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Problems in the international financial system

by
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Since the 1980s OECD investment-saving correlations – as an inverse measure of economic openness – indicate a very wide disparity of openness between the OECD and emerging market economies (EMEs) with an absence of open markets in the latter. Given the increasing weight of EMEs in the world economy this pattern of growth with disparity of openness is ultimately unsustainable. This approach to development is not in the interests of EMEs in the post-crisis global environment. Various studies show how the absence of capital mobility inhibits development though private sector capital expenditure at the firm level. This paper generalises those findings in a panel study, showing that in the period since 2008 the increased presence of capital controls is associated with highly significant negative effects on business investment. It suggests that the world economy could be entering a more dangerous phase of potential instability that is not in the interests of either the advanced or the emerging world. There is scope for better policies to encourage more openness; the OECD Codes of Liberalisation could be an effective tool for managing the reform process.

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I. Introduction

The opening up of OECD economies with respect to international trade and investment in the post-War period changed the operation of the international financial system helping to stimulate growth and to encourage international investment. Multinational enterprises emerged and moved across international boundaries more freely and this brought with it not only new markets, but also an ability to locate investment, production and employment in multiple locations where supply chains can be managed in the most advantageous way for the profitability of the firm, and where the savings to fund that investment could be allocated from sources quite separate from the domestic location of the firm's headquarters. While these developments brought many benefits, they also brought with them a greater complexity of financial needs, going well beyond the evidently increased demand for cross-border banking. These included, *inter alia*:

- New products that would facilitate hedging of exchange rate and credit default risks.
- Financial engineering to best match maturities required by savers and investors, and to take advantage of different tax and regulatory regimes that bear on the costs of doing business (for which swaps were very convenient).
- Mergers and acquisitions not only of businesses, but of stock exchanges and related markets with global capabilities.
- New platforms and technological developments to handle the trading of new products with volatile mark-to-market prices.

Policy makers in OECD countries accommodated these trends via financial deregulation – eliminating international capital controls,[1] moving towards auction systems for selling sovereign debt and developing monetary policy that moved away from sectoral quantitative and interest rate controls to operate instead via market-determined financial prices. This freeing up of financial markets followed after the opening of goods markets, particularly from the early 1980s, and in some respects was the necessary counterpart of it.

The trends towards openness in OECD economies were not mirrored in emerging markets. Capital controls have remained very strong, and these measures often support an exchange rate regime that is heavily managed versus the US dollar. The opening up of the OECD since the 1980s has certainly benefited economic development in emerging market economies (EMEs). To the extent that exchange rates can be held below market-determined levels via intervention, and inflation consequences can be mitigated by capital controls, then an export-oriented trade and development model can be successful in the absence of crises. As many of these countries are relatively poor compared to OECD countries, some of these policies might be regarded as appropriate for the stage of development and a sequencing of deregulation will follow (like the OECD countries in the post-War period). But the overall global balance has to be right, since these policies do not come without costs: both for the countries imposing them and for OECD countries where the distortions in prices created may have played a role as one of the causes of the financial crisis.

This paper examines and provides evidence on a number of problems in the international financial system which may have become more apparent in the post-financial-crisis environment. Section II examines the evidence on the intervention and capital control practices of EMEs and their impact on unstable carry trade loops and on trends in savings-investment imbalances in the global economy. It raises the issue of whether a "tipping point" may emerge in the direction of unsustainable growth patterns. Section III examines the micro evidence of the impact of reduced capital mobility on private investment in EMEs, first by summarising the case studies literature and then by testing the findings there in a more generalised study using a panel of 4 780 firms over the period 2004 to 2012. Finally, in section IV, the findings are summarised and a concluding comment on policy directions is offered. All of the technical details and results may be found in the Annex.

II. Some global impacts of the rise of emerging markets

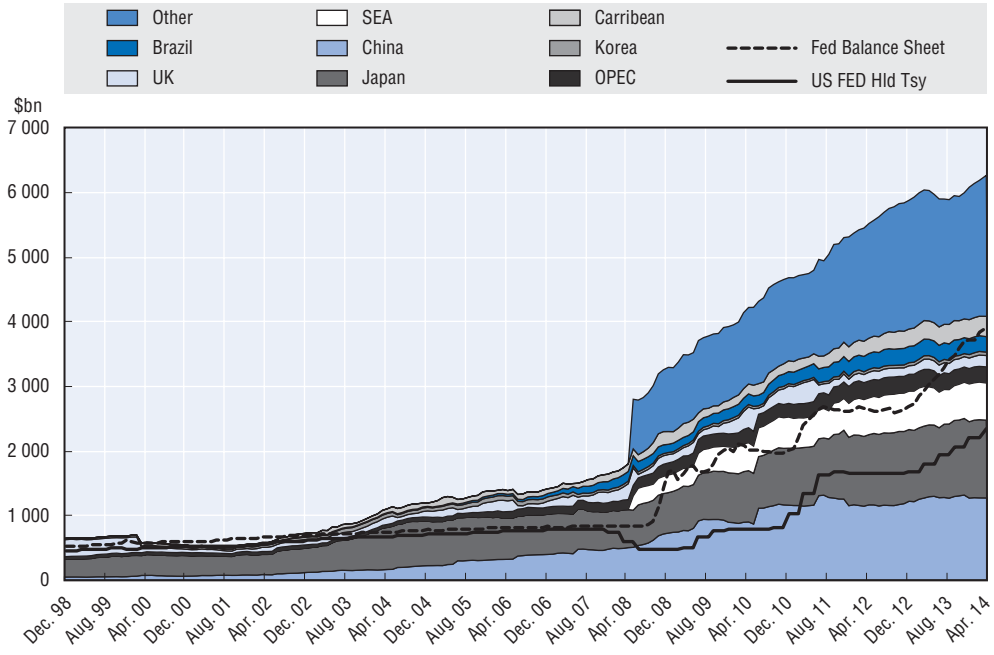
The US dollar has long served as the reserve currency in the global economy. When countries intervene to fix or manage their currencies versus the dollar as a growth strategy, they acquire US dollars and typically recycle these into holdings of US Treasury securities, which are the most liquid security (with little political risk) in the global economy. The systematic undervaluation of exchange rates in many of these countries has been a feature of the world economy since the early 2000s, with most Asian countries running trade surpluses with the USA which require *ex-post* net lending to the US to fund its deficits. The system somehow has to absorb these large persistent capital inflows that not only affect the configuration of exchange rates but also put downward pressure on US Treasury yields.

US monetary policy is forced to respond to the conditions created by these flows. For most of the period since the tech bust high and seemingly intractable unemployment has been combined with low inflation (itself in part due to the global supply shock coming from the EME world and the fear of job loss in the West that kept wage demands low) to encourage low policy rates and, since 2008, the use of unconventional monetary policy. Figure 1 shows the holdings of US Treasuries by foreigners (mostly central banks), which have accelerated since the crisis and now total something like USD 5.8 trillion. Also shown on the chart is the US Federal Reserve's own balance sheet, which has also risen sharply to around USD 3.8 trillion, and its holdings of Treasuries which have risen to around USD 2 trillion.

These sharp increases in foreign and holdings of Treasuries work to hold interest rates down, while the foreign exchange intervention behind the purchases is holding the dollar up against EME currencies. The rise in the Federal Reserve's own balance sheet puts opposing downward pressure on the dollar, providing a focal point for the clash between two fundamentally different approaches to policy in the world economy – an interaction that is not stable:

- Low interest rates and quantitative easing (QE) weaken the dollar, compared to what it would otherwise be. At the same time investors move out on the risk curve to generate better returns. Carry trade outflows into EMEs generate more intervention which, without capital controls, risks credit boom-bust cycles in those countries managing the exchange rate. These pressures generate incentives for more capital controls. Allowing the exchange rate to move up without intervention would avoid credit boom-bust cycles, but EMEs are fearful of the effect of a rising currency on exporting firms. With currency intervention this fear is replaced by the risk of the loss of monetary control in the "*risk-on*"

Figure 1. **Foreign central bank holding of Treasuries & the Fed balance sheet**



Source: US Treasury, Federal Reserve, OECD.

years, and the possibility of dollar funding drying up when money is pulled out of EMEs in the "*risk-off*" phase of the global cycle.

