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Stock Market Fluctuations and Consumption Behaviour: Some Recent Evidence

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ABSTRACT/RÉSUMÉ

This paper examines the likely influence of recent stock market fluctuations on major OECD economies, focusing on wealth effects and consumption. After reviewing the relevant theoretical framework and available empirical evidence, consumption functions are estimated for the US including the influence of financial wealth. The resulting estimates of the marginal propensity to consume out of financial wealth are extrapolated to other G7 countries, allowing for differences in stock market capitalisation, and compared with ones obtained more directly from consumption functions that include stock market prices as an explanatory variable. Simulations are then carried out to assess the potential world impact of a major fall in stock market prices in the G7 countries using a version of the OECD INTERLINK model which embodies the latter equations. The overall effects are found to be significant, particularly when relevant international linkage mechanisms are taken into account.

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Ce papier analyse les effets richesses potentiels générés par les fluctuations récentes des marché d'actifs financiers des principals économies de l'OCDE. Après une présentation rapide des fondements théoriques et des résultats empiriques récents, des fonctions de consommation incluant une variable de richesse financière sont estimées pour les Etats-Unis, permettant de calculer des propensions marginales à consommer les gains de richesse financière. Celles-ci sont alors extrapolées pour les autres pays du G7, en tenant compte des différences de ratio de capitalisation boursière. Elles sont ensuite comparées à des propensions estimées à partir de fonctions de consommation incluant le prix des actifs boursiers. Ces dernières sont intégrées au modèle INTERLINK de l'OCDE, ce qui permet de simuler l'impact potentiel sur l'activité réel d'un crash financier dans les pays du G7. Les effets sur l'économie globale sont significatifs, particulièrement lorsque sont pris en compte les mécanismes d'échange internationaux.

TABLE OF CONTENTS

STOCK MARKET FLUCTUATIONS AND CONSUMPTION BEHAVIOUR : SOME RECENT EVIDENCE

by Laurence Boone, Claude Giorno and Pete Richardson[1]

Introduction and summary

1. Over recent years stock markets in the major OECD countries have experienced wide fluctuations. For example, the Dow Jones index has *tripled* between early January 1990 and end September 1998 (see Figure 1), but has also experienced substantial drops, such as in autumn 1997, and more recently in the second half of 1998. At the same time, equity ownership has generally broadened within the OECD, though to different extents depending on country. The combination of these developments and, in particular, the recent volatility of markets have naturally stimulated renewed interest in the potential impact of major equity price movements on the real economy, both domestic and international[2].

2. Although recent empirical evidence on stock market effects is relatively scarce and essentially focuses on the United States experience, the theoretical mechanisms are relatively well known. Thus, it is generally agreed that fluctuations in asset prices are likely to influence real activity through (at least) three main channels:

- rising asset prices lower the *cost of capital* and thereby boost firm's demand for investment.

- a *credit channel*, which is likely to be influential in two ways: firstly the value of collateral is improved (which reduces the adverse selection problem); secondly the risks associated with profitable investments are reduced.

- a third channel operates through *wealth effects*: within an intertemporal consumption framework, a (persistent) increase in the stock of wealth would be perceived as an increase in permanent income. If households have a desired wealth target, then an increase in asset prices would allow them to save less to reach this desired level. Hence, spending on consumption would rise.

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1. The authors are all members of the Macroeconomic Analysis and Systems Management Division of the OECD Economics Department. They are grateful to Jorgen Elmeskov, Michael Feiner, Dave Turner and Ignazio Visco for comments on previous drafts, Isabelle Wanner and Marie Christine Bonnefous for technical support and Veronica Humi for technical preparation.

2. For example, a recent note published by Lehman Brothers in August 1998 ("US: Spreading the Wealth"), discusses the extent to which stock market gains contributed to the surge in consumer spending until mid-98 in the United States. A number of other recent articles consider the possible consequences of a global equity correction, for example Goldman Sachs "The Global Equity Correction - How Big and How Damaging?", August 1998 and the Financial Times "Severe and Risky Correction", 2 September 1998.

3. This paper examines the influence of stock market fluctuations in the G7 countries, with a particular focus on wealth effects and the consumption channel. Whereas the effects on investment are relatively difficult to quantify within a structural framework, since they come through a variety of sources[3], the wealth effect on consumer behaviour can be analysed more directly. The approach followed in this paper consists of estimating structural consumption equations which include the direct influence of (stock market) financial wealth and asset prices. It complements earlier OECD work focusing on the role of monetary policy with respect to asset prices movements[4]. This latter study revealed a general lack of empirical evidence on the impact of asset prices in particular, and non-human wealth more generally, on the real economy.

4. The following sections first review the underlying theoretical framework and the existing empirical evidence on consumption-wealth effects. The influence of financial wealth on consumption is then examined for the United States (for which good historical financial statistics are available, and previous studies can be used as a benchmark) on the basis of estimated consumption functions. Using these estimates of the marginal propensity to consume out of financial wealth and given the differences in stock market capitalisation between G7 countries, estimates of the influence of stock market fluctuations on private consumption for the six other G7 countries are then computed. A fourth section then compares these estimates with ones obtained more directly from consumption functions that include stock market prices as explanatory variables. Finally, these latter equations are incorporated in the OECD INTERLINK model, which is simulated to assess the potential impact of a major fall in stock market prices in the G7 countries on the OECD economy. This is found to be significant.

1. The role of wealth in the consumption function: theory and recent evidence

5. Analysis of the role of wealth in the consumption function goes back to the life cycle model (Ando and Modigliani [1963]). Within this framework, the level of household consumption is a function of permanent income, i.e. the present value of labour income (human wealth) and capital income (financial wealth). Given expected permanent income, households are assumed to try to spend evenly over their life times, borrowing in early age, saving during the middle of their working lives and dissaving in the later years. An unexpected increase in wealth (whether it is human or financial wealth) should therefore push consumers to spread the wealth gain over the reminder of their life times, spending a bit more and saving a bit less, hence enhancing current and future consumption.

6. Increases (decreases) in wealth may reflect changes in interest rates (by which future income streams are discounted to the present), changes in accumulated capital through saving, and mainly in the short run, changes in the market value of capital. The first two factors, as well as the latter to the extent that it is perceived to be persistent, will therefore not affect the desired ratio of consumption to wealth: but consumption growth could be temporarily higher (lower) until the new target level of consumption is reached.

