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Beggar-Thy-Neighbour Exchange Rate Regime Misadvice from Misapplications of Mundell (1961) and the Remedy

by

Robin Pope

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Bonn Graduate School of Economics
Department of Economics
University of Bonn
Adenauerallee 24 - 42
D-53113 Bonn

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Beggar-Thy-Neighbour Exchange Rate Regime Misadvice from Misapplications of Mundell (1961) and the Remedy

Robin Pope,^{*}
Bonn University[§]

Abstract

Economists invoke Mundell (1961) in arguing for the *general* policy of a flexible exchange rate regime as a means of restoring equilibria after shocks. But there is a discrepancy between the intent of the general policy and attempts at its implementation as identified by *specific* changes in exchange rates. When we assemble the set of specific changes called for by distinct economists operating as advocates for individual countries, these are uniformly in the form of beggar-thy-neighbour advice – ie travesties of objectively identifying disequilibria and a menace to international cooperation and peace. This paper traces the unintended travesties to problems of complexity and uncertainty, problems that implicitly are assumed absent in Mundell (1961) rendering the situation so simple that equilibria are transparent. The problems remained essentially unaddressed when economists extended Mundell (1961) via expected utility theory since this theory also ignores the impossibility of maximising and the complexities of central bankers, private firms and others in doing the evaluation stage in reaching decisions. The problems can be overcome by modelling within SKAT, the Stages of Knowledge Ahead Theory. This paper points to experimental evidence in support of the view that under all sorts of disequilibrating shocks, currency unions outperform flexible currencies by eliminating the inefficiencies generated by exchange rate uncertainty.

Key words: optimal currency area; exchange rate regime; certainty effects; policy; beggar-thy-neighbour; SKAT the Stages of Knowledge Ahead Theory; complexity; equilibrium; small world; shocks; expenditure-switching shocks; supply-side shocks; demand shocks; experiment, safety, international competitiveness.

JEL Classification D80, F31

* For comments and helpful criticism, thanks go to Reinhard Selten, Jannett Highfield, Ronald McKinnon and anonymous referees of this journal. For copies of Trevor Swan's seminal papers on the assignments of official instruments in an open economy; thanks go also Barbara Spencer and Peter Swan. I look forward to Peter Swan's planned publication of Trevor Swan's collected unpublished papers, including his Keynesian macro-econometric model of Australia. With Walter Georg Waffenschmidt's 1930 econometric model of Germany and Jan Tinbergen's 1936 econometric model for Holland (1936), Trevor Swan's 1943 macro-econometric model of Australia stand as perhaps one of the trio who preceded Larry Klein in his famous macro-econometric model of the 1920s and 1930s US business cycles, Klein (1950). On Waffenschmidt's model, some aspects are described in the volume of econometric studies edited by Hans Albert et al (1977) that commemorated Waffenschmidt's 90th birthday. Note in particular the accounts of it given by Germany's post World War 2 econometric modelling pioneer, Wilhelm Krelle (1977, especially p23). On Jan Tinbergen's 1936 model, aspects are described in the eulogies for Tinbergen of David Hendry and Mary Morgan (1996) and of James Tobin (1997). On Trevor Swan's 1943 model, economic historian Robert Dixon (2008) furnishes students (and particular readers) the opportunity to simulate it for themselves. This paper is dedicated to Trevor Swan, sparkling personally and in his exquisitely crafted scientific papers, including those on exchange rate regime usage – and bequeathing us Australians a legacy of valuable tax reforms toward the end of the last millennium.

§ Bonn University, ZEIB, Walter Flex Str 3, D-53113 Bonn, Germany
Tels +49-228-731887, +49-151 124 070 19; Robin.Pope@uni-bonn.de
Center for European Integration Studies: http://www.zei.de/zei_english/mitarbeiter/pope.htm
Experimental Economics Laboratory: <http://webserver.econ1.uni-bonn.de/>

1 INTRODUCTION

In the optimal currency area model of Mundell (1961), were there a shock of a particular sort, changing the exchange rate would enable attainment of the new equilibrium. Yearly economists proffer new estimates identifying pairs of countries with such shocks and concluding that these countries would suffer disequilibria if joined in a currency union. Without personally researching country shock characteristics, an even larger body of economists, appeal to Mundell's general concept of equilibrating exchange rate changes deliberately executed by a country's official sector.

This paper shows that there is a discrepancy between the impartial objective and admirable intent of having a *general* policy of flexible exchange rates in order to restore disequilibria and the *specific* calls of economists' to change exchange rates in the name of restoring equilibrium. It shows that the specific calls are biased, traces the sources for the bias, how alternative modelling can avoid these biases, and via an experimental set-up, points to evidence that currency unions are better for maintaining international competitiveness and in this sense, better for maintaining international equilibrium.

Parts 2 and 3 present the gist of the optimal currency area model of Mundell (1961), its origin in the Swan assignments model, and economists' attempts to apply it. Part 4 outlines Mundell's consistent opposition to use of that model to justify distinct currencies, and some of that model's deficiencies already identified in the literature. Part 5 identifies a trio of largely overlooked deficiencies in the model. These are assumptions of: (i) certainty concerning the future exchange rate; (ii) certainty concerning the ability of policy makers to discern where is equilibrium; and (iii) every country being too small to damage any other or face retaliatory action. It traces how this set of assumptions destroys the model's mechanism for enabling exchange rate changes to restore equilibrium after a shock. It demonstrates how real world complexity interacts with the model's simplistic small world certainty assumptions to generate the uniformly beggar-thy-neighbour advice from economists advising exchange rate changes.

Parts 6 and 7 concern the way forward, ie how to help those economists who advise exchange rate changes to recognise: a) their inability to get to first base in discerning equilibria; and b) the damage that may be wrought from mistakenly depreciating and from the additional complexity that variable exchange rates involve. That way forward for safer economic modelling of the exchanges rate change effects is aided by SKAT, the Stages of Knowledge Ahead Theory of choice under risk and uncertainty. In SKAT one stage is that of *evaluating* alternatives. The evaluation stage is ignored in Mundell (1961) and its subsequent expected utility theory extensions, as this class of models excludes the possibility that economists could make an evaluation mistake such as misdiagnosing the nature of a disequilibrium and how it might be corrected.

Part 8 points to an experimental application of SKAT, and a finding on the merit of currency unions, indeed of a single world money. The finding is that a single currency avoids the inefficiencies of agents making mistakes about equilibrium in the more complex world of variable exchange rates and thus of exchange rate uncertainty. Part 9 concerns the different challenges economists

take on in analysing within SKAT rather than taking on the challenges of extending our current battery of maximising models. Part 10 summarises.

2 BACKGROUND

Beggar-thy-neighbour dirty floats were commonplace in the 1930s. A country depreciated to seek to solve its unemployment problem by boosting its export and import competing industries. Often soon after, another country retaliated with a depreciation. In due course countries decided that none was too small to be sure of escaping retaliation, that world trade and global welfare had suffered drastically under the uncertainties of associated with such escalating exchange rate changes. With exceedingly few exceptions, economists and others alike deemed that a preferable exchange rate regime was the Bretton Woods Agreement.

Now when by the end of the 1930s, economists had reaching a recognition of beggar-thy-neighbour activity and global bias in their policy advice, it might be thought that this has remained part of general economic understanding. It might be thought that economists today would be sensitive to the issue of whether as a profession, they qualify as objective with an overview of cause and effect and of the desirability of proffering to countries sustainable exchange rate advice that avoids beggar-thy-neighbour policies. But as shown below economists became absorbed in other issues and have forgotten entirely the importance of doing global checks to see if they have fallen back into the ignominious beggar-thy-neighbour trap of which so many were guilty in the later 1920s and early 1930s.

One matter distracting economists from simple global checks on whether their advice is objective has been the investment of closed form algebraic modelling of macroeconomics. Within this closed form algebraic approach, Swan (1952) pioneered analysis of how a country might maintain macroeconomic equilibrium internally (neither over nor under activity) and externally (current account balance). Swan put the case that the official sector ought assist, and not rely exclusively on market forces after shocks as in the gold standard era. He noted that two instruments that the official sector could use in re-establishing equilibrium internally and externally after shocks could be the exchange rate and fiscal policy (the level of demand). If a shock meant that nominal wages were too high, given that nominal wages were sticky, a depreciation could, given certain speeds of response of other variables, more rapidly restore equilibrium, and so forth. He proposed assigning control of the exchange rate to the central bank and fiscal policy to the treasury. He furnished informative algebraic and graphical accounts of the possible speeds of re-attaining equilibrium internally and externally, with further developments in Swan (1953 and 1960).