- If the dollar rallies in the "*risk-off*" phase, where money is withdrawn from EMEs and carry trades are reversed, there is no incentive for EMEs to reduce capital controls since their currencies are under downward pressure – indeed controls on outflows of various forms are likely to increase during a crisis.

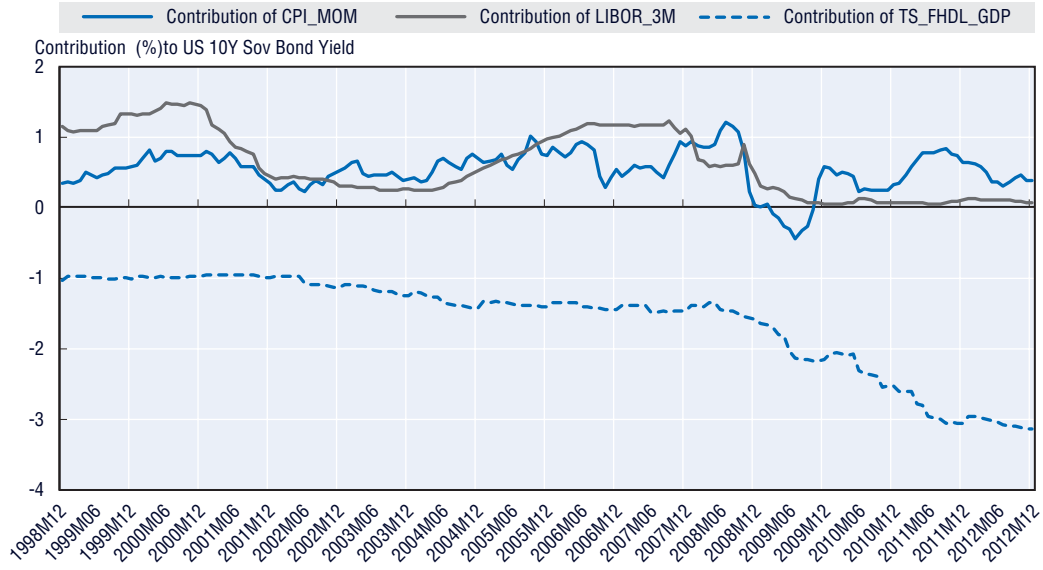
Capital controls therefore become "embedded" and risk "ratcheting-up" over the risk cycle, thereby further distorting relative prices in the global economy.

The impact of dollar-bloc investment in US Treasury securities

In the Annex A.I of the study a model of US 10-year Treasuries is estimated in a co-integration and error-correction framework, based on: short rates; inflation; foreign holdings of US Treasuries; and the Federal Reserve's own holdings of bonds. In the long-run model the main influences on the bond rate are inflation, short interest rates and holdings of Treasury securities by foreigners and the US Federal Reserve. The contributions to the overall fall in the US bond yield are shown in Figure 2:[2]

- The move up in foreign and Federal Reserve holdings of US Treasuries as a percentage of GDP over the crisis period from December 2007 (21% of US GDP), to its peak (of about 46%) by late 2013, amounts cumulatively to about 25% of US GDP. According to the model, with other things given, this would be associated with a 3-percentage point fall in the US 10-year bond rate (the largest proportion of which is due to foreign buying).
- The cut in the short rates over the same period was from 5.1% to 0.3%, or around 4.8 percentage points. Other things given, this would account for a 1.1 percentage point fall in the equilibrium 10-year bond rate.

Figure 2. **Main contributions to US 10-year bond yield**



Source: Authors' calculations based on data from Thomson Reuters Datastream.

- The fall in inflation, from around 4% to just less than 2% over this period, on average, subtracted around 50 basis points from bond yields over the period.

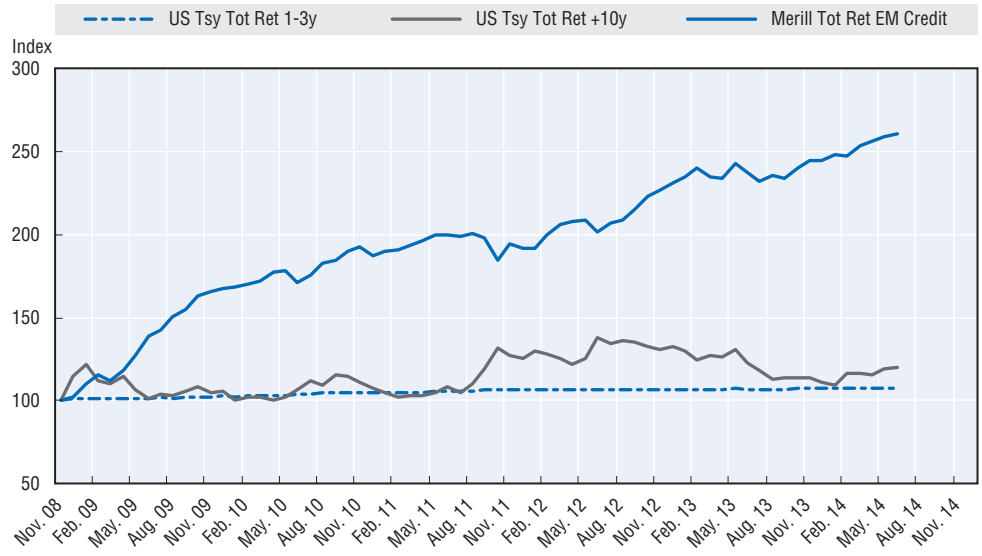
Since US short rates have hit the zero-rate bound to their contribution by 2009 (see Figure 2), most of the work in driving down bond yields has been carried by foreign and (particularly recently) US Federal Reserve buying of US Treasury securities. In this context, it is worth noting that the often-mentioned potential sell-off threat to US longer-term yields that would be caused by any shift of foreign buyers to other currencies for reserve management purposes need not have any negative impact on current monetary conditions supporting the US economy – such a shift would help to weaken the currency, while the US Federal Reserve could, if it so wished, substitute perfectly well for the foreign Treasury buying component.

The low US bond yields analysed here reinforce the carry trade search for better yield, including EME sovereign bonds and (more frequently) EME credit.

Carry trade feedback effects

These feedback effects are unstable for the global economy. Figure 3 shows the total return index for the low-duration 1-3-year Treasury bonds, and the longer-duration 10-year-plus index. This is compared to the Merrill Lynch Emerging Market Credit Index from late 2008, the worst point in the crisis. As the crisis hit in 2008-09, this initially led to a safe-haven trade favouring US Treasuries, and a huge sell off in EME economy credit, as capital flowed out of these countries in the "*risk-off*" trade. Subsequently, the policies discussed above led to extremely low interest rates in the US and other OECD countries, and inflows into emerging markets surged as the carry trade search for yield resumed with added force. This resulted in one of the biggest rallies in EME credit in history: the move up in the EME total return index shown in Figure 3 from January 2009 to February 2014 was a 124% gain, compared to a cumulative 30% return for the US 10y-plus index over that same period, and an even much smaller return for lower-duration Treasuries. As noted above, these flows generated strong foreign exchange market intervention over this post-crisis

Figure 3. **US Treasury versus emerging market credit USD: total return index**



Source: Authors' calculations based on data from Thomson Reuters Datastream.

period, the investment of which pushed US Treasury yields down further, reinforcing the carry trade (and hence intervention and capital controls) over this period in an unstable loop.

As monetary pressure built up during the "*risk-on*"phase, countries' intervention policies risked excess credit cycles and this resulted in a series of increased capital control measures, some of which are set out in Table 1.

