Complexity Bias versus Equilibria and Random Fluctuations Behind Economists' Preference for Variable Exchange Rates

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Abstract

Economists typically model exchange rates between currencies under equilibria with random fluctuations and advocate variable exchange rates to restore equilibria after shocks. From an analysis of field and laboratory data and modelling practices, this paper identifies 10 sources of evidence of bias in how economists' perceive exchange rate equilibria. In each case the bias results in economists systematically under-estimating complexity in the economic system. SKAT, the Stages of Knowledge Ahead Theory of choice under risk and uncertainty of Pope (1983, 1995)) and Pope, Leitner and Leopold-Wildburger (2006), differs from standard maximising economic theories since it allows for how complexity enters the evaluation and choice stages and for consistent recognition of the impact of variable exchange rates. A single world money, as under the gold standard and adopted by many private banks prior to World War I and advocated for today in Mundell (2003), would avoid the extreme costs of variable exchange rates.

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Money has a substantial fiduciary, trust, component that is complex to understand, rendering the price of money tricky to determine even with the use of divisia indices and allowance for computer software technological advances such as sweeping. These difficulties multiply in an open economy context with an array of currencies. Prior to governments taking charge of money and banking, unregulated banks typically chose fixed exchange rates in the form of the gold standard, D. Pope (1991). Most economists saw the

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return to reasonably fixed exchange rates after World War II under the Bretton Woods Agreement as desirable. Those advocating floating rates such as Friedman (1953) were a tiny minority. But with the breakdown of the Bretton Woods Agreement in the early 1970s, most economists have come to perceive variable exchange rates as a blessing. The shift to favouring variable exchange rates has coincided with the rise in general equilibrium modelling. This has enticed the perception that exchange rates between monies are in equilibrium apart from random fluctuations. Modern mainstream economists thereby advocate variable exchange rates to restore equilibria after disturbances. Some mainstream economists see the market as imperfect, in which case prices may be sticky and the government may be able to intervene in the exchange rate market to speed arrival at a new equilibrium. Other mainstream economists see the market as perfect, so there should be no government intervention in exchange rate markets.

This paper offers evidence that equilibrating claims for variable exchange rates stem from failing to discern the increase in complexity of variable exchange rates, and the cost of this gratuitous increase in complexity. The paper thus provides complementary evidence to support the significant number of economists who find variable exchange rates undesirable. Ten sources of evidence concerning undisclosed complexity effects and their macroeconomic costs are presented in the following eight sections of this paper. The paper also outlines the change required in the umbrella theory for models to discern complexity effects, namely a change from the maximising models devised under the umbrella of EUT, axiomatised expected utility theory, to models devised under SKAT, the Stages of Knowledge Ahead Theory.

1: Bias in Exchange Rate Change Proposals for Labour Market Failures

In the case of sticky wages, economists tend to claim that after a shock leaves country A with under-employment and country B with over-employment “equilibrium”, it may help if country A depreciates, while B appreciates. Such disequilibria are transparent in the simple tractable algebraic model. But consider the equilibrium implications, each country of type A with underemployment is matched by another country of type B with overemployment. On a trade-weighted basis, there must be exactly as many A type economies as B type economies. In the complex real world however, this is not what economists discern. Instead, with the exception of Singapore (with its minute trade-weighted role in the world), economists advising virtually every country perceive that country to be in disequilibrium with underemployment to be cured by depreciation.

Consider for instance Keynes' advice in later 20s, that the UK should depreciate to help her coal miners and their owners— but other countries also had high unemployment. Consider today, where the US and EU want to depreciate against China to reduce their unemployment – and have bullied China to appreciate and to promise more appreciations even though unemployment is even worse in China. The case is pressed by US senators, McCary (2007), and by economists who see the current exchange rates as unsustainable, and suggest that this is a consequence of the People's Bank of China being "not well integrated – some would say, not well socialised – into institutional channels where the exchange rate issue might be cooperatively handled", Simmons (2007, p17). In short, once we step from simple algebraic models into the complexity of the real world, the situation is too complex for economists to discern equilibria. Indeed the real world is even too complex for them to discern the blatant bias in the equilibria presumed to be discerned.
as evidence by the lack of a literature on how to locate the missing countries suffering overemployment. This bias renders use of variable exchange rates useless, and indeed dangerous. Such economists’ unrecognised but biased use of the equilibrium concept to improve labour markets thus generates unwarranted international tensions – efforts to beggar-thy-neighbour via competitive devaluations.