Mundell applied Swan's model to ask what sort of shocks must a country encounter for changing the exchange rate to be an efficient way to restore equilibrium after these shocks. In the same spirit, Mundell applied Swan's model to ask under what sort of shocks would changing the exchange rate be an inefficient means of restoring equilibrium, so that it would be preferable for the country to avoid ever changing its exchange rate by forming a currency union, Mundell (1961). Mundell via his application of the Swan model has captured the imagination of generations of economists with curiosity to ascertain the nature of shocks buffeting an area, and whether their nature indicates, according to Mundell (1961), merit in retention of a separate currency so as to use exchange rate changes to restore equilibrium more quickly. Over

fifty years later, the notion continues that multiple currencies are desirable so as to enable exchange rate changes between currencies that do not constitute an “optimal” currency area, eg Alesina et al (2002), Mongelli (2002), Baldwin and Wyplosz (2004), Lee (2007).

In the Swan-Mundell model everybody in both countries understands where, after the shock, is the new equilibrium. Everyone understands that it is good (with rigid nominal wages) for one of the two countries to depreciate to restore the international level of competitiveness after a special sort of shock. Thus there is no scope for retaliation. Everybody agrees that the single never-to-be repeated exchange rate change is beneficial to both countries and will be instantly implemented.

3 BEGGAR-THY-NEIGHBOUR

a The Accounting Identity Test of Objective Exchange Rate Advice

If the world were as in Mundell (1961), no country would ever face the risk of being accused of beggar-thy-neighbour activity in lobbying another country to appreciate or in itself depreciating. In the world of Mundell (1961), as in reality, there is an adding up accounting identity. The accounting identity is that the disequilibrium of *overfull* employment in one currency bloc is matched by a disequilibrium of *inadequate* employment in the other currency bloc. After a shock, *both* currency blocs recognise and agree on the sort of shock and *both* agree if one currency bloc should appreciate, ie *both* agree which is the other currency that should depreciate.

Now contrast reality with the simple algebraic Swan-Mundell world. If disequilibria are so simply discernible, we should find a roughly equal number of currency blocs declaring that they are suffering from overfull employment (and so wishing to appreciate) as the reverse. Such however is not the case. Economists advise virtually every land that their country's unemployment woes arise via too high wages relative to international competitors. Those bemoaning overfull employment (to be cured by an appreciation) are non-existent, even when we consider conceivable cases like Singapore and Australia.

b Advice to Raise Wages to Restore the International Competitive Equilibrium

Singapore is perhaps the only economy seeking to have that country's wage level raised relative to other countries. Singapore's recurrent appreciation decisions, however, cannot be classified as inspired by notions of restoring labour market equilibria after shocks. Singapore is a directed economy. Its political directors have been explicit that their goal is to prevent Singapore having cheap labour and to force those undertaking direct foreign investment in Singapore into activities involving higher skilled more expensive labour.

In Australia, but behind closed doors, there was an era in the mid 1980s after a wage freeze had been negotiated. This era comes close to the notion of a country's advocates deeming its wages too low as regards international competitiveness. The governor of the central bank implored the leader of the union movement (on the central bank board) to raise wages since international competitiveness was too high and local skilled labour too scarce. The request to raise wages was refused – on the grounds that the union leaders who had negotiated union acceptance of the wage freeze would lose face. Even this case however, falls short of being a Swan-Mundell style disequilibrium. For this was a complicated situation, in which the wage freeze had lowered skills wage

margins, while skilled and unskilled workers were complements hired in relatively fixed proportions. Firms had the bottleneck of insufficient skilled workers precluding them from employing more unskilled workers and reducing unemployment of the unskilled. In short this was not an era in which Australia's general wage level was too low for international competitiveness causing a Swan-Mundell disequilibrium of overfull employment. It was rather an era of a skill to unskilled wage rate disequilibrium, something not solvable by an exchange rate change.

c Advice to Depreciate to Aid Local Output and Employment

There are thus no cases of economic advocates of a given country seeking appreciations to aid that country back to its employment equilibrium. Economic advocates of a country call exclusively for an effective depreciation for that country. The notion that every country has suffered a special sort of shock that might be aided by a depreciation is untenable. It violates accounting identities that require each case of underemployment must be matched by overemployment in the partner currency blocs. The fair Swan-Mundell model translates in the complexity of the real world into a beggar-thy-neighbour dirty float policy. The complexity of the real world generates uncertainty on just where is equilibrium and just what sorts of shocks have occurred. A few examples of these biased calls for exchange rate changes may be helpful.

US advocates have for several years called on China to appreciate the Renminbi. They see in such an appreciation a solution to the US's virtually jobless private sector recovery after 2000, declare China's reluctance to appreciate anti-social behaviour, eg Simmons (2006), and estimate substantial US trade gains from a Renminbi appreciation, eg Thorbecke (2006). For its part, China seeks to avoid this appreciation as far as is feasible, given its massive unemployment problems.

Across the Atlantic, the situation is similar. The EU calls on China to appreciate against its members' currencies to give EU exporters a "fair go" and to alleviate high unemployment rates in the EU. As with US economists campaigning for appreciations of the Renminbi, these calls carefully avoid offering comparable statistics on the relative unemployment rates of China and the EU. Instead they highlight some other index perceived to denote exchange rate equilibrium eg the bilateral trade balance (with a careful avoidance of mention of the multi-lateral trade and capital flows perspective that they endorse via the WTO's free trade manifesto).

Within the EU, the story is the same. There are campaigns to have Italy quit the EURO so as to depreciate against Germany and solve Italy's unemployment problem. Amongst apologists for Germany, there is essentially the reverse belief, namely that German's international competitiveness has sunk so far below equilibrium that it has turned into a bazaar economy – meaning an economy unable to contribute virtually any value added to its imports before they are exported, and thus unable to hire enough people and mop up its unemployment. See eg Sinn (2003, 2005a, 2005b).

The same holds for historical studies of unemployment problems facing specific countries. These propose that high unemployment suffered by some countries in say the 1930s could have been remedied by depreciations, or by depreciating earlier. Such studies likewise essentially assume that there would have been no retaliatory action. They also often locate international competitiveness series and evidence on the types of shocks studied that in the spirit of Mundell (1961) corroborate their conclusion, eg Eichengreen (1992).

Economists however have failed to notice that when all these specific calls for depreciation are laid side by side, there is an adding up problem. When one side uses one index to measure the disequilibrium demonstrating its need to depreciate, the other side rarely grapples with this directly. Instead apologists for the other side latch onto a different index, and its usage goes largely unquestioned in academic journals or in the media.

There is an implicit opposition to these beggar-thy-neighbour calls in investigations to better stabilise exchange rates, eg Wilson and Ren (2007). There are questionings about whether there is the particular disequilibrium supposed, or whether changing the exchange rate might have undesired consequences, eg Eckes (1999) and Wang, Hui and Soofi (2007), Tatom (2007). There is even explicit opposition to these beggar-thy-neighbour calls for exchange rate changes, Mundell (2003, 2005), McKinnon (2006a, 2006b, 2006c, 2007a, 2007b), McKinnon and Schnabl (2006). All these objections to the proposed beggar-thy-neighbour exchange rate depreciations warrant consideration, and in varying degrees tell against flexible exchange rates. But none of these objections include the simplest objection, namely the demonstrated incapacity of economists calling for exchange rate changes, to be in the right ball park in discerning disequilibria – to be instead invariably – not occasionally – biased

Davidson (2007) is an exception, taking a more statesman-like approach and identifies the global lack of objectivity of economists in these sorts of calls for restoring international equilibria. Davidson notes the universal calls of economists for lower wages to cure that particular country's disequilibrium of unemployment. He notes that if a country heeded its economists' calls for lower real wages to solve its unemployment problem, it would be exporting the unemployment problem to others who already are labouring under high unemployment.

4 MUNDELL'S OBJECTION

Mundell (1961) attributes the horrors of the 1930s to the failure to quickly enough make the Bretton Woods agreement and remove floating exchange rates and beggar-thy-neighbour competitive depreciations. He never advocated the abandonment of Bretton Woods, never praised floating exchange rates, as have numerous scientists who refer to his 1961 model. Unlike Swan, he has never been an advocate of using power to alter exchange rates.

