CFR-Working Paper NO. 05-09

Saving, Investment and the Net Foreign Asset Position

Mathias Hoffmann

centre for financial Research
Look deeper

Saving, Investment and the Net Foreign Asset Position

Mathias Hoffmann*
Department of Economics
University of Cologne†

August 24, 2005

Abstract

Over the last two decades, countries have exhibited net foreign assets and liabilities. This paper develops an empirical model to examine the causes for the stock of the net foreign asset positions in 51 developing and industrialised countries. The reasons for significantly high or low net foreign asset positions can be derived from long-run trend differences in saving and investment. Using cointegration techniques, it is shown that GDP per capita, public debt and demographic factors influence long-run saving and investment and, hence, net external wealth of developing and industrialised countries.

JEL Classification: C23, F41, G15

Keywords: Savings, Investment and Net Foreign Assets, Cointegrated Panel Data

*I would like to thank Philip R. Lane for helpful comments and suggestions.

†Address of Correspondence: Mathias Hoffmann, Department of Economics, University of Cologne -Chair of International Economics, Albertus-Magnus-Platz, 50931 Cologne, Germany. email: m.hoffmann@wiso.uni-koeln.de

1 Introduction

Over the past two decades free capital mobility around the world has become increasingly important and has encouraged the financial integration across countries. Financial integration comprises international asset trade, which allows countries to borrow resources from the rest of the world or lend them to the most productive locations abroad. This resource exchange across time is called intertemporal trade and is *inter alia* mirrored in the net foreign asset position of countries. The intertemporal asset trade enables a country with a temporary income shortfall to smooth consumption with the aid of loans from foreigners. Similarly, the intertemporal trade in assets allows countries to participate in productive investment opportunities in countries with relatively low saving rates. Thus, financial integration de-links national saving and domestic investment in an open economy. Consequently, a country is able to accumulate net foreign liabilities if consumption and investment cannot be funded domestically.[1]

The German unification in the beginning of the 1990s led to a significant decumulation of its net foreign asset position, which was due to the need to finance the temporary increase in consumption and investment over this time period. Thus, the country utilised the intertemporal asset trade by increasing its domestic absorption and decreasing domestic savings. The switch of the United States from a large net foreign creditor to a net foreign debtor as a result of a large and persistent current account deficit in the 1980s and 1990s is another good example of the importance of savings and investment in determining the net foreign asset position of an open economy.[2] The change in the net foreign asset position was due to a sharp fall in the national saving rate relative to the investment undertaken. The shortfall in saving was covered by foreign capital inflows and led to a deterioration of the net foreign asset position. As the United States' net foreign asset position became weaker, other industrialised countries became net foreign creditors. The Federal Reserve Board (2002) found that from 1996-2002, about 40 percent of the total increase in the United States' capital stock was financed, on net, by savings from abroad.

These examples illustrate that intertemporal trade is strongly affected by the saving and investment behaviour of countries and that saving and investment determine the net foreign asset position of countries in the long-term. The purpose of this paper is to examine whether

[1] This perception motivated Feldstein and Horioka's (1980) work in which the authors highlight the correlation between national savings and domestic investment.

[2] Countries with growing output may be able to run perpetual current account deficits by reducing their external liabilities relative to GDP. Should foreign investors become less willing to invest in a country, the debt would have to be repaid by running trade surpluses. Maintaining domestic investment will necessitate an increase in national saving.

significant net foreign asset positions across countries are due to long-run trend differences in saving and investment behaviour rather than business cycle effects. The paper explains long-run saving and investment by a set of three variables, namely GDP per capita, public debt and demographic factors. There is evidence that these variables act as the principal determinants of net foreign assets in the long-run, as suggested by Lane and Milesi-Ferretti (2002).[3] Thus, the three variables provide the starting point for the paper's analysis of a long-run relationship between saving, investment and the net foreign asset position.

This paper utilises time series and cross section data in a dynamic model to differentiate between the effect of the three variables on saving and investment. The dynamic model allows to capture the long-run relationship between the variables of interest. Once the precise influence of GDP per capita, public debt and demographic factors has been clarified, further insights on their ability to influence net foreign assets via saving and investment are obtained. The differential effects of the three variables on long-run saving and investment allow to determine the residual between the two, the long-term net foreign asset position. Despite its importance there is relatively little empirical work addressing the effect of output per capita, demography and public debt on the net foreign asset position via savings and investment. Papers closest to this work are Higgins (1998) and Taylor (1994). Higgins analyses demographic effects on national savings and investment. The author discusses the implications for the current account balance but does not take into account effects of public debt and domestic wealth per person. Taylor also incorporates demographic factors into his analysis to investigate the saving-investment puzzle initiated by Feldstein and Horioka (1980). However, he only concentrates on the correlation between saving and investment.

The approach taken in this paper allows to make predictions about whether saving or investment drive the long-run net foreign asset position of countries. Since differences in life expectancy and retirement patterns in industrialised and developing countries affect saving and investment in a distinct manner the paper provides evidence whether demographic changes affect the long-run net foreign asset position mainly via long-run saving or investment behaviour of industrialised and developing countries. Similarly, analysing the effect of public debt on long-term investment helps to make predictions whether long-run changes in the fiscal position of countries affect countries' ability to attract new investment and, hence, capital, mirrored in the net foreign asset position. With respect to the long-run saving rate, it might shed further light on the discussion whether the Ricardian equivalence holds across industrialised and developing

[3] The authors concentrate on the stocks of net foreign assets. Previous literature on foreign assets and liabilities concentrated on flows rather than stock positions of countries. Flows arise to close the gap between the actual and desired stock position.

countries. Moreover, GDP per capita reflects a country's wealth per person. There are two off-setting affects, namely the income and substitution effect, which influence the saving, and to a certain extent the investment behaviour of countries. The saving rate might either increase or decrease, depending on the relative strength of the income and substitution effects. This in turn feeds back into the net foreign asset position of countries.

To examine the impact of long-run saving and investment flows on a country's net foreign asset position in more detail, the next section outlines the theoretical background underlying this work. Section 3 depicts the empirical strategy and the data used for this study. Estimates of the effects of income per capita, public debt and the population age structure on long-run saving and investment are also presented in this section. Moreover, the role of GDP per capita, public debt and demographic factors in influencing the net foreign asset position via long-run saving and investment is delineated in more detail. Section 4 concludes by discussing the main implications of the paper.

2 Theoretical Background

In a closed economy saving and investment are identical by definition. However, in an open economy they do not need to equalise. If capital is mobile, changes in the long-run saving rate will be directly mirrored in the net foreign asset position, F. Hence, the gap between saving and investment is financed by borrowing or lending, and F is the indicator of the long-run saving-investment balance of an economy.[4] The net foreign asset position includes all forms of financial assets and is calculated as the sum of all foreign claims minus all foreign liabilities. Thus, countries with negative net foreign assets at time t, $F_t < 0$, are net debtors while $F_t > 0$ identifies a country as a net creditor at time t. In the balance of payments, the change in the net foreign asset position equals the current account and a term $\mathcal{E}_t$, which captures valuation effects, net errors and omissions. $\mathcal{E}_t$ includes changes in unrecorded debt assets held by country residents abroad as well as capital gains and losses on existing claims.[5] Given valuation effects, net errors and omissions, it is difficult to analyse the flow of net foreign assets. Therefore, the paper concentrates on the stock position of net foreign assets, which is the relevant state variable at the macroeconomic level. The econometric approach utilises the long-term relationship between saving, investment and net foreign assets. This long-run relationship can be clarified by

[4] Saving, investment and net foreign assets are clearly part of a unified theory with an intertemporal dimension (see Obstfeld and Rogoff, 1996).

