Indirect convertibility and quasi-futures contracts: two non-operational schemes for automatic stabilisation the price level?

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Abstract

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This paper examines two proposals for automatic stabilization of the price level based on indirect convertibility and something called a 'quasi futures contract'. These two schemes represent attempts to render operational ideas implicit in the Black (1970) Fama (1980) and Hall (1982) vision of the monetary system. Criticisms of the two schemes have been rejected by their exponents. The paper clarifies the analytical issues at stake in this debate and concludes that both schemes do suffer from fundamental flaws which would render them non-operational. Hence, neither scheme offers an operational basis for a *laissez faire* banking system or provides a workable alternative to current methods of stabilising the price level.

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Introduction

Deregulation of financial systems, technological innovations and dissatisfaction in some quarters with the perceived failings of 'discretionary' monetary policy have led to increased interest in aspects of what can loosely be called a *laissez faire* approach to banking and finance. One element in this coalition draws its inspiration from papers by Fischer Black (1970) , Eugene Fama (1980) and Robert Hall (1982). The BFH scheme as it is now known in the literature provided some inspiration for the so-called New Monetary Economics and models of competitive cashless payments systems.

More recently the BFH set-up also provided the inspiration for two schemes which are intended to either put control of the price level on automatic pilot in a *laissez faire* banking set-up or to eliminate the discretionary element in the current central bank practice of price level or inflation targeting. These schemes rest on the concepts of indirect convertibility and something called a 'quasi futures contract' (QFC). The ideas have been championed by Greenfield and Yeager *et al* (1995), Coats (1994), Sumner (1995) and Kevin Dowd (1994, 1995, 1996) in response to theoretical criticism of the BFH scheme and as a means of rendering operational the theoretical insights of the BFH vision[1].

The idea of indirect convertibility has been around for a long time and was apparently criticised by Wicksell (1919)[2]. More recently Schnadt and Whittaker (1993) have argued that indirect convertibility is 'inoperable'. These criticisms are rejected by Greenfield,

Woolsey and Yeager (1995) and Dowd (1996) but restated by Schnadt and Whittaker (1995). By contrast to the long history of indirect convertibility the QFC appears to be a recent invention by Dowd (1994) to which Cowen (1997) has raised a series of telling objections.

In this paper we do two things. First, we assess the debate and clarify some of the ambiguity about the analytical issues at stake. We conclude that neither indirect convertibility nor QFCs offer a feasible mechanism for stabilising the price level. Examination reveals analytical flaws in both proposals. These flaws have, in our view, been clearly exposed by Schandt and Whittaker (1993, 1995) and Cowen (1997)[3].

Second, and more fundamentally, we argue that it would be impossible in a sophisticated financial system (including a *laissez faire* system) to control the quantity of money in the manner required by the two schemes. Consequently, even if the flaws identified in the literature were not present both proposals rely on a mythical interpretation of the naive quantity theory of money[4]. What both schemes have in common is the idea that the quantity of money is something that can be controlled directly and that control of this stock can be rendered automatic in a fashion which ties down the price level and reduces monetary disturbances to the real economy. Put simply, we argue that this objective is a

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[1] See Rogers and Rymes (1997) for a discussion of the theoretical criticisms levelled at the BFH scheme.
[2] Dowd (1996, p. 501) provides a brief history of the idea.
[3] Cowen and Kroszner (1994, p. 87n14)) also accept the criticism of indirect convertibility but on somewhat different grounds from those outlined in this paper.
[4] Eichengreen (1985, p. 3) argues that theoretical models of the gold standard shed more light on the myth of the gold standard than on historical reality. We would suggest that the myth of the gold standard unearthed by Eichengreen has its parrallels in the quantity theory and monetarist literature.

mirage; the goal of an identifiable and controllable quantity of money is not attainable in a sophisticated financial system. Somewhat paradoxically Fisher Black (1970) attempts to stress the latter point.