7. The empirical evidence on the role of financial wealth in determining consumption is very mixed. Prior to financial deregulation, empirical work on the United States reported a marginal

3. Such factors include the cost of capital, the level of debt of the corporate sector, the availability of internal finance, the uncertainty on demand and capacity utilisation. The quantification of such effects is discussed by Meredith (1997).

4. See Kennedy, Palerm, Pigott and Terribile (1998), "Asset Prices and Monetary Policy", OECD Economics Department Working Paper No. 188.

propensity to consume out of wealth within the range of 4 to 8 per cent (Ando and Modigliani [1963], Modigliani [1971], Bhatia [1972]). But this "consensus" did not survive the 1987 crash, which some (see for example Cagan [1990]) claimed to have had no impact at all on consumption. At the same time, new developments in economic theory pointed out a number of pitfalls in the life-cycle model. In particular, the life-cycle model takes no account of uncertainty in the future stream of revenues (Deaton [1991] and Carroll [1992]), or bequest motives (Wilhelm [1996] and Laitner and Juster [1996]). Furthermore, Zeldes (1989) argued that the strength of any wealth effect should also be linked to the distribution of wealth and the existence of liquidity constraints.

8. However, extensive financial deregulation in recent years should have weakened these specific criticisms and may indeed have contributed to a strengthening of wealth effects (Bayoumi [1993] and Caporale and Williams [1997]). Recent studies of the United States suggest a marginal propensity to consume out of wealth within the range of 3 to 5 per cent, the so-called "3 to 5 cents rule-of-thumb". In recent articles, M. Starr-McCluer (1998) of the US Federal Reserve Board of Governors reports, "Studies in the consumption function tradition found a marginal propensity to consume out of stock market wealth of 0.03 to 0.07, with the effect materialising over one to three years" and, Brayton and Tinsley (1996), report that, "In 1996, estimates from the FRB/US quarterly model placed the marginal propensity to consume at 0.03 for stock market wealth and 0.075 for other net wealth".

9. For other countries, the evidence remains, at best, mixed. For Japan for instance, estimates of the marginal propensity to consume out of wealth range from around 1 per cent (Mutoh *et al*.[1993], Ogawa [1992*b*]), up to around 4 per cent (Horioka [1996], Ogawa *et al*.. [1996]), varying considerably with the definition of wealth (liquid wealth versus total wealth) and income (labour versus disposable income). For France on the other hand, a variety of studies, (Bonnet and Dubois [1995], Grunspan and Sicsic [1997]) provide no strong evidence of any wealth effect at all. This may reflect the rather high degree of financial intermediation in France (according to INSEE [1997] households hold only 10 per cent of total market capitalisation). For Italy, Rossi and Visco (1995) provide evidence of a marginal propensity to consume out of wealth of the order of 3 to 3½ per cent, once account is taken of double counting of social security transfers in the measurement of disposable income and pensions wealth. Overall, the wealth effect is generally thought to be weaker in the other G7 economies than in the United States (except maybe in Canada and the UK), reflecting the respective degrees of market capitalisation relative to GDP: 110 per cent in the United States, against 70 per cent in Japan, 29 per cent in Germany, 39 per cent in France and 139 per cent in the UK in 1996[5].

10. Many previous econometric studies fail to take account of financial liberalisation, which has mostly taken place since the mid-80s and whose effects are likely to be empirically captured only more recently[6]. Also, stock ownership has broadened in the recent years in many OECD countries. This would tend to raise the influence of stock market fluctuations on consumption through two mechanisms. Firstly, as the share of equity holdings in income increases (as shown in Table 1), stockholders consumption should become more sensitive to asset prices fluctuations. Indeed, Mankiw and Zeldes (1991) show that the correlation between consumption growth and stock market fluctuations is higher for stock holders than for non stock holders. Poterba and Samwick (1995) argue that this is also true for indirect stock ownership: households with pension plans exhibit a higher correlation between consumption growth and stock market fluctuations than households without pension plans. Secondly, stock ownership has tended to become less unevenly distributed over the population (Poterba and Samwick [1995], Branthomme and

5. Source: Banque de France (1998).

6. For a discussion of the implications of capital market imperfections and savings behaviour, see Ando *et. al.* (1994).

Dedryver [1997]), particularly in Europe where the privatisation process has raised the proportion of households directly holding equities. This is important as a lower degree of concentration in asset holding would tend to enhance the overall influence of the assets value on consumption.

2. How much is consumption affected by stock market wealth?

11. Historically, financial markets have been more highly-developed in the United States than in most other OECD countries. Hence the wealth effect is likely to have been significant there for a longer time than in most other countries. A non-negligible side consideration for the present research strategy is also that reliable historical time series for wealth are more readily available for the United States. Hence, the present study begins by estimating the likely magnitude of wealth effects for consumption in the United States. These estimates are then extrapolated and evaluated for the other G7 economies, taking into account specific differences in the degree of stock market capitalisation in each country.

3.1 Methodology

12. Within the life-cycle permanent income theoretical framework, consumption is a function of human and non-human capital wealth. These include labour income, transfer income, property income and financial wealth. Within financial wealth, one can further distinguish between wealth held in equities (stock market wealth) and other financial assets. Combining labour income, property income, and transfer income into a single variable *y* on the one hand, and stock market wealth and other net wealth on the other hand, this can be represented more formally as the following linear approximation to the equilibrium relationship in logarithmic form:

$$cy = \alpha + \beta(smwy) + \delta(nsmwy) \qquad [1]$$

where *cy* is the consumption to income ratio, *smwy* represents stock market wealth and *nsmwy* non-stock market wealth to income ratios, all expressed in nominal terms with lower case letters used to denote variables in logarithms. Coefficient α is a constant term , β and δ are the elasticities of the consumption to income ratio with respect to the stock market wealth and non-stock market wealth to income ratios respectively. Such a representation implicitly imposes long-run homogeneity between consumption and income.