Table 1. **Capital controls introduced**

Country	Capital control measures introduced in EMEs since 2009				
	Restrictions on portfolio flows		Restrictions on banking flows		
	Tax on foreign investments	Restrictions by asset type or maturity	Tax on short-term external borrowing	Quantitative limits on banks' FX exposure	Required reserves on FX liabilities
Brazil	Oct, Nov 2009 (R)		Mar, Apr, Jul, Aug 2011		Jan, Jul 2011
	Oct, Nov 2010 (R)		Mar, Jun, Dec 2012		Dec 2012
	Jul, Dec 2011 (R)				
Indonesia		Mar, Jun 2010		Jun, Dec 2010	Dec 2010 (R)
		Apr 2011			
Korea	Nov 2010 (R)	Jul 2011	Apr 2011	Nov 2009 (D), Jan 2010	
	Jan 2012 (R)			Jun 2010 (D), Jun 2011 (D)	
				Nov 2012 (D)	
Chinese Taipei		Nov 2009 (R)		Dec 2010 (D)	Jan, Dec 2010 (R)
		Nov 2010 (R)			
Thailand	Oct 2010 (R)				

Note: "R" denotes measures that discriminate by residency and "D" denotes limits on banks FX positions.
Source: Authors' calculations from national press releases and media articles; Ahmed and Zlate (2013).

The joint effect of this is that the US economy cannot have the exchange rate regime it needs against trade partners that are jointly larger than the US economy itself and are growing rapidly. For the USA a stronger dollar versus the *dollar-bloc* (due to intervention) and lower Treasury yields (dollar-bloc reserves investment) contributed to financial imbalances that played a role in the build-up of imbalances before the crisis. The stronger dollar works against manufacturing and other traded goods sectors and favours services and housing, while the lower Treasury yields in relation to policy-determined short rates feeds into the pricing of mortgages and other financial securities that spread into sub-prime borrowers and securitisation processes. Nor do very low rates favour business investment which, in larger firms, is based on retained earnings (and hence on the cost of equity and accelerator mechanisms, discussed further below). More recently low interest rates and the exchange rate policies of EMEs work in a *feedback loop* that helps boost the carry trade and risks more financial market volatility later on.

Unbalanced economic development

Another analytical measure of financial and goods market openness is the correlation between national saving and investment. Feldstein and Horioka (1980) interpret the high correlation between these variables in the 1970s and 1980s to imply that global savings are not sufficiently mobile to fund ex-ante demand for investment goods – or, alternatively, to absorb excess national savings. Numerous subsequent articles have mostly corroborated the findings and offered alternative explanations.[3] For example, some argue that real productivity and terms of trade shocks, or a fall in the rate of time preference that acts to lift saving, may result in a high saving-investment (S-I) correlation in the presence of a non-traded goods sector.[4] If the non-traded goods sector is labour-intensive, a rise in productivity would release factors of production, and proportionately more labour would be allocated to the traded-goods sector. This would result in a higher marginal product of capital in the traded-sector, thereby raising the desired capital stock, resulting in the co-movement of savings and investment. These and other arguments may have some application in developing countries, where covered interest parity does not hold, but this should not be the case for most OECD countries.[5]

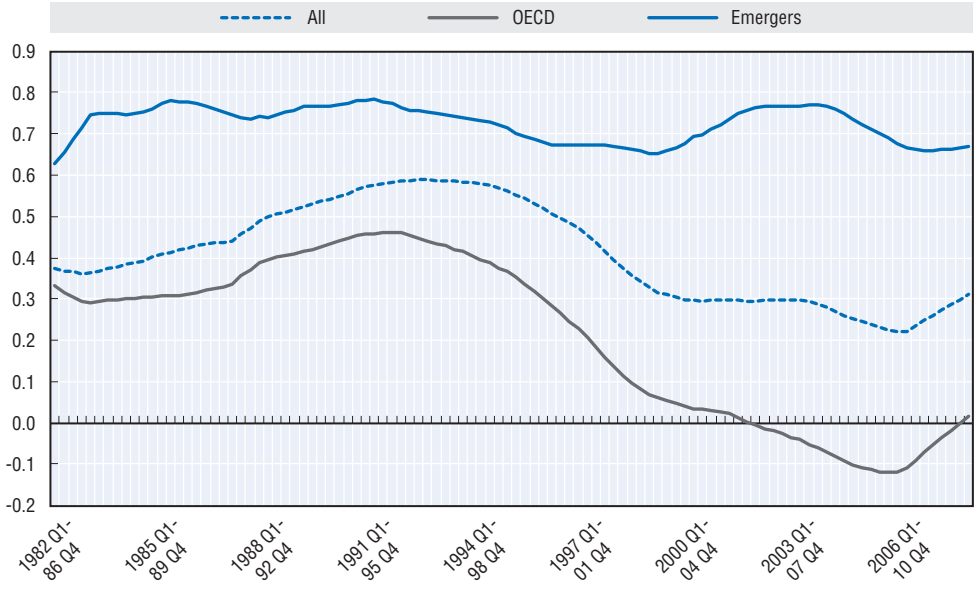
Within the borders of countries free trade does apply and capital can be assumed to be perfectly mobile so that the S-I correlation should be zero. Helliwell (1998), using regional data, shows there is little correlation between savings and investment in the Canadian provinces, just as theory would predict, regardless of the presence of traded and non-traded goods. This latter finding is quite interesting, and implies that the freeing up of international trade and capital flows should also see something similar occurring in countries and regional groupings. Countries which open up to foreign private participation in domestic investment opportunities benefit from technology transfer, synergies in the global supply chain, and resources development. Such countries should see S-I correlations decline over time as this opening up occurs. Countries that are not open, or which are excessively selective in their openness, should see higher more stable S-I correlations.

The S-I correlation in OECD countries has declined continuously in an extending sample period from 1960 (from 0.7 1960-1964, to 0.3 from 1960 to 2011).[6] To explore the case for the EMEs the cases of China, India, Brazil, Mexico, South Africa, and Korea[7] are considered, and complete data is available for this group from 1982. Despite some modest efforts at opening up at times, both the structure of trade and the maintenance of significant capital controls appear to be consistent with a much higher S-I correlation than

found for the OECD. In an extending sample from 1982, EME correlations remain at around 0.7 and show no sign of declining over time. This suggests a very wide disparity of openness between the OECD and EMEs in terms of willingness to open trade and to remove capital controls.

Figure 4 shows the results for the 5-year rolling window of the S-I correlation. The OECD countries reflect a sharp decline in the 2000s essentially to zero. The EMEs show no evidence of decline. The coefficient for the 5-year period to 1986Q4 was around 0.78 and it remains around that level in the most recent period.

Figure 4. **Saving-investment correlation, EMEs vs. OECD, rolling window**



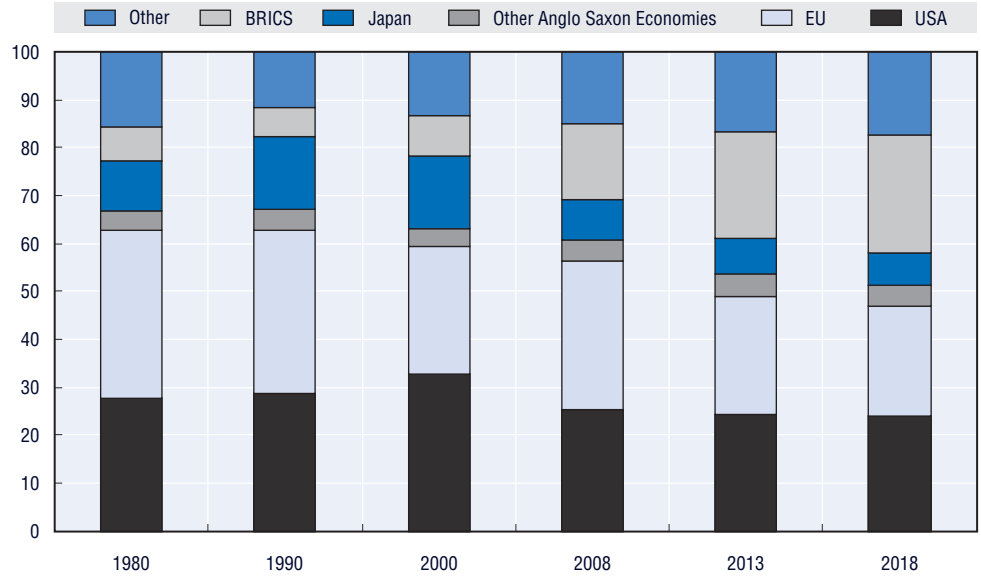
Source: Authors' calculations.