The mechanics of convertibility.

To fix ideas this section will briefly sketch the difference between direct and indirect convertibility and outline the limitations of the former which indirect convertibility is intended to circumvent.

The gold standard is a well known example of direct convertibility under which the Central Bank stands ready to convert notes and token coins into gold at a predetermined price. The determination of the absolute price level then amounts to the determination of the relative price of gold. As Barro (1979, p. 13) explains: “In this sense the absolute price level becomes a determinate quantity that is amenable to usual supply and demand analysis, as applied to such things as gold production and non-monetary uses of gold”.

The logic of direct convertibility is straightforward but the limitations of the mechanism have been well documented in the literature. For example, as a practical matter conditions of gold supply do not approximate the perfectly competitive industry assumed in theoretical models of the gold standard. Consequently gold supply volatility generates price level volatility. In addition, selection of the price of gold poses insurmountable problems. World real income growth has far outstripped the value of world stocks of monetary gold so selecting the Bank’s price of gold requires either a

Bank's price well above the current market price or a massive deflation of the current price level. Hence Eichengreen (1985, pp. 28-29) concludes his survey of the debate on the merits of the gold standard in the following terms: "Resurrecting the gold standard would appear to involve significant costs, serious uncertainties, and dubious benefits." These difficulties do not seem to deter those exponents of free banking who suggest gold as a suitable monetary base.[5]

The difficulties with direct convertibility into a single commodity have however stimulated interest in indirect convertibility as a means of circumventing the problems thrown up by the gold standard in particular and direct convertibility in general. The problems of direct convertibility into a single commodity arise largely as a result of instability in the price of that commodity. Indirect convertibility is an attempt to avoid this source of instability by defining the base as a broad basket of commodities. To avoid the problems with storage that arise with this proposal (Banks cannot store and trade a wide basket of commodities) convertibility is indirect via a third medium which may be gold or some financial asset.

As indirect convertibility is less well known some terminology will help clarify the mechanism. Following McCallum (1985) it is useful to distinguish between the medium of exchange (MOE); the medium of redemption (MOR); the medium of account (MOA), and the unit of account (UOA). Indirect convertibility requires that the medium of exchange (the MOE, eg $ notes) be convertible on demand at a bank into some medium of redemption (the MOR), which could be gold or some form of financial asset, and that the redemption medium differ from the medium of account (the MOA). The

[5] A mechanism based on direct convertibility into gold or a frozen monetary base is proposed by the

latter would consist of a broadly defined bundle of commodities. The idea here is that the broader the bundle the lower the probability that shocks would disturb the absolute price of the bundle. Throughout, the unit of account (UOA) remains the $. Thus the UOA and the MOA are quite distinct in this proposal. The MOA is a list of commodities while the UOA is the $. The MOE may be a $bill or the equivalent book entry.

Dowd's (1995) proposal for indirect convertibility runs as follows: Assume a 'free' banking system in which competitive banks issue title to *$* holdings and practice indirect convertibility. The *$* remains the UOA and *$* holdings the MOE; the MOR is gold and the MOA is a broad based commodity bundle. That is, the MOA is a broad commodity bundle defined so that 1 unit has a legal 'par' value equal to $1. If the unit of the commodity bundle has a market price that differs from $1 then indirect convertibility requires the banks to convert $ holdings into a sufficient quantity of the MOR so that, by sale of the MOR in the market for $'s, individuals can purchase 1 unit of the commodity bundle. Dowd then argues that deviation of the price of the commodity bundle from $1 will set in motion 'arbitrage' opportunities which will result in a return in the price of the commodity bundle to $1[6].

Dowd argues that a rise in the market price of the commodity bundle above $1 would open up an 'arbitrage' opportunity for *$* holders to convert their *$'s* into sufficient redemption medium (a quantity) at the bank to purchase the commodity bundle. A $1 bill

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Austrian element among exponents of *laissez faire* banking. See for example, (Selgin and White, 1994).