13. This specification, which allows the identification of a target level of consumption in terms of wealth (both expressed as ratios to income), can also be enriched to take into account some of the main criticisms directed at the permanent income theory (see section 2), more specifically by adding[7]:

- the real interest rate (*irsrc*), to reflect substitution effects;
- the inflation rate (*infl*), as a proxy for uncertainty and real depreciation of non-indexed financial assets;
- fluctuations in the unemployment rate (*unr*), as a proxy for uncertainty surrounding the future stream of income.

7. There are a wide number of ways of taking into account all these variables. See for example Church, Smith and Wallis (1994) in which Table 1, p. 74 presents the range of measures used in various models for the definition of wealth, the interest rate to be included and other possible explanatory variables.

14. Since all the above variables (with the possible exception of the unemployment rate) are integrated of order 1 (see the Annex for the relevant stationarity tests), cointegration analysis was necessary to identify the target level defined in equation [1]. The corresponding cointegrating vector (*CI*) was then embedded in an error-correction model of the following form to capture the dynamics of the relationship:

$$\Delta(cy) = \mu + \tau CI(-1) + \sum_{i=1}^{n} \gamma_i \Delta(cy)(-i) + \sum_{i=0}^{n} \nu_i \Delta(smwy)(-i) + \sum_{i=0}^{n} \lambda_i \Delta(nsmwy)(-i) + \sum_{i=0}^{n} \kappa_i \Delta(unr)(-i) + \sum_{i=0}^{n} \rho_i \Delta(irsrc)(-i) + \sum_{i=0}^{n} \upsilon_i \Delta(infl)(-i) \quad [2]$$

where Δ represents first-order differences, *i* is the order of time lags, and *CI* the cointegrating vector, with *CI(-1)* the corresponding error-correction term. Intuitively, τ should be negative so that when the ratio *cy* is moving away from equilibrium, it adjusts back in the next period. The larger τ is, the quicker the return to equilibrium. The other explanatory variables which do not enter the cointegrating vector, but help explain short-run adjustments, such as fluctuations in the unemployment rate, are included in differenced form. Equation [2] was then estimated by OLS.

3.2 Data and financial series

15. There is considerable debate regarding the appropriate definition of non-human wealth to be used in consumption studies of this sort. A number of researchers suggest that assets should be given different weights according to their degree of liquidity (Church *et al*. (1994), Ogawa *et al*. [1996]). For its US model, the Federal Reserve Board distinguishes separately between transfer wealth, property wealth, the value of corporate equity and other net financial and tangible assets wealth. Since the main interest here is in stock market effects, we choose to distinguish only between stock market wealth and aggregate other financial wealth. The Federal Reserve Board publishes historical flow of funds data, which permit the computation of stock market financial wealth, separately from total net financial wealth. Stock market wealth embodies corporate equities (directly held and in close-end funds), mutual fund shares and life insurance reserves.

16. There are conflicting views regarding whether pension funds should be included. On the one hand, these cannot be considered as liquid wealth and therefore might be less likely to have an impact on consumption. On the other hand, Poterba and Samwick (1995) provide evidence that households with pension plans exhibit a higher correlation between consumption growth and stock market fluctuations than those without such plans. Furthermore, there is a rising trend in pension plan ownership. Overall, it was therefore decided to include pension fund reserves in the main definition of stock market wealth, denoted hereafter FED, but the alternative definition excluding pension fund holdings, denoted by BIS[8], was also used to assess the sensitivity of estimated wealth effects to alternative definitions of wealth. The sample used covers the period 1974-1998, and the data are quarterly.

8. This also includes money market fund shares.

3.3 Results

17. Using the Johansen technique, cointegration tests were undertaken for five variables: the ratios of consumption, stock market wealth, non-stock market wealth to income, the inflation and interest rates[9]. Both the inflation and interest rate appeared generally to be statistically insignificant and the cointegration tests were undertaken with nominal interest rates. This overall specification proved to be generally more satisfactory (see Annex).

18. Two significant types of cointegrating vectors were then identified (see the Annex): vector (1) embodies three variables (the consumption to income ratio, the stock market wealth to income ratio and the nominal interest rate); vector (2) embodies the same variables as vector (1) but also includes the non-stock market wealth to income ratio. These results hold for both definitions of wealth, though they are slightly less robust under the BIS definition. To distinguish between the alternative cointegrating vectors and select the best representation, the dynamic equation [2] was re-estimated with the cointegrating vector replaced by the variables in levels themselves, lagged once[10]:

$$\Delta(cy) = \mu + \tau\{cy(-1) - [\alpha + \beta(smwy)(-1) + \delta(nsmwy)(-1) + \varphi irs(-1) + \eta infl/(-1)]\} + \sum_{i=1}^{n} \gamma_i \Delta(cy)(-i) + \sum_{i=0}^{n} \nu_i \Delta(smwy)(-i) +$$

$$\sum_{i=0}^{n} \lambda_i \Delta(nsmwy)(-i) + \sum_{i=0}^{n} \kappa_i \Delta(unr)(-i) + \sum_{i=0}^{n} \rho_i \Delta(irs)(-i) + \sum_{i=0}^{n} \upsilon_i \Delta(infl)(-i) \qquad [3]$$

where *irs* is the nominal interest rate.

19. On this basis, a representation using cointegrating vector (1) was found to be the statistically preferred long-term representation, since the lagged level of the ratio of non-stock market financial wealth to income was consistently found to be non-significant. Also the coefficients in the long-term relationship using vector (1) are identical when estimated with either the dynamic representation (3) or the Johansen technique, confirming the general robustness of this representation. Non-stock market financial wealth was found to be significant only in first differenced form[11]. Table 2 presents the corresponding dynamic relationships.

20. The equilibrium relationship given by the preferred cointegrating vector (both from Table 2 and in the Annex), implies a long-run elasticity of consumption with respect to stock market wealth of about 5¾ per cent using the FED variable, and about 4½ per cent with the BIS variable. Corresponding estimates of the marginal propensity to consume out of stock market wealth are 4.5 per cent with the FED

9. Short-term interest rates which are found generally to have more explanatory power than long-term rates in the consumption equations estimated for INTERLINK (see footnote 17), were used in the analysis.

10. To confirm the results for the real interest rate and the inflation rate, the dynamic equation was also estimated including these variables. Both are found to be non-significant in levels terms and the real interest rate appears to be significant only in difference terms. However, estimates of the marginal propensity to consume out of stock market wealth were found to be insensitive to the precise choice of interest variable, and in the range of 5 to 7 per cent.