The size of the EMEs in the global economy and the tipping point issue

Of course, what is true about individual countries and groupings of countries cannot be true of the full global economy. Were it possible to have high-quality data for all countries in the world, then savings and investment must be co-integrated. It is not possible for the whole world to violate the budget constraint that savings equals investment. If the non-OECD becomes large enough, a continuation of the recent S-I correlation trends would in the end require OECD saving in aggregate to become negative in order to support the growth strategy of the *dollar bloc* – a clearly unbalanced, unsustainable and unlikely picture for the global economy.[8]

The intervention and capital controls process does not matter for the global economy if a small country does this in an isolated way. In the early period of globalisation this feature of the world financial system didn't really matter. But since the end of the 1990s the size of the BRICS and other countries that manage the exchange rate has risen strongly, bringing with it a new set of issues. Figure 5 shows the PPP shares of the USA, the BRICS, Japan, the EU, other Anglo-Saxon countries, and the rest (mainly other EME countries) in world GDP. The US share is around 20%, whereas the approximate size of the BRICS and other EMEs has risen from around 28% in 1980 to about 50% currently. This latter share is expected to rise further.

Figure 5. **The rising share of BRICS and other non-OECD countries**



Source: IMF, OECD.

III. Are exchange rate management and capital controls still benefiting EMEs?

Recent literature dealing with the effects of capital controls on economic well-being show mixed results. One strand focuses on capital controls as a macro-prudential measure as in Rey (2013), who attempts to show the existence of a global financial cycle driven by US monetary policy. Floating no longer guarantees independent monetary policy, and the author argues that "*independent monetary policies are possible if and only if the capital account is managed*". The demonstration of this cycle is the basis of some very unorthodox conclusions which are wholly rejected by the current study. The author argues that the right policies to deal with the "*trilemma*" (independent monetary policy, floating exchange rates and capital controls) are probably to take actions directly aimed at the main source of concerns, i.e. excessive leverage and credit growth. This is argued to require a convex combination of macro-prudential policies based on aggressive stress-testing and tougher leverage ratios. Depending on the source of financial instability and institutional settings, the use of capital controls as a macro-prudential measure is required to enable independent monetary policy. Unfortunately the set of correlations considered in this paper does not justify such strong conclusions. Such policies may indeed be highly damaging, with countries believing that macro-prudential measures may be used to avoid or delay appropriate monetary policy actions and much needed structural reforms.[9]

Aoki et al. (2010) suggest that capital controls could have welfare-enhancing aspects if credit markets are imperfect. They investigate how the adjustment to liberalisation of international financial transactions depends upon the degree of domestic financial development. Using a model with domestic and international borrowing constraints, they show that when the domestic financial system is underdeveloped, capital account liberalisation is not necessarily beneficial because total factor productivity (TFP) stagnates in the long-run or employment decreases in the short-run. They suggest that government policy, including allowing foreign direct investment, can mitigate the possible loss of employment, but cannot eliminate it unless the domestic financial system is improved.

Similarly, Calvo et al. (2000) suggest that capital controls could be beneficial with imperfect information in which financial globalisation may promote contagion effects. Financial globalisation may strengthen contagion effects by weakening incentives for gathering costly information and by strengthening incentives for imitating arbitrary market portfolios. Numerical simulations show that these two frictions can be quantitatively significant and may induce large capital outflows unrelated to country-specific fundamentals in emerging markets. These findings raise the question of whether globalisation is necessarily welfare improving, and suggest that capital controls may be desirable because of the welfare costs induced by contagion.

Jeanne et al. (2010) analyse prudential controls on capital flows to emerging markets from the perspective of a Pigouvian tax that addresses externalities associated with the deleveraging cycle. It presents a model in which restricting capital inflows during boom times reduces the potential outflows during busts. This mitigates the feedback effects of deleveraging episodes, when tightening financial constraints on borrowers and collapsing prices for collateral assets have mutually reinforcing effects. In their model, capital controls reduce macroeconomic volatility and increase standard measures of consumer welfare.

Finally, Bruno and Shin (2014) develop methods for assessing the sensitivity of capital flows to global financial conditions, and apply the methods in assessing the impact of macro-prudential policies introduced by Korea in 2010. Relative to a comparison group of countries, they found that the sensitivity of capital flows into Korea to global conditions decreased in the period following the introduction of macro-prudential policies and controls on capital flows. However, these measures were introduced after the financial crisis. Korea faced a major funding squeeze during 2008. During a "*risk-on*" period when investment into EMEs is strong, it is quite likely that controls can help resolve "*tri lemma*" issues; but during crisis periods they may be counterproductive (see below).[10]

Other macroeconomic studies have found at best ambiguous results on the effects of capital controls on economic well-being. For example, Prasad et al. (2003) found no significant relationship between openness and growth in per capita income between countries, after controlling for initial endowments. Their survey of other studies shows mixed results (though none found that liberalisation reduces growth). Similarly, Satyanath and Berger (2007) , in a panel of 50 (mostly) EMEs, controlling for standard economic growth determinants, found that there is no statistically significant linkage between capital controls on inflows and lower average economic growth over the period 1995-2005, i.e. prior to the global financial crisis (GFC).

In an influential IMF paper Ostry et al. (2010) using a probit model approach found that in the post-global-crisis period the intensity of capital controls was negatively associated with the fall in output; i.e. made things better. Blundell-Wignall and Roulet (2013) reproduced those results and tested their robustness. They found that the results were not robust to a simple stability test. If Latvia (with by far the biggest GDP drop in the crisis) is excluded from the decile of countries with the largest fall in output and the next-worse country (Russia) is included, the results no longer hold. The key coefficient is then insignificantly different from zero. In short, these tests show that the IMF results cannot be used as a basis for claiming some form of general support for the use of capital controls. In testing the same IMF capital control measures with panel data on GDP growth, including data both before and after the global crisis, while also controlling for macroeconomic factors (lagged

domestic GDP world GDP growth and lagged oil prices), they find quite unambiguous results: that in the pre-crisis period capital controls support growth but that they have had a very negative impact in the post-crisis period.

In contrast to the above macro studies, there is a considerable body of microeconomic evidence showing that EMEs that lift capital controls do experience the positive benefits predicted by economic theory. Particularly where firms do not have ready access to international capital markets, lifting controls sees a reduced dependence on cash flows for capital expenditure (Harrison, Love and McMillan, 2004). Similarly, property rights improve, and newly "investible" firms see increased investment, rising stock prices and a fall in the cost of equity (Chari and Henry, 2004). Forbes (2007) presents an interesting summary of her own and other works looking at very specific case-study evidence on the effects of capital controls:

- Their presence increases financing costs by reducing the amount of capital available to domestic firms.
- The attempt to avoid capital control leads to inefficiencies and corruption aspects that have real costs for the firm.
- Desai, Foley and Hines (2004) study the behaviour of US multinationals and find that affiliates operating in low capital mobility countries are 10% more likely to remit dividends to parent companies (rather that retain earnings to invest), and the distortion to profitability caused by such controls is equivalent to a 24% increase in the corporate tax rate. Capital controls increase borrowing costs and reduce the size of foreign investment by multinationals by some 13-16% compared to what it would otherwise be.
- Case studies show that the initial "costs" of removing controls is usually found in the protected rent-seeking domestic firms that have to adjust to global competition. But for smaller firms, the evidence shows that stock prices rise (reducing the cost of equity), and they find it easier to attract capital.
- In the case of Chile, Forbes (2003) found that the *encaje* caused investment to plummet in smaller firms, and investment was also generally lower for larger firms.

Forbes wonders whether it is possible to generalise this case-by-case micro evidence.