[6] We have 'arbitrage' in quotation marks because the analysis which follows reveals that there are no arbitrage opportunities.

can be converted at a bank for *Pb$/Pmor$ units of the MOR*. This *quantity of MOR*, it is claimed, can then be sold in the market *for Pmor$(Pb$/Pmor$) = Pb$* (sufficient $'s to buy the commodity bundle). These operations cause a fall in the quantity of MOE which in naive quantity theory fashion causes (with a lag?) a fall in the *$* prices of commodities in the bundle, restoring parity. The mechanism works in reverse when the *$* price of the commodity bundle falls below par.

Dowd's scheme for automatic stabilisation of the price level therefore consists of two elements: (i) an arbitrage incentive to engage in indirect convertibility and, (ii) changes in the quantity of MOE which restore the price level to par in naive quantity theory fashion.

Why indirect convertibility fails and the paradox of indirect convertibility

Schnadt and Whittaker (1993; 214) are the latest advocates of what Woolsey (1987) christened the 'paradox of indirect convertibility'. The Schnadt-Whittaker critique of indirect convertibility runs as follows.

Following Dowd, assume a 'free' banking system in which competitive banks issue title to *$* holdings and practice indirect convertibility. The *$* remains the UOA and *$* holdings the MOE; the MOR is gold and the MOA is a commodity bundle[7]. How do banks implement indirect convertibility?

[7] In their discussion of indirect convertibility Cowen and Croszner (1994, p. 80) suggest that traders post prices in the commodity bundle (the MOA). This doesn't strike us as a practical proposition.

If the *$*-issuing banks are to practice indirect convertibility they need to monitor the market price of the commodity bundle, $P_{b\$}^{M}$ relative to the market price of gold, $P_{g\$}^{M}$ in order to meet the commitment to convert *$* holdings into an *amount* of gold sufficient to purchase the commodity bundle at the market price of gold. Because gold is not the MOE gold holdings (the quantity of MOR) must be re-sold for *$* holdings to purchase the commodity bundle.

The redemption price of gold at the banks is then[8]:

$$P_{g\$}^{B} = P_{b\$}^{*} / P_{bg} \qquad (1)$$

As the banks cannot make direct observations of P_{bg} because gold prices are only quoted in dollars (the UOA) they must derive the commodity basket-gold cross-price from the gold and commodity markets. Thus:

$$P_{bg} = P_{b\$}^{M} / P_{g\$}^{M} \qquad (2)$$

where $P_{b\$}^{M}$ is the market price of the commodity bundle which may differ from the par price, $P_{b\$}^{*} = 1$. Hence the redemption price of gold at the banks is obtained from (1) and (2) as:

$$P_{g\$}^{B} = P_{g\$}^{M} / P_{b\$}^{M} \qquad (3)$$

Expression (3) reveals the source of the ‘paradox of indirect convertibility ‘ because it implies two prices for the MOR commodity (gold in this case) - the banks’ price, $P_{g\$}^{B}$ and

[8] $P_{b\$}^{*}$ is the par price of the commodity bundle so expression (1) is simplified by setting the par price to unity.

the market price, $P_{g\$}^{M}$. Schnadt and Whittaker (1993; 216) note that this price differential is unsustainable: "With the bank selling gold at [$P_{g\$}^{B}$], no gold dealer is going to be prepared to buy gold for some higher price. In the converse case, no gold dealer would be prepared to sell gold at a lower price than the bank's price. This obvious 'law of one price' means that the market 'price-takes' the banks' rate; market behaviour would ensure that any difference between [$P_{g\$}^{B}$] and [$P_{g\$}^{M}$] would be quickly eradicated by changes in [$P_{g\$}^{M}$]."

The process of price equalisation will therefore operate immediately in the gold market.

