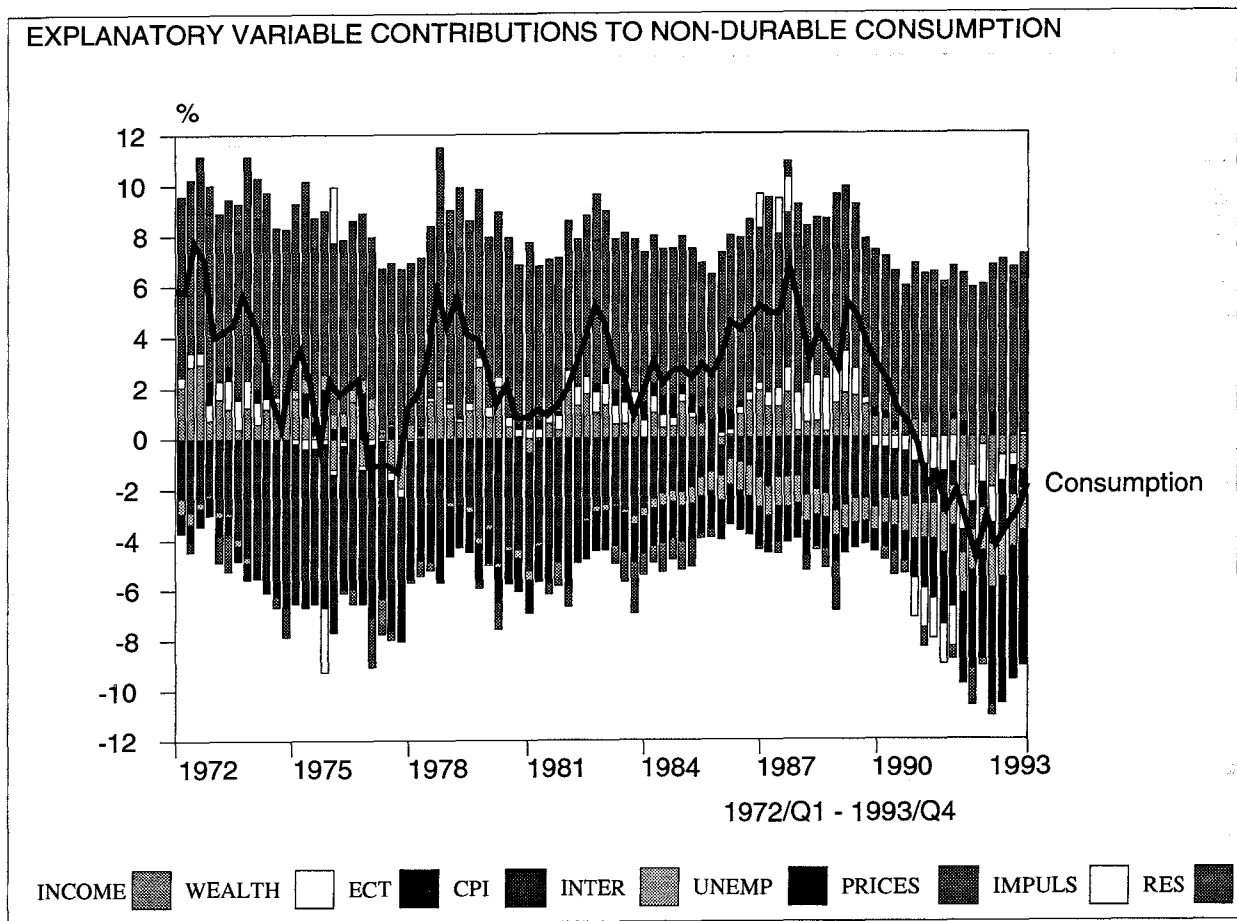
7 Conclusions

This paper has presented an updated error-correction specification of a consumption function for non-durable consumption in Finland. Based on the permanent income hypothesis, consumption should depend on current labour income, net wealth and the present value of human capital (income expectations). In accordance with this, a cointegration relationship including non-durable consumption, disposable income and net wealth was formulated and tested. Therefore a linear combination of disposable income and net wealth represents a proxy of permanent income, which is used by consumers as an implicit budget constraint in the optimization of consumption.

Estimation results showed that a more stable consumption function could be attained if net wealth is included in the cointegration relation. In fact the results from the disaggregation of net wealth showed quite clearly that there exists only **one cointegration relation** between consumption, income and net wealth. On the other hand, there was no strong evidence of any stable wealth-income relationship.

Data problems were confronted in the construction of net wealth due to the financial deregulation of the late 1980s. Structural changes in the parameters of the cointegration relation were also found. Although our results confirm a distinct wealth effect during deregulation, they also indicate that the more important effect may due to favourable income expectations. During 1987—90 the marginal propensity to consume out of real disposable income rose significantly above one. Overspending was due to an increased demand for durables and housing purchases, which lead to significant indebtedness.