Since most of this micro evidence focuses on investment, the rest of this section attempts to see whether the propositions may be more general in a panel study of the effects of capital controls on the capital expenditure decisions of 4 780 non-financial companies in the MSCI index, covering most countries in the world economy (both with and without capital controls). The technical aspects of this study are set out in full in Annex A.II.

The capital controls measure

None of the above studies use a dynamic measure of capital controls, and none of them distinguish between countries that have non-deliverable forward (NDF) markets, which emerge when controls on capital are particularly strong. Countries that impose capital controls experience deviations from covered interest parity (CIP), particularly at times when capital inflow or outflow pressures are strongest. CIP compares the yields on assets with the same duration issued in different countries and denominated in different currencies but hedged to eliminate currency risk. In the absence of capital controls, the yield on the foreign asset hedged in the forward market should be in line with the domestic rate, except for (small) transactions costs. While it is true that in extreme crisis situations

market illiquidity can be a factor driving deviations, these are much smaller than for capital-control countries and have only a temporary effect. The interest parity condition from the viewpoint of a dollar investor is:

$$F/S-(1+R)/(1+R^*)= \varepsilon \quad (1)$$

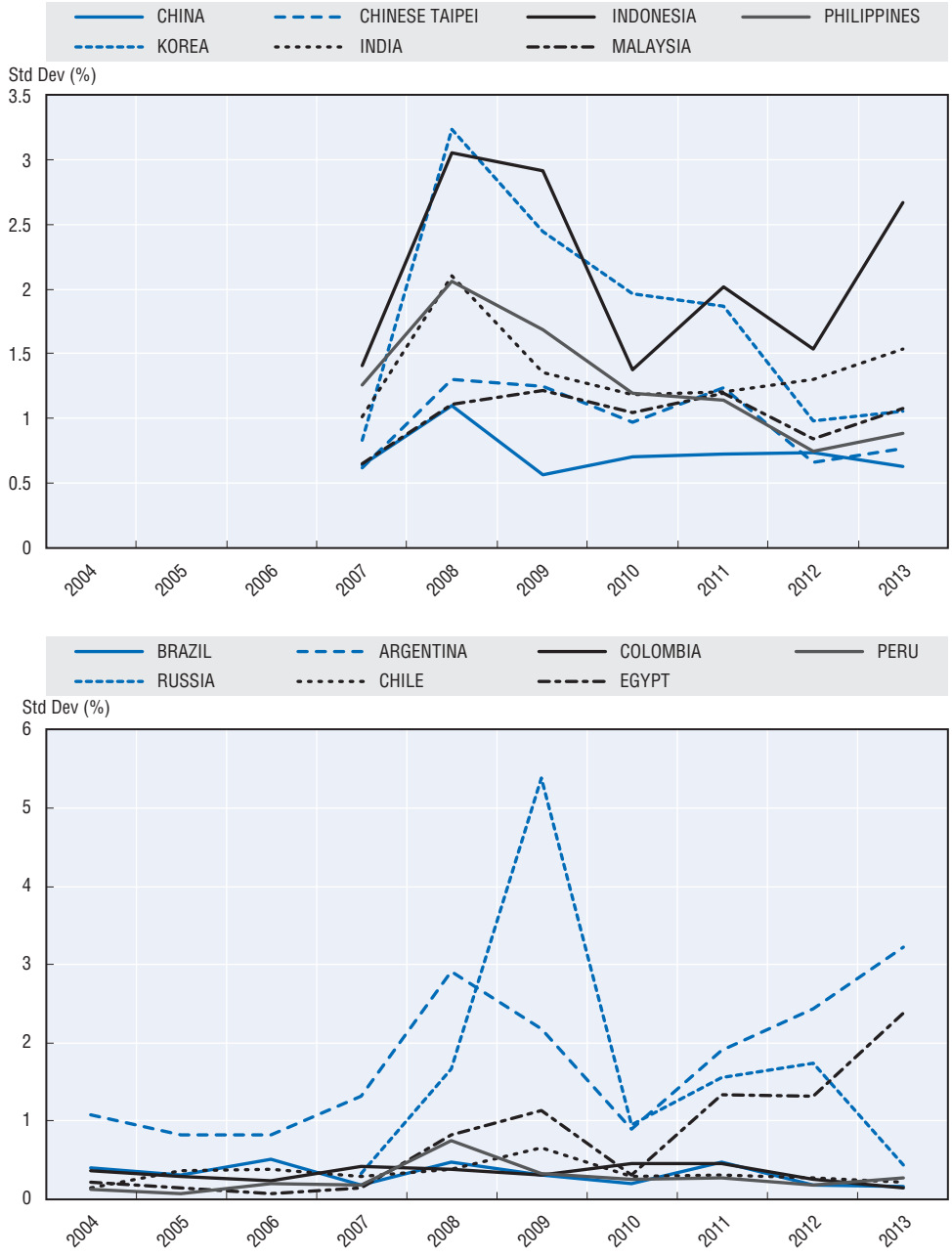
Where: (F) is the forward rate, (S) the spot rate, R the dollar interest rate and R^* is the foreign rate and ε is a deviation. There is a substantial literature on deviations from CIP as they pertain to capital controls.

Capital controls leading to deviations from CIP reflect pricing distortions as inflows and outflows cannot clear in the normal manner. Sometimes, despite the constraints, the market may still cope with trades, albeit inefficiently. However, in other cases capital controls are so restrictive in the forward market that an NDF market develops to deal with the desired trading of capital flows. NDF markets are located offshore and are structured contractually to allow net settlement in US dollars. The development of NDF markets implies the presence of tough capital controls. The tighter the restrictions on the domestic forward market are, the larger the deviations between the two markets will be and the more difficult it becomes to arbitrage between the NDF, spot and domestic forward markets. The NDF market is essentially "mimicking" the deliverable market with *basis risk*; i.e. using conversion exchange rates to compensate counterparties in US dollars for hedging currency movements that can't be delivered in local currency.

One problem in using CIP as a capital control measure is that it can move above or below the transactions cost inertia band (including positive or negative deviations). For this reason use of CIP as the basis for such measures requires a time-series modeling transformation to reflect the degree of capital mobility. Generally speaking, movements to greater openness should see covered differentials diminish and their variance decline over time. In the literature a dynamic measure of capital mobility treats the residual ε in equation (1) as a *time-series* model that captures the autoregressive structure in both the mean and the variance: that is, the conditional variance estimated from a GARCH (1,1) model gives an indication of dynamic capital mobility (see the Annex).[11] In the face of capital flow pressures countries with greater capital controls would exhibit greater conditional variance of CIP than would more open economies. The *time-series* models of conditional variance used in this study were estimated on daily data (where available) from 2004 to 2013, for both the deliverable forward (DF) market and the NDF markets, so that all significant countries in the world economy are covered. Since the MSCI capital expenditure data is available on a consistent basis annually, the conditional variance was re-estimated for each calendar year and the annual averages were taken.

The resulting data are shown in Figure 6 for the case NDF markets in the country shown. The DF markets for countries without capital controls have very small means and conditional variances (see Annex Table A2) and therefore are not shown here. All of the NDF countries saw a sharp rise in conditional variance during the crisis, which fell back to (still large) pre-crisis levels subsequently. In the cases of Indonesia, India, Argentina and Egypt, the conditional variance of CIP is typically very high and has been rising again, suggesting less mobility in the post-2012 environment in these countries. The Latin American group of Brazil, Chile, Peru, and Colombia have relatively more open economies, according to this measure, while the other countries shown lie somewhere between the two extremes.

Figure 6. **Conditional variances (shown as standard deviations) NDF CIPs**



Source: Authors' calculations based on data from Thomson Reuters Datastream.