Schnadt and Whittaker (1993; 217) argue that the paradox will arise if the banks actually attempt to open a wedge between the bank's price and the market price. In that case the gold price would fall (rise) without limit and banks would ultimately be forced to suspend indirect convertibility. For example when, $P_{b\$}^{M} > 1$ the redemption price of gold, $P_{g\$}^{B}$, must fall as the banks act to maintain expression (3). Banks' adjust the quantity of MOR on the basis of the existing market price for MOR. But in so doing they change the market price of MOR and cut off the opportunity for holders of MOR to sell at the existing price in the market. That is, when the banks reduce $P_{g\$}^{B}$ below $P_{g\$}^{M}$ so as to maintain their commitment to indirect convertibility the market determined gold price, $P_{g\$}^{M}$ follows it (see Dowd's explanation 1995; 77). Attempts by the banks to lower the

redemption price of gold below the market price succeed only in driving both prices down indefinitely. If $P_{b\$}^{M} < 1$ the converse holds.

The proposed route to indirect convertibility breaks down because by contracting to supply sufficient *quantity* of the redemption medium at the market price the banks are simultaneously adjusting the implicit *redemption price* of gold to compensate for observed changes in the *$* price of the commodity basket. But when the banks do this the law of one-price means that the market price of the MOR must equal the banks' price. There is then no way the MOR acquired from the banks can be sold for sufficient $'s to purchase the commodity bundle. It is not possible to satisfy $P_{g\$}^{B} = P_{g\$}^{M}$ and $P_{g\$}^{B} = P_{g\$}^{M} / P_{b\$}^{M}$ unless $P_{b\$}^{M} = 1$.

For indirect convertibility to work a discrepancy must exist between the gold price at the bank and the market price of gold. If that gap cannot appear then indirect convertibility is not feasible and no such contract would be proposed. The paradox of indirect convertibility arises because it is not possible to generate a wedge between the *market price* of gold and the implicit *bank price* when the banks offer a contract to supply a variable *quantity* of the MOR. Thus if the 'law of one price' operates, (which seems inevitable) expression (3) simply breaks down when disturbed from par suggesting that the scheme is not feasible. Any attempt by the banks to generate this wedge is the source of the pressure for the price of the MOR to explode. Agents with model-consistent

expectations would see this from the outset and dump (hoard) the redemption medium. What is more likely, the scheme would not be implemented.

Assessment of arguments in defence of indirect convertibility

Dowd (1995) and Greenfield, Woolsey and Yeager (1995) reject the 'paradox' argument but on somewhat different grounds. Dowd argues that the model has a unique and stable equilibrium and that the paradox argument has 'serious problems' while GWY seem to argue that given the broad definition of the commodity bundle its *$* price will never deviate from par. Agents with model consistent expectations expect it to remain at par and therefore always behave in a stabilising fashion.

Dowd argues, for the case where $P_{b\$}^{M} > 1$, that the act of converting *$* holdings into gold will reduce the quantity of MOE sufficiently to 'rapidly' return the *$* price of the commodity bundle to par. He suggests that the paradox argument ignores the second arm of the adjustment process- the effect of a changing quantity of MOE on the *$* price of the commodity bundle- and that it tacitly assumes that once $P_{b\$}^{M} \neq 1$ it is sticky in returning to par (Dowd, 1995; 79, fn's 16 and 17).

A close inspection suggests that Dowd's (1996, p. 302) defence of indirect convertibility rests on two crucial assumptions: (1) he assumes that a wedge can exist between the banks' and the market price of the MOR, and/or (2) he tacitly assumes that the price of the commodity bundle adjusts instantaneously ('rapidly' is not good enough) back to par once notes are surrendered for MOR at the banks. In particular he argues that the paradox

argument ignores the consequences of changes in the quantity of MOE on commodity prices. The second arm of the adjustment process identified in section 1.