[5] The long-run or steady state net foreign asset position in a non-zero growth environment depends on output growth as well as the rates of return, which are not explicitly discussed above but captured by $\mathcal{E}_t$ (see Lane and Milesi-Ferretti, 2002).

recognising that in a small open economy the net foreign asset position, F, at time t follows the difference between country $i's$ wealth, W, and its capital stock, K:

$$F_{t,i} = W_{t,i} - K_{t,i}. \tag{1}$$

In country $i's$ long-run equilibrium or steady state linear relationships between saving and domestic wealth as well as investment and the capital stock exist. In the long-run, the capital stock approaches its steady state value and investment, I, will become stable since it is used to replace the depreciated capital. Similarly, saving, S, will establish a level which allows to off-set long-term changes in domestic wealth. Hence, in the long-run or steady state all variables are linearly related. Consequently, a fixed fraction of an economy's wealth will be consumed while the remaining fraction γ is used for saving,

$$W_{t,i} = \omega S_{t,i}, \text{ where } \omega = \frac{1}{\gamma}. \tag{2}$$

As the capital stock consists of all productive assets in the economy, a constant fraction, λ, of productive assets in the economy will be used for the reproduction of depreciated capital and, hence, will be reinvested:

$$K_{t,i} = \kappa I_{t,i}, \text{ where } \kappa = \frac{1}{\lambda}. \tag{3}$$

Since the empirical part analyses the long-run equilibrium relationships of the data, the capital stock and domestic wealth are captured by country $i's$ investment and saving rate. Thus, with the use of equations (2) and (3) it is possible to express the net foreign asset relationship in equation (1) as

$$F_{t,i} = \omega S_{t,i} - \kappa I_{t,i}. \tag{4}$$

Equation (4) shows that the net foreign asset position can be gauged by the long-run behaviour of saving and investment. Based on the fact that the net foreign asset position of country i can be explained by income per capita, public debt and the population age structure, equation (4) implies, that the long-run or steady state effects of saving and investment are also captured by the behaviour of GDP per capita, public debt and demographic factors. Now, the question to what extent long-run saving and investment are affected by income per capita, public debt and the population age structure arises. The effect on the external position depends on the extent to which the long-run saving rate restricts the domestic supply of capital. If the long-run investment rate is not influenced by output per capita, public debt and the population age structure, changes in savings will be directly reflected in the net foreign asset position. If capital is not perfectly mobile, the outcome is less pronounced. The effects of the three factors on the net foreign asset position vanish if capital is immobile. Nevertheless, if long-run investment is independently affected by changes of the three factors, a more complex scenario arises. Domestic investment and saving rates may be more or less correlated. The effects on the country's net foreign asset position might be either reinforced or weakened even if capital is internationally mobile.

To examine the empirical implications of GDP per capita on saving, investment and the net foreign asset position in more detail, one has to account for the fact that more developed countries tend to have higher capital stocks and, if productivity is the same, lower marginal products of capital. This decreases the rate of return on domestic capital and tends to lower savings (substitution effect). However, in the open economy the negative saving effect might be off-set if home investors have access to international capital markets. This allows them to seek new investment opportunities abroad with higher rates of return than at home. This would transform the home country into a holder of net foreign assets. The saving rate tends to rise as a closed economy grows richer, which is due to the diminishing gap between current and permanent income (income effect). Consumption tends to fall relative to income while the saving rate rises. In the open economy, there could be a permanent change in the net foreign asset position even if the path of the high saving rate is temporary. Developing countries might operate under credit constraints, which are particularly binding for low-income countries with low growth performance. However, an increase in growth and, hence, production allows such countries to participate more strongly in international capital markets. Consequently, the link between domestic saving and investment might be relaxed.

The demographic effects on a country's wealth and capital stock depend on the population age structure and can be summarised by the dependency rate theories of savings and theories of population-sensitive capital formation (see Goldberger, 1973 and Leff, 1969). Saving rates are negatively affected by a high dependency rate or an old population ratio. Young and old people consume more than they produce and depend on the provision of goods by productive members of the economy.[6] Hence, countries with a high ratio of a working-age population should explore positive saving effects. The two opposite effects on the saving rate are due to off-setting demographic mechanisms at work. Domestic investment will be negatively affected by a reduction in growth of the working-age population if capital and labour are complements in production.[7] A high dependency and an old population ratio imply a heavy demand for social

[6] This follows from the life cycle theory of consumption, where higher income and saving in mid-life offset dissaving when young and old.

[7] This will especially hold for business investment. An efficient and experienced workforce has a favourable

infrastructure and might positively affect investment rates. From the discussion it becomes clear that the impact of demographic factors on the saving and investment rate clearly depends on the distribution of population age in the economy. Thus, the empirical investigation helps to shed further light on the actual relationship between saving, investment and demography.

The last variable to be considered in the empirical analysis is the stock of public debt. The effects on the saving rate depend on whether the Ricardian equivalence holds. Higher levels of public debt are associated with higher domestic saving rates by households when the Ricardian equivalence theorem holds. A rise in public debt may have no effect on the overall saving rate of the economy, S, since private saving will rise by an equivalent amount in anticipation of future repayments of debt. A departure from the Ricardian equivalence implies that an increase in public debt is not fully off-set by an increase in private saving. This is due to the positive impact on private wealth. The effect on the saving rate becomes more ambiguous. Myopic households will raise consumption since households shift the burden from present to future generations. A decline in government saving will lead to a decline in national saving. This result would also hold if households form rational expectations about future liabilities but are liquidity constrained. This constraint would prevent households from acting on these expectations by adjusting their consumption-saving behaviour. Nevertheless, in an open economy the increase in public debt may increase the domestic interest rate and lead to an increase in foreign savings. High public debt may also result in households' transferring funds abroad instead of saving domestically due to the expected high future tax burden. This would increase the costs of capital formation at home. A higher public debt may crowd out private capital formation by reducing the availability of credits to the private sector or by raising interest rates. Given this, the overall effect on the domestic investment rate might become negative. When public debt is used for investment in infrastructure projects this may complement private investment. A high public debt burden could discourage foreign investment in the economy since the government may resort to restrictions on external payment obligations on investment income. Overall, the effect of public debt on saving and investment is ambiguous and requires an empirical assessment.

3 Empirical Approach

To shed light on the long-run relationship between saving, investment and the net foreign asset position this paper utilises a dynamic econometric approach. In particular, it investigates whether it is saving or investment which drives the long run net foreign asset position of countries via demographic factors, GDP per capita and public debt. The paper concentrates on the

impact on capital accumulation in production.

post 1980s period, which reflects an environment of capital mobility due to liberalised capital accounts. The sample consists of 30 developing and 21 industrialised countries (see Tables 1 and 2). To control for a potentially different relationship between public debt, output per capita and demographic factors on long run saving and investment in industrial and developing countries, this paper splits the sample into long-standing members of the OECD and less developed countries. Most industrialised countries are holders of net foreign assets while developing countries in the sample are mainly characterised by holding net foreign liabilities. Liquidity constraints and other sources of violation from Ricardian equivalence in developing countries may induce differences in the relation between saving, investment and public debt in the two groups. Income per capita has different effects on saving and investment behaviour, depending on whether a country is richer or poorer. Different demographic structures are clearly present in the industrialised and developing countries under consideration. Thus, to distinguish between the different effects of the two groups' structure of variables, the sample is split into developing and industrialised economies.