11. This result holds with both definitions of wealth.

variable and 7 per cent with the BIS variable[12] i.e. broadly in line with the range of estimates in the recent literature, especially when pension plans are included.

21. The error-correction term in the dynamic relationship (CI(-1)) has the expected negative sign implying that when the consumption to income ratio departs from its long-term value, there is a reversion effect in the following period. Increases in both stock market and non-stock market wealth have a positive impact on consumption growth and quite rapidly. The unemployment rate was found to be insignificant throughout. It was also possible to include a (negative) price effect in the dynamic specification, of about 0.45, but this estimate is not very robust and its exclusion does not change the overall results.

3.4 Extending the US results to the other G7 countries

22. Although data limitations make it difficult to provide comparable analysis for the other G7 countries, it is possible to infer from the United States estimates approximate orders of magnitude for these countries of the potential effects of stock market prices on private consumption. This is done by computing the capital loss for households resulting in each country from a fall in the value of their stock market financial wealth. The corresponding estimate of the decline in consumption is then given by the product of the marginal propensity to consume and the estimated capital loss. This computation is presented in Table 3 for a fall of 10 per cent of stock market prices for all G7 countries. The size of these estimates depend on assumptions about the marginal propensity to consume out of wealth, which are based on two alternative hypotheses. In the first case, it is assumed that consumers outside the United States exhibit the same behaviour as US consumers, i.e. they have the same marginal propensity. In the second case, as financial asset holdings by households in the non-US G7 countries are narrower than in the United States, and therefore likely to be more concentrated in well-off groups, smaller adjusted estimates are used[13]. Effectively, these estimates use the US marginal propensity rescaled by the shares of equities in disposable income for each country, relative to the share in the United States[14].

23. As shown in Table 3, the calibrated wealth effects are the largest for the United States given the comparatively high share of household wealth held in equity (in relation to income). Overall, these estimates are generally consistent with the range found in the previous literature, though on the weak side in the case of Japan. For the United States, a 10 per cent fall in stock market prices is estimated to reduce consumption by 0.45 to 0.75 per cent (depending on the inclusion or not of indirect equity holdings) compared with estimates of around 0.45 per cent for Canada and the United Kingdom and less than 0.2 per cent for the other G7 countries. The difference between the United States and the other major OECD countries is even more striking when weighted marginal propensities are used for the latter group

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12. A quick and easy way to approximate the marginal propensity to consume out of wealth is by using the following expression: $\varepsilon(c/w) = (\Delta c/c)/(\Delta w/w) = (\Delta c/\Delta w)*(w/c) = mpc*(w/c)$, where ε is the elasticity of consumption with respect to wealth and mpc is the marginal propensity to consume out of wealth. This expression implicitly assumes that the consumption to wealth ratio is stable over the sample period.

13. A description of the limited character of equity holding by German households compared with other countries is provided in the monthly bulletin of the Deutsche Bundesbank (January 1997). In 1997, the share of households with equity holdings remained close to or below 10 per cent of the population in Germany and France compared with 25 per cent in the United Kingdom and 18 per cent in the United States (Branthomme and Dedryver, 1997). For the United States, a large proportion of households also hold equities indirectly through mutual and pension funds, see Table 1.

14. See footnote 3, Table 3.

of countries, with the estimated effects on consumption for continental Europe and Japan being then almost negligible.

4. The wider impact of a fall in equity prices on the real economy

24. Whereas the estimates presented in the previous section provide a guide to how recent developments in the stock markets may affect consumption behaviour, they do not provide a full assessment of the wider impact on the overall economy. This section therefore examines the likely impact of a fall in stock markets using a more direct set of estimates of consumption elasticities with respect to stock market prices, in conjunction with simulations of the OECD INTERLINK model[15]. The analysis again emphasises the consumption channel and proceeds in two steps: first a set of consumption equations including stock market prices as a variable is estimated; then these equations are incorporated into full-model simulations of a 20 per cent reduction in equity prices for the G7 countries.

4.1 Estimation of consumption equations incorporating stock market indices

25. Historical time series data for households financial wealth are not as readily available for G7 countries other than the United States. Hence, the approach adopted here is more *ad-hoc* than used in the previous section, with real equity prices used separately as a proxy for financial wealth effects in the consumption equation[16]. This approach essentially assumes the share of assets held by households in disposable income and financial wealth to be relatively stable in the short-run[17]. The overall equation specification stems from the current specification used in INTERLINK[18]. The general representation is:

$$\Delta \ln CPV = a0 + a1*\Delta \ln CPV(-1) + a2*\Delta \ln YDRH + a3*\Delta(UNR) + a4*(\ln YDRH(-1) - \ln CPV(-1))$$

$$+ a5*(PCP/PCP(-2) - PCP(-1)/PCP(-3))*100 + a6*IRSRC + a7*(PCP/PCP(-2) - 1)*100$$

$$+ a8*\Delta \ln(SP/PCP) + a8*\Delta \ln(RHP) \qquad [4]$$

where: CPV is household real consumption
YDRH is household real disposable income
UNR is the unemployment rate
PCP is the private consumption deflator
IRSRC = IRS - 100*[((PCP/PCP(-1))**2-1] is the real short-term interest rate
SP is the stock market index
RHP is the real house price index (for the UK only).

15. Meredith (1997) reports a similar analysis using the IMF Multimod, but mostly through investment demand.

16. The indices used are: the Dow Jones for the United States, Topics in Japan, Toronto stock exchange for Canada, FTSE for the UK, DAX for Germany, SBF250 for France and MIB storico for Italy.

17. Looking for a longer-term wealth effect would require the identification of the absolute level of wealth which cannot be done within this framework.

18. Consumption growth is currently explained by an error-correction mechanism involving real disposable income, inflation and the real short-term interest rate, as well as their first differences; unemployment fluctuations are included to represent confidence effects. For the United Kingdom, the change in real house prices is also included. For more details see Holtham and Kato (1986) and Turner and Rauffet (1994).

Equation [4] was estimated by OLS on half-yearly data and subjected to the usual statistical tests. Overall results are presented in Table 4.

