

Methodological Triangulation at the Bank of England: An Investigation

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Abstract: This paper investigates the extent to which triangulation takes place within the Monetary Policy Committee (MPC) process at the Bank of England. Triangulation is at its most basic, the mixing of two or more methods, investigators, theories, methodologies or data in a single investigation. More specifically, we argue for triangulation as a commitment in research design to the mixing of methods in the act of inference. The paper argues that there are many motivations for triangulation as well as types of triangulation. It is argued that there is evidence of extensive triangulation of different types within the MPC process. However, there is very little theoretical triangulation present; raising concerns about pluralism. Also, it is argued that the triangulation which occurs is mainly undertaken for pragmatic reasons and does not reflect other, coherent ontological and epistemological positions.

Draft of July 2005.

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1. INTRODUCTION

There has been a growing concern that one single method is inadequate for investigating complex social phenomena. Thus, there has been interest in several quarters, including in government agencies (such as research councils) and academic departments in the feasibility of mixing methods in a process of *triangulation*. In a series of papers, we have investigated the philosophical and methodological rationale for triangulation (Downward and Mearman, 2002, 2003, 2004, 2005); and we have attempted to show triangulation in action, particularly in investigating pricing (Downward and Mearman, 2003). Specifically, we have argued that triangulation offers a potential solution to the impasse between the mainstream monist formalist ‘deductivist’ approach and the approach of critics – such as critical realists – who seem to imply rejection of mainstream methods. In this way, we work in the spirit of pluralism in economics as advocated by, for instance, Dow (1985 *et passim*). For us, triangulation operates within what might be called a Keynesian or ‘Babylonian’ approach (Dow, 1985).

This paper expands upon our earlier work, by investigating motivations for triangulation. Most significantly, it investigates the always topical and – often controversial – process of the Monetary Policy Committee (MPC), and more specifically, the support for this process provided by the Bank of England, behind the setting of interest rates. This task is warranted because of the frequent claims (see, for example, Dow, 2004; Backhouse, 2005) that the Bank is an example (albeit rare) of economists using triangulation. Such an investigation is easier now given the greater transparency of the process following the independence of the Bank from other arms of government in 1997. We argue: 1) that there are many examples of triangulation within the MPC process; but that 2) most of these are of a weak form, involving mainly data triangulation, mainly for pragmatic reasons; and that (3) the Bank lacks a coherent framework for mixing methods to the extent to which it does. The paper proceeds as follows: first, types of triangulation are discussed. Second, motives for triangulation, as found in the existing literature, are explored. Third, the Bank of England’s MPC process of forecasting inflation is evaluated in terms of types of and motivations for triangulation.

2. TYPES OF AND MOTIVES FOR TRIANGULATION

2.1 Types of triangulation

¹ We acknowledge comments received at a staff seminar at the University of the West of England in November 2004. In particular, we acknowledge detailed and helpful comments received from Peter Howells. We acknowledge the participants at a session at the conference of the Association for Heterodox Economics at City University, London in July 2005. In particular we should like to thank Victoria Chick for her discussion of the paper. Thanks also to Geoffrey Church. We also acknowledge the comments of Kevin Butler of the Bank of England. All views expressed here are the authors’ and do not reflect the view of the Bank. All remaining errors are our own.

Triangulation as an applied concept derives from navigation and surveying, whereupon taking measurements from two separate locations one can derive, or predict, a third measurement or location². In social research, in its broadest sense triangulation implies combining together multiple insights in an investigation³. However, this simple definition of triangulation masks a range of its meanings and uses. This section presents a non-exhaustive classification of types of triangulation.

The simplest form of triangulation is also the least extensive, and indeed may not at first appear to be triangulation. It is the employment of *judgement* by the economist about their model, tool, theory or data. For example, an economist might use an econometric model (which often they have created) to produce an estimation. They could in principle, passively receive the information from the model, simply report this result and stop their investigation. However, they can be more active, and apply their judgement to the result, perhaps to interpret it in a specific way. This employment of judgement can be interpreted as the interaction of economist with model, and thus is a form of triangulation. Dow (2004) notes that the use of judgement becomes crucial when faced with 'Keynesian' unquantifiable uncertainty.

Denzin (1970) offers four main types of triangulation. *Data triangulation* is when different sets (and often types) of data are combined. Different types of data might be used; for example, survey data might be used alongside time series data. Additionally, the data could be differentiated spatially or temporally. Thus, the insights of a person at different times could be triangulated to make an inference about the whole time period. Clearly, also, different people could be asked once, but at different times. An example would be the combination of survey and interview data.

Investigator triangulation is the combination of insights from multiple investigators on the same subject. Imagine three people in the dark examining an unknown object. If the men perceive that they feel a tail, a thick upright rough surface, and a ivory object, they might infer that they have, respectively, a donkey, a tree (or umbrella stand) or a horn to be played. However, the combination of the insights leads the three to conclude that the mystery object is an elephant. Examples of this type of triangulation abound: for example, the replication or repeated trials of a study, or the seeking of a second opinion, are common techniques in medical research. The recent advances in cell biology, particularly in the discovery of how cells move proteins through a specific pathway in order to be able to secrete them from the cell (see Pelham, 2001; Del Rio et al, 2004), is an example of triangulation in 'natural science'.

² Blaikie (1991) has some reservations about the appropriateness of this nautical or surveying analogy to social science. One related criticism of the term is that triangulation implies a precision which is unjustified in social research. An alternative terminology is of "mixed methods" (Downward and Mearman, 2005); pluralist (Dow, 2004); or Babylonian (Dow, 1985). However, the term triangulation is well established now, justifying its use.

³ It is clear that many of the most prominent economists, particularly Smith and Marshall, have broadly engaged in triangulation, as they drew upon different evidential bases and arguments. Moreover, it can be argued that, as evidenced by Laidler (1993), a process of triangulation – in this case, the combination of methods and data types – led directly to the conclusion that the demand for money function is unstable (see 140).

In the case of multiple investigators, each may have their own prior theory, or theoretical paradigms, whose insights are then combined (in various different ways) to reach a collective conclusion. In the literature this is known as *theoretical triangulation* (Denzin, 1970). Such theoretical triangulation can also take place within an individual, who might analyse a finding from multiple perspectives.

Denzin's (1970) fourth type of triangulation is *methodological triangulation*, which involves the combination of different methods. A weak form of methodological triangulation can be what Denzin calls *within-method* triangulation, in which different varieties of the same method are combined. An example of this might be the triangulation of VARs with different specifications or different lag lengths. More adventurous is *between-method* triangulation, which involves the use of different methods in combination. Between-method triangulation is challenging because it often involves the combination of different underlying methodologies: for example, the combination of an econometric study with a discourse analysis combines methods based on opposed philosophical bases⁴. Our preferred definition adopts the most adventurous position. For us, triangulation is: *the prior commitment in research design to investigation and inference via the mixing of methods*. That, then, is the implicit standard by which apparent triangulation is assessed. However, in discussing the Bank of England's practices, all of the pre-existing definitions will be used.