With regard to the first point, the crux of the paradox argument is that changes in the quantity of MOE cannot occur. There is no way that indirect convertibility can produce a change in the quantity of MOE because rational agents will recognise that they cannot convert gold into sufficient MOE to purchase the commodity bundle. It is not possible in a world of rational agents to create a wedge between the price of the MOR in the market and at the banks. There is simply no way via indirect convertibility for agents to convert $1 into more than $1. There are no so-called arbitrage profits to be made. This is the Schandt and Whittaker point.

This conclusion follows no matter what the degree of deviation from par and has nothing whatsoever to do with relative speeds of commodity price adjustment. Any shock that results in $P_{b\$}^{M} \neq 1$ renders the first arm of the adjustment mechanism non-operational. The banks cannot meet the commitment to supply sufficient *quantity* of the MOR to purchase the commodity bundle because the market price of gold adjusts immediately they attempt to adjust the redemption value of gold.

All agents with model consistent expectations would know this so the gold price in the market would adjust immediately without the need for any trades. There is then no *mechanism* for restoring par once it has been disturbed. If the market price of gold is determined by the banks' redemption price then *$* holders cannot acquire sufficient *$s* to

avoid the loss which results from the rise in the *$* price of the commodity bundle. The scheme simply cannot provide the mechanism through which the banks enable *$* holders with a means to purchase the commodity bundle once its *$* price deviates from par. This is the essence of the 'paradox' position. Consequently, on these grounds alone indirect convertibility is not a feasible proposition; banks would have no incentive to offer such contracts and traders would have no incentive to act on them. Indirect convertibility cannot then be used to put the money supply on automatic pilot. Contrary to Dowd's assertion the process cannot be classed as stable. Hence the doubts expressed by Selgin and White (1994, p, 1741) about the viability of the BHF scheme are well founded[9]. Outside of the initial equilibrium or state used to define or state used to define the par value of the commodity bundle indirect convertibility is simply not feasible. If banks attempt to meet the contract the price of the MOR explodes.

Can Dowd's position be salvaged by recourse to the second leg of the adjustment mechanism? - the impact of changes in the quantity of MOE on the price of the commodity bundle. In this case the speed of adjustment of the price of the commodity bundle is in fact crucial. For Dowd's argument about the second leg of the adjustment process to go through the price of the commodity bundle must adjust back to par immediately a (the correct?) quantity of the MOE is exchanged for MOR at the banks (assuming that traders have an incentive to do this). Only if the price of the commodity bundle adjusts immediately back to par will the conversion of $1 into $1 via indirect

[9] Cowen and Kroszner (1994, ch. 3) also reject viability of the BFH scheme and support the Schandt and Whittaker critique. They differ in their interpretation of the BFH scheme in that they suggest that traders post 'prices' in terms of the commodity bundle rather than dollars, (Cowen and Kroszner, 1994, p. 80).

convertibility put the trader in a position to buy the commodity bundle for the par value of $1. Any degree of sluggishness in the speed of adjustment of the price of the commodity bundle will mean that the traders' $1 is insufficient to purchase the commodity bundle and the scheme collapses.

Consequently we can conclude that Dowd's defence of indirect convertibility as an operational scheme rests on one (or both) of two implausible conditions: (1) the belief that it is possible to create a wedge between the market and bank prices for the MOR and (2) that the price of the commodity bundle adjusts back to par immediately sufficient quantity of MOE has been exchanged for MOR at the banks. As neither of Dowd's requirements are likely to be met in any application of the scheme it seems safe to conclude that indirect convertibility is of theoretical interest only.

GWY(1995) propose two arguments in defence of indirect convertibility. First, they suggest that the banks should use the market price of the MOR when calculating the redemption price. Second, they argue that focussing on the price of the MOR is a red herring. The real issue is the broad definition of the commodity bundle which means that its price would not deviate from par. To believe otherwise is 'unrealistic' although conceivable. The problem revealed by the paradox is thus of academic (theoretical?) interest only; it is unlikely that the problem would actually arise. In short GWY appear to argue that the *$* price of the commodity bundle would not deviate from par so the paradox would not arise.