Mundell rightly complains that he distanced himself from floats in Mundell (1961) – not merely in his (1973) piece taking into account capital flows, and his subsequent advocacy since of a single world money, eg Mundell (2003). He objects to the persistent misinterpretation of his 1961 article by those advocating floating exchange rates. He advocates a single world currency simply on the grounds that this will reduce transaction costs, pointed this out in his 1961 article, as also the matter that there was something defective in the simple 1961 model since it implied that absurdly small regions could constitute optimal currency regions.

The optimal currency literature has however by and large ignored Mundell's 1961 observation that the logic of the model would render almost every tiny village an optimal currency area – largely because the observation was made in words. Economists and their literature have lost much of the scientific dimension that requires attention to such an issue that must be expressed verbally in their focus on algebra. The attention to algebra has exceeded our

capacity to interpret the algebra. Interpreting it involves words and verbal arguments.

The basic problem in the Mundell (1961) models is its implying minute regions could be optimal currency areas, a problem for which Mundell proffered one possible solution, include transaction costs. But the economic literature did not take the direction of saying that it would be absurd to use this model until we overcome the basic problem, that at least on some empirical estimates, did not seem to be transaction costs as typically defined. Instead the literature has pretended that there is no basic problem. The literature instead modified Mundell (1961) to incorporate various omitted effects that lent themselves to algebraic expression within either the neoclassical competitive markets paradigm or extensions thereof including into the expected utility theory. For informative surveys of the modifications, see Obstfeld (2001), Kenen (2002) and McKinnon (2004). The modifications however, have not identified the beggar-thy-neighbour nature of its applications, nor indeed reduced the extent of them. The beggar-thy-neighbour nature of applications of even extended Mundell (1961) thus stems from overlooked features.

5 OVERLOOKED FEATURES

In the Swan-Mundell model there is implicitly a once for all shock, never to be repeated. Nobody ever expects another shock, and the official sector knows precisely where is equilibrium before and after. If everybody believes in certainty, always did before the shock, and always does after. This remained the case, even when one uncertainty was added, that about people's desire for more leisure as distinct from more material goods (by working harder) as in an Obstfeld (2001) extension.

But such certainty, including with respect to the exchange rate remaining at the position to which it has now moved, is, to put it mildly, a dubious assumption if market agents have any shred of commonsense. This is not to deny that deciders are irrational, or at least myopic, and unduly inward looking. For instance, it did take countries in the 1930s a while to discover that each country is big – ie that other countries would retaliate. Initially they all seemed to think that they were "the small country case". But of course this is untrue even of a tiny economy like Australia. While tiny on the world scale, in Australia's primary export products (initially merino wool, now mining and coal) it has over the last two centuries provided of the order of a third of the total world supply. All countries essentially are big – important via idiosyncracies in resources and geography to particular other countries that supply their imports, and to yet other that are rivals in export markets. In the notorious floats of the interwar period, countries quickly learned that they were big, and that with the abandonment of the gold standard, exchange rates were exceedingly uncertain and unpredictable. It is thus unfortunate that, with partial exceptions such as Mundell (2005), a basic lesson learned by economists and policy makers by the later 1930s is ignored by economic modelling today. Even for descriptive purposes, this renders the models more irrational than the empirical evidence warrants.

Likewise it is dubious to propose that a country can use the Swan-Mundell exchange rate solution more than once. In addition to traded goods idiosyncracies rendering every country big, as regards the international capital flows, no matter how small a country is moreover, lenders to it like repayment, not default, while the borrowers, even ones living in a tiny isle, are unappreciative of unanticipated hikes in what becomes due for repayment.

A repeat Swan-Mundell solution requires both countries and all those other countries dealing with them to be rather more myopic and non-anticipatory than is the norm. The norm is after a currency area depreciates sharply and unexpectedly, lenders to that area sharply increase the currency area risk premium. The increase in currency risk premium can plausibly be interpreted as a realisation that the country's exchange rate is uncertain, something excluded under the Swan-Mundell model's reliance on certainty. This in turn excludes repeated use of the Mundell (1961) model within the period before forgetting occurs and people get lulled into seeing the future as certain. See Allais (1972) and Blatt (1983) for evidence on how long is required for such forgetfulness.

McKinnon (1963) noted the exchange rate certainty assumption of Mundell (1961), as did Mundell himself in Mundell (1973). Nevertheless economists ignore this fatal flaw, remaining as McKinnon (2004) puts it, in the thrall of Mundell (1961). Nor, in McKinnon's eyes, is Mundell himself entirely immune from criticism in this respect. McKinnon (2004) argues that in several of Mundell's influential essays collected up to 1968, Mundell endorses the scope for flexible exchange rates to equilibrate and ignores the issues of exchange rate uncertainty.

McKinnon terms Mundell (1961) a Keynesian model because it assumes sticky wages, it is a profoundly non-Keynesian model in that it ignores uncertainty. But Keynes' introduction of macroeconomics is via a distinction between consumption goods whose demand he deemed certain, and investment goods whose demand he deemed uncertain. See eg Walsh (1996, pp 56, 62-65) and Davidson (2007). Hence an alternative classification is that of Mundell (1961) being a variant on neoclassical maximising under certainty, a variant in which there is a constraint precluding nominal wage changes.

The Swan-Mundell 1961 model's assumption of certainty about the exchange rate before and after the single shock is coupled with another implicit assumption, namely that everybody knows exactly what sort of shock has occurred and what are its (small world) consequences. This assumption of full knowledge about the shock's type and consequences has misled economists in their analysis and policy advice concerning exchange rate regime. In the murky world where nobody knows where the equilibrium is and has only a vague notion of what sort of shocks have occurred, the Swan-Mundell world has translated into unidirectional advice. As we saw in Part 3, this advice is depreciate in order to beggar-thy-neighbour, with essentially zero countervailing advice to appreciate in order to help others out of their unemployment difficulties. The model's small world assumption helps put other countries out of the picture, and in the complex real world where unemployment is a recurrent problem, spring to the conclusion that a depreciation would help, locating a trade imbalance or an international "competitiveness" index of some sort that shows indeed that this is their country's problem. This is despite the irony, that in numerous other countries, including many of that country's trading partners, other economists have constructed alternative trade imbalance and international "competitiveness" indices that show the reverse.

6 THE WAY AHEAD FOR ASSESSING EXCHANGE RATE REGIME CHOICE

a An end to Maximisation

We need a new theoretical umbrella in accord with stylised facts, Kenen (2002). Maximising would be feasible and within the stylised facts if we could collapse our goals to a univariate dimension and operate in a perfectly understood simple economy with equilibrium transparent to all. We live however in a complex world so difficult to understand that out of sample we have yet to discover exchange rate fundamentals that have the correct sign for interest parity if they predict better than a random walk over the pertinent time horizon for decision making, Meese and Rogoff (1983), Chinn, Cheung and Pascual (2005), Alquist and Chinn (2006).

One stylised fact being highlighted in this paper is how short economists fall of being able to maximise in the real world of policy. Economists fall so short that those advising exchange rate changes to equilibrate proffer systematically biased advice to beggar-thy-neighbour. Models constructed under the new theoretical umbrella must recognise that members of official sectors, of the private sector and we, its actual and would-be economic advisers, are fallible human beings. We need models that include the real life heuristics of the key players in exchange rate markets – par excellence the official sectors. As central bankers themselves report, eg Papademos (2006), and those watching them, eg Cobham (2002a, 2002b and 2006), they do not attempt the impossible of maximising techniques. We need models to include decision makers' evaluation stage – instead of assuming that evaluating alternatives is a costless instant maximising process yielding the Swan-Mundell equilibria. We thus need to abandon as our umbrella theory EUT, axiomatised expected utility theory, which makes these maximising assumptions and starts the decision procedure at the point of choice with this maximisation exercise already accomplished. We need to include the earlier stages of how choosers find alternatives, and how they evaluate them.

This does not mean that our economic decision models are entirely psychological. It simply means that our decision models need to be constructed within an umbrella that recognises human frailty – including that of economists – and includes this as an ingredient in formulating decision procedures. We do not comment on a water boiling apparatus that turns off automatically once the water boiled, "oh this is a purely psychological product. So we reject it and buy the cheaper one that ignores human mistakes and does not automatically turn off." Rather, we consider the past evidence of how often in our home or office (or wherever it is to be used), fallible humans have forgotten to switch off the power once the water has boiled, necessitating us in the cost and time of replacing the burned-out element. In so considering, we are being reasonable and rational.