It is our evaluation that, in the economic mainstream, generally it is the case that triangulation, beyond the interaction of modeller and model, is limited. The relative lack of triangulation might reflect positivist philosophical underpinnings (see Frankfort-Nachmias and Nachmias, 1996). More likely, the lack of triangulation results from the widely held belief that certain types of method necessarily have higher statistical power; and that wherever possible such methods should be used. Sophisticated developments of regression analysis are the best example, perhaps because of their claimed analogy to controlled experiments.

2.2 Motives for triangulation

Types of triangulation are just one part of the story. In order to evaluate the Bank's practices, we also need to ascertain their motives for their actions. A range of motives for triangulation can be found in the literature. One of the most common is the rationale that often data are incomplete or inadequate, and that it is necessary to use different data types

⁴ Typically, it is viewed as controversial to combine different methodologies, because this involves ontological and epistemological clashes. For example, quantitative data is based on an empiricist ontology, whereas qualitative data is derived from the presupposition that reality is exhausted by meanings. For the proponent of quantitative data, qualitative data are not subject to measurement and thus are useless; whereas for the qualitative researcher, it is impossible to measure meanings, and thus quantitative analysis is useless. It is beyond the scope of this paper to resolve this clash. However, elsewhere (Downward and Mearman, 2005) have argued that the ontological clash can be removed if an ontology of complex objects residing in deep structures is adopted. Specifically, they (see also Downward and Mearman, 2002) argue that the Critical-Realist logic of retrodution inherently involves triangulation, because various empirical methods can illuminate both what Critical Realists refer to as the empirical and real domains of reality.

to fill the gaps in the original data set. For example, gaps in time series are often filled with estimates. Additionally, errors in data might be corrected or taken into account by using other data.

The tactic of econometricians of re-estimating equations under different specifications is an appeal to the above argument; however, estimating multiple equations can also be interpreted as an appeal to the law of large numbers. There is an implicit claim made that increased numbers of confirming estimations increases the ‘validity’ of the estimation and/or underlying theory (Campbell and Fiske, 1959).

Triangulation can also occur for political reasons. If an investigation is being carried out amongst a group, as is often the case, in order to convince each participant that their input is valued, it may be that some part of each party’s view is incorporated into the group action. This satisfies all stakeholders involved; and it can unwittingly admit theoretical or even methodological triangulation. Another political factor is that the research group may have a clear (explicit or implicit) view that pluralism ought to be practised.

Support for pluralism could be based on a prior conviction; but equally it could be based on epistemological grounds: for example, if the research group adopts a fallibilist position. Fallibilism is the view that all theories, views, models, etc. are inherently fallible and that no grounds exist for judging any view completely correct. Often, it is recognised that no single theory, or more often, one single investigator, has the computational capacity to deal with the myriad facts in a complex environment. Equally, such fallibilism may be simply the product of a pragmatic evaluation of experience: if one’s models – whatever their formulation – have tended in the past always to be incorrect, the judgement is made that they are likely to be flawed in the future.

Finally, there might be ontological grounds for triangulation, some of which are suggested above. If objects are complex, it is unlikely that any single datum or observer can describe them adequately. Therefore, there needs to be several observers/observations in different locations and/or times, so that a more complete picture can be constructed. Elsewhere (Downward and Mearman, 2005) we argue that in order to grasp the complex empirical reality and the (also complex) deeper structures of reality, different empirical methods are necessary. Also, I argue (2004) that in so-called open systems of reality, in which the degrees of closure of reality and the methods chosen to examine them are unlikely to match, triangulation can attempt to compensate for this mis-match by combining insights from various perspectives.

3. TRIANGULATION AT THE BANK OF ENGLAND

3.1 The Monetary Policy Committee process

The processes under investigation are those surrounding the meetings of the Monetary Policy Committee (MPC). The Bank, aiming for transparency, has published an extensive set of papers laying out the process of the MPC’s decision regarding interest rates (see, for example, Whitley, 1997; Britton, Fisher and Whitley, 1998; Budd, 1998; Bean, 1998;

Britton, Cutler and Wardlow, 1999; King, 1999; Kohn, 2000; Bank of England, 1999, 2000, 2003; Bean and Jenkinson, 2001; Pagan, 2003). The Bank's publications show a complex, iterative process involving many different models, methods, data types and people, both MPC members and Bank staff. This paper is based on the interpretation of the Bank's publications.

The well-publicised and much-anticipated MPC monthly meetings are the end result of a month-long (and longer for the production of the Inflation Report) process of data collection, analysis, presentation and interpretation. The process involves Bank staff and its Agents collecting and manipulating data to be presented to the MPC, which then considers the information and makes its decision. The principal tool for decision-making is the projection of inflation. Every quarter this projection generates the lengthy official Inflation Report, but in other months, a projection is still required.

The processes by which the Report and the monthly projections are arrived at are rather similar and their differences will not be considered here (cf. Britton, Fisher and Whitley, 1998; Bean and Jenkinson, 2001). They both are iterative processes, involving a series of meetings, both with and apart from the MPC members, reflection on past projections, reconsideration of the projection model, and an amendment of the models after deliberation on relevant events (or data) from the relevant period. The process culminates in the production of a numerical projection of inflation.

The final tool for use by the MPC is the "fan chart". The fan chart is a probability distribution of projections (Britton et al, 1998; Bank of England, 2000). For each estimate of inflation (or GDP) which is produced, a probability weight is added, according to the MPC's assessment of it (Budd, 1998). The whole fan chart therefore plots the range of outcomes considered possible by the MPC, together with their subjective assessment of the likelihood of those outcomes.

3.2 Evidence of triangulation in the process

On a cursory examination, there appears to be considerable evidence of triangulation. Often, the triangulation appears to be extensive; but on further analysis, it tends to be fairly superficial, driven by pragmatic concerns. In contrast, for us, 'deeper' forms of triangulation are those which triangulate between methodologies *and* which do so for ontological reasons. The grid below summarises our findings. In each case, the motive for triangulation is found in the rows; the type of triangulation is in the columns. Each box is either empty, indicating no basis for a judgement; or it contains 'yes' or 'no'. If there is strong evidence for or against a type of triangulation undertaken for a specific motive, the yes or no becomes capitalised⁵. No *direct* evidence at all was found relating to validity or the 'law of large numbers' as a motive, so they have been deleted. However, in the light of our other findings, it seems likely that both are relevant in informing the Bank's use of triangulation.

⁵ Clearly, the rigour of such assessments can be questioned. More formal methods, such as content analysis, are available for assessing quantitatively textual data; however, any content analysis carried out here is somewhat informal and a matter of judgement.