2: The Elusive Fundamentals
Consider next the other branch of mainstream that sees markets as perfectly competitive (no sticky prices, nobody with any market power), and exchange rate changes as equilibrating in accord with market "fundamentals". For this view to be valid, the fundamentals need to be discernible, and the equilibrium needs to be stable and unique. From research on these issues concerning markets in general, such stability and uniqueness is implausible. See eg Grandmont (1985), Arcangeli and Gandolfo (1996), Chichilnisky (1999), Hahn (1999), Drèze and Herings (2003), Phelps (1999), Barnett and He (1999, 2002, 2006), Sordi and Vercelli (2003) and Dieci, Sordi and Vercelli (2006). In addition, the estimated parameters of the fundamentals need to have the right sign. But systematically, despite decades of experimenting with new models, the wrong sign surfaces and is "statistically significantly" wrong for the fundamental connecting the interest rates and the forward and spot rates, eg Rapp and Sharma (1999). The wrong sign persists even after data are improved via techniques such as using divisia indices and correcting for sweeping in computation of the money stock, eg Bissoondeal, Binner and Elger (2006).

3: The Complexity of Market Power
Efficient markets hypothesised fundamentals equations with so-called rational expectations are refuted by the complexities of the market power exercised by major fund managers a defect noted by Soros (2003) and Merton (2001), and that exercised by central banks. When fully cooperating central banks have unlimited market power – can fully set the exchange rate by legislative decree on their exclusive power to print their own currency.

4: The Testimony of Key Players
Under the efficient markets equilibrating hypothesis there is a critical mass of maximisers. But given the complexities of the real world, nobody at all, let alone a critical mass of people, can maximise, Simon (1993), not even for planning a family picnic, Savage (1954). In exchange rate decisions in accord with reality, key private players and official players report that they do not maximise. See eg Soros (2003) and Papedemos (2006).

5: Expected Utility Theory Biases
Economists mainly use EUT, axiomatised expected utility theory, to theorise about exchange rate equilibrium. This theory abstracts from complexity and assumes a world so simple that people costlessly and instantly know: their alternatives and for each alternative the utility of each possible outcome and its probability of occurring; and costlessly maximise by choosing the act with the highest expected utility after all risk is past. Ie the theory skips over all the complexities of all the stages of risk, uncertainty and all the effects of

1 Objectors to use of such simple models like Mundell (1961) to justify variable exchange rates, include Mundell himself; who has also been prominent amongst those seeking to force an appreciation on China (2005).
such complexity on real choosers. To allow for the complexity of real world
decision making in order to ascertain whether variable exchange rates
behave and what is the appropriate choice of exchange rate regime, it is
necessary to depart from EUT. Indeed it is necessary to depart not only from
EUT but also from the entire class of maximising theories that, via the
imposition of the dominance principle, consider only the most distant portion
of the future when all risk will be past. It is necessary to instead analyse and
evaluate using models within the umbrella of SKAT, the Stages of
Knowledge Ahead Theory, Pope (1983, 1995) and Pope, Leitner and Leopold
(2006). It is essential to take into account stages 3 to 5 in the below schema,
not simply analyse as does EUT and all maximising dominance principle
preserving theories, as if the chooser jumps straight to stage 6 without ever
going through the earlier uncertain stages, nor having legacies from having
gone through them.