26. Generally, the results are satisfactory in the sense that stock market price indices are found to be statistically significant and correctly signed for all the G7 countries, except Italy (where it is significant at only 12.5 per cent level). For Japan the stock market index appears to be significant only in the later period, starting in 1984. In line with the degrees of stock market capitalisation, the United States exhibits the largest direct elasticity estimates, followed by the United Kingdom, Canada and Japan. For the United Kingdom, separating a house price effect significantly reduces the estimated sensitivity to market fluctuations[19]. Overall, these elasticity estimates are broadly in line with the calibrated wealth elasticities computed in the previous section (Table 3), even though they are weaker for Canada and slightly higher for Germany and France.

27. For the United States, the single equation dynamic simulations based on these estimates suggests that a 10 per cent decrease in share prices leads to a 0.5 per cent reduction in consumption within a year, which suggests a confidence effect consistent with there being a short-term overreaction. For the United Kingdom, Japan and Canada, the estimates suggest corresponding declines in consumption of 0.4, 0.3 and 0.2 per cent respectively within two years. For the continental European economies, the estimated effect of an equivalent fall in equity prices within two years is less than 0.2 per cent.

28. Aside from the standard tests, further investigation was undertaken to test three additional hypotheses[20]. First, stock market volatility has dramatically increased over the past ten years (see Figure 1). This may have raised uncertainty about stock market gains and thereby affect their influence on consumption. Secondly, the recent literature suggests that financial liberalisation might have enhanced the wealth effect (mostly by alleviating the liquidity constraint). Finally, a test for potential asymmetric effects was made.

29. To assess the potential impact of stock market volatility on estimated responses, a number of different proxies for volatility were introduced into the above specification[21]. The corresponding estimates for whatever measure of volatility was used suggest that this influence is largely insignificant. Moreover, when significant, the coefficient is positive, which is counter-intuitive: rising uncertainty should affect consumption negatively. Overall, these estimates provide no evidence of any significant impact of stock market volatility on the consumption relationship.

30. Evidence of stronger wealth effects in the more recent sample period was obtained for three of the seven major OECD countries, supporting the idea that financial liberalisation and broadening of stock ownership has increased the potential impact of stock market fluctuations on consumption behaviour. This is most clearly the case for Japan, where the influence of real share price is only significant from

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19. A priori, house prices affect household wealth in a similar way to financial asset prices. However this only applies to house owners; a rise in house prices might actually depress the current consumption of households wishing to buy a house, since they then need to accumulate higher savings. For the United Kingdom, where two-thirds of households own their houses (compared with 54 per cent for France and 38 per cent for Germany in 1995), a positive effect appears to be dominant

20. The statistical results are not reported here, but are available from the authors upon request.

21. Three main proxies for stock market volatility were used: the acceleration in the real stock market share index, the erratic component of the real stock market index filtered with Hodrick-Prescott methods (with alternative smoothing constants of 400, 1600 and 6400), and a five year moving variance of the real stock market index.

1984 on. For the United States and the United Kingdom, the estimated elasticities with respect to real share prices have also increased over the recent period. Estimates over shorter samples, as well as a search for possible shifts in parameters, suggest that the estimated elasticity for the United States has risen from about 4½ per cent to 6½ per cent since 1985. For the United Kingdom, this elasticity also appears to be significantly stronger since the mid-1980's, at 4 to 5 per cent now (depending on the choice of specification) compared with less than 2 per cent before that period.

31. Finally, no significant asymmetries were detected for the G7 economies. Estimates for the United States, suggest that a fall might have a slightly larger impact than a rise, but a Wald test shows the difference in the coefficients to be statistically insignificant. These results may appear paradoxical as, in general, episodes of rising equity prices have been more closely associated with periods of falling private savings, especially in the United States, whereas past episodes of falling stock market prices seem to have had little influence on household consumption and economic activity (e.g. in 1987). However, one should note that over the recent past, share price increases have tended to be persistent, whereas falls have been comparatively temporary. Furthermore, as illustrated in 1987, monetary authorities have sometimes reacted relatively quickly to sharp drops in stock market values by lowering policy-controlled interest rates, thereby counteracting the potential negative wealth effects on households. There is little evidence of any similar reactions to persistent increases.

4.2 Simulated impact of a 20 per cent fall in stock market prices

32. Based on the consumption equations reported in Table 4, simulations were carried out with the OECD INTERLINK model to take account of wider multiplier effects[22]. Two sets of simulations were made: a fall of 20 per cent in equity prices (e. g. as observed between mid-July and mid-October 1998) for each of the G7 countries (i.e. a single country shock), and a simultaneous fall in equity prices of 20 per cent for all G7 countries (i.e. a global shock). In all these simulations, real interest rates, real government expenditures and nominal exchange rates were assumed to remain unchanged relative to baseline. The corresponding results are reported in Table 5 below.

33. The *single country* results show the size of the potential direct macroeconomic impact of a fall in share prices in each of the major OECD countries given the ranking of estimated elasticities. The effects on private consumption are as expected considerably stronger for the United States than for any other country. For the United States, the simulated effect on GDP of a 20 per cent fall in equity prices reaches about ¾ per cent relative to baseline over the first two years and is roughly twice as large as for Japan or the United Kingdom. For all other countries, the GDP reduction does not exceed 0.2 per cent. In all countries, the simulated reduction in GDP is smaller than for private consumption and total domestic demand, reflecting a contraction in imports.

34. The effects of a *simultaneous* fall in equity prices in all the major countries are found to be more significant, with an average 0.7 per cent fall in the level of GDP in the G7 countries relative to baseline in the first year, cumulating to 0.8 per cent by the end of the second year, compared with an average 0.5 per cent in the single-country case. The corresponding GDP reductions for the OECD area as a whole, are 0.6 and 0.7 per cent respectively in the first and second years. The United States, followed by Japan, the United Kingdom and Canada are found to be most affected. However, even though the direct impact of the shock may be smaller, the continental European G7 economies are significantly affected by international trade linkage effects, with GDP falling by up to ½ per cent in the case of a global shock,

22. Equation [2] (Table 4) was used for the United Kingdom.

compared with an average of less than 0.2 per cent in the single-country case. For all these latter countries there is a stronger negative effect on activity than on domestic demand, reflecting the relative importance of the indirect trade effects. The response of the major OECD economies is also found to be quite rapid, with most of the effect on activity taking place within the first year for most countries.