Table 1: Summary of findings – motives for and types of triangulation at the Bank

	Data	Judgement	Investigator	Theoretical	Methodological	Summary
Data inadequacy	YES	yes			yes	YES
'Political' factors			YES		no	yes
Pragmatism	YES	yes	YES	yes	yes	YES
Pluralism			no	no	NO	NO
Epistemology		YES	yes	no	yes	YES
Ontology	yes	yes	no	no	no	no
Summary	YES	YES	YES	no	yes - within no - between	

3.2.1 Triangulation via judgement

We support Dow's (2004) and Cobham's (2003) opinion that judgement is an important part of the Bank of England process. Indeed, the Bank's own literature portrays the generation of forecasts as a process of judgement working in tandem with formal modelling. Whitley (1997: 165) cites approvingly Higgins' comments on Bryant et al (1988), that "a formal and quantified framework is an irreplaceable adjunct to the process of policy thought"; i.e., thought has primacy. Moreover, the projections made by the Bank's models are subject to interrogation and interpretation by both Bank staff and the MPC. Indeed, as the Bank (2004a: 188) notes, the inflation projections are always ultimately the *product of the MPC*, not the models. Such an emphasis on judgement inevitably harks back to the 'wise men [sic]' of the pre-independence period (1993-1997).

The role of judgement introduces a distinctly human element to the setting of interest rates. Budd (1998) argues that a decision-maker's mood will always affect the interpretation of a model. Thus, a MPC member's decision about the interest rate will be

complex. It will be informed by their interpretation of the models (and other data) presented to them, and by other data they have seen, or by their own modelling done prior to the meeting. Their decision will also be affected by their pre-suppositions about the economy and about what their role is in it. Cobham (2003) shows that different preferences among participants in meetings will affect the final decision taken. However, also, their decision will be affected by their own *feeling* or intuition about the current economic situation. For example, Cobham shows that some members of the MPC have been instinctively more active than others. Some may have a preference for lower inflation than others (although Cobham: 481 discounts the importance of possible different preferences for *stability*). Some might be more concerned about doing what the markets expect (see Bell-Kelton, 2005, for a lengthy discussion of this). Finally, some might be feeling optimistic about the economy, while others will be pessimistic: Bell-Kelton shows how within the US Federal Reserve's Open Market (operations) Committee (FOMC), two camps emerged, one optimistic 'elves', the other pessimistic 'wolves'. All of this suggests a process in which psychology is significant.

3.2.2 Investigator triangulation

The effect of the MPC members using their judgement is multiplied by their interaction. The MPC listens to the evidence presented to them; each member presents their assessment of the evidence and their subsequent recommendations; and *eventually* they vote. MPC meetings "explore all possible views on the cause and significance of recent economic developments" (Budd: 1789). The final projection arrived at is therefore the product of discussion and negotiation amongst the committee. The committee might not reach a unanimous decision – very often it does not – but its decision can be said to be "collegiate" (Whitley, 1997: 170); a "collective examination of forces shaping the outlook to come to a conclusion that belongs to most of the [MPC]" (Kohn, 2000: 24-25).

Although the MPC's decision is collective, clearly the internal dynamics of the committee will affect that final decision. More research is required on that, and little is revealed in the meetings' minutes; but Bell-Kelton (2005) demonstrates very clearly that strong personalities or perceived hierarchies of authority in a monetary policy committee can be significant. The ultimate authority of Chairman Greenspan seems to prevail over the FOMC. Similarly, in the FOMC, there seems to be some tension between 'bankers' and 'economists'.

The composition of the MPC is similarly varied. the committee as being made up of academic economists, professional bankers, and professional economists (all with some degree of academic background). It is possible that such different backgrounds produce different types of judgements. Cobham (2003: 485) provides some examples of this, for instance in (Governor) Eddie George's apparent aversion to interest rate reversals; Buiter and Vickers, both academic economists, seemed more prone to make interest rate changes than did 'career' bankers. However, Cobham denies any systematic tendencies of types of MPC members.

As Dunne (1991) and Smith (1994) note, economic modelling has traditionally been done in teams. This tradition continues at the Bank. Bank staff are arranged into departments (such as *Monetary Analysis*) responsible for specific areas of study and for the production of specific data. One of the functions of these teams is to evaluate their models and their performance in providing accurate projections. In consultation with the MPC, the staff amend their models *ad hoc*, according to the models' past performance (Budd, 1998; Pagan, 2003). Thus, the interaction within and between teams is a form of triangulation, and a possible source of tension in the process. Furthermore, the Bank's agents present reports from around the country, for the consideration of the Bank staff and MPC members. Finally, the teams and the MPC discuss all of the data together: there is an interaction between the groups (Bank, 2004a: 188). In short, there seems to be considerable investigator triangulation at the Bank.

3.2.3 Theoretical triangulation

There are two main potential sources of theoretical triangulation. One is the fact that every member of the Bank staff and the MPC will have (possibly subconscious) theoretical presuppositions which they impose on the evidence they interpret. Second, the Bank's suite of models may display theoretical diversity.

There are several ways in which the first could occur. It is clearly possible that different members of the MPC may have different theoretical backgrounds which they bring into the process. As discussed above, Cobham (2003) shows that debates between economists and bankers bring in different perspectives on the economy and the role of the Bank⁶. However, in general, it is our view that although there have been small differences between the perspectives of members, in the wider spectrum of perspectives available, these differences are small. Second, there might be differences in outlook between different Bank staff; however, we have found little evidence of this, which in any case would be difficult to assess given the mainly technical nature of the research of Bank staff.

The second source of theoretical triangulation would be through the use of multiple models with different theoretical bases, or a theoretically pluralistic model. Smith (1994) notes that there was a macro-modelling *industry* in the 1980s. Effectively, a competition took place between different macro-models, usually based in different universities with different traditions in economics. For example, Cambridge models were Keynesian, while the Liverpool, London Business School and City University Business School models were strictly monetarist or New Classical (Dunne, 1991; Wallis et al, 1986). The Bank recognises that the theoretically distinct models of the 1970s and 1980s performed poorly and that theoretical coherence (as found in the 1980s model) can conflict with

⁶ On the other hand, perceived differences in theoretical perspective tend to be accentuated more by academic economists than others. This could work in two ways: one, academic economists could stress differences, making them appear larger than they are, creating the impression of greater diversity than actually exists; two, non-academic economists might downplay paradigm differences and present actually quite different views as being quite similar, creating more apparent consensus than is actually present. What actually happens is an empirical question.

empirical coherence (the ability to provide good forecasts). Thus, a balance must be struck and a slightly broader model was required (Britton et al, 1998; Pagan, 2003; Bank of England, 2003). This is an enforced pluralism. Thus, main Bank model is *more* pragmatically constructed and *less easy* to neatly categorise into, a narrow theoretical camp than previously. The same observation can be made about some of the auxiliary models. Nevertheless, it is apparent that in practice, there is in evidence little theoretical diversity. Within the modelling process, there is scope for alternative assumptions to be made, but the alterations tend to be of a fairly minor nature.