<table>
<thead>
<tr>
<th>Stages 3-6 in SKAT</th>
<th>Change in Knowledge Ahead (in what he knows) ending the Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Pre Discovery of Choice Set: tricky negotiations</td>
<td>knows his choice set</td>
</tr>
<tr>
<td>4 Pre Evaluation and Choice: expensive, stressful,</td>
<td>knows his choice within this set</td>
</tr>
<tr>
<td>using heuristics since maximising is infeasible</td>
<td></td>
</tr>
<tr>
<td>5 Pre-Outcome: before he learns the outcome (result)</td>
<td>knows the outcome (result) of his choice, whether lucky or</td>
</tr>
<tr>
<td>of the risks taken in his chosen alternative so</td>
<td>unlucky</td>
</tr>
<tr>
<td>planning costs of flexibility, anxiety, thrills</td>
<td></td>
</tr>
<tr>
<td>6 Post-Outcome: Certainty but legacies from before of</td>
<td></td>
</tr>
<tr>
<td>risk premia, blame if bad result (maybe fired), praise</td>
<td></td>
</tr>
<tr>
<td>if better (maybe promoted)</td>
<td></td>
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</tbody>
</table>

Constructing algebraic models and making econometric estimates of the
exchange rate determination within the SKAT umbrella will be demanding as
regards tractability and as regards having sufficient data in which each
case is held constant. The model analysis and estimation is already
demanding in these regards in maximising models that ignore the
complexities arising out of stages 3 to 5 that such models omit entirely. The
tractability and constancy problems are even more daunting when one
considers implications of each stage of the market power of key players. In
the simple situations of maximising models, everyone chooses alike their
maximising strategy. But under real world complexity, people and
organisations cannot maximise. So they must use heuristics to choose – and
will also rely more on friendships and enmities in selecting their heuristics.

In stages 3 and 4, for instance, individual differences and group dynamics
will enter – above all in matters of exchange rate determination where fully
cooperating central banks can by legislation, thwart all private speculation.2
The difficulties of understanding these personal interactions and their impact
on the exchange rate even with the hindsight of extensive documentation may
be judged from the ongoing disputes amongst commentators on the degree of
central bank cooperation underlying famous historical episodes. See eg on
the role of 19th century cooperation in maintaining the gold standard and of
the role of friendships and personal/ national friendships and hostilities in
generating 20th century degrees of cooperation, the differing accounts offered

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2 This scope of cooperating central banks was noted for instance in the context of the
exchange rate turmoil of 2007 by a member of the European Central Bank, Lorenzo Bini
Smaghi. See the report of his speech in the Frankfurter Allgemeine 21st September 2007.
Evidence from Laboratory Experiments

Laboratory experiments are a means of avoiding most of the tractability and constancy problems in employing SKAT to get fresh insights into the issue of whether variable exchange rates equilibrate and if not, of damage from variable exchange rates. In the laboratory constancy of regime is set; there is no imposition on agents of what heuristics they employ to seek to meet their objectives as governments, central banks, union and employer bargaining representatives or firms (with requirements for imported materials and a scope to speculate on their own currency appreciating or hedge against their own currency depreciating before the imports bill fell due).

Each laboratory session comprised 20 rounds and was conducted by a fresh set of participants enabling complete independence of each session as regards statistical significance. Such independence is not feasible with field data as there is but on world history. All participants were paid in accord with their success in meeting their goals. For governments and central banks, the goals were seven-fold: meeting their price target, keeping prices steady, keeping the interest rate at its ideal level, meeting their exchange rate target, keeping international competitiveness at its ideal level, avoiding under or over employment, with a higher weight on avoiding underemployment. As in reality, the official sector was short of instruments, having only four, fiscal policy, announcing its price and exchange rate targets, and setting its interest rate. For a firm, maximising firm real profits was the goal. For the employer wage bargaining representative, the goal was total real firm profits, and for the union representative, real wages. In the exchange rate market, in addition to firm offers to buy currencies (dependent on their import repayment requirements and their perceptions of gains to be made in light of intercountry interest differentials and anticipated exchange rates), central banks did limited interventions to attain their goals, and fully cooperated to the extent needed to avoid the private sector pushing the exchange rate beyond the range that either central bank desired. There were two countries, currencies. For other details of the set-up, see Pope, Selten, Kube, Kaiser and von Hagen (2007).