Testing the effect of capital controls on corporate capital expenditure

A panel regression approach for firm-level capital expenditure is used for all the non-financial companies in the MSCI index, using a co-integration and error-correction framework. The results are based on an unbalanced panel of 4 780 publicly traded companies from 55 countries and 9 sectors over the period 2004-12. All of the data and the formal results are set out in the Annex. The model for capital expenditure by the non-financial firm (k) depends on sales (s), the cost of equity (q), the corporate bond rate (r), the output gap (y-y*) and the volatility of the firms stock price (s) to control for firm-specific

risk. As noted above, capital expenditure by firms within the country jurisdiction should be negatively impacted by the presence of binding capital controls: the cost of equity will be higher (stock price lower), the cost of debt funding will be higher, multi-national affiliates will reduce expenditure in such jurisdictions and they will remit dividends to parent companies rather that retain earnings for capital expenditure to a greater degree than would otherwise be the case. The conditional variance of the CIP measure of capital mobility (cv) is then added to this model in three alternative ways:

1. For more open economies that have no NDF market the conditional variance for the DF market is used. For countries where an NDF market exists (regardless of whether there is also a limited DF market) the conditional variance of this market is used. The sample therefore includes countries with both heavier and lighter capital controls.
2. For all countries with a DF market, so that the conditional variance of CIP is included only for countries with moderate or no capital controls.
3. For only those countries with an NDF market. This sample includes only countries with relatively heavy capital controls.

The model tested is:

$$\frac{k}{s} = a + b_1(q) + b_2(r) + b_3(y - y^*) + b_4(s) + b_5(cv_i) \quad (2)$$

Where i = 1, 2, or 3, for the three above alternative specifications.

The results are set out in Table A4.1 of the Annex of this paper. All of the standard macro arguments of the capital expenditure model (cost of equity and debt, the output gap and risk) have the correct signs and are mostly supported by the data.[12] For the dynamic capital control variable experiments the following results are obtained:

1. For the full model with DF only countries and NDF countries (where one exists), the coefficient is negative and significant at the 1% level. A 1-standard deviation rise in the conditional variance would on average be associated with in a fall of company capital expenditure equivalent to some 0.9% of total sales.
2. If DF market only countries are included, the conditional variance measure of capital mobility is not significant.
3. If only countries with an NDF market are included (a much smaller sample), the coefficient on the conditional variance term is negative and significant at the 5% level. A 1-standard deviation rise in the conditional variance would be associated with a fall in company capital expenditure equivalent to 1.2% of total sales.

These results are consistent with earlier case studies that capital controls have general negative effects on firm capital expenditure. Capital controls pose a real cost to companies within such jurisdictions, resulting in less capital expenditure than would be the case with more open markets with greater opportunities for lower cost funding and better incentives to retain earnings for investment.

Testing the effect of capital controls before and after the crisis

Table A5 shows the result of a Wald Test for equation 2, for the case of capital mobility measured by the conditional variance of the DF market for countries without an NDF market and by that for the NDF if one exists (i.e. the i = 1 case above). The dummy variable is set equal to 1.0 for the period 2008 to 2012, and zero elsewhere.

$$\frac{k}{s} = a + b_1(q) + b_2(r) + b_3(y - y^*) + b_4(s) + b_5(cv_i) + b_6 DUM(cv_i) \qquad (3)$$

The results show that b_5 is positive but insignificantly different from zero, while the coefficient b_6 is equal to -1.29 and is significant at the 1% level. That is, post the crisis, a 1-standard deviation rise in capital immobility will be associated on average with capital expenditure falling by 1.29% of company sales. The test of the null hypothesis that $b_5 + b_6 = 0$ is rejected at the 1% level and the sum of the two coefficients is similar to that obtained in estimating equation (2) without the dummy variable.

These before- and after-the-crisis results for firm-level capital expenditure are broadly consistent with those found in the earlier study of the macroeconomic GDP effects of capital controls using the IMF measure.[13]

- In the years prior to the recent crisis, capital controls appear to have had no significant negative effects on investment. This is likely because company profits are supported by the lower-than-otherwise exchange rate, and companies are not constrained for finance with good earnings in the stronger growth years.
- However, since the crisis the exact opposite is found. Capital controls tend to become stricter in EMEs, capital is less mobile and this constrains firm-level capital expenditure even after controlling for macro factors and firm specific risk. Just at the time when foreign capital is most needed, countries with the most controls appear to suffer the greatest retreat of foreign funding and negative impacts on firm level capital expenditure.

The overall effect using both pre- and post-crisis data (as noted earlier), is negative.

IV. Summary and conclusions on the requirements for sustainable global growth

This paper has considered evidence that raises serious concerns about the functioning of global capital markets. At the international finance level many EMEs ('*the dollar bloc*') manage their currencies against the US dollar reserve currency. This requires intervention in the face of capital inflow during "*risk-on*"periods, which would otherwise cause EME currencies to appreciate. To prevent excess credit cycles and increased dependence on dollar funding resulting from such exchange rate policies, these countries frequently utilise capital control measures. Where these are very strict, NDF markets develop to mimic the DF market by compensating hedgers and speculators in US dollars. The proceeds of the exchange market intervention are typically invested in US Treasuries, and this has been a major contributor to the huge build-up in these holdings to some 46% of US GDP (including the Federal Reserve holdings). This build-up has made a very large contribution to driving down the yields on longer-duration Treasury securities. The huge rally in the Treasury market drove yields to such a historically low level that the carry trade into EME credit since 2009 (in search of much higher risk and better yields) was reinforced. The increased capital inflow pressure in EMEs led to more capital controls being introduced.

World saving-investment correlations for the OECD and EMEs were also examined. This correlation has fallen to zero for OECD countries in the most recent periods, and is in strong contrast to the high correlation of above 0.7 for a selection of large EMEs. This is ultimately unsustainable, given the global budget constraint that savings equals investment. If investment-driven growth funded by high domestic saving remains the

preferred growth strategy of EMEs, then as the EME world grows to be even larger than the OECD a "tipping-point" problem begins to emerge. OECD savings cannot become increasingly negative to support such a strategy in EMEs in the longer run.

A survey of micro case studies shows a multiple set of reasons why capital controls are not in the interest of EMEs hoping to develop with private sector corporate investment as opposed to state-driven SOE activity. A study of the impact of capital mobility (measured by the conditional variance of CIP) on corporate capital expenditure of the non-financial MSCI companies is shown to provide more generalised support for this case-study evidence. Reduced capital mobility post the crisis (after controlling for the usual macro determinants of investment) has had a negative impact on firm level capital spending.

While some caution is required, the findings of this study suggest that the world economy could be entering gradually into a more dangerous phase of potential instability that is not in the interests of either the advanced OECD or the emerging world. There is scope for better policies to sequence a reform of the international financial system, moving it away from the dangers of an increasingly large dollar-bloc focused on managed exchange rates supported by capital controls. This scope arises because there is no conflict in policy objective here. Reform would help to: reduce feedback loops that re-enforce the carry trade; allow EME consumers to benefit from cheaper imports from abroad; permit more domestic-demand-driven growth in EMEs to restore more balanced global growth; and facilitate more efficient and cheaper funding for private capital expenditure in EMEs.

The OECD Codes of Liberalisation provide a flexible framework for dealing with a gradual global liberalisation process, by allowing for specific "*reservations*"on becoming an adherent (in the recognition of the fact that the country may not be in the position to remove controls on specific operations), and incorporating principles of "*standstill*" (no new controls, though derogations for temporary crisis measures can be accommodated). The Codes are particularly useful for dealing with some of the key global issues by calling for: the avoidance of discrimination between residents and non-residents; freedom of residents to transact abroad, where national rules do not apply; and freedom of non-residents to carry out certain operations in the territory of a Member, indistinctively of treatment granted to residents (e.g. operations in foreign exchange).

Use of the Codes as a reform instrument would be preferable to risking more disruptive outcomes in the future. The Codes have mechanisms providing for transparency, accountability and peer review of remaining controls. Their purpose is to minimise potential harm to other countries and to the collective interest in an open financial system, and to help countries find less restrictive alternatives to the control mechanism in question.