So-called rational economic models ignore evaluation difficulties. The ignored evaluation difficulties include those of determining whether a pair of countries is facing a disequilibrium caused by a particular shock such that equilibrium could be restored by an exchange rate change are in fact irrational. Such models ignore the past history of economists' incapacity to identify these. Economists have an established record of systematic bias in their identifications of needed exchange rate changes.

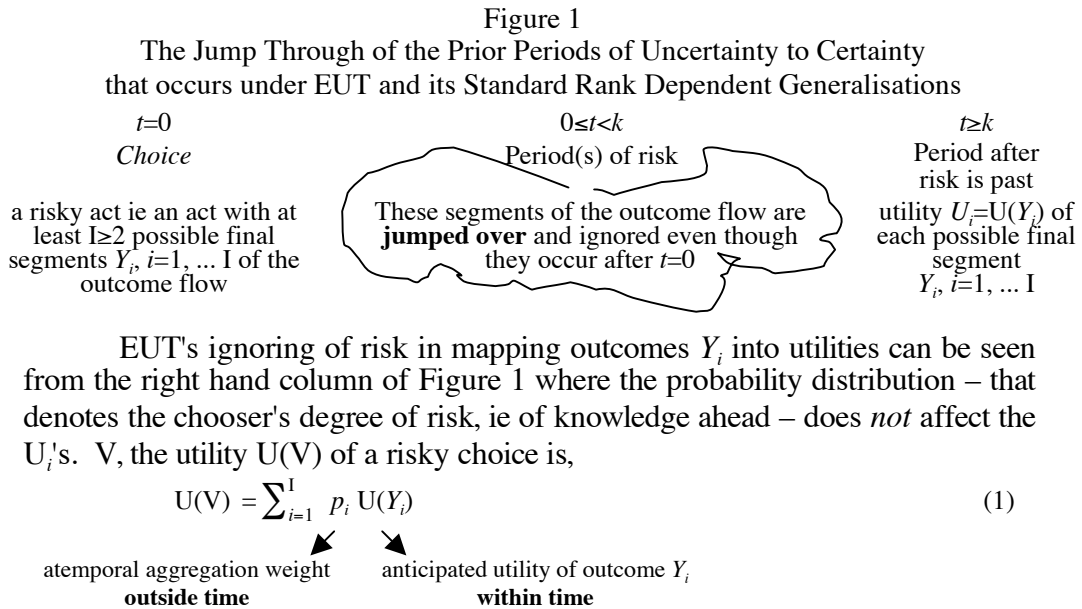
To do what economists do and ignore this bias is analogous to ignoring the matter that in a particular office, at least every second time the hot water appliance has previously been turned on, the element was burned out.¹ A second

¹ Note that every second time allows for a situation in which each time depreciation is advised for both trading partners, for one of the two partners, the advice might happen to

problem is economists' inference that their algebraic models allow maximising conclusions. To have such hubris and to conclude that such a model deduces what is optimal is to be oblivious to the fact that our models simplify, abstract, and contain other flaws we miss. For all these reasons, the conclusions drawn are from our fallible heuristics of the modelling, of abstracting, not from genuine maximising.

b An End to Atemporal theorising

We cannot just graft the evaluation stage and other earlier stages onto EUT. This is because EUT, when consistently applied, excludes attributing utility to any segment of the outcome flow that occurs before all risk and uncertainty is past, Samuelson (1952), Pope (2006) and that remaining segment of the outcome flow must, as Friedman and Savage (1948) put it, be evaluated "as if certain". See Figure 1.



Nothing that is anticipated to be happen in the future in reality – ie *within time* – concerning risk that can impact on utility, is in EUT's equation (1). The only way risk enters is *atemporally*, in how probabilities concerning the mutually exclusive outcomes aggregated to attain a single overall value of the alternative. This limit of risk effects to their atemporal aggregation role pertains to the limited role of risk in the Obstfeld (2001) extension of the Swan-Mundell model to include risk in the form of shock changes in the preference for leisure relative to material goods in one of the countries.

Under EUT the atemporal aggregation rule is simple probability weights. Under cumulative prospect theory of Tversky and Kahneman (1992) and other standard rank dependent generalisations, the atemporal aggregation rule is a more complex (de-) cumulative probability function, but still no real time risk

be correct – while we violate our definition of equilibrium, to propose that the advice on both sides could be correct.

effects are included as the anticipated utility mapping is identical to that of equation (1).

The same "as if certain" property is even inadvertently embedded, generating timing contradictions, in efforts to solve the problem by elaborating the EUT outcomes, Pope (1983, 1985a, 2000). It even recurs when the axioms are replaced by temporal ones as in Kreps and Porteus (1978) or Klibanoff and Ozdrenen (2007). This is because an axiomatisation has to derive its representation theorem – its distinctive expected utility property of using probabilities as atemporal weights to aggregate the mutually exclusive outcomes. To derive this it has to include a compound gamble axiom in which its falsely attributes simultaneity to the sequence of when the temporal succession of probabilities successively become degenerate, Pope (1985a, 2005, 2006).

c SKAT

To consistently model the decision process and avoid missing out on all those cause effect chains generated by uncertainty before and after choice, we need SKAT, the Stages of Knowledge Ahead Theory, Pope (1983, 1995) and Pope, Leitner and Leopold-Wildburger (2006). Each stage is demarcated by one particular issue about which there was previously risk and uncertainty becoming known, ie on that particular issue, there has been change in knowledge ahead.

To illustrate the four main stages, consider the central bank of France and its decision procedure, upon learning of the July 1993 attack of the franc. Table 1 is fictional, but draws on analyses of this event, Eichengreen, Wyplosz, Branson and Dornbusch (1993), Cobham (1994) and Méritz (1994).

Table 1 The Banque's Four Main Stages of Knowledge Ahead After Encountering a Crisis		
<i>Stage / Period</i>	<i>Activity</i>	<i>Unknown</i>
<i>Outcome Segment</i>		
1 Pre-Choice set	Discovering Alternatives	Choice set
2 Pre Choice	Evaluating Alternatives a) safe option – raise interest rates at once; or b) safe option – depreciate at once and exit the EMS; or c) risky option – try to ride out the crisis with three possible outcomes: 1, failure – big depreciation after losing huge amount of taxpayers' funds in a vain effort to hold the Franc within the EMS band and failing to persuade the EMS committee to widen the band; 2, modest luck – a bit of a drop below the old band in the franc's value, and having to keep interest rates higher than desirable to fend off future attacks, but able to get the band widened so that still in the EMS; or 3 huge luck – no Lay out for each alternative its major possible effects and evaluate how these impact on the Banque's various goals in order to choose among them	Chosen alternative
3 Pre-outcome*	Waiting to learn its luck with choice of c) and finding the economy's efficiency diminished through speculation / hedging	Last Outcome Segment
4 Post-Outcome	Living with modest luck under its choice of c) of not	Nothing – full

too big a loss in taxpayer funds and to private sector	knowledge
stakeholders with prior debts in DM that have	ahead,
become more burdensome	certainty

* Irrelevant, as of zero duration, if the Banque had chosen sure alternative a) or b)

Table 1's stages of knowledge ahead framework allows us to identify, for the chooser who has encountered a problem that warrants action, what is uncertain at each stage.

7 BUILDING BLOCS

SKAT highlights uncertainty – avoids us skipping over it as in EUT. Within its umbrella, we can construct models to shed light on the key exchange rate regime choice issue. This key issue is whether the costs of exchange rate uncertainty outweigh the possible benefits of using it. Already useful work has been done on measuring the degree of pressure experienced in holding exchange rates, eg Horváth (2005) and predecessor work in this area. The next steps in this direction are to measure the uncertainty costs of applying such pressure.

a Behavioural Studies

There is scope for descriptive and qualitative analyses of the actual pressures on official and private sector key participants in the exchange rate process. As Simon (1955, 1996) warns, arm-chair theorising is no substitute for looking and describing how choices are derived, how the evaluations are conducted.² Analyses of how central bankers evaluated and chose over some time spans include, for France those listed above Table 1, for England, Cobham (2002a, 2002b and 2006) and for the US, Mehrling (2001) and Goodfriend and King (2005).

Changes take place as the disadvantages of one regime choice became transparent and a different regime choice seemed more attractive, Eichengreen, Wyplosz, Branson and Dornbusch (1993). The changes highlight the fact that official sectors and their economic advisers have no global maximising overview of where to move their currency area under a float. The changes are in general character remarkably similar to the foreign exchange rate dealers studied by de Grauwe and Grimaldi (2006). They found that these dealers switch from one technique to another as another starts seeming more attractive.