6 Indiscernibility of a Game Theoretic Equilibrium

The laboratory set-up was a compromise between real world complexity, playability for 20 rounds within a day by advanced economics students, and analysability. As a result of this compromise it was far simpler than complex reality. Nevertheless, not even Reinhard Selten could ascertain whether the set-up had a game theoretic equilibrium. Instead as a benchmark conforming to EUT, axiomatised expected utility theory, in a set-up allowing for player’s market power, he constructed a new concept of incomplete equilibrium (in which players do not contemplate branchings that could not enhance their payoffs), and established that the symmetric incomplete equilibrium was unique. The matter that the existence of (complete) equilibrium is not feasible to ascertain reveals the futility of economists talking about exchange rate variations moving markets into equilibrium.

7 Non-equilibrating Changes in the Exchange Rate

In every session participants altered the initial exchange rate, even though they began in equilibrium. This reveals that participants are even unable to discern a simpler equilibrium than is the norm in reality, simpler in the sense of being symmetric and of an incomplete nature.

8 The move of the Exchange Rate toward a Non-Equilibrium Prominent Ratio

In every session participants altered the initial exchange rate of two countries out of equilibrium toward the prominent number ration of 1:1. The matter of this being by chance can be statistically excluded at a level well in excess of
1%. This reveals that in a complex situation in which nobody understands where equilibrium is, people use heuristics such as prominent number ratios. Other incidents in history of exchange rates being set by prominent number ratios are in Pope, Selten, Kaiser, Kube and von Hagen (2006).

9 The unpredictability of the Exchange Rate to Speculators
Firms could improve their payoffs by predicting well the exchange rate, but had zero success, Kaiser and Kube (2005). In turn this means that their impact on changing exchange rates was non-equilibrating, contrary to the equilibrating role of speculation assumed in Friedman (1953, 1998).

10 The Superior Performance of Macroeconomic Management with a Currency Union
The government and the official sector had significantly greater success in maintaining international competitiveness in a control set of experiments with a currency union than with variable exchange rates, and indeed had a higher attainment of their set of goals with a currency union, Pope, Selten, Kube and von Hagen (2006). In turn this indicates that in a complex system, the extra degree of freedom of being able to vary the exchange rate does enhance well macroeconomic well being and lead to speedier welfare enhancing equilibria. Rather the additional uncertainties of the complexity of variable exchange rates in an already complex world is overall damaging.

Summary and Recommendations
We have found that the notion of variable exchange rates beneficially equilibrating exchange rate market to be unsubstantiated from the following 10 sources of evidence listed in the table below.

1 Proposed policy use of imperfect labour market exchange rate equilibrium models is one sided, essentially entirely of the beggar-thy-neighbour form, something impossible if changes are equilibrating.
2 Economists’ perfect market exchange rate equilibrium models cannot detect equilibria and cannot get correctly signed parameters
3 Key private and public players have market power that is ignored in rational expectations perfect market equilibrium models
4 Central bankers and speculators say they do not decide and behave as in the economists’ maximising equilibrium models
5 EUT, axiomatised expected utility theory, the lynchpin of the market equilibrium models omits the uncertain stages that occur before certainty arrives and thereby omits all the complexities that these uncertainties generate
6 When within EUT, market power is included, even a simple game theoretic equilibrium is too complex for economists to discern, let alone assess whether or not the economy reaches it
7 In a laboratory set up, players cannot discern even a symmetric incomplete equilibrium
8 In a laboratory set up, players cannot predict the exchange rate
9 In a laboratory set up, in every session, the exchange rate veered not towards equilibrium, but towards a prominent number ratio
10 In a laboratory set up, the official sector significantly better attains international competitiveness without variable exchange rates, and does better on its basket of goals.

Once complexity effects are taken into account, the ground for advocating multiple world monies is thus found lacking. Rather, the evidence indicates adverse macroeconomic outcomes from the complexity costs imposed on the official and private sectors under variable exchange rates. EUT, axiomatised expected utility theory, omits the earlier stages of decision making under uncertainty when variable exchange rates do much damage the economy. Employing a theory that omits the stages when much of the damage occurs, renders it difficult to detect the damage analytically and empirically. We accordingly recommend:

A To detect and understand the damage, construct models within the umbrella of SKAT, the Stages of Knowledge Ahead Theory so as to incorporate the complexity effects that enter exchange rate determination.
B Adopt one world money - not variable exchange rates – as advocated by Mundell (2003)
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