Arestis and Sawyer (2002) analysed the theoretical structure of the Medium-Term Macroeconomic Model (MTMM), which was until recently the Bank's main macroeconomic model. According to Arestis and Sawyer, the MTMM had a number of key features: long run equilibrium, with short run dynamics captured by ECMs (see also Pagan, 2003); Cobb-Douglas production functions; vertical Phillips curve at the NAIRU; sluggish adjustment of nominal and real variables; and significantly, money supply endogeneity. The model is emblematic of the "new consensus" on money and macroeconomics. Moreover, Sawyer (private) suggests that there have been shifts in more subtle ways, for example in the movement from investment functions which were more Kaleckian (emphasising profits as well as capacity utilisation) to neo-classical (where investment depends on the price of capital as well as capacity utilisation) formulations.

In response to Pagan's (2003) criticisms, the Bank has replaced the MTMM with a new Bank of England Quarterly Model (BEQM; see Bank, 2004a). As yet, no systematic study to mirror Arestis and Sawyer's (2002) has been carried out. However, a cursory analysis of the model suggests that it is highly similar to the MTMM in its theoretical orientation. It maintains a 'new consensus' approach, i.e., it is a New Keynesian-orthodox hybrid emphasising optimising behaviour, steady state long run outcomes, a vertical long-run Phillips curve, structural determinants of industrial competition, open economy, balanced budgets, a simple monetary policy rule geared to an inflation target, and wage and price inertia. Indeed, the Bank (2004a: 189) states explicitly that the new model does not reflect or represent a desire by the Bank to change its view of the structure of the economy. Thus, Arestis and Sawyer's comments about the MTMM apply almost without exception to the BEQM.

The only substantial difference between the BEQM and the MTMM is on expectations. Expectations played a minimal role in the MTMM, although that might be for practical reasons of data unavailability. Expectations were considered, for instance, in the transmission mechanism from interest rates (Bank of England, 1999); however, they mainly play a role in creating inertia in nominal and real variables (Arestis and Sawyer, 2002: 532) or (implicitly) as bringing about equilibrium. This deployment of expectations had a very classical flavour to it. In contrast, for Keynesians, confidence plays a crucial role, for example as a determinant of investment. The BEQM incorporates short term expectations of demand to affect investment Bank of England (2004a: 189); however, the main determinants of investment remain the cost of capital and expected return. There is a greater and more sophisticated role for expectations in the BEQM than in the MTMM.

However, the theory of expectations within that model is somewhat unclear. It is acknowledged that agents have neither perfect foresight nor full information (2004a:191); but the model falls short of rejecting rational expectations.

Overall, therefore, there is little evidence of theoretical triangulation. It seems that there is a broad consensus among those involved behind this model as the main tool for policymaking. Budd (1998) claims that alternative assumptions, when used, are deployed to explore why forecasts have been inaccurate. Ideally, it seems, a single effective paradigm, on which everyone agrees, would simplify the process of projection considerably (Whitley, 1997; Pagan, 2003: 16). Whilst alternative paradigms might sneak in – for instance via the forecasts of outside economists (Bean and Jenkinson, 2001), which are used as a comparison for the Bank’s forecast – there is no commitment to theoretical pluralism or to theoretical triangulation⁷.

3.2.4 Data triangulation

The Bank’s use of different data types is perhaps its clearest example of triangulation. The main source of data for the MPC is that produced by the *suite of models*, principally, a macro-model. That main model initially tries to create a current picture of the economy, based on National Accounts data. However, this data is somewhat outdated, capturing past not current conditions, given the lag in the collection and collation of the raw data (Britton, et al, 1999; Bean and Jenkinson, 2001; Pagan, 2003). Thus, for the most current information on existing conditions and trends, other data are required. Furthermore, the Bank is concerned about measurement error and the consequent revision of incorrect past data (see Harrison, Kapetanios and Yates, 2004; and Kapetanios and Yates, 2004, for discussions of how to improve forecasts by taking into account measurement error in past data). These concerns about data open the door to triangulation, albeit merely based on the grounds of data deficiency.

At the series of meetings preceding the main meeting, the MPC undertakes a complete reassessment of all the relevant evidence, and peruses data on, for example, labour markets, monetary conditions, demand, output, prices, and financial markets. Much of it is basically descriptive. Some of it might be termed “historical” (Bank, 2004b), whilst other data is much more recent (Budd, 1998). The MPC has the opportunity to analyse sectoral, regional and international data which the Bank deems relevant (Kohn, 2000; Bank, 2004b). Much of this data is on emerging trends. This is data not covered in the National Accounts. In particular, the Bank utilises independent non-governmental survey data (see Britton, et al, 1999; Budd, 1998; Whitley, 1997). Such data might have been collected at different times and places from the official data. Typically, the Bank uses surveys on business (state of trade surveys: Britton, et al, 1999) and consumer confidence and sentiment (Bean and Jenkinson, 2001). For example, the Bank employs the CBI Industrial Trends survey, which is used to ascertain position of the economy in its cycle (Britton, et al, 1999). The Michigan Consumer Sentiment survey can capture some of the trends in consumer spending (Bank, 2004b).

⁷ The suite of models includes small ‘analytical’ models. These models are most commonly based on optimising assumptions: more evidence of limited use of competing perspectives.

Reports by the Bank's staff utilise a wide range of sources, including press news reports, which focus on current specific significant events. A recent past example is the demutualization of the building societies. These events can affect the degree of uncertainty of the Bank's forecasts and can bias the fan chart (Budd, 1998; Britton, et al, 1999). These current events also assist the staff in choosing which data should be presented to the MPC and thereby which issues should be discussed (Budd, 1998). These presentations are supplemented by data collected from other organisations, such as building societies, the Royal Institute of Chartered Surveyors (RICS), research institutes, trades unions and economists from academic and commercial organisations (Bean and Jenkinson, 2001). These data sources show other examples of triangulation of opinions and people.

Furthermore, the data from different organisations are often of different types: the RICS data tends to be on recent house price data, and is often based on recent surveys by RICS members; building societies draw on recent mortgage completions. On the other hand, data from other economists is of a more conventional type, often being competing forecasts with which the Bank's forecasts are compared. Particular attention is paid to forecasts and other data from other central banks (Bean and Jenkinson, 2001). Also, the data might have been collected in different ways from the official data.

A similar role in the decision-making process is played by reports from the Bank's Agents around the UK. The Agents' principle task (in this context) is to visit UK firms (they make 7000 such visits each year: King, 1999: 10) to gather information. The Bank values the information they collect in the same way as survey data: it is timely and fills gaps which would otherwise exist (King, 1999). Indeed, because it tends to be more anecdotal (Budd, 1998; Bank, 2004b), it is the most recent data at the Bank's disposal on current economic conditions. Firms can report to agents their stock levels, recent changes in demand, their expectations of inflation and above all, their confidence about the economy and their subsequent intentions for investment. Typically, in each MPC meeting round, data from 150-200 agents' reports are presented for consideration (King, 1999; Bean and Jenkinson, 2001).