There has been failure to model these changes in assessing whether flexible exchange rates are good. The changes may well explain much of our failure as economists to detect "fundamentals" and out of sample robustly predict the exchange rate. This may well explain much of the exchange rate's unpredictability to the private sector. Since official sectors are made up of human beings, it is implausible that this will change. In our complex world, typically they will keep trying to do a better job, and to do so by switching to another regime – the process of institutional forgetting – often via a major change of leadership at the top. Changes in official sector exchange rate regime reflect our successive new generation models of the exchange rate process, with no solid evidence that we can yet discern where equilibria are, and shift exchange rates to attain them. Our latest generation models require the out-of-sample robustness check of the next exchange rate crises.

² Out of his looking at how decisions really are made during a period as a student worker in a government office, he constructed his satisficing model (1955). A variant on this model is the aspiration adaptation procedure of Sauermann-Selten (1962) and Selten (1998).

b Safety margins for "Equilibria"

SKAT allows us to incorporate into our policy advice safety margins in the way that our electric jug turns itself off – a fallible person may not remember and burn the element – and that a bridge engineer adds a safety margin for materials input – his model of the sandiness of the soil beneath and the give in the materials used may be faulty. The bridge engineer's safety margin is based on the number of past bridge collapses. As techniques improve, countries lower safety margins, from say seven a century plus back to three or less today in many countries.

It is an interesting question, what sort of safety margin should be put around the claim that floating exchange rate regimes are good since they enable equilibria to be reached more rapidly. Our evidence from econometric modelling failures and from policy advice bias, would suggest that our models are so unreliable as to require a safety margin far above seven before concluding that deregulation, floating exchange rates should be introduced, and countries not treated as social outcasts likely to beggar their neighbours if floating.

SKAT allows us to put the safety margin somewhere. EUT does not. EUT requires every outcome to be evaluated as if certain. There is no way to consistently consider any uncertainty effects experienced in chronological time. Recall Figure 1. There is no way to consider the impact of the range of possible outcomes, eg by a measure such as their variance. This is apparent from Figure 1 and equation (1). It has also been proven formally, eg Schneeweiß (1968a, 1968b, 1973a, 1973b), Borch (1969) and Feldstein (1969). The only way could be a coincidence if choice were limited to a set of complete perfect markets, something that does not exist.

c Missed Costs via the EUT Lens

Even though the EUT lens forbids looking at variance, economists have looked to see if exchange rate volatility has costs. But the EUT lens has damaged the estimation process. We give one example here related to that theory omitting the earlier three stages of the decision (and thus economic production) process. This concerns how exchange rate uncertainty affects international flows of 1) portfolio capital, 2) direct investment and 3) goods. Here, even for 1), portfolio investment, the lags are typically considerable due to inertia at the borrower end. Even though the funds were borrowed short term, they are for normal business activity typically, so that rollover is needed, and the discrepancies between local and foreign interest rates, not to mention issues of local fund availability, can continue for extended periods. For 2) direct investment and 3), international goods shipment, there are substantial set-up costs.

Thus for all three groups of private sector clients of exchange rate dealers, the lags between events, decisions and actions need to be considered. We need to stop wearing out EUT lens where all this is instantaneous. We need to understand the evaluation stage in Table 1, and how lengthy it is, including implementation aspects since nothing is quite certain until that is done. Consider for instance the drop in the EURO soon after its introduction attributed in the financial press (possibly with inside knowledge) to the lags in three European companies paying for their massive US direct investments by shipping funds from the EURO bloc. As regards trade flows, estimates from Pope (1981, 1985b and 1987) suggest a response lag of 15 months after an exchange rate change. This is likely because deciding whether to alter inter-country supply lines following relative price changes can involve production changes and such a

firm typically only does once a year, whereas it responds monthly or even more rapidly to demand changes that often only involve matters of varying overtime, slack or minor increments and decrements in the labour force.

When we look adequately in stage 2 of Table 1, we shall start getting more suitable modelling of the effects of exchange rate variability. Presently we often try to estimate it with quarterly data, or even monthly or weekly (as this gives us more degrees of freedom, and consider only lags up to a year. But if the actual lags for most of the effects start little before a year when we look at real world decision making, we can see that we have been misusing econometrics. We can see for instance that the minimal effects detected on trade from exchange rate variability in most studies, stems from us starting and ending the lags far too soon.

Already useful work has also been done on the costs of variable exchange rates without identifying any extent to which this is caused by the uncertainty itself, or by other factors. Thus Mundell (1961) attributes to variable exchange rates much of the misery of the Great Depression. Rose (2000) identifies trade costs from any unpredictability whatsoever in exchange rates. An interesting step at qualitatively separating transactions from pure uncertainty effects on trade, is Adam and Cobham (2005), a study that also ventures into measuring the effects of more versus less unpredictable exchange rates.

SKAT allows us to look in a sensible realistic way into the micro-foundations of decisions taken by those influencing exchange rate changes. For descriptive and estimation work, it allows us in a sensible realistic way to lay out the anticipated beneficially or (mostly) adversely affected by these unpredictable changes, and to estimate uncertainty effects with more realistic lags. It allows us to see economists and official sectors as non-maximising human beings – ones not too dissimilar to the exchange rate dealers identified in eg de Grauwe and Grimaldi (2006).

For prescriptive work, SKAT allows us to consider real time uncertainty effects and put safety margins around the "equilibria" we see variable exchange rates effecting via the Swan-Mundell model, and thus more realistically analyse the wisdom of retaining flexible exchange rates. SKAT can allow every policy proposal to be accompanied by a measure of its safety margin. A new branch of statistics can emerge on methods of measuring the safety margins for the purported effects of current policies and proposed new ones, both in the exchange rate area and in other areas.

8 EXPERIMENTAL APPLICATION OF SKAT TO EXCHANGE RATE REGIME

An experimental set-up is sketched below in which participants perform the roles of central bankers, government officials, union and employer wage bargainers and of firms, each with specified objectives pertinent to their roles. The set-up was conducted with a single currency and with two currencies, one for each of two countries. The set-up allows for some of a key stage of SKAT omitted under maximising models, namely that of evaluating outcomes. Each participant had to evaluate how to seek to attain his set of goals within his constraints. In the case of the official sector, these constraints are the standard ones of reality, namely too few instruments, and the goals were also standard ones, namely keeping price steady, predicting them well, keeping the interest rate at its ideal, attaining its exchange rate goal, keeping international competitiveness steady, and employment neither too high nor too low, with the latter being more serious. For the Mundell (1961) case of flexible exchange rates, the key focus

is the maintenance of international competitiveness in the face of a full variety of types of shocks with wages sticky due to union wage negotiations and employer wage negotiation tactics. Our experiments accordingly include union and employer representative wage bargainers and the gamut of types of shocks. Our experiments revealed that this was significantly better maintained with a currency union. For further details, see Pope, Selten, Kube and von Hagen (forthcoming).

This finding from our experiment would be impossible with a maximising model. In our experiment, participants have to use their own limited understanding of the complex economic set-up of the experiment and of how others will react to seek to attain their goals. By contrast maximising models are constrained to make the world modelled so simple that the official sector could not do worse if given the extra degree of freedom of being able to alter the exchange rate.

That is to say, in conventional non-SKAT economic modelling in which stage 2 is skipped over, the maximising official sectors simply calculate that fixed exchange rates are best and, given the power of fully cooperating official sectors to fully set the exchange rate, would set it. In the real world however, neither a central banker nor anyone else can compute the "optimising" equilibrium, and thus is ignorant of where that equilibrium is, as also of how to attain it. This opens the possibility, found in our experiment, that eliminating one complexity, exchange rate uncertainty, can improve the situation. The private sector one may remark, knew this a century and more ago. It chose the gold standard, as close as could be gotten to a single currency. In developed countries moreover, prior to the disruption of the First World War, the private sector with some government help, succeeded in maintaining this, including in countries like Australia in which the totally unregulated private banks printed their own notes and chose their own exchange rate – pegged to gold. See eg David Pope (1991).

In the misleading process of skipping stage 2 and evaluation that no real person can do in a maximising fashion, extreme simplifications are required. Otherwise the economist constructing the model could not solve it even after weeks, months, of energetic analysing that the model supposes every economic actor does effortlessly and instantaneously miraculously somehow in the brain via untraceable means. The extreme simplifications involved include those implicit assumptions of Mundell (1961) highlighted in this paper, namely the absence of uncertainty of what will happen, of what anyone else will do, and typically, an absence of market power, ie the small world assumption of so-called rational expectations. Allowing for market power – as advised by Merton (2001) after identifying that ignoring market power was key to the breakdown of the Long Term Capital Management fund, and also by Soros (1987) who is aware of his own market power – makes the maximising model virtually impossible to solve.