Notes

1. For the purposes of this paper, "capital controls" are defined as measures affecting operations in foreign currencies or with non-residents that have the effect of directly restricting capital flows.
2. The significant error-correction result establishes the presence of a co-integrating relationship between the bond rate and the explanatory variables, and the lag structure demonstrates causality. It suggests a 7-month lag for the full effects to work through from a change in the co-integrating variables to the observed 10-year bond rate.
3. The correlation itself is not due to econometric anomalies, such as the treatment of the endogeneity via instrumental variables. Feldstein and Bacchetta (1991) respond to criticisms of an econometric nature, such as omitted variables (e.g. economic growth; Obstfeld, 1986), and dynamic

effects such as Summers and Carroll (1987) that governments adjust their budgets to "fill in" for private investment savings gaps rather that see capital inflows or outflows.

4. Murphy (1986), Engel and Kletzer (1989), and Wong (1990).

5. Obstfeld and Rogoff (2001) show that in a world with transport and transactions costs, combined with inter-temporal consumption smoothing, the S-I correlation can be positive.

6. See, Blundell-Wignall, Atkinson and Roulet (2013).

7. Korea and Mexico are included here as they joined the OECD only in the 1990s, and the focus of this paper is historical.

8. If EME investment and saving correlation is represented by: $I_e = a + 0.7S_e + \varepsilon_e$ and OECD by: $I_o = b + \varepsilon_o$, as implicit in the correlations shown here, then $S_o = a + b + \varepsilon_e + \varepsilon_o - 0.3S_e$. A significantly large EME world would become destabilising if the correlations did not begin to change.

9. For example, Professor Rey focuses on the 'leverage' of banks which she finds is correlated with the VIX index, which is also correlated with the Fed funds rate (with lagged responses). Leverage is traditionally defined as assets divided by bank capital, but this is not Professors Rey's definition. She divides assets by bank deposits. But if assets is denoted A, wholesale funding WF, deposits D, and equity E, the basic identity is A=D+WF+E. Dividing by D gives A/D=1+(WF+E)/D. The right-hand side is akin to the ratio of unstable to stable funding. This "funding ratio" analogue is then taken for 20 European countries and the median of these 20 is taken as 'the key variable' for a study over the period 1990 to 2012. This period corresponds with the sharp rise in the use of derivatives and also contains the 3 biggest movements in the VIX index: the 2001 tech bust, the global crisis in 2008-09 and the euro crisis in late 2011. Professor Rey finds that a rise in the VIX leads to a jump up in A/D, followed by a sustained fall over a number of quarters. But this is what one would expect mechanically without a VAR study, since Professor Rey has constructed her data that way. A rise in the VIX instantly raises the gross market value of derivatives, which is in the numerator but doesn't affect the deposits in the denominator. Following this initial impact during high-risk period, investors are induced to switch out of risk assets into cash deposits and at the same time lending in the interbank wholesale market stops. These are standard risk prevention reactions. The A/D ratio will fall over a prolonged period following a crisis. This comes from data definitions, and in no sense can her correlations justify her strong policy conclusions with respect to capital controls. There are major problems with banks' use of derivatives and their funding methods, but these need to be addressed by very different policies than the imposition of capital controls.

10. It is worth noting that Australia, which had higher external funding of its banks than Korea, and has no capital controls, experienced no crisis or problems during 2008-09.

11. See Faruqee (1992), Huang and Guo (2006), and Hutchinson, Kendall, Pasricha and Singh (2009).

12. The error-correction terms (see Annex) imply co-integration and strong causality, with a relatively rapid mean lag of around half of one year.

13. See Blundell-Wignall and Roulet (2013).

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ANNEX

Empirical results

A.1. US bond yield model and foreign holdings effect

Figure A1 shows the Engle-Granger co-integration and error-correction model estimates for the 10-year US Treasury bond yield,[1] where CPI is the consumer price index, LIBOR is the US 3-month rate, and TS_HLD_GDP is the holdings of Treasury securities by foreigners and by the US Federal Reserve (shown in Figure 1 of the text).

Table A1. **US 10-year bond yield model**

	[1]	[2]
CPI_MOM	0.22 *	-
	(1.88)	
LIBOR_3M	0.22 ***	-
	(9.98)	
TS_HLD_GDP	-0.09 ***	-
	(-15.03)	
RESID_EQ1(-1)	-	-0.13 ***
		(-3.57)
D_CPI_MOM	-	-0.03
		(-0.59)
D_LIBOR_3M	-	0.15 **
		(2.26)
D_TS_HLD_GDP	-	-0.01
		(-0.23)
C	0.05 ***	-0.0001
	(32.17)	(-0.64)
R^2	0.83	0.08
F-Stat	263	4
Prob(F)	0.00	0.01
Durbin Watson Stat.	0.28	1.58
Total Obs.	169	168

Source: Authors' calculations based on data from Thomson Reuters Datastream.

The CPI, the short rate and the foreign holdings of US Treasuries are major factors in the co-integrating equation. The Federal Reserve holdings have the right sign, but the size of the effect (if present at all) is very small.

A.II. Capital expenditure of non-financial companies in the MSCI

To investigate the determinants of firms' (excluding financials) capital expenditure (k), a fairly standard model is postulated, incorporating microeconomic and macroeconomic variables. The dependent variable is company's capital expenditure which is measured as a share of the firms' total sales ($\frac{k}{s}$).

The explanatory variables are:

- Cost of equity (**q**) which is measured as the dividend yield of the company plus the trend rate of growth of earnings over the period 2000-12. A higher cost of equity discourages firms to retain earnings for the purpose of capital expenditures. ($\frac{k}{s}$) is expected to have a negative relationship with this variable.
- Cost of debt (**r**) which is the yield of AAA-rating corporate bond index of the country location of the company. A higher bond yield discourages firms from borrowing to increase their capital expenditures. ($\frac{k}{s}$) is expected to have a negative relationship with this variable.
- Output gap (**y-y***) which is measured as actual GDP minus potential GDP (estimated using the Hodrick-Prescott Filter) as a percentage of potential GDP. A boom in economic activity increases the propensity of firms to invest. ($\frac{k}{s}$) is expected to have a positive relationship with this variable.
- The 1-year volatility of national equity benchmark (**s**) is calculated from the standard deviation of day-to-day logarithmic historical price changes. The 260-day price volatility equals the annualised standard deviation of the closing price change for the 260 most recent trading days. Higher market volatility implies a higher firm-specific risk premium and discourages firms to retain earnings for the purpose of capital expenditures. ($\frac{k}{s}$) is expected to have a negative relationship with this variable.
- The 1-year average conditional volatility of Covered Interest Parity (CIP) which is the conditional standard deviation calculated using a GARCH (1,1) model.[2] Along with interest parities, the conditional variance of CIPs might be a measure of dynamic capital mobility. Indeed with greater capital mobility, not only covered differential rates but also the variance would decline over time. CIP is calculated using deliverable and non-deliverable forward rates considering 3 different possibilities:
  1. CIP is calculated using deliverable forward (DF) rate for countries with only a DF market. CIP is also calculated using non-deliverable forward (NDF) rate for countries with both DF and NDF markets and for countries with only a NDF market (**CV**).
  2. CIP is calculated using the DF rate. It means that countries with only a DF market and countries with both a DF and an NDF market are included (**CV_DF**).
  3. CIP is calculated using the NDF rate. It means that countries with only an NDF market and countries with both DF and NDF markets are included (**CV_NDF**).
- The greater the volatility, the more CIP is deviating from the 0 equilibrium. This phenomenon is observed in countries with strong capital control measures. Stronger controls on capital flows discourage firms to retain earnings for the purpose of capital expenditures. ($\frac{k}{s}$) is expected to have a negative relationship with this variable.
- To investigate the possible changes of the impact of CIP deviations following the 2008 financial crisis, a dummy variable is interacted with the 1-Year average conditional

volatility of CIP in the **CV** regressions. This variable (**DC**) is equal to 1 after the most recent financial crisis, i.e. from 2008 to 2012, and is otherwise 0.