Obviously, the Bank does use several types of data from a number of different sources. It does practice data triangulation. Clearly the main motives for doing so are pragmatic: official data is often incomplete and/or inaccurate, and suffers from being always backward-looking and lagged. Thus other data is required to correct for measurement error and to create a more complete picture. How that data is treated is crucial for assessing the extent of methodological triangulation.

3.2.5 Methodological triangulation

To reiterate, Denzin (1970) distinguishes between within-method and between-method triangulation. Within-method triangulation is based on the premise that two trials of the same test are better than one: it is an inductive exercise. Between-method triangulation involves the mixing of different methods and is therefore, methodologically at least, more

significant. However, between-method triangulation can also be sub-divided: one can observe the mixing of methods which come from the same methodology (within-methodology) or from different methodological foundations (between-methodologies). That raises questions about how the methods are to be combined, and whether one type of method has primacy. These questions are crucial in understanding the process of the MPC.

The uncertainty over model specification, and over the reliability of one single model – all pragmatic concerns about past poor performance, but also hints at fallibilism – have led to an “eclectic” approach (Whitley, 1997), in which models are combined. The Bank does not rely on one model: rather, it has a ‘suite of models’ approach. This is common practice in central banks (Kohn, 2000; Pagan, 2003). The suite includes a main model, such as the BEQM, which provides the ‘big picture’. The main model provides the initial average projection of inflation, based on the average response of the model to average shocks (Whitley, 1997). In addition, a set of as many as thirty-two ‘auxiliary’ (Whitley, also uses the term ‘analytical’) models, such as a Real Business Cycle model, a labour market model and others to model specific sectors, providing more specific sectoral or regional information, add detail which allows the projections of the model to be adjusted.

For example, a small, five-equation macroeconomic forecasting model is employed (Whitley, 1997), in order to supplement the main model. Other simple, stylised macroeconomic models are used, to provide an overall picture of the economy. Simple two equation output gap models are also used (Whitley, 1997). Moreover, a range of model types is used, including time-varying component models, structural VARs, Bayesian VARs and factor models (Whitley; Budd, 1998; Pagan, 2003). Pagan claims that different models are used for different purposes. One such example is the use of VARs for assigning the probabilities of shocks (Whitley). The smaller models are used to fill the vacuum – partly in confidence – left by the large-scale models of the 1980s (Whitley). Final estimates and forecasts would seem, therefore, to result from a combination of inferences from these other models.

Overall, methodological triangulation seems considerable. A selection of models is used from within the range of formal models (within-method triangulation). Within each type a range of modelling techniques is utilised (within-method). A large number of auxiliary models add considerable specific detail to the information set available to the MPC. From above, the range of data types used indicates between-method triangulation. The surveys used tend to be informed by conventional *positivist* principles; but the anecdotal evidence presented by Agents is informed by *interpretivist* philosophy, suggesting between-methodology triangulation. However, this interpretation must be tempered considerably, because of the way the models are employed.

A crucial question regarding triangulation is how the triangulated data (or models, etc.) are to be combined. There is no easy formula for this. In (between-)methodological triangulation, no assumption is made of the inherent superiority of any methods. As Downward and Mearman (2004, 2005) argue, the specifics of the question being asked will determine the method chosen. The Bank has no stated formula for combining data

types, so one must be inferred. The treatment of the models used by the Bank suggests that a fairly clear hierarchy of models exists and that the projection process is geared around those models at the top of the hierarchy. Specifically, the main macroeconomic model is the driver of the process. This position is very clear in the Bank (2004a) in which the BEQM is described as the “*main tool* in the suite of models” (188; emphasis added) the Bank uses and is the “*primary* organisational framework” (188; emphasis added) for assisting the judgements of the MPC. Other models are largely adjuncts to the main model (Whitley, 1997).

As a corollary, the data type *preferred* by the Bank is a time series of official quantitative data, collected in the usual way. Other data types are adjuncts to the preferred data. These supplementary data would not, ideally, be used, but the lags and gaps in official data necessitate a search for other, less reliable data. Overall, while the Bank would prefer to use only regularly quantified official data, they are forced to take into account other data types, partly because of data inadequacy and also for pragmatic reasons of poor past performance. A few examples illustrate the point. The quarterly forecast is “explicitly quantitative” (Bean and Jenkinson, 2001: 438) as is the fan chart. Admittedly, the initial modal forecast from the model can be adjusted in the light of other information. However, only information which will have a “quantitatively significant” effect on the forecast is considered by the MPC (Bean and Jenkinson, 2001: 439). According to Whitley (1997), the analytical models provide qualitative data for input into the other (macro) models; this data will be transformed into a quantitative form or used as proxies for unavailable data (Britton, et al, 1999). As Whitley notes, only quantifiable shocks can be included in models. Indeed, this is considered necessary, for survey data to be put to its “best use” (Britton et al: 179). Survey data is kept in a time series and compared with other time series data (Britton et al). Quantification occurs via correlation and regression with other quantitative data (Britton et al). Similarly, the CBI Business Optimism Balance, a measure of business confidence, is regressed against lags of itself and other variables (e.g. GDP). Thus, while the merits of surveys *per se* are acknowledged by the Bank, in the end they are subsumed under the main, quantitative model. The survey data have to be subordinated to the quantitative methods, which are apparently superior and more powerful.

These statements suggest a clear hierarchy of data and models, with the quantitative macro models at the top. In this light, Higgins’ comment on Bryant et al, quoted above, that quantitative and formal analyses are an “irreplaceable adjunct to the process of policy thought” (Whitley, 1997: 165) looks rather different. Rather, policy thought is based around quantitative analysis; the thought almost looks like an adjunct to the quantitative analysis, in spite of the many stresses of the role of judgement in Bank literature. Such an approach is consistent with the way in which methods are used throughout economics: certain methods have a higher power and intrinsically more value; and therefore, studies conducted with those methods consequently also have a higher value. However, the open-systems arguments underpinning triangulation suggest that this is not the case: methods only have power if they are appropriate to their object.

3.3 Analysis of motives for triangulation at the Bank

Whereas Cobham (2003) and Dow (2004) focus on the motives and underlying conditions for types of decisions taken by the MPC, this paper has taken a twin approach to the analysis of the MPC process. A taxonomic account of the types of methods used, and how they are employed, is combined with an analysis of the motivations behind those actions. This allows us to argue that although there is considerable evidence of triangulation, particularly of some forms of it, significant questions can be asked about why.