Partly for this reason, to the author's knowledge, no exchange rate model includes indubitable facts about market power like that mentioned in the prior paragraph, namely that of fully cooperating official sectors to set their exchange rate. To her knowledge the first model incorporating such market power, carefully eschewing the impossibility of ascertaining any maximising procedure for so doing, is that of Pope, Selten and von Hagen of which a particular parameterisation is in Pope, Selten, Kaiser, Kube and von Hagen (2007). The difficulty of incorporating official sector market power plus that of key private firms and others involved in exchange rate determination – ie the difficulty of

adequately abandoning the small country assumption – can be gauged from our experimental set-up. It needed to be constructed such that advanced economics students could play it after an hour plus of instruction, and sufficiently well not to have made such losses that they abandoned play before the end of the day. Reality as we know is more complex: giant multi-national firms go broke if not bailed out by their governments, and official sectors run up losses of billions through their misunderstandings of the system. Nevertheless the set-up was sufficiently complex that Reinhard Selten was unable to ascertain if it had a game theoretic equilibrium. He needed to construct a new concept of an incomplete equilibrium whereby branches that could not improve payoff are not investigated, and for this obtained under plausible selection criteria, a unique symmetric equilibrium that could be a reasonably traditional benchmark against which to judge the performance of our experimental participants.

The lack of a unique equilibrium even under the concept of incomplete equilibrium conforms to other disquieting information on equilibria, even within conventional simple maximising models. This is the finding of Grandmont (1985) that for a range of standard models within the plausible parameter range, few would be both stable and unique as required for flexible exchange rates to be justifiable as an equilibrating mechanism. Subsequent investigations reinforce these concerns that the equilibrium concept is of doubtful value, de Arcangelis and Gandolfo (1996), Chichilnisky (1999), Hahn (1999), Drèze and Herings (2003), Phelps (1999), Barnett and He (1999), Sordi and Vercelli (2003) and Dieci, Sordi and Vercelli (2006).

Consider what our inability to discern an indubitably unique stable equilibrium, even in the simplified setting of our laboratory set-up, means. It means that none of the simpler again exchange rate models used to justify flexible exchange rates, neither Mundell (1961) nor later elaborations, identify true equilibria. None take into account the actual and uncontroversial market powers of leading exchange rate participants. Most of these models, by skipping stage 2, assert that there is an identifiable equilibrium after a shock, and that according to the simplified model, changing the exchange rate can put the economy on the new equilibrium. The algebraic modelling, with no stage 2 evaluation to discover that the equilibrium is indiscernible, blithely leads economists into declaring where is the new equilibrium – in the form of the appalling panoply of beggar-thy-neighbour advice documented above. Further, when economists have such simple models, Davidson (2007) seems to be alone in looking at the aggregate international implications of their equilibrating advice – in noticing what this paper identifies as the violation of international accounting identities in which a plus shock to employment in one currency area must be matched by a minus shock to employment in another currency area.

9 THE CHALLENGES OF MODELLING WITHIN SKAT

SKAT is attractive. SKAT allows understanding that economists find some parts of the evaluation process so difficult that they fail to notice that their perceptions of equilibrium are not in the right ballpark. SKAT allows a start of the re-think on whether it is nonsense to talk about flexible exchange rates equilibrating when our perceptions of equilibria are not merely hazy, but biased in a manner dangerous to international cooperation and peace. SKAT allows us to include the effects of all key stages from encountering a problem to after all uncertainty is resolved – including the effects of the principal heuristics that central bankers, speculators and others use in the evaluation stage.

Qualitative, quantitative and algebraic modelling within the SKAT umbrella will be demanding. But so also has been demanding modelling within the false maximising tradition of the current paradigm. SKAT modelling need not be more demanding than at present. What is altered is which challenges are addressed. Under the current modelling paradigm, the challenges addressed are more akin to constructing mathematical crossword puzzles. This is because the challenges under our current paradigm are devising new models still tractable enough for deductions – after months of energetic mathematical work, the challenge is met, and a theorem or lemma deduced. This tractability constraint on keeping the challenges meetable precludes modelling under the current paradigm having assumptions that conform to stylised facts. Assumptions that conform to the stylised facts make the challenge bar too high given the tractability constraint. The tractability constraint is to obtain an informative linear deduction when the entire model is artificially constrained to imply inherently a uni-dimensional index to be maximised within an epistemically atemporal framework.

By contrast, under SKAT, the challenges addressed involve less focus on mathematical derivations from maximising a uni-dimensional index subject to various conditions. Under SKAT, economics can be more like other sciences concerned with understanding and improving the real world. SKAT can allow economists to look more seriously at the cause effect chains of the real world, and at the stages from facing a problem and thus uncertainty, through to its resolution. Thereby economics can return to be a science, where science is defined more broadly than abstract mathematics. The change in focus on which are the important challenges to meet that arise from switching to SKAT, and thus to what challenges an economist should aspire can enable economics to become less dangerous in offering exchange rate advice than at present. At present economic advice to change exchange rates is especially dangerous, as neither the economists proffering advice to change exchange rates, nor those receiving the advice, bear in mind that the advice stems from models that are contrary to stylised facts. Consider also the scope delineated in Part 8 for experiments within the SKAT umbrella to side-step some of the need for meeting the challenge of doing any sort of algebraic modelling. Consider too the scope for experiments to shed light on what is appropriate algebraic modelling of each of SKAT's stages.

10 SUMMARY

Mundell (1961) remains the lynchpin of those calling for official sectors to retain separate currencies so as to restore equilibria after shocks. But this paper has identified: 1) overlooked certainty features and largely overlooked small country features of Mundell (1961) that destroy its equilibrating capacity; and 2) biassed application of Mundell (1961) amongst economists calling for exchange rate changes – all calls are of the beggar-thy-neighbour form. Such bias is a danger to international cooperation and peace.

The bias that stems from modelling within the umbrella of expected utility theory. This umbrella skips the evaluation stage and pretends that economists (and everyone else) can maximise and infallibly discern international disequilibria. This paper has shown how a more realistic umbrella, SKAT, the Stages of Knowledge Ahead Theory, can introduce the evaluation stage and later stages, and enable more realistic and safer appraisals of whether flexible exchange rates are desirable.

Within the umbrella of SKAT, this paper has reported results of an experiment indicating that a currency union, indeed a single world money, better enables external equilibrium in the sense of better maintaining international competitiveness. The experimental results indicate that the additional complexity of exchange rate uncertainty from variable exchange rates on average damages macroeconomic policy. That is, the experimental results indicate that multiple currencies are not merely dangerous in their demonstrated tendency to entice economists to biasedly advocate uncooperative beggar-thy-neighbour policies. The experimental results indicate that multiple currencies are actually inefficient. They are inefficient in the sense that they damage maintenance of international competitiveness in the face of wage stickiness due to union and employer representative bargains and the range of sorts of shocks to aggregate supply, aggregate demand and of expenditures switching sorts.

The paper's findings thus provide fresh evidence in favour of fixed exchange rates on two new grounds from those already adduced, eg in Mundell (1961 concerning transaction costs, and in McKinnon (1963) concerning exchange rate uncertainty effects on liquidity. First, is safer for international cooperation and peace. Second, this is better for avoiding destabilisation of international competitiveness.

REFERENCES

- Adam, Christopher and Cobham, David (2005), 'Exchange Rate Regimes and Trade', *Centre for Economic Reform and Transformation (CERT) Discussion Papers 0505*, Heriot-Watt University, October.
- Allais, Maurice, (1972), 'Forgetfulness and Interest', *Journal of Money, Credit and Banking*. MIT Press: Cambridge, MA. 4, 40-73.
- Alesina, Alberto, Robert Barro and Silvana Tenreyro (2002), 'Optimal Currency Areas,' *NBER Macroeconomic Annual*, 301-55.
- Alquist, R and M. D. Chinn (2006), *Conventional and Unconventional Approaches to Exchange Rate Modeling and Assessment*, revised version dated 21 June 2006) of paper presented to the ECB-Bank of Canada workshop on "Exchange rate determinants and impacts," Frankfurt, December 6-7, accessed from http://www.ssc.wisc.edu/~mchinn/alquist_chinn_21jun06.pdf.
- Baldwin, Richard and Charles Wyplosz (2004), *The Economics of European Integration*. New York: McGraw Hill.
- Barnett, William A. and Yijun He (1999), 'Stability Analysis of Continuous-Time Macroeconomic Systems,' *Studies in Nonlinear Dynamics and Econometrics*, January, 3(4), 169-188.
- Blatt, John M. (1983), *Dynamic Economic Systems. A Post-Keynesian Approach*, Wheatsheaf Books, Brighton, Sussex.
- Borch, Karl Henrik (1969), 'A Note on Uncertainty and Indifference Curves', *Review of Economic Studies*, 36 (1), 1-4.
- Chichilnisky, Graciela (1999), 'Existence and Optimality of a General Equilibrium with Endogenous Uncertainty', in G. Chichilnisky ed, *Markets, Information and Uncertainty: Essays in Economic Theory in Honour of K.J. Arrow*, Cambridge University Press, UK, 72-96.