Data and Time Series Properties

The investment rate equals the gross rate of capital formation over GDP and is derived from the World Development Indicators (WDI, 2002). The saving rate follows as the residual from the current account identity, calculated by the current account balance plus the investment rate of country i. Wealth per person of a country is approximated by its GDP per capita in 1995 US dollars and measured in logs (WDI). The stock of public debt as a ratio of GDP is obtained from Lane and Milesi-Ferretti (2002). The demographic variables are calculated by a method of cubic polynomials, suggested by Fair and Dominguez (1991).[8] This technique allows to incorporate the demographic information into the statistical analysis and has the advantage of capturing the entire age distribution, splitting it into twelve population age cohorts: 0-14, 15-19, 20-24, ..., 65+. The coefficients have no structural interpretation but the implicit age distribution coefficient α_j can be easily recovered from the estimated polynomials. The sources of the demographic variables are Lane and Milesi-Ferretti (2002) and Herbertson and Zoega (1999).

All variables are corrected for fixed and time effects to take into account unobserved country specific effects and common global movements. The fixed effects also have the advantage of controlling for unobserved variables that could lead to long-standing differences in saving and investment rates between countries. Adjusting for time effects allows to express the data relative to the world average.

As a precursor to the long-run analysis, the data series need to be tested for unit roots

[8] For a detailed explanation of this approach the reader is referred to the appendix.

and cointegration. To test the null hypothesis that the data generating process in question is stationary, the paper applies Hadri's (2000) approach. Tables 3 reports the results for the industrial and developing country sample. The test clearly rejects the null of stationarity in both samples.[9] Given that the time series properties of the data are not stationary, one has to consider the long-run relationships between the different time series to see whether there is a cointegration relation between the variables of interest.[10] The null hypothesis that the residuals are nonstationary, hence, that the data are not cointegrated, is used. Pedroni's (1999) and Kao's (1999) multivariate cointegration tests are applied. The test statistics are presented in Table 4 for the two country sets. A cointegration relation between saving and GDP per capita, public debt and demographic factors as well as between investment and these explanatory variables exists.[11]

Long-run Relationship

Having identified that the data series follow a common trend, Stock and Watson's (1993) procedure is utilised and the long-run relation between saving, investment and GDP per capita, public debt and demography is estimated by dynamic OLS (DOLS). $y_{t,i}$ reflects country i's ratio of either saving or investment to GDP in year t. $\mathbf{X}_{t,i}$ is a vector containing the explanatory variables. The $\boldsymbol{\beta}s$ are the parameters in the DOLS equation which estimate the long-run relationship between saving or investment and public debt, GDP per capita as well as the demographic age factors. Saving and investment are then estimated by seemingly unrelated regression (SUR) equations of the following form:

$$y_{t,i} = \mu + \boldsymbol{\beta}'\mathbf{X}_{t,i} + \boldsymbol{\gamma}_1'\Delta\mathbf{X}_{t,i} + \boldsymbol{\gamma}_2'\Delta\mathbf{X}_{t+1,i} + \boldsymbol{\gamma}_3'\Delta\mathbf{X}_{t-1,i} + v_{t,i}. \tag{5}$$

Tables 6 and 7 report the statistical inference for the 'dynamic' SUR estimations, which accounts for cross-equation error correlation in the saving and investment equation.

Industrial Countries Table 5 details the industrial countries' estimates of the saving and investment relationship. The estimated cointegrated investment equation shows a strong positive relationship between output per capita and the investment rate. An increase in a country's GDP

[9] The tests discussed are performed using the NPT 1.2 package by Chiang and Kao (2001). The test is applied for fixed and time effects. Using fixed effects only returns similar results. The alternative null hypothesis that the series is nonstationary using Levin and Lin (1992) was also tested. The test accepts the null of nonstationarity. Results are available on request.

[10] Particularly the treatment of saving and investment rates as $I(1)$ has been accepted in the recent literature. Assume that a variable X equals $X_t = X_{t-1} + \epsilon_t$ and that GDP equals $Y_t = Y_{t-1} + u_t$. Then $\frac{X_t}{Y_t} \equiv \left(1 - \frac{u_t}{Y_{t-1}}\right)\frac{X_{t-1}}{Y_{t-1}} + \frac{\epsilon_t}{Y_t}$. If Y_t is sufficiently large, $\frac{X_t}{Y_t}$ will behave like a random walk (see Levy, 2000).

[11] Pedroni's variance ratio test, ADF test and 'Philips-Perron' test also indicate a cointegration relationship. Kao's ADF test with one lag also rejects the null hypothesis that the residuals are nonstationary.

per capita by 20 percent means that the country's investment rate in relation to GDP increases by around 2.2 percentage points. This result provides evidence for the correlation between income per capita and the investment rate as a driving force in promoting a country's capital stock in the long-run. The estimated investment equation also illustrates that the parameter of public debt is statistically significant. A one percentage point increase in public debt reduces the investment rate of industrialised countries by 0.03 percentage points, suggesting that public debt crowds out capital formation in the long-run. Overall, a Wald test of the joint null hypothesis that the $\boldsymbol{\beta}$ parameters are equal to zero can be rejected at the 5 percent level. The age distribution coefficients, α_j, show that the maximal impact is found for the age group j =0-14 years. This might reflect a high demand for social infrastructure by the young people in the economy. A one percentage point increase in the share of the youngest in the economy is associated with a 0.22 percentage point increase in the investment rate. By contrast, a one percentage point rise in the age cohort 50-54 implies a fall in the investment rate by 0.2 percentage points. A complete picture of the effects of the age distribution on the investment and saving rate is provided in Figures 1 and 3. The estimation of the saving equation is able to explain 32 percent of the variation in the saving rate, given a country's GDP per capita, debt and demographic factors. The estimated parameter of public debt has a negative and statistically significant impact on the saving rate, implying that an increase in domestic public debt reduces the saving rate in industrialised countries. Interestingly, the result provides some evidence for a deviation from the Ricardian equivalence in developed countries. A Wald test of the null hypothesis that the $\boldsymbol{\beta}$ parameters are jointly equal to zero can be rejected.

Since the differential effects of the three variables on long run saving and investment allow to determine the residual between the two, the net foreign asset position, it is possible to make predictions about whether saving or investment initiate changes in industrial countries' long-term external wealth. Table 5 illustrates that an increase in public debt by 20 percentage points leads to a decline in savings by 0.42 percentage points and a reduction in the capital formation by 0.52 percentage points. Thus, the investment rate accounts for most of the long-run effects on the net foreign asset position. Leaving other factors unchanged, the net foreign asset position would not deteriorate strongly. This result is in line with Lane and Milesi-Ferretti (2002) who find that an increase in public debt is absorbed domestically to a large extent. An increase in income per capita has a four times stronger impact on investment than on saving for industrialised countries. With respect to income, the investment channel seems to be the driving force in determining the external wealth of rich countries in the long-run. This result, however, is not consistent with the findings by Lane and Milesi-Ferretti (2002). They find a strong positive correlation between income per capita and the net foreign asset position. The contradicting findings indicate that wealthier countries provide relatively safe investment opportunities and, therefore, are able to attract more international capital in the long-run. Overall, the results suggest that the long-run rate of investment determines the external wealth of industrialised countries.