As Table 1 shows, our analysis finds clear evidence for certain types of motivations. It is very clear that a concern about data inadequacy has led the Bank to employ several different types of data from diverse sources. In addition, to the extent that it engages in methodological triangulation, much of this occurs (indirectly) through the uses of different types of data, such as anecdotes presented by Agents. This too is inspired by concern about the adequacy of published official data. It does not seem driven by concern about formal modelling, either in terms of its ability to provide forecasts (although this is relevant later) or in terms of its applicability in open systems contexts.

There is some evidence that ‘political’ factors such as satisfying the stakeholders involved, is relevant to the extent of investigator triangulation. However, it is less clear how the internal politics of the MPC affect outcomes or affects the choice of methods used. The choice of methods seems to be a product of organisational convention, self-evaluation, observation of other comparable organisations, and independent evaluation (for example the Kohn, 2000, and Pagan, 2003 reports). Further, there seems to be little evidence of the overriding desire for pluralism *per se*. As argued above, little theoretical diversity is present – indeed, the main macro- model seems to be moving away from pluralism – and the innovations of different data types and auxiliary models is an *ad hoc* response to practical problems.

Indeed, pragmatic responses to epistemological problems seem to be the main drivers of the current approach. The Bank’s process evolves relative to the quality of past performance. Different data types are necessary because of the existing current practical limitations of official data. Judgement is necessary because the models cannot be relied upon as yet to provide good enough forecasts on their own. The job of creating forecasts is too large and too complex to rely on individuals. Past large-scale models, which relied on one very narrow theoretical structure, have been unsuccessful in prediction and policy application (Whitley, 1997). Smaller models which provide detailed information on specific sectors augment the admittedly and inevitably limited main model. The Bank is cognisant that all models are abstractions from the complex reality which cannot possibly capture all the relevant features of the economy; consequently, they are careful not to rely too heavily on models (Bean and Jenkinson, 2001; Bank of England, 2003)

Of course, such concerns are not merely practical. They are epistemological positions. There is some evidence in the Bank literature of an awareness of the fallibility of models and of theory. Whitley (1997) claims that the Bank is more cautious in its claims partly because modellers in the 1980s contributed to the mistrust about models by making too

strong claims about their models and by refusing to acknowledge their limitations. On the other hand, the Bank's approach effectively engages in inference from a single model, supported by other models. There is an overriding desire that the process be geared towards one effective model (Pagan, 2003), if only one could be found.

Second, in the Bank's process there seems to be an implicit faith in the main model, which undermines the impression of fallibilism discussed earlier. There is insufficient recognition that the main model might be inherently – fundamentally – flawed, and that its initial central projection might be seriously misleading. That is problematic because of the inevitable path dependency in the final formulation of the inflation projection, given that the other models are used only to tweak the projection of the main model. Thus, the concern underpinning triangulation, that all methods are flawed and must be combined with other methods, is weakened.

Dow (2004) argues that, particularly in the face of unquantifiable uncertainty, ordinary human logic, relying on intuition, common sense and judgement, becomes crucial for decision making. Dow (1995) notes that people must act, but that when faced with such uncertainty, they lack a clear rational strategy and can be paralysed. She argues that making decisions on monetary policy is an example of such necessary action under uncertainty. Dow (2004) identifies four types of uncertainty relevant to the macro-modelling problem: additive, in which the variance of error term increases; multiplicative, in which there is uncertainty about the parameter values and hence about the model itself; there might also be uncertainty about the structure of the model. In all three cases, the uncertainty is caused by randomness either in nature or in the understanding of the economist. Dow is most interested in a fourth form of uncertainty, in which the economist's understanding is simply limited and "where it is regarded as intractable to formalise the choice between all possible models" (2004: 547). In this case, uncertainty is not measurable and thus cannot be incorporated into the model's specification. Dow argues that in this fourth case, there is a need for judgement.

Dow (2004) goes on to claim that judgement is and must be a fundamental feature of monetary policy-making. She cites the fact that the Bank constructs a fan chart which, she says, is a quantified expression of judgement. The final projection is thus an average of those offered in the discussion during the various stages of meetings and data analysis, as described above. The Bank's desire for a range of projections reflects their caution about making firm predictions. The range of the chart embodies the inherent uncertainty in the forecasting process (Kohn, 2000). This level of uncertainty increases and decreases with the current period's economic news; however, even in a period of relative economic stability (as was the case in particular prior to 11th September, 2001), by using the fan chart the Bank pays heed to fallibilism and also to the ever-present possibility of unanticipated shocks to the economy.

Moreover, the general level of uncertainty is augmented by paying attention to specific risks (Whitley, 1997; Britton et al, 1998). While the general uncertainty is embodied in the spread of the distribution, specific risks can lead to the mean of the distribution shifting. An integral part of the process is that structural changes and/or specific events

are assessed, *a priori* and consequently, *ad hoc*, the centre of the fan chart can shift up or down, depending on the assessment. For example, news of house price increases often leads to a shift upwards in the central projection of inflation. This process of adjustment of the fan chart is therefore an iterative one (Britton, et al, 1998), incorporating learning from past forecasting errors and the *a priori* assessment of the likely quantitative effect of specific changes in the economy.

Fundamentally, of course, the MPC uses its judgement to evaluate the need for action. Indeed, there is considerable evidence that the Bank acknowledges uncertainty as licensing judgement and indeed the triangulation of investigators and methods. Cobham (2003) considers the effect of uncertainty on the MPC's decision. He concludes that uncertainty may be slightly more influential in creating 'no change' decisions⁸. More generally, Whitley (1997) states that a reason for using judgement is that there is uncertainty about the underlying structure of the economy and therefore about the appropriateness of the model. Further, a standard practice in the Bank process is that the main model is estimated under different assumptions. This usually involves changing model parameters or values of variables. These changes of assumption occur most often in order to produce new forecasts (Kohn, 2000) which can be incorporated into the fan chart (Budd, 1998). The changes arise because of model uncertainty (Whitley).

In terms of ontology, there is limited evidence that this is driving the process or triangulation within it. Nevertheless, there is an implicit acknowledgement within the Bank's approach that the world is too complex for any single model to capture or to predict correctly. The Bank's suite of models could be interpreted as a tacit strategy to capture different parts of the complex whole with separate models. It is not clear whether this complexity runs up against an epistemic constraint, or whether it is independent of our ability to understand it. This question relates back to Dow's (2004) discussion of uncertainty: there can be randomness in the world; or, under an open, organic view, the world is simply too complex for any one theory or model to cope with it: there is genuine unquantifiable uncertainty about it.

Other than an acknowledgement of complexity, there is no evidence of ontological concerns informing the Bank's approach. Crucially, for us, there is no evidence of a commitment to or recognition of an ontology of open systems. There is little evidence that the Bank recognises that its models impose closure on an open reality and that this must be accounted for in the way the models are used. There is no admission of the principle that quantitative models impose greater closure than qualitative (see Downward and Mearman, 2002; Mearman, 2004) and that qualitative data might be more powerful in given circumstances. Although the use of qualitative data to assess and weigh up the quantitative is methodological triangulation, there is no explicit indication that the rationale for such work rests on open systems concerns.