- Chinn, M. – Y.-W. Cheung – A.C. Pascual (2005), 'Empirical Exchange Rate Models of the 1990's: Are Any Fit to Survive?' *Journal of International Money and Finance* 24, 1150-1175.
- Cobham, David, ed. (1994), *European Monetary Upheavals* (New York: Manchester University Press).
- Cobham, David (2002a), The exchange rate as a source of disturbances: The UK 1979 -2000, *National Institute Economic Review* 181. No. 1. 96-112
- Cobham, David 2002b, *The Making of Monetary Policy in the UK 1975-2000*, (John Wiley).
- Cobham, David, (2006), 'The overvaluation of sterling since 1996: How the policy makers respond and why', *The Economic Journal*, **116**, F185-F207.
- Davidson, Paul (2007), Is a Plumber or a New Financial Architect Needed to End Global International Liquidity Problems? in *Interpreting Keynes for the 21st Century – Volume 4: The Collected Writings of Paul Davidson*, Palgrave, New York.
- De Arcangelis G. and Gandolfo G. (1997), Nonlinear phenomena in economics: the exchange rate, *Nonlinear Analysis*, 30 (2), 1043-1049(7)
- de Grauwe, Paul and Marianna Grimaldi, 2006, *The Exchange Rate in a Behavioral Finance Framework*, Princeton University Press.
- Dieci, Roberto and Serena Sordi and Alessandro Vercelli (2006) 'Financial Fragility and Global Dynamics,' *Chaos, Solitons and Fractals* 29, 595-610.
- Dixon, Robert (2008), *Simulation with EViews: Swan's Model*, Department of Economics, University of Melbourne, <http://www.economics.unimelb.edu.au/simulation/eviewsswan.pdf>
- Drèze, Jacques H. and P. Jean-Jacques Herings, 2003, Sequentially Complete Markets Remain Incomplete, METEOR Research Memoranda No. RM/03/044, University of Maastricht, August.
- Eckes, Alfred S.(1999), *Testimony to US Trade Deficit Review Commission*, 11pp., <http://govinfo.library.unt.edu/tdrc/hearings/16nov99/aeeckes.pdf>
- Eichengreen, Barry, 1992, *Golden Fetters: The Gold Standard and the Great Depression*, 1919-39, Oxford University Press.
- Eichengreen, Barry, Charles Wyplosz, Branson William H., Dornbusch Rudiger (1993), 'The Unstable EMS', *Brookings Papers on Economic Activity*, Vol. 1993, No. 1, 51-143.
- Feldstein, Martin S. (1969), 'Mean-Variance Analysis in the Theory of Liquidity Preference and Portfolio Selection', *Review of Economic Studies*, 36, 5-12.
- Friedman, Milton, and L.J. Savage (1948), 'Utility Analysis of Choices Involving Risk', *Journal of Political Economy*, **56**(4), 279-304.
- Goodfriend, Marvin and King, Robert G. (2005), 'The Incredible Volcker Disinflation', *Journal of Monetary Economics*, 52 (5): 981-1015.
- Grandmont, J.M. (1985) 'On Endogenous Competitive Business Cycles,' *Econometrica*, 53, 995-1045.
- Hahn, Frank (1999), A Remark on Incomplete Equilibrium, in in G. Chichilnisky ed, *Markets, Information and Uncertainty: Essays in*

- Economic Theory in Honour of K.J. Arrow*, Cambridge University Press, UK, 67-71.
- Hendry, David F. and Mary S. Morgan (1996), 'Jan Tinbergen, 1903-94', *Journal of the Royal Statistical Society. Series A (Statistics in Society)*, 159, (3) (1996), 614-616
- Horváth, Roman (2005), 'Exchange Rate Variability, Pressures and Optimum Currency Area Criteria: Some Empirical Evidence from the 1990s', *Applied Economics Letters*, 12, 919-922.
- Kenen, P. (2002a), Currency Unions and Policy Domains. <http://www.princeton.edu/~pbkenen/recent.html>.
- Kenen, P. (2002b), Currencies, Crises, and Crashes, *Eastern Economics Journal* 28 (1), 1-12.
- Klein, Lawrence (1950), *Economic Fluctuations in the United States, 1921-1941* (New York: John Wiley; London: Chapman & Hall).
- Klibanoff, Peter, Ozdenoren, Emre (2007), 'Subjective Recursive Expected Utility', *Economic Theory*, 30, 1, 49-87.
- Krelle, Wilhelm (1977), "Wirtschaftsprognosen mit ökonometrischen Modellen - Probleme und Erfahrungen" (Economic Forecasts with Econometric Models - Problems and Experiences), in Hans Albert et al., eds, *Ökonometrische Modelle und sozialwissenschaftliche Erkenntnisprogramme. Beiträge zu einem Symposium anlässlich des 90. Geburtstages von W. G. Waffenschmidt* (Econometric Modelling and the Agenda for Acquiring Knowledge in Social Sciences. Contributions to a Symposium on the Occasion of the 90th Birthday of W.G. Waffenschmidt), Bibliographisches Institut Mannheim, BI Wissenschaftsverlag, 13-40.
- Kreps, David M. and Evan L. Porteus (1978) 'Temporal Resolution of Uncertainty and Dynamic Choice Theory', *Econometrica*, 46 (1), 185-200.
- Lee, Yu-Feng L. (2007), "Bilateral Trade and Intra-Regional Business Cycles: Is East Asia Feasible for a Currency Area?", *Global Economy Journal*: Vol. 7: No. 3, Article 6, <http://www.bepress.com/gej/vol7/iss3/6>.
- McKinnon, Ronald I. (1963), 'Optimum Currency Areas,' *American Economic Review*, September, 717-25. Reprinted in R. Cooper, ed., *International Finance*, Penguin, 1969.
- McKinnon, Ronald I. (2004), 'Optimum Currency Areas and Key Currencies: Mundell I versus Mundell II,' August 2004, *Journal of Common Market Studies*, 42(4), 689-715.
- McKinnon Ronald (2006a), 'China's new exchange rate policy: will china follow Japan into a liquidity trap?'. *The Economists' Voice*, 3 (5), Article 2.
- McKinnon Ronald (2006b), 'China's Exchange Rate Appreciation in the Light of the Earlier Japanese Experience,' *Pacific Economic Review*, 287-298.
- McKinnon Ronald (2006c), China's Exchange Rate Trap: Japan Redux? May 2006, *American Economic Review*, 96 (2), May, 427-431.
- McKinnon Ronald (2007a), 'Why China Should Keep Its Exchange Rate Pegged to the Dollar: A Historical Perspective from Japan,' *International Finance*, 10(1), March, 43-70.
- McKinnon, Ronald I. (2007b), 'Towards a Stronger Dollar', mimeo, Department of Economics, Stanford, 20 November.