5. Conclusions

35. The estimates reported in this paper generally confirm statistically significant stock market wealth effects for the United States, with an impact on consumption (measured in terms of marginal propensity to consume) in the range of 4 to 7 per cent, i.e. in line with other recent empirical evidence. These results are generally confirmed by evidence obtained by including share price indices directly in the US consumption equation. However, such effects are not so well determined for other G7 countries and are generally weaker, especially for the continental European countries, due to smaller stock ownership, less equal distribution, and later financial liberalisation.

36. When incorporated in full macro-model simulations, these estimates suggest that a 20 per cent fall in equity prices in all G7 stock markets, would have a significant impact on the world economy, with the level of OECD GDP reduced by up to ¾ per cent over two years. As expected, the effect is found to be stronger for the United States than for any other country. But even for continental Europe, where the estimated direct effects are weaker, activity would be quite significantly affected, with a fall of ½ per cent within two years, reflecting also wider international trade effects.

37. Nevertheless, these estimates should be interpreted with care, as they are necessarily limited in scope. Two points deserve particular attention. First, it should be borne in mind that the effect of a sharp correction in equity prices will also affect investment and credit[23]. Taking such effects also into account, the impact on OECD GDP could be more substantial. On the other hand, past episodes of stock market adjustment (such as the 1987 crisis) have shown that, by lowering interest rates, monetary policy may have sufficient leverage to avoid and offset the effects of an important reduction in equity prices.

23. While difficult to assess, available evidence suggests that the impact of equity price movements on investment could be up to four times as large on investment as on consumption (see Meredith [1997]). Since investment is normally one-fourth as large as consumption, both components might contribute roughly equally to the possible decline in output.

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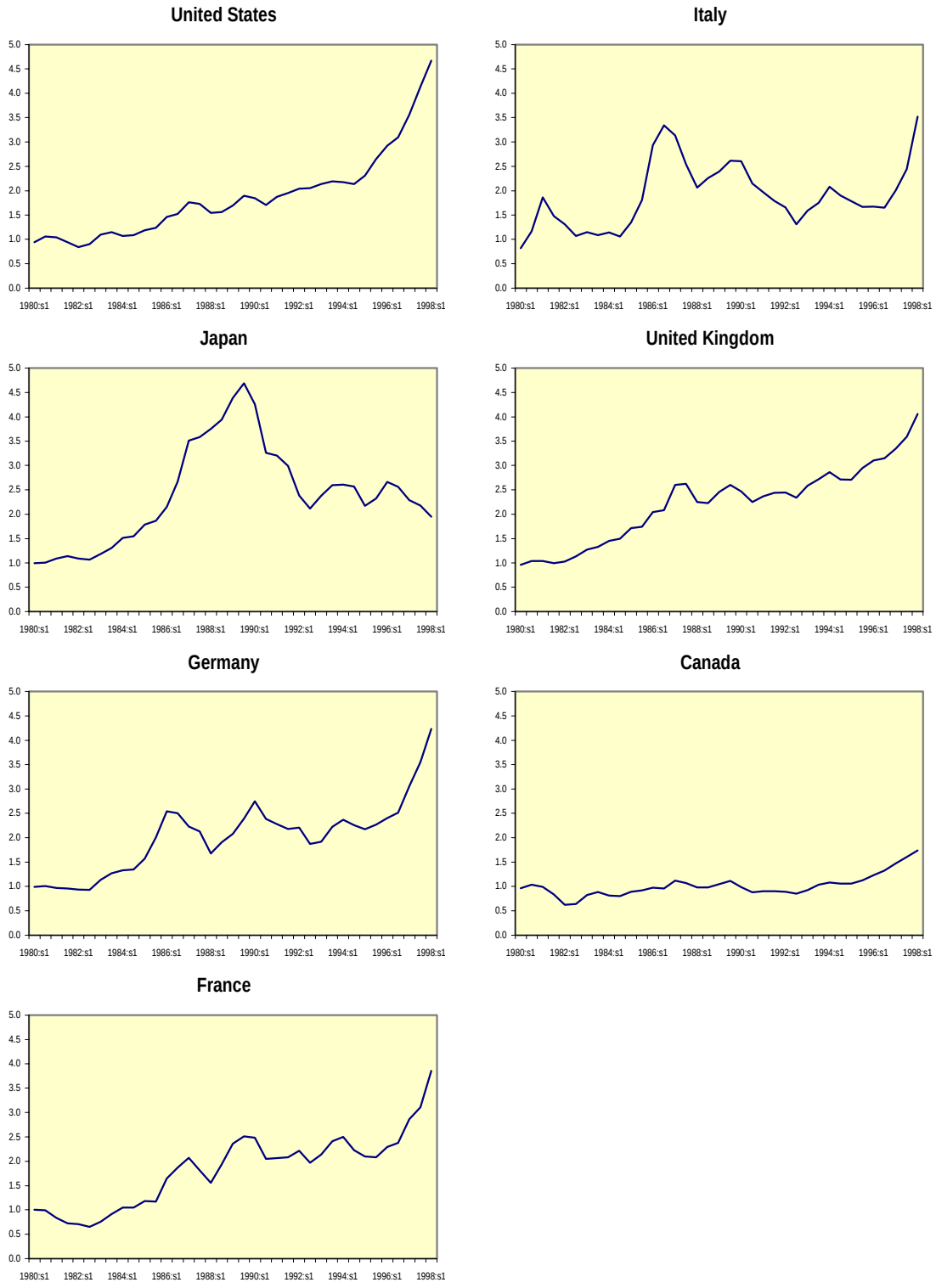
Figure 1. Real share prices
(index 1980 = 1)



Source: the Dow Jones for the US, Topics in Japan, Toronto stock exchange in Canada, FTSE in the UK, DAX in Germany, SBF250 in France and MIB storico for Italy. Share prices are deflated by the consumption deflators.