A recursive static long-run equation and VAR analysis indicated that parameter changes have appeared during the late 1980s, especially in real income. Same conclusion can be drawn from the rolling long-run static equation estimation of the consumption function. Combining this evidence with the effect of financial deregulation hints of changes in income expectations and uncertainty. It seems clear that the role of income uncertainty has to be studied more carefully in the context of the consumption function. Consumption depends on income expectations and it is not possible to model consumption without modelling the income process. Net wealth can be seen to proxy for income expectations through real estate asset prices.

A single equation equilibrium correcting 'consumption function' was estimated in differences by using real disposable income and real net wealth (lagged two quarters) plus a lagged error correction term as the basic variables. Additional stationary variables were used to account for the short-run adjustment; inflation, the expected real interest rate, unemployment and relative price between durables and non-durables. The cointegration analysis also showed that the disaggregation of wealth was needed in order to understand the turbulent period of increasing indebtedness.

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Appendix

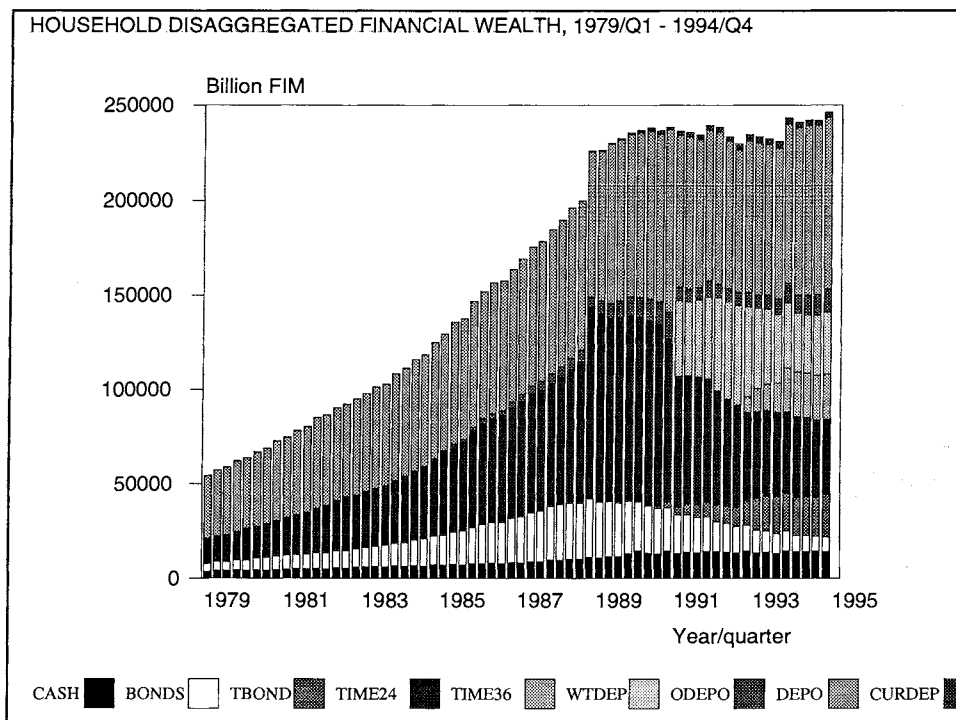Figure 1.   **Household sector financial wealth**