Developing Countries The first part of Table 6 reports results on the evolution of net foreign assets since the developing country sample in this paper is not the same as in Lane and Milesi-Ferretti's (2002) work. The paper focuses on the DOLS (-1,1) panel estimation with fixed time and country effects. The net foreign asset position of developing countries relative to their GDP is measured by cumulated current account balances (*CumCA*) and as a robustness check by the sum of stocks of external assets and liabilities (*CumFL*). The latter is calculated by adjusted cumulative capital flows.[12] The estimated net foreign asset equation is able to explain 42 (58) percent of the cross-country variation given the *CumCA* (*CumFL*) measurement. As established by Lane and Milesi-Ferretti (2002), public debt is a very important explanatory variable, explaining the evolution of the net foreign asset position. A joint statistical significance is established for the estimated coefficients of GDP per capita, public debt and demography.

The second part of Table 6 reports the panel estimation for the developing country sample of the saving and investment rate. Looking at the estimated saving equation, 25 percent of the cross-country variation are explained by public debt, output per capita and demography. The joint null hypothesis that the $\boldsymbol{\beta}$ parameters are equal to zero has to be rejected at the 1 percent level. The individual null hypothesis that the $\boldsymbol{\beta}$ parameter of public debt equals zero has to be rejected at the 10 percent level. A 50 percentage point increase in domestic public debt decreases the total saving rate in developing countries by 1.6 percentage points. The result implies a deviation from the Ricardian equivalence. This might be due to liquidity constraints of household and corporate borrowing. These constraints are clearly present in less developed countries. In contrast to the industrial country sample, a statistically strong positive relationship between income per capita and the saving rate of developing countries is established. The point coefficient of 0.13 means that a 20 percent improvement in domestic GDP per capita raises the saving rate by 2.6 percentage points. This suggests that the saving-income relationship is dominated by the income effect in the long-run. Demographic factors are an important explanatory factor in defining a country's saving rate. The second part of Table 6 shows that the joint null hypothesis that the $\boldsymbol{\beta}$ parameters of the three demographic polynomials equal zero has to be rejected at the 1 percent level. Figure 2 provides the distribution of the twelve age cohorts. The maximal impact is found in the age group 40-44. The implicit α_{40-44} coefficient means that a ten percentage point rise in the population share in this group increases

[12] For a more detailed explanation see Lane and Milesi-Ferretti (2001). All data are obtained from Lane and Milesi-Ferretti (2002).

the saving rate by approximately nine percentage points. A very strong negative impact is found for the age group of over 65 (α_{65+}). A one percentage point decrease in the share of the over 65 improves the saving rate by three percentage points. This result confirms that a high old population ratio negatively affects the propensity to save in less developed countries.

The investment equation is able to explain 21 percent of the variation in the data. As for the industrial countries, GDP per capita has a strong explanatory power. A ten percent increase in income per capita raises the investment rate by 1.3 percentage points. Table 6 shows the estimated demographic coefficients and illustrates that the strongest positive impact is found for the age cohort 25-29. Similar to the saving equation, a strong negative impact is found for the population share over 65. A ten percentage point increase in the share of the 65+ population decreases the investment rate by 19 percentage points. Comparing the results with the industrial country sample, it becomes obvious that older age groups (65+) have a more negative impact on the investment rate than in developed countries. Another interesting finding is that the investment rate increases within the entire young population in developing countries (Figure 4). The results obtained suggest that domestic investment in developing countries is negatively affected by a reduction in the working-age population, indicating a complementary relationship between capital and labour. A Wald test of the joint null hypothesis that the $\boldsymbol{\beta}$ parameters are equal to zero has to be rejected at the 1 percent level. There is no statistically significant evidence that public debt is able to crowd out new capital formation in the long-run.

To answer the question whether it is saving or investment which drive the external wealth of developing countries, reconsider Table 6. The demographic factors are more pronounced for saving than for investment. In this respect, the net foreign asset position is mostly influenced by changes in the saving rate in developing countries. Saving and investment are positively affected by an increase in income per capita. When comparing the point estimates of GDP per capita, it becomes apparent that an increase of output per capita by ten percent leads to a rise in savings by 1.26 percentage points and an increase in capital formation by 1.27 percentage points. Leaving other factors unchanged, the net foreign asset position would deteriorate slightly overall. As a country becomes relatively richer, it increases its net external liabilities, as illuminated in Tables 6. The net foreign asset position is negatively affected by debt to GDP, which can be seen from the stronger decline in the saving relative to the investment rate. The empirical evidence shows that a high 'pass-through' from net government liabilities to net external liabilities occurs in developing countries.[13] In contrast to the industrialised country sample it is mainly the saving rate which determines whether developing countries are net creditors or net debtors in the long-run.

[13] The reported findings are supported by Lane and Milesi-Ferretti (2002).

Adjustment Mechanisms

This section shifts the attention to the adjustment mechanisms of saving and investment in response to shocks which have hit industrialised or developing economies in the past. Due to the cointegrated relationships between saving or investment and public debt, income per capita as well as demography, the desired change of saving or investment, $\Delta y_{t,i}$, can be estimated by an error correction model, represented by the following equation:[14]

$$\Delta y_{t,i} = \mu + \boldsymbol{\rho}' \Delta \mathbf{X}_{t,i} - \theta \epsilon_{t-1,i} + \phi \Delta y_{t-1,i} + u_{t,i}. \tag{6}$$

$\epsilon_{t-1,i}$ represents the error correction term of an estimated panel OLS regression, which takes into account fixed time and country specific effects. The vector $\mathbf{X}_{t,i}$ has the same interpretation as above. The feedback coefficient θ provides the key to the long-run relation by capturing the behaviour of the adjustment term $\epsilon_{t-1,i}$. A lower value of θ implies that country i is able to maintain a saving or investment rate in excess of or below its long-run value. Hence, a country is able to smooth the adjustment process of saving or investment. The correlation of saving or investment with the three explanatory factors is given by the impact parameters $\boldsymbol{\rho}'$. They capture the contemporaneous correlation in equation (6) in response to shocks which have hit the economy in the past.[15] The specification of the regression also includes the lagged changes in either saving or investment.

To address the issue of causality the paper follows Enders (1995) and compares error correction models which either contain saving, GDP per capita, public debt as well as demography or investment and the variables of interest as dependent variables. The speed of adjustment is estimated by using the lagged error term from the panel regression with saving or investment as the dependent variable.[16] For the industrial countries it is found that either saving or investment together with GDP per capita adjust similarly to shocks to the system. By contrast, for the other two sets of variables the error correction terms are not statistically significant. Thus, GDP per capita as well as saving and investment do not evolve independently. In the investment specification of the developing country sample, investment responds to changes in the system. The other error correction terms are statistically insignificant. The analysis of the adjustment parameters under the saving specification illustrates that the saving rate as well as public debt and GDP per capita adjust to shocks to the system in the same way while the adjustment of

[14] It is assumed that the slope coefficients are the same within the groups of developing and industrial countries.