Table 1. Households direct equity holdings, net financial wealth and disposable income

A. Household's equity holdings as a per cent of net financial wealth [1]

	1970[2]	1980[3]	1990	1994	1997
United States	-	13.8	12.1	16.0	20.7
memo: including indirect	-	17.0	16.9	23.7	33.6
Japan	24.7	19.0	26.1	16.1	-
Germany	12.1	5.3	6.1	6.0	9.0
France	-	14.1	22.2	14.6	13.4
Italy	1.9	2.5	7.8	7.3	13.0
United Kingdom	23.0	17.9	23.0	23.1	26.1
Canada	39.9	38.5	34.2	38.4	42.6

B. Household's equity holdings as a per cent of disposable income [2]

	1970[2]	1980[c]	1990	1994	1997
United States	80.6	46.8	44.3	62.1	100.1
memo: including indirect	100.1	57.6	62.1	92.1	162.3
Japan	24.0	23.5	58.1	36.2	-
Germany	13.9	7.4	11.6	10.9	18.8
France	-	9.0	11.7	12.2	15.3
Italy	2.1	2.7	15.6	16.9	33.8
United Kingdom	30.1	24.0	45.2	58.5	87.9
Canada	63.3	57.9	57.5	79.0	98.9

1. For France and Italy, national source estimates for household equity holding have been corrected to exclude non-quoted shares.
2. 1975 for Italy and the United Kingdom.
3. 1985 for France.

Source: Annex Table 58 in *OECD Economic Outlook No. 64*.

Table 2. Estimation of stock market wealth effect for the United States

	Wealth definition	
	FED	BIS
Dependent variable: Δ(cy)		
Explanatory variables: constant	-0.02	-0.006
	(-3.3)	(-2.05)
(cy)(-1)	-0.35	-0.27
	(-5.01)	(-4.66)
smwy(-1)	0.02	0.012
	(3.85)	(3.08)
nsmwy(-1)	--	--
irs(-1)	-0.0009	-0.0008
	(-2.72)	(-2.45)
Δ(cy)(-1)	-0.16	-0.22
	(-1.88)	(-2.57)
Δsmwy	--	--
Δsmwy(-1)	0.031	0.015
	(2.25)	(1.79)
Δnsmwy	0.21	0.19
	(3.62)	(4.07)
R2	0.40	0.40
SE of regression	0.007	0.007
Sum of squared residuals	0.004	0.004
DW	2.1	2.2
F=statistic	9.92	9.7
Implied long-run elasticity with respect to stock market wealth (per cent)	5.7	4.7

Note: Both specifications pass the standard serial correlation and recursive test. Student t-tests are in brackets.

Table 3. Estimated change in consumption following a 10 per cent in the value of stock market wealth fall

	Disposable income to private consumption ratio[1]	Households' equity holdings as a percentage of disposable income[1]	Calibrated marginal propensity to consume[2]	Change in private consumption in per cent[3]	
				Assuming an mpc of 4.5 per cent as in the US	Assuming a lower mpc than in the US[4]
United States					
excluding indirect equity holdings	1.02	100.1	4.5	-0.46	-0.46
including indirect equity holdings	1.02	162.3	4.5	-0.75	-0.75
Japan	1.14	32.6	1.5	-0.17	-0.05
Germany	1.12	18.8	0.8	-0.10	-0.02
France	1.17	15.3	0.7	-0.08	-0.01
Italy	1.14	33.8	1.5	-0.17	-0.06
United Kingdom	1.12	87.9	4.0	-0.44	-0.39
Canada	1.02	98.9	4.4	-0.45	-0.45

1. Estimates for 1997. See Annex Table 58 in *OECD Economic Outlook No. 64*. For France and Italy, national sources' estimates for household equity holding are corrected to exclude non-quoted shares. Data presented are based on national authorities' estimates of the ratio of quoted to non-quoted shares in household portfolios.

2. The mpc in country k is estimated by weighing the US marginal propensity to consume according to the degree of country k households equity holding in the disposable income relative to the US. Thus, mpc(k)=mpc(US)*(equity as % of disposable income)(k)/(equity as % of disposable income)(US).

3. The change in private consumption is $\Delta C=mpc*(\Delta stock\ index)*(\Delta equity\ holdings)$, which may be computed as $\Delta C/C=mpc*(\Delta stock\ index)*(\Delta equity\ holdings\ as\ \%\ of\ disposable\ income)*(disposable\ income\ to\ private\ consumption\ ratio)$, where Δ is the change in the variable.

4. As shown in the third column of the table.

Table 4. Private consumption equations for the Major Seven OECD countries

	USA	Japan	Germany	France	Italy	United Kingdom (1)	United Kingdom (2)	Canada
Dependent variable DLnCPV								
Estimation period	74:2-97:2	79:1-96:2	70:1-97:2	65:1-96:2	76:1-96:2	63:1-97:2	63:1-97:2	62:1-97:2
C	-	-	-0.0230***	-0.0127**	-	-0.0130**	-0.014**	0.0193***
DLnCPV(-1)	-	0.3854***	-	-	0.1852*	-	-	-
DLnYDRH	0.3083***	0.2417	0.6131***	0.3178***	0.2094**	0.5567***	0.4482***	0.2162***
DUNR	-0.0057***	-0.0183	-	-0.0071**	-	-0.0088***	-0.0056***	-
DUNR(-1)	-	-	-0.0039*	-	-	-	-	-
DDPCP	-	-0.0032	-	-	-	-	-	-
DLn(SP/PCP)	0.0178**	0.0216**	-	0.0141*	-	0.0260**	-	-
DLn(SP((-1)/PCP(-1))	0.0460***	-	0.0179**	-	0.0080	-	-	0.0234**
DLn(SP(-2)/PCP(-2))	-	-	-	-	-	0.0351*	0.0430**	-
DLn(RHP)	-	-	-	-	-	-	0.0984***	-
Ln(YDRH(-1)/CPV(-1))	0.3508***	0.0416***	0.2285***	0.1645***	0.1135***	0.1787***	0.1949***	0.1031
DPCP	-0.0026***	-	-	-0.0008**	-	-	-	-0.0030**
DPCP(-1)	-	-	-		0.0011***	-	-	
IRSRC	-	-	-0.0009**	-	0.0008***	-	-	-
IRSC(-1)	-0.0012***	-	-	-	-	-	-	-0.0029***
R2	0.86	0.65	0.80	0.66	0.79	0.73	0.78	0.73
S.E. of reg. X100	0.384	0.578	0.532	0.682	0.557	0.806	0.733	0.676
Sum squar. res. X100	0.056	0.093	0.136	0.260	0.106	0.403	0.333	0.293
DW	1.86	2.34	1.72	1.82	1.93	1.75	1.89	2.00
F-statistic	29.2	7.5	32.4	18.1	18.6	28.2	36.2	24.8
Implied elasticity with respect to real equity prices (per cent)	6.4	2.2	1.8	1.4	0.8	5.1	4.3	2.3