HOUSEHOLD DISAGGREGATED FINANCIAL WEALTH, 1979/Q1 - 1994/Q4

Billion FIM

CASH ▮ BONDS □ TBOND ▨ TIME24 ▮ TIME36 ▤ WTDEP ▨ ODEPO ▮ DEPO ▨ CURDEP ▮

Figure 2.   **Household debt**

HOUSEHOLD SECTOR DEBT, 1979/Q1 - 1994/Q4

Billion FIM

HOUSING LOANS ▨ CREDITS ▮ OTHER ▨
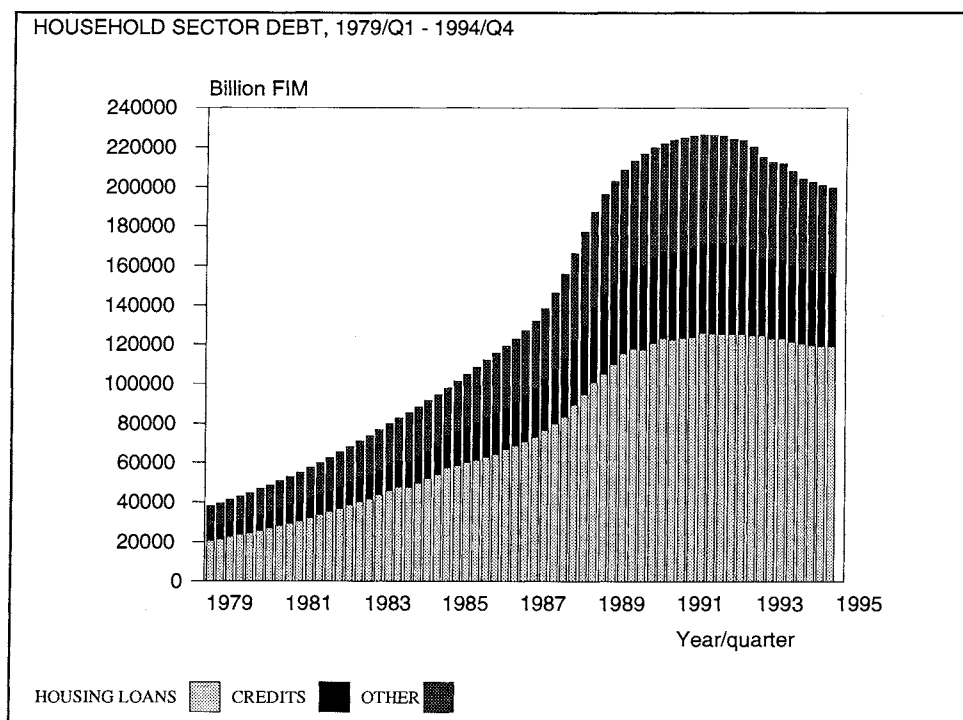
Figure 3.   **Household sector real estate wealth**

HOUSEHOLD DISAGGREGATED REAL ESTATE WEALTH, 1979/Q1 - 1993/Q4

FIELDS ░ AGRIC █ FOREST ☐ DURABLES ▓ ENTREP ░ SUMCOT █ STOCKS ▒ HOUSES ▓
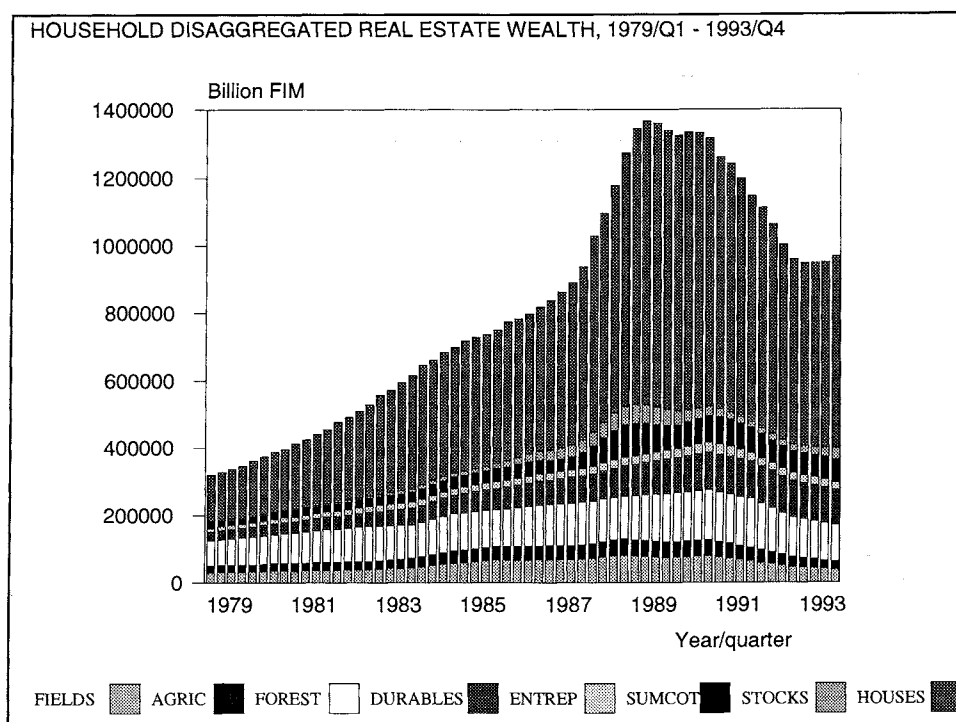
Financial wealth

Cash   = Cash holdings
Bonds   = Non-taxed government bonds and other bonds
Tbond   = Taxed bonds (issued from 1989 onwards)
Time24 = Taxed 24 month time deposits
Time36 = Taxed 26 month time deposits
Wtdep   = Withholding taxed deposits
Odepo   = Other taxed deposits
Depo   = Ordinary non-taxed deposits
Curdep = Currency deposits

Household debt

Housing
loans   = Household sector housing loans
Credits = Consumer credits
Other   = Other loans including entrepreneurial loans

Real estate wealth

Fields   = Agricultural wealth in form of fields
Agric   = Other agricultural wealth like barns, equipment etc.
Forest   = Forest real estate wealth
Durables = Household durables, autos, boats etc.
Entrep   = Personal entrepreneurial wealth
Sumcot   = Summer cottages
Stocks   = Stocks in firms Helsinki stock exchange
Houses   = Housing wealth (houses, flats etc.)

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