[15] Higher $\boldsymbol{\rho}'$ coefficients imply a short run importance of debt, GDP per capita and demography in explaining the dynamics of saving and investment.

[16] Since cointegration between the variables exists, any residuals from an equilibrium relationship could have been used.

demography remains statistically insignificant. Hence, saving responds to changes in public debt and GDP per capita and vice versa.[17]

Industrial Countries Table 7 reports the estimated error correction model of industrial countries for the saving and investment rates. 31 percent of the short-run variations in the data are explained by the specification of savings. Especially GDP per capita and public debt play an important role in explaining short-run deviations in the industrial countries' saving rate. The statistically significant negative point estimate on changes in debt to GDP confirms the long-run findings and point towards a departure from the Ricardian equivalence. The positive coefficient of GDP per capita implies that a two percent increase in the growth rate of income per capita is associated with a 0.5 percentage point rise in the short-run saving rate in industrial countries. The error correction coefficient θ illustrates that industrialised countries adjust towards their long-run saving rate by a half-life of approximately 1.5 years. This indicates that a high persistence in the deviations of the saving rate from the long-run trend does not exist in industrialised countries. Since demographic factors do not play an important role, the second part of Table 7 excludes the demographic factors from the short-run saving equation. This reduces the explanatory power. The error correction model explains only 29 percent of the variations in the data. However, the speed of adjustment remains relatively stable compared to the estimated model above. The point estimates of GDP per capita and debt to GDP remain statistically significant at the 1 percent level.

The deviations of the investment rate from its long-run trend expose a half-life of around two years. The relative persistency is also confirmed by the lagged investment variable in the regression specification. In response to a shock industrialised countries are able to smooth the adjustment process of investment. Overall, the regression is able to explain 46 percent of the variations in the short-run investment rates. Movements in the demographic distribution of industrial countries explain short-run deviations of investment from equilibrium. A joint test that the three parameters are equal to zero has to be rejected at the 1 percent level. As before, the implicit age distribution coefficient, $\Delta\left(\alpha_{0-14}\right) = 1.31$, suggests that the positive impact on the investment rate is the highest for the youngest people in the economy. A short-run rise in public debt by 2.5 percentage points has positive implications for capital formation in industrial countries. It raises the investment rate by one percentage point. This finding stands in

[17] Hendry (2001) emphasises the importance of testing for misspecifications in the error correction model. He suggests to investigate the properties of the error term with respect to autocorrelation and normality. To test for autocorrelation in the errors this paper applies a Lagrange Multiplier (LM) test for the null hypothesis of no autocorrelation (Baltagi, 2001). Additionally, the paper analyses whether the residuals are non-normal. There is evidence for neither autocorrelation nor non-normality. Results are available on request.

contrast to the long-run investment analysis, depicted in Table 5. As in the long-run, investment is positively correlated with income per capita. When the growth rate of income per capita changes by five percent, the short-run investment rate increases by two percentage points. Thus, fast-growing industrial countries are able to promote their short-run capital formation relative to industrial countries which show a weaker growth performance.

The adjustment of the net foreign asset position of industrial countries is clearly influenced by saving and investment via public debt, demography and income per capita. However, demographic changes seem to feed through the investment channel of long-standing OECD members. The findings in Table 7 suggest a negative impact of short-run changes in output per capita and public debt on the net external position. As for the long-run findings the net foreign asset position is mainly affected via investment in industrial countries.

Developing Countries Table 8 reports the results of the error correction model for the developing country sample. The regression specification of the saving rate is able to explain 33 percent in the variation of the data in developing countries. The error correction coefficient θ shows a point estimate of around -0.6 and points towards a very quick adjustment process of the saving rate. After an initial deviation it would return to its long-run value within a half-life of 10 months. Thus, developing countries are not able to smooth the adjustment process of saving as a response to external shocks. The short-run estimates of public debt and income per capita confirm the long-run findings depicted in Table 6.

The investment equation is able to explain 32 percent in the variation of developing countries' capital formation rate. In contrast to the long-run specification, a positive and statistically important impact of public debt on capital formation is established in Table 11. In the short-run, a positive change of debt to GDP by two percentage points improves new capital formation by 0.54 percentage points. This is an important finding and it is in line with the findings for the industrial country sample. The results seem to support the view that an increase in public debt does not crowd out new capital formation in the economy in the short-run.

The findings also have implications for the adjustment behaviour of the net foreign asset position. As for industrial countries, the external wealth position of developing countries is clearly influenced by short-run changes in the investment and saving rate via public debt and income per capita. With respect to income per capita the main contributor to changes in the short-run net external wealth is the investment rate. This is in contrast to the results of the long-run analysis. Moreover, in developing countries public debt influences the net foreign asset position through both, saving and investment.

The demographic factors are less important and the individual null hypothesis that the ϕ parameter of the lagged dependent variable of the saving equation equals zero cannot be rejected.

Therefore, the second part of Table 8 estimates the error correction model without these variables. The exclusion of lagged savings and demography weakens the statistical significance of the debt to GDP coefficient in the investment equation. The exclusion of the demographic factors increases the persistency in the investment equation relative to the results obtained from the first part of Table 8. This is illustrated by the decline in the point estimate of the error correction term. In the saving equation the exclusion of the variables increases the statistical importance of debt to GDP coefficient while the impact of output per capita is weakened.

4 Conclusion

This paper investigates the relationship between saving, investment and the net foreign asset position of industrialised and developing countries. More specifically, three factors are determined which are supposed to influence the net foreign asset position. It is analysed whether GDP per capita, public debt and demographic factors affect the net foreign asset position via changes in national wealth and domestic capital stock.

The regression analysis clearly demonstrates the importance of public debt, output per capita and demographic variables in determining saving and investment in industrial and developing countries. In the long-run, the three variables influence the net foreign asset position of developed countries via investment while developing countries' net foreign assets are influenced via savings. However, in the short-run both, saving and investment rates, appear to be affected by output per capita, public debt and demographic factors. Hence, the three factors are able to influence the net foreign asset position in industrial and developing countries via both saving and investment rates.

Several conclusions emerge from the analysis of the impact of output per capita, public debt and demographic factors on saving and investment. Income per capita positively influences industrialised and developing countries saving and investment rates in the short and long-run. Developing countries' saving rate positively depends on the working age population, while the rate of capital formation generally decreases with an increased share of elderly people in developing countries. This last effect is less pronounced for the industrial country sample. The level of public debt is also an important determinant of national savings in less developed countries but also in industrialised countries. Interestingly, in both samples there are indications that a departure from the Ricardian equivalence theorem occurs in the long-run. There is evidence that public debt has a negative impact on long-run investment rates in industrialised countries.

It has become clear that the net foreign asset positions of industrialised and developing countries significantly depend on the long-run saving and investment rates of the respective economies. The saving and investment rates are mainly determined by GDP per capita, public debt and demographic factors. These variables have short and long-run effects on saving and investment and can therefore be used as a tool for explaining the net foreign asset position of countries.