⁸ Cobham (2003) studied MPC minutes and decisions over 62 months from 1997-2002. He cited uncertainty (of various types) as a contributory factor to the decision on 30 occasions. 20 of those 30 periods resulted in no change. 20 of the 32 remaining periods resulted in no change.

Rather, there is much more evidence of closed-systems thinking⁹. The process of projection undertaken by the Bank is very much of what Dow (1990) calls an ‘event-predictive’ type. The effectiveness of the prediction is assessed by its accuracy (even acknowledging the range of the fan chart) according to subsequent events: it is an ‘event-truth’ assessment (Dow, 1990). While qualitative data could be employed to make predictions about processes underlying data, without making specific event projections, instead it is used to adjust the event-prediction generated by the formal quantitative models. Such event-predictive action is symptomatic of closed systems: in open systems, the various sources of openness, such as the multiple and intermittent action of mechanisms, the organic, changing nature of material, and the shifting boundaries of the system itself would all mitigate against the effectiveness of prediction *per se*.

3.4 Policy implications

We advocate methodological triangulation because we hold that it has practical benefits. It allows some of the problems of working in uncertain, open environments to be addressed and hopefully mitigated. Furthermore, we see methodological triangulation as a coherent strategy in response to the nature of the world. Dow (2004) advocates Keynes’ ordinary logic, scepticism about formal methods and role for judgement as a response to that world. Triangulation fits into that view well: methods are applied to problems as appropriate; relevant evidence, whatever its source, adds to the weight of one’s argument and provides greater confidence for action. *If*, as Dow suggests, the Bank implicitly embraces that outlook, we applaud it: it stands out in contemporary economics. However, Dow’s commentary implies that the Bank needs to move even further: we support her claim. In particular we urge the Bank to develop a specific rationale, and subsequently strategy, for its mixing of methods.

What difference could it make? One puzzle which faces the Bank is that, on casual observation, there seems to be a systematic tendency in the main model and in the MPC forecasts to overestimate the rate of inflation; i.e., the economy tends to undershoot the forecast. Now, from an open-systems perspective, the inability to predict correctly is unsurprising: because of the factors cited above, there would be no expectation to predict correctly. However, a systematic bias is intriguing. The undershooting could simply be a function of the way in which economic agents react to policy announcements. As Bell-Kelton (2005) notes, every intonation and even facial expression of Greenspan is analysed to ascertain the likely economic future, as seen by the FOMC, and therefore future interest rate changes. Thus, if the tone of the Bank’s Governor is always unduly pessimistic about inflation, agents could react by expecting future rate increases, thereby slowing the economy. Interestingly, based on Cobham’s (2003) study, it appears that, faced with what he calls “wider” uncertainty (which is comparable to Dow’s, 2004, unquantifiable uncertainty), MPC members were more likely to act than they were when faced with uncertainty about either model parameters or data quality¹⁰.

⁹ In addition, the theoretical models employed assume long-run equilibrium and expect that regular successions of events will occur. In open systems, neither would occur.

¹⁰ On 9 occasions of wider uncertainty, changes were made on 4 occasions. For data and parametric uncertainty the ratios were, respectively, 8:1 and 7:1.

However, other explanations of the overestimates are possible. One obvious source could be the preferences of the economists and policy makers towards conservatism and towards low inflation. However, it is possible that the overestimation might arise from the mixture of methods used; the type(s) of model employed; the composition of the team of investigators; and the data used. One simple hypothesis is that overestimation is the consequence of the theoretical basis of the model, which has an in-built bias against demand and inflation, via a long-run upward-sloping Phillips curve. An alternative macroeconomic model with, say, the assumption that investment in the short run has long-run employment effects (through capacity), might generate different forecasts (see Arestis and Sawyer, *passim*). Theoretical triangulation could also be achieved by having a more diverse range of views on the MPC. This diversity would then feedback into the types and specifications of models used.

This leads to several concrete proposals, which can only be introduced here. First, the Bank needs to be clearer in its acknowledgement of its epistemological position; and it must develop more explicit mechanisms for the exercise and legitimisation of judgement in its process. Second, it should continue to use, and indeed expand, its use of different data types drawn from different philosophical positions. Third, it should embrace greater theoretical diversity, either through its models or through the composition of the MPC. Strategies of the Bank for hiring staff could also assist in this process: as Smith (1994) notes, as modelling teams change, models can change. In terms of methodological triangulation, this paper has pushed the case for *between-method* triangulation. Two obvious ways of achieving this are possible. One, there is more scope than is presently explored for qualitative prediction along the lines discussed in Dow (1990). The notion of ‘asymmetric tightening’ is already used in FOMC announcements in the USA (see Bell-Kelton, 2005). Finally, as Dow (2004) has shown, and as we have affirmed, the MPC meetings involve the imposition of qualitative judgements on quantitative data: this is methodological triangulation through the back door. Given our stance, we advocate an even greater role for judgement in the process.

There are several constraints on these proposals. Qualitative prediction may have value, and indeed be just as useful as a probability distribution of predicted outcomes (as in the fan chart). However, the Bank faces the requirement to produce a quantitative estimate. This requirement is partly legislative: the formation of the MPC is part of the independence of the Bank; independence requires transparency. Equally, though, it derives from the demands of markets and from the conventions of economists. Thus, transparency requires that the Bank’s decision-making be clear to those examining it; the majority of observers will use primarily quantitative tools; therefore, the Bank is restricted to orthodox tools. However, we can find no evidence within the Bank’s literature of a desire to move away from the conventional tools, methods and means of understanding and predicting the economy.

4. CONCLUSIONS

This paper has considered the process of data generation at the Bank of England, principally that designed to serve the needs of the Monetary Policy Committee. The Bank's processes of data generation have been analysed in terms of their use of triangulation. Triangulation can take many forms and have many motivations. The Bank's processes do indeed exhibit triangulation, principally of data, judgement, and investigators. There is also evidence of within-methodological triangulation. There is less evidence of between-methodological triangulation and little of theoretical diversity. However, the triangulation is based mostly on pragmatic considerations, such as data absences or lags, the failure of theoretically coherent (single, narrow paradigm) models in earlier eras, the inferior predictive performance of the Bank's models in previous periods, and the need to reach credible forecasts which largely conform with those produced by external agencies.

Supporting Dow (2004), there is some evidence that the strategy is driven by uncertainty. There is only very limited evidence that triangulation is adopted for other epistemological reasons such as fallibilism, or because of ontological concerns, except for the acknowledgement of a complex reality. For instance, where other data types are utilised, this appears to be a compromise necessitated by circumstances, rather than a commitment to the notion that quantitative models are inherently flawed because there might be a disjuncture between the methods and the reality they are attempting to capture (either now or into the future). There is little evidence, in fact, of a coherent rationale for, or strategy of, triangulation.