Note:

a) The following tests were performed on the estimated equations: Chow stability test (with the sample split in 83:1 except in Japan in 87:1); Chow in prediction (as from 92:2); autocorrelation (LM test with 2 lags);

b) Functional form (Ramsey-rest test) and normality of residuals. They led to a shortening of the estimation period in the case of Japan. The following dummies were also added in the equations;

c) United States: 88:2 and 91:2; Japan 84:2 and 92:2, Germany: 83:1; France 68:2; Italy: 78:1 and 93:1; United Kingdom: 79:2 in equations 1 and 2; Canada: 74:1 as well as a shift in the constant since 90:1;

d) Overall the equation reported all pass the tests carried out at conventional levels.

e) ***, ** and * mean significant at 1.5 and 10 per cent respectively.

Table 5. Simulation results

	Simulated effect of a 20 per cent fall in real share prices in each individual country				Simulated effect of a 20 per cent simultaneous fall in real share prices in G7 countries			
	(per cent difference from baseline)				(per cent difference from baseline)			
	CPV level		GDPV level		CPV level		GDPV level	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year2
United States	-1.2	-1.1	-0.8	-0.8	-1.2	-1.2	-1.0	-1.0
Japan	-0.6	-0.7	-0.5	-0.4	-0.7	-0.8	-0.7	-0.8
Germany	-0.2	-0.4	-0.1	-0.2	-0.3	-0.5	-0.4	-0.5
France	-0.3	-0.2	-0.1	-0.1	-0.3	-0.3	-0.3	-0.4
Italy	-0.1	-0.2	-0.1	-0.1	-0.1	-0.2	-0.2	-0.4
United Kingdom	-0.0	-1.0	-0.0	-0.4	-0.0	-1.0	-0.1	-0.7
Canada	-0.3	-0.4	-0.1	-0.1	-0.3	-0.4	-0.5	-0.5
Major 7	-0.7	-0.8	-0.5	-0.5	-0.7	-0.8	-0.7	-0.8
OECD total					-0.6	-0.7	-0.6	-0.7

Note: real interest rates, real government expenditures and nominal exchange rates have been kept unchanged to baseline in the simulations.

ANNEX

1. Stationarity Tests and Cointegration Analysis Tests

38. Stationarity was tested using the standard ADF procedure. The chosen specification includes an intercept in the equation, but no trend except for the consumption to income ratios and stock market wealth to income ratios. The results are as expected: all the variables are I(1) (though it is less clear cut for the unemployment rate that could be stationary).

Table A1. Results of ADF tests

	Null hypothesis	
	I(0)	I(1)
cy	-2.63	-6.52
smwy(BIS)	-2.78	-5.72
smwy(FED)	-2.35	-5.92
Inflation	-1.85	-3.98
nsmwy (BIS)	-0.34	-5.20
nsmwy (FED)	0.41	-4.44
irs	-1.44	-4.92
irsrc	-1.91	-6.27
unr	-2.77	-

McKinnon critical values are:

specification with intercept only:
-3.4986 (1%), -2.8912 (5%), -2.58 (10%)

specification with trend and intercept:
-4.055 (1%), -3.4561 (5%), -3.231 (10%)

2. Johansen Cointegration tests

39. Only significant cointegrating vectors (at 5 per cent or 1 per cent confidence level), whose components are all significants are reported below. When the real interest rate is used, the only cointegrating vector found to be significant has eight lags. When the nominal interest rate is used, two types of cointegrating vectors are significant, with lag lengths varying between 2 and 8: vector (1) embodies three variables (the consumption to income ratio, stock market wealth to income ratio and the nominal interest rate); vector (2) embodies the same variables as vector (1) but also includes the non-stock market wealth to income ratio. These results hold for both definitions of wealth, though they are slightly less robust under the BIS definition.

Table 2. Significant cointegrating vectors

Vector number	Lags	Constant	cy	smwy(FED)	smwy(BIS)	nsmwy(FED)	nsmwy(BIS)	irsrc
	8	0.040	1		-0.055			0.0008
					(0.0007)			(0.0001)
Vector number	Lags	Constant	cy	smwy(FED)	smwy(BIS)	nsmwy(FED)	nsmwy(BIS)	irs
1	2	0.073	1	-0.056				0.0015
				(0.007)				(0.0008)
	4	0.071	1	-0.052				0.0017
				(0.008)				(0.0009)
	6	0.055	1	-0.039				0.0034
				(0.01)				(0.0011)
	8	0.054	1	-0.0359				0.0034
				(0.01)				(0.0012)2
	2	0.031	1		-0.047			0.0019
					(0.008)			(0.001)
	6	0.025	1		-0.034			0.0037
					(0.009)			(0.001)
	8	0.029	1		-0.035			0.0031
					(0.009)			(0.001)
2	2	0.101	1	-0.089		-0.072		0.0017
				(0.0019)		(0.037)		(0.0009)
	4	0.097	1	-0.089		-0.085		0.0026
				(0.0022)		(0.045)		(0.001)
	6	0.102	1	-0.094		-0.112		0.0032
				(0.022)		(0.047)		(0.0013)
	8	0.098	1	-0.084		-0.106		0.0032
				(0.020)		(0.043)		(0.0013)
	6	-0.179	1		-0.0212		-0.212	0.0046
					(0.01)		(0.10)	(0.001)

Since real interest rates did not provide statistically significant and robust relationships, it was decided to focus on the nominal interest rate. To distinguish between the various cointegrating vectors, as well as confirm these tests, the individual variables were directly included in levels terms into the dynamic relationship, lagged once. On this basis, cointegrating vector (1), with two lags was found to match the dynamic representation, for both definitions of wealth.

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