Appendix

The appendix explains in more detail the demographic specification. The population is divided into $J = 12$ age cohorts. The age variables enter the saving and investment equation as $\sum_{j=1}^{12} \alpha_j p_{tj}$. p_{tj} is the population share of cohort j in period t. A key restriction is that $\sum_{j=1}^{12} \alpha_j = 0$. The age coefficient α_j can be obtained from a cubic polynomial

$$\alpha_j = \delta_0 + \delta_1 * j + \delta_2 * j^2 + \delta_3 * j^3.$$

The zero sum restriction of the α-coefficients allows to obtain δ_0 by the following equation:

$$\delta_0 = -\frac{\sum_{j=1}^{12} j}{J} * \delta_1 - \frac{\sum_{j=1}^{12} j^2}{J} * \delta_2 - \frac{\sum_{j=1}^{12} j^3}{J} * \delta_3.$$

The δ_1, δ_2 and δ_3 can be obtained by estimating a model in the following way

$$\delta_1 DEM_{1t} + \delta_2 DEM_{2t} + \delta_3 DEM_{3t},$$

with

$$\begin{aligned} DEM_{1t} &= \sum_{j=1}^{12} j p_{tj} - \frac{\sum_{j=1}^{12} j * \sum_{j=1}^{12} p_{tj}}{J}, \\ DEM_{2t} &= \sum_{j=1}^{12} j^2 p_{tj} - \frac{\sum_{j=1}^{12} j^2 * \sum_{j=1}^{12} p_{tj}}{J} \text{ and} \\ DEM_{3t} &= \sum_{j=1}^{12} j^3 p_{tj} - \frac{\sum_{j=1}^{12} j^3 * \sum_{j=1}^{12} p_{tj}}{J}. \end{aligned}$$

From the estimated δ_1, δ_2 and δ_3 the δ_0 can be recovered and all four coefficients can be utilised to calculate the α_j.

References

[1] Baltagi, B.H., 2001. *Econometric Analysis of Panel Data*. Wiley, Chichester.

[2] Chiang, M.H., Kao, C., 2001. Nonstationary Panel Time Series Using NPT 1.2-A User Guide. mimeo, Syracuse University.

[3] Enders, W., 1995. *Applied Econometric Time Series*. John Wiley and Sons, New York.

[4] Engle, R.F., Hendry, D.F., Richard, J.F., 1983. Exogeneity. *Econometrica* 51, 277-304.

[5] Fair, R., Dominguez, K., 1991. Effects of the Changing U.S. Age Distribution on Macroeconomic Equations. *American Economic Review* 81, 1276-1294.

[6] Federal Reserve Board, 2002. 2002 National Summit on Retirement Savings. http://www.federalreserve.gov/boarddocs/speeches/2002/20020228/default.htm, Washington.

[7] Feldstein, M., Horioka, C., 1980. Domestic Saving and International Capital Flows. *Economic Journal* 90, 314-329.

[8] Goldberger, A., 1973. Dependency Rates and Saving Rates: Further Comment. *American Economic Review* 63, 232-233.

[9] Hadri, K., 2001. Testing for Stationarity in Heterogeneous Panel Data. *Econometrics Journal* 1, 1-14.

[10] Hayashi, F., 2000. *Econometrics*. Princeton University Press, Princeton.

[11] Hendry, D.F., 2001. *Dynamic Econometrics*. Oxford University Press, Oxford.

[12] Herbertson, T., Zoega, G., 1999. Trade Surpluses and Life-Cycle Saving Behaviour. *Economics Letters* 65, 227-237.

[13] Higgins, M., 1998. Demography, National Savings and International capital Flows. *International Economic Review* 39, 343-369.

[14] Kao, C., 1999. Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics* 90, 1-44.

[15] Lane, P.R., Milesi-Ferretti, G.M., 2001. The External Wealth of Nations: Measures of Foreign Assets and Liabilities for Industrial and Developing Countries. *Journal of International Economics* 55, 263-294.

[16] Lane, P.R., G.M. Milesi-Ferretti, 2002. Long-Term Capital Movements. *NBER Macroeconomics Annual* 16.

[17] Leff, N.H., 1969. Dependency Rates and Saving Rates. *American Economic Review* 59, 886-896.

[18] Levin, A., Lin, C.F., 1992. Unit Root Test in Panel Data: Asymptotic and Finite sample Properties. *University of San Diago Discussion Paper* 92-93.

[19] Levy, D., 2000. Investment-Saving Comovement and Capital Mobility: Evidence from Century Long U.S. Time Series. *Review of Economic Dynamics* 3, 100-136.

[20] Obstfeld, M., Rogoff, K., 1996. *Foundations of International Macroeconomics.* MIT Press, London.

[21] Pedroni, P., 1999. Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics* 61, 653-678.

[22] Stock, J., Watson, M., 1993. A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems. *Econometrica* 61, 783-820.

[23] Taylor, A.M., 1994. Domestic Savings and International Capital Flows Reconsidered. *NBER Working Paper* 4892.

[24] United Nations, 2000. *Demographic Yearbook: Historical Supplement 1948-1997, CD-Rom.* New York.

[25] White, H., 1980. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 48, 817-838.

[26] World Bank, 2002. *World Development Indicators CD-Rom.* Washington.

[27] Zellner, A., 1962. An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregate Bias. *Journal of American Statistical Association* 63, 502-511.

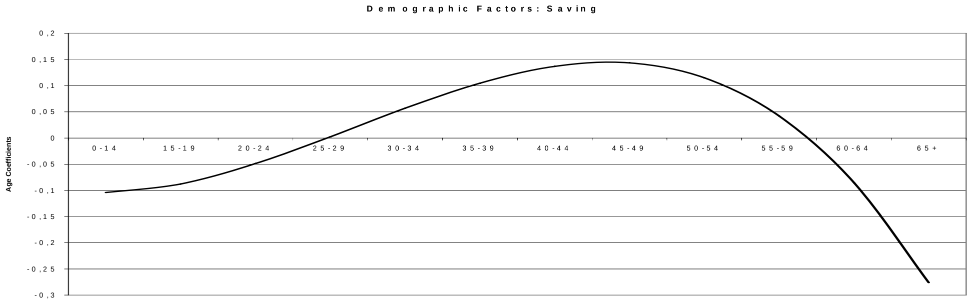

Figure 1: Industrialised Countries (Saving)

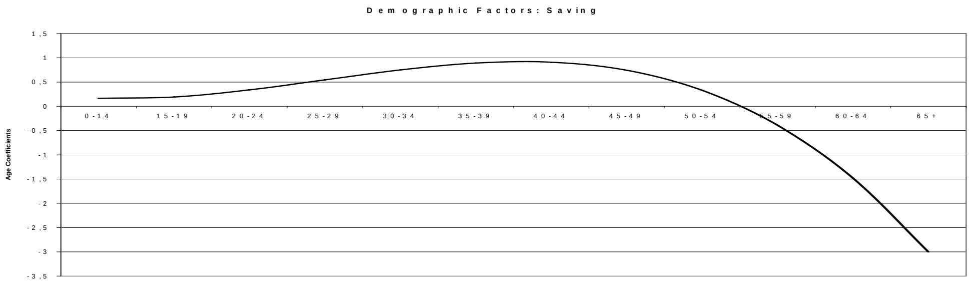

Figure 2: Developing Countries (Saving)