Several practical recommendations follow for the creation of projections for and by the MPC. There is little evidence of theoretical pluralism within the Bank's approach. The Bank's main model is essentially a New Keynesian-orthodox hybrid, emphasising optimisation but market clearing inhibited by real and nominal sluggishness, plus elements such as money supply endogeneity and a NAIRU (Arestis and Sawyer, 2002). We recommend that this be addressed. While there is an awareness of the failure of past single-paradigm models, there is no commitment to theoretical pluralism *per se*: deviations from a theoretical norm are permitted only where this leads to greater empirical coherence (Pagan, 2003) in the form of better predictions. Second, whilst the use of suites of models and data types other than the conventional quantitative is to be applauded from the perspective of triangulation, the Bank's approach remains one in which quantitative modelling has primacy. Where qualitative data is used, for instance in affecting the mean forecast of inflation, it is first quantified and then inputted into the model. This final step is unnecessary and, from the perspective of triangulation informed by open systems, it is potentially damaging.

REFERENCES

- Arestis, P. and Sawyer, M. (2002) 'The Bank of England Macroeconomic Model: Its Nature and Implications', *Journal of Post Keynesian Economics*, 24 (4): 529-545.
- Backhouse, R. (2005). 'Comment on Fullbrook, "A Guide to What's Wrong With Economics"', Association for Heterodox Economics conference, London, July.
- Bank of England (1999). *Economic Models at the Bank of England*, London: Bank of England.
- _____ (2000) *Bank's Response to the Kohn Report*, Bank of England.
- _____ (2003) *Bank's Response to the Pagan Report*, Bank of England.
- _____ (2004a). 'The New Bank of England Quarterly Model', *Bank of England Quarterly Bulletin*, Summer.
- _____ (2004b). *Minutes of the Monetary Policy Committee, 7-8 January, 2004*, Bank of England.
- Bean, C. (1998). 'The New UK Monetary Arrangements: A View from the Literature', *Economic Journal*, 108: 1795-1809.
- _____ and Jenkinson, N. (2001) 'The Formulation of Monetary Policy at the Bank of England', *Bank of England Quarterly Bulletin*, Winter: 434-441.
- Bell-Kelton, S. (2005). 'Behind Closed Doors: The Political Economy of Central Banking in the United States', *International Journal of Political Economy*, forthcoming.
- Blaikie, N. (1991). 'A Critique of the Use of Triangulation in Social Research', *Quality and Quantity*, 25: 115-136.
- Britton, E., Cutler, ? and Wardlow, A. (1999). 'The Bank's Use of Survey Data', *Bank of England Quarterly Bulletin*, May: 177-182.
- Britton, E., Fisher, P. and Whitley, J. (1998) 'The Inflation Report Projections: Understanding the Fan Chart', *Bank of England Quarterly Bulletin*, 38 (1): 30-37.
- Bryant, R., Henderson, D, Holtham, G., Hooper, P. and Symansky, S (eds) (1988) *Empirical Macroeconomics for Interdependent Economies*, Washington, DC: Brookings Institution.
- Budd, A. (1998) 'The Role and Operations of the Bank of England Monetary Policy Committee', *Economic Journal*, 108: 1783-1794.
- Campbell, D. and Fiske, D. (1959). 'Convergent and Discriminant Validity by the Multi-trait Multi-method Matrix', *Psychological Bulletin*, 56: 81-105.
- Cobham, D. (2003). 'Why Does the Monetary Policy Committee Smooth Interest Rates?', *Oxford Economic Papers*, 55: 467-493.
- Del Rio, L., Corpas, J. and Barroso, J. (2004). 'Nitric Oxide and Nitric Oxide Synthase Activity in Plants', *Phytochemistry*, 65: 783-792.
- Denzin, N.K. (1970). *The Research Act in Sociology*, Aldine: Chicago.
- Dow, S. (1985). *Macroeconomic Thought: A Methodological Approach*, Oxford: Blackwell.
- _____ (1990). 'Post Keynesianism as Political Economy: A Methodological Discussion', *Review of Political Economy*, 2 (3).
- _____ (1995). 'Uncertainty about Uncertainty', in S.C.Dow and J.Hillard (Eds.) *Keynes, Knowledge and Uncertainty*, Aldershot: Elgar.
- _____ (2004). 'Uncertainty and Monetary Policy', *Oxford Economic Papers*, 56: 539-561.

- Downward, P. and Mearman, A. (2002). 'Critical Realism and Econometrics: Constructive Dialogue with Post Keynesian Economics', *Metroeconomica*, 53 (4): 391-415.
- _____ (2003). 'Presenting Demi-regularities: the Case of Post Keynesian Pricing', in P. Downward (Ed.). *Applied Economics and the Critical Realist Critique*, London: Routledge.
- _____ (2004). 'On Tourism and Hospitality Management Research: A Critical Realist Proposal', *Tourism and Hospitality Management Planning and Development*, 1 (2): 107-122.
- _____ (2005). *Retrodution as Mixed-Methods Triangulation: Reorienting Economics into Social Science* mimeo.
- Dunne, P. (1991). 'Macroeconomic Modelling' *Quantitative Marxism*, London: Polity.
- Frankfort-Nachmias, C. and Nachmias, D. (1996). *Research Methods in the Social Sciences*, Arnold.
- Harrison, R., Kapetanios, G., and Yates, T. (2004). 'Forecasting with Measurement Errors in Dynamic Models', *Bank of England Working Paper* series, no. 237.
- Kapetanios, G. and Yates, T. (2004). 'Estimating Time-variation in Measurement Error from Data Revisions; an Application to Forecasting Dynamic Models', *Bank of England Working Paper* series, no. 238.
- King, M. (1999). *The MPC: Two Years On*, Bank of England.
- Kohn, D. (2000) *Report to the Non-Executive Directors of the Court of the Bank of England on Monetary Policy Processes and the Work of Monetary Analysis*, Bank of England.
- Laidler, D. (1993). *Demand for Money: Theories, Evidence and Problems*, New York: Harper Collins.
- Mearman, A. (2004). *Open Systems and Economic Methodology*, University of the West of England Working Paper in Economics, 04/02.
- Pagan, A. (2003) *Report on Modelling and Forecasting at the Bank of England*, Bank of England.
- Pelham, H. (2001).
- Smith, R. (1994). 'The Macromodelling Industry: Structure, Conduct and performance', in Hall (ed.) *Applied Economic Forecasting Techniques*. Prentice Hall.
- Wallis, K.F., Andrews, M.J., Fisher, P.G., Longbottom, J.A. and Whitley, J.D. (Eds.) (1986). *Models of the UK Economy: A Third Review by the ESRC Macroeconomic Modelling Bureau*, Oxford: Oxford University Press.
- Whitley, J. (1997) 'Economic Models and Policy-Making', *Bank of England Quarterly Bulletin*, 37 (2): 163-173.