Estimation method and data

When economic theory suggests – as in the case of investment models – that there exists an equilibrium relationship between integrated variables, co-integration and vector-error-correction models provide an efficient estimator to describe short-run dynamics. Beyond these pure econometric reasons, co-integration techniques and VECM are especially useful in modelling investment. As Hubbard and Hassett (2002) argue, a number of fundamental variables affecting investment move together over the business cycle. This causes simultaneity problems. Shifts in the investment function (often associated with the business cycle) imply a positive relationship between the user cost of capital and investment, while interest rate shocks cause negative correlation between the two. If the first dominates, the user cost elasticity will be small, and accelerator effects (the impact of output on investment) large. This problem could be circumvented by focusing on the long-run relationship instead. In addition, VECM allows a rich dynamic representation of the data, which often turns out to be very useful given the sluggish nature of capital stock adjustment and investment. In this paper Engel and Granger methodology is used.

The econometric analysis is run on a global sample of 4 780 publicly traded companies from 55 advanced and emerging countries and 9 sectors[3] over the period 2004-12. Annual market and macroeconomic data were extracted from Datastream. Company data were also extracted from Bloomberg. Table A2 presents some general descriptive statistics of the final sample. Table A3 contains correlation coefficients among all explanatory variables.

Table A2. **Summary descriptive statistics of the sample**

	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
k/s	9.5	4.7	99.8	-24.7	13.7	61365
q	17.8	16.5	203.6	-99.2	30.6	57324
r	4.8	5.0	15.8	0.5	2.6	60973
s	21.7	20.2	72.9	6.9	9.0	62140
y-y*	0.0	-0.2	17.8	-17.2	2.4	62140
cv	0.2	0.0	6.1	0.0	0.4	50933
cv_df	0.1	0.0	6.1	0.0	0.3	50762
cv_ndf	1.1	1.0	5.4	0.1	0.8	4261

Note: OECD (2004-12). All variables are expressed in percentage.
Source: Authors' calculations based on data from Bloomberg and Thomson Reuters Datastream.

Results

Regressions are run on the global panel of non-financial companies for the years 2004 to 2012, involving some 47 149 observations. The results are shown in Table A4.1 and Table A5.

Table A3. **Correlations among the main explanatory variables**

	q	r	s	y-y*	cv
q	1				
r	0.04	1			
	0.00				
s	0.01	0.10	1		
	0.02	*0.00*			
y-y*	0.00	0.05	-0.02	1	
	0.49	*0.00*	*0.00*		
cv	0.03	0.40	0.04	0.01	1
	0.00	*0.00*	*0.00*	*0.07*	

Note: All variables are expressed in percentage. Correlation coefficients are calculated using a balanced sample. Figures in italics indicate values of the T-statistics that test for null hypothesis of Pearson's coefficients of correlation equal to 0.

Table A4. **The determinants of investment of non-financial companies**

Cointegration equation				Error correction equation			
Dependent variable: CAPEX %SALES				Dependent variable: Δ CAPEX %SALES			
	[1]	[2]	[3]		[1]	[2]	[3]
q	-0.19 ***	-0.20 ***	-0.23 ***	**Resid_VECM(-1)**	-0.54 ***	-0.53 ***	-0.58 ***
	(-8.97)	(-9.23)	(-3.04)		(-117.62)	(-117.05)	(-20.41)
r	-0.12 ***	-0.07 *	-0.29 ***	**Δ q**	-0.06 ***	-0.06 ***	-0.14 *
	(-3.28)	(-1.78)	(-2.86)		(-3.60)	(-3.22)	(-1.78)
y-y*	0.08 ***	0.07 ***	0.06	**Δ r**	-0.07 *	-0.05	-0.01
	(3.17)	(2.65)	(0.71)		(-1.76)	(-1.29)	(-0.05)
s	-0.02 **	-0.01	-0.07 ***	**Δ y-y***	0.17 ***	0.14 ***	0.97 ***
	(-2.04)	(-1.48)	(-3.24)		(6.75)	(5.65)	(6.46)
cv	-0.88 ***	-	-	**Δ s**	-0.02 ***	-0.02 ***	0.03
	(-2.55)				(-2.44)	(-2.47)	(1.40)
cv_df	-	0.31	-	**Δ cv**	-0.43	-	-
		(0.55)			(-1.36)		
cv_ndf	-	-	-1.18 **	**Δ cv_df**	-	0.52	-
			(-2.19)			(1.20)	
C	0.13 ***	0.13 ***	0.19 ***	**Δ cv_ndf**	-	-	0.07
	(29.25)	(27.62)	(10.86)				(0.11)
				C	-0.001 ***	-0.001 ***	-0.001
					(-3.85)	(-3.66)	(-0.43)
R^2	0.74	0.74	0.70	**R^2**	0.32	0.31	0.41
F-Stat	26.84	28.33	8.85	**F-Stat**	3.91	4.01	1.31
Prob(F)	0.00	0.00	0.00	**Prob(F)**	0.00	0.00	0.00
Durbin-Watson Stat.	1.04	1.02	1.25	**Durbin-Watson Stat.**	1.96	1.95	2.58
Total Obs.	45 576	45 689	3 193	**Total Obs.**	40 191	40 758	1 884

Note: This table shows the results of estimating a VECM model for an unbalanced panel of 4 780 publicly traded companies from 55 countries and 9 sectors over the period 2004-12. Cross-section and time fixed effects are used in the regressions as is the White cross-section covariance method. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table A5. **The determinants of investment of non-financial companies testing the impact of the 2008 financial crisis**

Cointegration equation		
Dependent variable: CAPEX %SALES		
		[1]
q	**c(1)**	-0.19 ***
		(-9.00)
r	**c(2)**	-0.10 ***
		(-2.54)
y-y*	**c(3)**	0.08 ***
		(3.24)
s	**c(4)**	-0.02 ***
		(-2.42)
cv	**c(5)**	0.47
		(0.83)
cv*dc	**c(6)**	-1.29 ***
		(-3.00)
C	**c(7)**	0.13 ***
		(29.04)
R^2		0.74
F-Stat		26.84
Prob(F)		0.00
Durbin-Watson Stat.		1.04
Total Obs.		45 576
Wald Test H0: c(5)+c(6) = 0		-0.81 ***
		(-2.34)

Note: This table shows the results of estimating a VECM model for an unbalanced panel of 4780 publicly traded companies from 55 countries and 9 sectors over the period 2004-12. Cross-section and time fixed effects are used in the regressions as is the White cross-section covariance method. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Notes

1. The Phillips-Perron (PP) unit root test is employed, which corrects, in a non-parametric way, any possible presence of autocorrelation in the standard ADF test. Tests are showing that all variables are non-stationary series at levels but stationary series at first differences.

2. If we denote y generically as the CIP, a time-series model that captures the autoregressive (AR) structure in both the mean and the variance can be written as:

$$y_t = \alpha_o + \alpha_1 y_{t-1} + \cdots + \alpha_h y_{t-h} + \xi_t \quad with\ \xi_t \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \beta_o + \sum_{t=1}^{\phi} \beta_1 \xi_{t-1}^2 + \sum_{t=1}^{\nu} \beta_2 \sigma_{t-j}^2$$

Where $\sum \beta_1 \xi_{t-1}^2$ is the ARCH term (the squared error term in the previous time period) of q order, generally being news about volatility from the previous period; $\sum \beta_2 \sigma_{t-j}^2$ is the GARCH term (the conditional variance in the previous time period) of p order. Thus, yt follows an AR (h) process with a conditional variance equation described by a GARCH (p, q) process. The GARCH model is implemented via maximum likelihood estimation of the log-likelihood function. The estimated conditional variance σ_t^2 will give us an indication of the evolution of capital mobility. In this paper, GARCH (1, 1) model is adopted, which is sufficient to capture the dynamics of the conditional variance of y. The properties of the dataset are examined before the analysis of the empirical results. The Phillips-Perron (PP) test is employed. It is found that the null hypothesis of one unit root can be rejected in all of the time series. CIP time series are driven by AR (1) processes. It is also identified that the estimated coefficients are significant and all the diagnostic statistics are reasonable.

3. These sectors are: oil and gas, basic materials, industrials, consumer goods, healthcare, consumer services, telecommunication, utilities, technology.