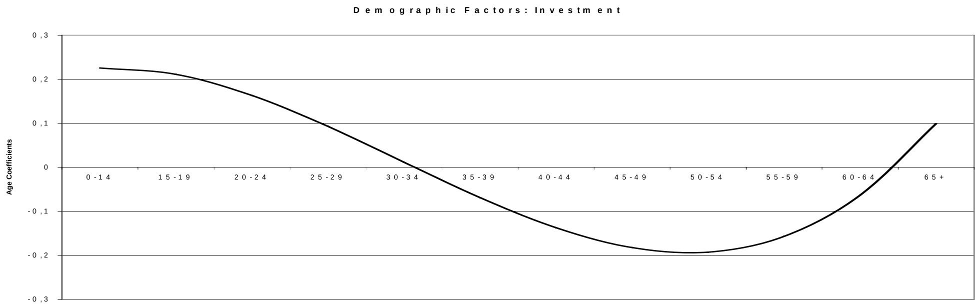

Figure 3: Industrialised Countries (Investment)

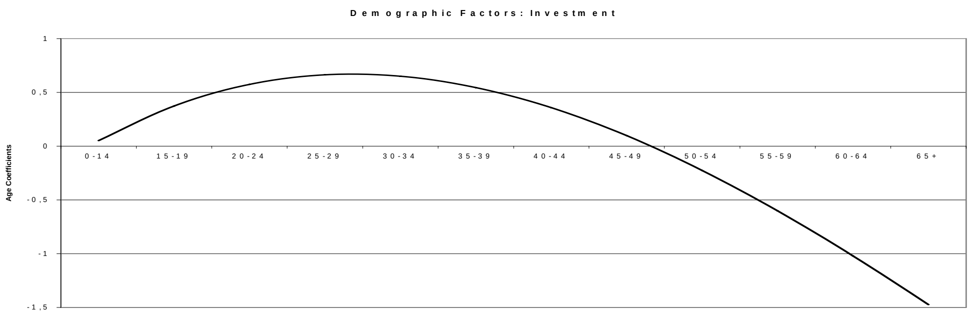

Figure 4: Developing Countries (Investment)

Developed Countries		
Austria	Greece	Norway
Belgium	Iceland	Portugal
Canada	Ireland	Spain
Denmark	Italy	Sweden
Finland	Japan	Switzerland
France	Netherlands	United Kingdom
Germany	New Zealand	United States

Table 1: Industrial Countries

Asia	**Middle East/ North Africa**	**Sub Saharan Africa**	**Latin America**
India	Morocco	Botswana	Brazil
Indonesia	Israel	Mauritius	Colombia
Korea	Jordan	South Africa	Costa Rica
Malaysia	Tunisia	Zimbabwe	Ecuador
Pakistan	Turkey		El Salvador
Philippines			Guatemala
Sri Lanka			Jamaica
Thailand			Mexico
			Panama
			Paraguay
			Trinidad and Tobago
			Uruguay
			Venezuela

Table 2: Developing Countries

Variables: Industrialised Countries				**Variables:Developing Countries**			
Hadri							
		criticalProb.				*criticalProb.*	
Saving	8.3935	0.0000	(reject)	Saving	9.68424	0.0000	(reject)
Investment	6.6912	0.0000	(reject)	Investment	7.41427	0.0000	(reject)
Debt	13.1051	0.0000	(reject)	Debt	12.5751	0.0000	(reject)
GDP per Capita	13.8197	0.0000	(reject)	GDP per Capita	20.563	0.0000	(reject)
Demographic 1	21.3099	0.0000	(reject)	Demographic 1	30.2705	0.0000	(reject)
Demographic 2	22.3479	0.0000	(reject)	Demographic 2	29.2088	0.0000	(reject)
Demographic 3	23.2359	0.0000	(reject)	Demographic 3	28.4483	0.0000	(reject)

Table 3: Panel Unit Root Test: Industrialised and Developing Countries. *Note: The null hypothesis is that the series is stationary.*

Industrial Countries		Developing Countries	
Pedroni (1999): t-rho statistic			
Saving:	-27.846 (0.0000)	Saving:	-43.775 (0.000)
Investment:	-23.808 (0.000)	Investment:	-34.853 (0.000)
Kao (1999): DF-test			
Saving:	-4.173 (0.000)	Saving:	-7.582 (0.000)
Investment:	-5.782 (0.000)	Investment:	-6.18 (0.000)

Table 4: Residual Based Cointegration Tests. *Note: The null hypothesis is that there is no cointegration (unit root in the errors). The critical probabilities are in parentheses. The dependent variable is either saving or investment and the independent variables are debt, GDP per capita and the three demographic factors.*

Explanatory Variables	Dependent Variable	
	Saving	*Investment*
Debt to GDP	-0.021* *(1.757)*	-0.026* *(1.945)*
GDP per Capita	0.026 *(1.078)*	0.118*** *(4.363)*
Demographic 1	-0.032 *(0.208)*	0.061 *(0.354)*
Demographic 2	0.021 *(0.705)*	-0.028 *(0.851)*
Demographic 3	-0.002 *(0.993)*	0.002 *(1.041)*
$\chi^2_{(3)}$(Demographic)	*0.154*	*0.113*
$\chi^2_{(5)}$(All Variables)	*9.26**	*18.91****
α max.	0.152 (45-49)	0.218 (0-14)
α min.	-0.263 (65+)	-0.190 (50-54)
adj. R^2	0.32	0.35
Observations	336	336
Countries	21	21

Table 5: Regression Results (DOLS): Industrial Countries. *Note: t-Statistics in absolute values. *** Significance at the 1 percent; ** at the 5 percent; * at the 10 percent level.*

Explanatory Variables	**Dependent Variable**			
	CumCA	*CumFL*	*Saving*	*Investment*
Debt to GDP	-0.704***	-0.871***	-0.032***	-0.0004
	(5.127)	*(6.636)*	*(2.743)*	*(0.038)*
GDP per Capita	-0.158	-0.279	0.126***	0.127***
	(0.728)	*(1.344)*	*(6.868)*	*(7.243)*
Demographic 1	-0.545	1.553	0.008	-0.152
	(0.170)	*(0.507)*	*(1.472)*	*(0.031)*
Demographic 2	0.124	-0.318	0.076	0.078
	(0.189)	*(0.509)*	*(1.383)*	*(1.473)*
Demographic 3	-0.007	-0.018	-0.008***	-0.007
	(0.190)	*(0.501)*	*(2.611)*	*(1.199)*
$\chi^2_{(3)}$(Demographic)	0.046	0.238	*22.57****	*4.323*
$\chi^2_{(5)}$(All Variables)	31.72***	41.01***	*37.62****	*18.68****
α max.	0.399	1.66	0.99	0.602
	(50-54)	(65+)	(40-44)	(25-29)
α min.	-0.47	-0.711	-3.088	-1.903
	(65+)	(45-49)	(65+)	(65+)
α (POP<15)	-0.025	-0.621		
adj. R^2	0.42	0.58	0.25	0.21
Observations	480	480	480	480
Countries	30	30	30	30

Table 6: Regression Results (DOLS): Developing Countries. *Note: t-Statistics in absolute values.*