- McKinnon Ronald and Gunther Schnabl (2006), 'Devaluing the dollar: A critical analysis of William Cline's case for a New Plaza Agreement', *Journal of Policy Modeling*, 28(6), September, 683-694.
- Meese, R. A. and K. Rogoff (1983), 'Empirical Exchange Rate Models of the Seventies: Do they fit out of sample?' *Journal of International Economics* 14, 3-24.
- Mehrling, Perry (2001), 'Interview with Paul A. Volker', *Macroeconomic Dynamics*, 5: 434-460 Cambridge University Press
- Méltiz, Jacques (1994), 'French monetary policy and recent speculative attacks on the Franc', in Cobham, David (ed.), *European Monetary Upheavals* (New York: Manchester University Press) pp. 61-77.
- Merton, Robert C. (2001), 'Comments on the Reasons for Long Term Capital Management's Problems', presentation, American Economic Association Meetings, New Orleans.
- Mongelli, Franco Paolo (2002), 'New' Views on the Optimum Currency Area: What is the EMU Telling US?, *European Central Bank, Working Paper 138*.
- Mundell, R. (1961), 'A Theory of Optimum Currency Areas', *American Economics Review* 51, 657-665.
- Mundell, R. (1973), 'A Plan for a European Currency', in H.G. Johnson and A.K. Swoboda eds *The Economics of Common Currencies*, Allen and Unwin, 143-72.
- Mundell, R. (2003), 'The International Monetary System and the Case for a World Currency'. Leon Kozminski Academy of Entrepreneurship and Management (WSPiZ) and TIGER Distinguished Lectures Series n. 12, Warsaw.
- Mundell, Robert, (2005), China should keep currency peg, lecture organised by the Chinese University of Hong Kong, China Daily, (Agencies) Updated: 2005-06-03 20:14, http://www.chinadaily.com.cn/english/doc/2005_06/03/content_448457.htm
- Obstfeld, Maurice (2001), International Macroeconomics: Beyond the Mundell-Fleming Model. *Center for International and Development Economics Research Working Paper C01-121*.
- Papademos, Lucas (2006), 'Policy-making in EMU: strategies, rules and discretion' *Economic Theory*, 27, 25-38.
- Phelps, Edmund, 1999, "Expectations in Economics and the Rational Expectations Debate", in Alessandro Vercelli and Nicola Dimitri *Macroeconomics: A Survey of Research Strategies*. Oxford University Press.
- Pope, D. (1991), 'Bank Deregulation Yesterday and Today: Lessons of History', Australian National University Working Papers in Economic History No. 156.
- Pope, R. (1983), 'The Pre-Outcome Period and the Utility of Gambling', in B. Stigum and F. Wenstøp (eds), *Foundations of Utility and Risk Theory with Applications*, D. Reidel, Dordrecht, pp. 137-177.
- Pope, R. (1995), 'Towards a More Precise Decision Framework, A Separation of the Negative Utility of Chance from Diminishing Marginal Utility and the Preference'. *Theory and Decision*, 39 (3), pp. 241-265.

- Pope, R.E. (2005), 'The Riskless Utility Mapping of Expected Utility and All Theories Imposing the Dominance Principle: its inability to include loans, commitments even with fully described decision trees' in Ulrich Schmidt and Stefan Traub eds, *Advances in Public Economics: Utility, Choice & Welfare*, Springer, 289-327.
- Pope, R.E. (1981), *Revaluation: Help or Hindrance to Australian Manufacturing?* C.A.E.R. Paper No. 14, University of New South Wales, December, 1-84.
- Pope, Robin E. (1985a), "Timing Contradictions in von Neumann and Morgenstern's Axioms and in Savage's 'Sure-Thing' Proof", *Theory and Decision*, **18**, 229-261.
- Pope, Robin E. (1985b), "Revaluations: Help or Hindrance to Australian Manufacturers?", in W. F. Gossling, ed, *Western Pacific Trade*, Input-Output Publishing Company, Suffolk, 75-104.
- Pope, R.E. (1987), *Revaluations: Help or Hindrance to Australian Manufacturing?* PhD Thesis, University of New South Wales, Sydney.
- Pope, Robin (2000) 'Reconciliation with the Utility of Chance by Elaborated Outcomes Destroys the Axiomatic Basis of Expected Utility Theory', *Theory and Decision*, 49, 223-234.
- Pope, Robin E. (2006), 'Replacing Payroll with Sales Taxes Shifts Risks from Firms to Governments, *The Economists' Voice*: Vol. 3: No. 9, Article 3. Available at: <http://www.bepress.com/ev/vol3/iss9/art3>.
- Pope, Robin, Johannes Leitner and Ulrike Leopold-Wildburger, 2006, *The Knowledge Ahead Approach to Risk: Theory and Experimental Evidence*, Springer Lecture Notes.
- Pope, Robin, Reinhard Selten, Johannes Kaiser, Sebastian Kube and Jürgen von Hagen (2007), Exchange Rate Determination: A Model of the Decisive Role of Central Bank Cooperation and Conflict.
- Pope, Robin, Reinhard Selten, Sebastian Kube and Jürgen von Hagen, forthcoming June 2008, Experimental Evidence on the Benefits of Eliminating Exchange Rate Uncertainties and Why Expected Utility Theory causes Economists to Miss Them, *Indian Journal of Economics and Business*.
- Rose, A (2000), 'One Money, One Market: Estimating the Effects of Common Currencies on Trade'. *Economic Policy* 30, pp. 9-33.
- Samuelson P. (1952), 'Probability, Utility and the Independence Axiom', *Econometrica*, 20, 670-678.
- Sauermann, H. and Selten, Reinhard, 1962, Anspruchsanpassungstheorie der Unternehmung (aspiration-Adaptation Theory for the Firm), *Zeitschrift für die gesamte Staatswissenschaft* **118**, 577-97.
- Schneeweiß, H. (1968a), 'Die Unvertäglichkeit von (m, s))-prinzip und Dominanz-prinzip', *Unternehmensforschung (Operations Research)* 12, 180-184.
- Schneeweiß, H. (1968b) 'Note on Two Dominance Principles in Decision Theory, *Unternehmensforschung (Operations Research)* 12, 213-216.
- Schneeweiß, H. (1973a) 'The (m, s)) Decision criterion on the Class of Normal Distributions', *Inference and Decision*, 1, 23-30.

- Schneeweiß, H. (1973b) 'On the Consistency of classical Decision Criteria', *Inference and Decision*, 1, 31-44.
- Selten, R. (1998), 'Aspiration Adaptation Theory', *Journal of Mathematical Psychology*, 42, 191-214.
- Simmons, Beth A., (2006), The Future of Central Bank Cooperation, BIS Working Papers No 200, 1-24.
- Simon, Herbert A. (1955), "A Behavioral Model of Rational choice", *Quarterly Journal of Economics*, 69, 99-118.
- Simon, Herbert A. (1996), *Models of My Life*, MIT Press, USA
- Sinn, Hans-Werner (2003, 2005b), *Ist Deutschland noch zu retten?* (Can Germany be Saved?), Econ Verlag: Munich 2003, 8 hardcover editions; 1st to 3rd paperback edition: Ullstein: Berlin, 2005.
- Sinn, Hans-Werner (2005a), *Die Basar-Ökonomie. Deutschland: Exportweltmeister oder Schlusslicht?* (The Basaar Economy. Germany: World Export Master or Trailing Last?) Econ Verlag: Berlin.
- Sordi, Serena and Alessandro Vercelli (2003), 'Financial Fragility and Economic Fluctuations: Numerical Simulations and Policy Implications,' *Quaderni Del Dipartimento Di Economia Politica*, Siena, Ottobre 2003.
- Soros, George (2003), *The Alchemy of Finance*, John Wiley & Sons, Hoboken New Jersey.
- Swan, Trevor (1952, 1953, 1960), 'Economic Control in a Dependent Economy Economy', *Economic Record*, 51-66.
- Tatom, John A. (2007), "The US-China Currency Dispute: Is a Rise in the Yuan Necessary, Inevitable or Desirable?", *Global Economy Journal*: Vol. 7: No. 3, Article 2, <http://www.bepress.com/gej/vol7/iss3/2>
- Thorbecke, William (2006), "How Would an Appreciation of the Renminbi Affect the U.S. Trade Deficit with China?" *The B.E. Journal of Macroeconomics Topics*, 6 (3).
- Tobin, James (1997), 'Jan Tinbergen (12 April 1903-9 June 1994)', *Proceedings of the American Philosophical Society*, 141 (4) December, 511-514
- Tversky, Amos and Daniel Kahneman (1992), 'Advances in Prospect Theory: Cumulative Representation of Uncertainty', *Journal of Risk and Uncertainty*, 5, 297-323.
- Walsh, Vivian (1996), *Rationality, Allocation and Reproduction*, Clarendon Press, Oxford.
- Wang, Y., X. Hui and S.A. Soofi (2007), 'Estimating the Renminbi (RMB) Equilibrium Exchange Rate', *Journal of Policy Modelling*, 29 (3), 417-429.
- Wilson, Peter and Henry Ng Shang Ren (2007), 'The Choice of Exchange Rate Regime and the Volatility of Exchange Rates after the Asian Crisis: A Counterfactual Analysis', *World Economy*, 30 (11), 1646-61.