**** Significance at the 1 percent, ** at the 5 percent, * at the 10 percent level.*

Explanatory Variables	**Dependent Variable**		
	Saving	*Investment*	*Saving*
Error Correction Term	-0.357***	-0.271***	-0.353***
	(9.496)	(7.977)	(10.044)
Δ_{t-1}Lagged Dep. Variable	-0.018	0.179***	-
	(0.405)	(4.265)	
ΔDebt to GDP	-0.078***	0.037**	-0.075***
	(4.258)	(2.322)	(4.135)
ΔGDP per Capita	0.227***	0.391***	0.217***
	(6.099)	(11.377)	(5.972)
ΔDemographic 1	-0.306	-0.772**	-
	(0.809)	(2.345)	
ΔDemographic 2	-0.009	0.074	-
	(0.127)	(1.221)	
ΔDemographic 3	0.003	-0.002	-
	(0.727)	(0.635)	
$\chi^2_{(3)}$(Demographic)	6.21	18.56***	-
$\chi^2_{(5)}$(*Debt, GDP, Demo.*)	86.49***	140.79***	-
adj. R^2	0.31	0.46	0.29
Observations	357	357	357
Countries	21	21	21

Table 7: Regression Results (ECM): Industrial Countries. *Note: t-Statistics in absolute values.*

**** Significance at the 1 percent, ** at the 5 percent, * at the 10 percent level.*

Explanatory Variables	**Dependent Variable**			
	Saving	*Investment*	*Saving*	*Investment*
Error Correction Term	-0.609***	-0.252***	-0.586***	-0.237***
	(13.957)	(5.969)	(14.809)	(5.635)
Δ_{t-1}Lagged Dep. Variable	-0.048	-0.169***	-	-0.169***
	(1.429)	(4.429)		(4.364)
ΔDebt to GDP	-0.065***	0.028**	-0.074***	0.024*
	(4.091)	(2.141)	(4.625)	(1.847)
ΔGDP per Capita	0.125***	0.321***	0.101***	0.306***
	(3.50)	(10.442)	(2.751)	(10.078)
ΔDemographic 1	0.539	-0.623	-	-
	(0.695)	(0.971)		
ΔDemographic 2	-0.063	0.164	-	-
	(0.399)	(1.258)		
ΔDemographic 3	-0.0006	-0.011	-	-
	(0.067)	(1.506)		
$\chi^2_{(3)}$(Demographic)	5.018	5.03		
$\chi^2_{(5)}$(*Debt, GDP, Demo.*)	50.36***	116.24***		
adj. R^2	0.33	0.33	0.31	0.32
Observations	510	510	510	510
Countries	30	30	30	30

Table 8: Regression Results (ECM): Developing Countries. *Note: t-Statistics in absolute values.*

**** Significance at the 1 percent, ** at the 5 percent, * at the 10 percent level.*

cfr/working paper series

centre for financial research
Look deeper

CFR working papers are available for download from **www.cfr-cologne.de**.

Hardcopies can be ordered from: centre for financial research (CFR), Albertus Magnus Platz, 50923 Koeln, Germany.

2006

No.	Author(s)	Title
06-09	R. Wermers, T. Yao, J. Zhao	The Investment Value of Mutual Fund Portfolio Disclosure
06-08	M. Hoffmann, B. Kempa	The Poole Analysis in the New Open Economy Macroeconomic Framework
06-07	K. Drachter, A. Kempf, M. Wagner	Decision Processes in German Mutual Fund Companies: Evidence from a Telephone Survey
06-06	J.P. Krahnen, F.A. Schmid, E. Theissen	Investment Performance and Market Share: A Study of the German Mutual Fund Industry
06-05	S. Ber, S. Ruenzi	On the Usability of Synthetic Measures of Mutual Fund Net-Flows
06-04	A. Kempf, D. Mayston	Liquidity Commonality Beyond Best Prices
06-03	O. Korn, C. Koziol	Bond Portfolio Optimization: A Risk-Return Approach
06-02	O. Scaillet, L. Barras, R. Wermers	False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alphas
06-01	A. Niessen, S. Ruenzi	Sex Matters: Gender and Mutual Funds

2005

No.	Author(s)	Title
05-16	E. Theissen	An Analysis of Private Investors´ Stock Market Return Forecasts
05-15	T. Foucault, S. Moinas, E. Theissen	Does Anonymity Matter in Electronic Limit Order Markets
05-14	R. Kosowski, A. Timmermann, R. Wermers, H. White	Can Mutual Fund „Stars“ Really Pick Stocks? New Evidence from a Bootstrap Analysis
05-13	D. Avramov, R. Wermers	Investing in Mutual Funds when Returns are Predictable
05-12	K. Griese, A. Kempf	Liquiditätsdynamik am deutschen Aktienmarkt
05-11	S. Ber, A. Kempf, S. Ruenzi	Determinanten der Mittelzuflüsse bei deutschen Aktienfonds

No.	Author(s)	Title
05-10	M. Bär, A. Kempf, S. Ruenzi	Team Management and Mutual Funds
05-09	M. Hoffmann	Saving, Investment and the Net Foreign Asset Position
05-08	S. Ruenzi	Mutual Fund Growth in Standard and Specialist Market Segments
05-07	A. Kempf, S. Ruenzi	Status Quo Bias and the Number of Alternatives - An Empirical Illustration from the Mutual Fund Industry –
05-06	J. Grammig, E. Theissen	Is Best Really Better? Internalization in Xetra Best
05-05	H. Beltran, J. Grammig, A.J. Menkveld	Understanding the Limit Order Book: Conditioning on Trade Informativeness
05-04	M. Hoffmann	Compensating Wages under different Exchange rate Regimes
05-03	M. Hoffmann	Fixed versus Flexible Exchange Rates: Evidence from Developing Countries
05-02	A. Kempf, C. Memmel	On the Estimation of the Global Minimum Variance Portfolio
05-01	S. Frey, J. Grammig	Liquidity supply and adverse selection in a pure limit order book market

2004

No.	Author(s)	Title
04-10	N. Hautsch, D. Hess	Bayesian Learning in Financial Markets – Testing for the Relevance of Information Precision in Price Discovery
04-09	A. Kempf, K. Kreuzberg	Portfolio Disclosure, Portfolio Selection and Mutual Fund Performance Evaluation
04-08	N.F. Carline, S.C. Linn, P.K. Yadav	Can the Stock Market Systematically make Use of Firm- and Deal-Specific Factors when Initially Capitalizing the Real Gains from Mergers and Acquisitions
04-07	J.J. Merrick, Jr., N.Y. Naik, P.K. Yadav	Strategic Trading Behavior and Price Distortion in a Manipulated Market: Anatomy of a Squeeze
04-06	N.Y. Naik, P.K. Yadav	Trading Costs of Public Investors with Obligatory and Voluntary Market-Making: Evidence from Market Reforms
04-05	A. Kempf, S. Ruenzi	Family Matters: The Performance Flow Relationship in the Mutual Fund Industry
04-04	V. Agarwal, N.D. Daniel, N.Y. Naik	Flows, Performance, and Managerial Incentives in Hedge Funds
04-03	V. Agarwal, W.H. Fung, N.Y. Naik	Risks in Hedge Fund Strategies: Case of Convertible Arbitrage
04-02	A. Kempf, S. Ruenzi	Tournaments in Mutual Fund Families
04-01	I. Chowdhury, M. Hoffmann, A. Schabert	Inflation Dynamics and the Cost Channel of Monetary Transmission

centre for financial research
cfr/university of cologne
Albertus-Magnus-Platz
D-50923 cologne
fon +49(0)221-470-6995
fax +49(0)221-470-3992
kempf@cfr-cologne.de
www.cfr-cologne.de