GWY's first line if defence runs into the paradox problem. The banks have a contract to supply sufficient gold at the market price $P_{g\$}^{M}$ to purchase the commodity bundle at $P_{b\$}^{M}$. Start from a position where \$1 = $P_{g\$}^{M}$ for one ounce of gold. If a shock produces $P_{b\$}^{M} >$ \$1 then indirect convertibility requires that the banks must supply more than an ounce of gold at the market price (assuming it has not changed). But that is formally equivalent to saying that the banks' redemption price of gold per ounce has fallen below the market price per ounce and we are back with the paradox. There is no way out here.

The second line of defence appears to beg the question. Schnadt and Whittaker (1995; 297) set out the issue clearly: "We all accept that if [indirect convertibility] is feasible, a deviation from par of the currency price of the basket must initiate some process that restores the par value, and the issuing bank must be able to maintain indirect convertibility whilst this process runs its course. The position of GWY is that the system is stable in this sense. Our position is that any such deviation would force abandonment of indirect convertibility."

In fact, GWY (1995) appear to be suggesting that defining the MOA as a broad commodity bundle is *sufficient* to ensure that no deviation from par occurs. But in that case why bother with indirect convertibility? Indirect convertibility is redundant if the use of a broad commodity standard itself ensures price stability. As a simple empirical matter most commodity price indices seem to be anything but stable.

Quasi futures contracts

A related scheme for automatically stabilising the price level has been proposed by Dowd (1994, 1996)) and Sumner (1995). Although Sumner places his scheme in free banking context the proposal does not rely on the existence of free banking for its implementation. This section briefly outlines and assesses Dowd's proposal. Attention is focussed on the core analytical issues in what is meant to be a simple idea (Dowd, 1994).

The intention is for a credible quasi-futures contact scheme to replace monetary policy as we now know it with a mechanism which puts control of the price level on automatic pilot. However, Cowen (1997) has criticised the proposal arguing that it is almost inevitable that traders would bankrupt any central bank (or competitive banks in a *laissez faire* set up) issuing such contracts! We concentrate on the latter issue in this note acknowledging that additional issues are raised by the Dowd-Sumner scheme (See Cowen, 1997, for a useful overview).

Mechanics of Quasi futures contracts

The key element in Dowd's (1994, 1996, Ch. 14) proposal aimed at automatically stabilising the value of some price index, p_t, eg., the RPI or CPI is that the central bank should create a new financial instrument, called a quasi-futures contract (QFC), and commit itself to buy and sell this instrument periodically at a fixed price.

The form of the contract is such that the purchaser makes a payment at time *t* when the contract is made, at a contract price $\$ p_t^c$ and the seller promises in return to make a payment to the purchaser in the next period, *t+1*, contingent on the value of some nominated price index, p_{t+1} on that date. The payment would include interest at the market rate[10]. The index-linked payment would be $\$(1+r_t)p_{t+1}$.[11] The central bank then undertakes to buy and sell contracts to keep the contract price, $\$ p_t^c$, at a pre-announced level. (Note that p_t is an index number while $\$ p_t^c$ is a monetary value.) The present value of the expected profit from such an arrangement is given by:

$$E_t[\$(1+r_t)p_{t+t} / (1+r^*)] - \$p_t^c \qquad (1)$$

where E_t is the expectations operator based on information at time *t* and r_t^* is an appropriate discount rate. Dowd argues that the two interest rates r_t^* and r_t are approximately the same so that, ignoring risk premia for simplicity, the expected profit from buying a contract will be zero:

$$E_t\$p_{t+1} - \$p_t^c \approx 0 \qquad (2)$$

Hence the equilibrium value of the expected future price index is simply:

$$E_t\$p_{t+1} \approx \$p_t^c \qquad (3)$$

Expression (3) is intended to represent an equilibrium outcome achieved by riskless arbitrage. In addition it is intended to be a stable equilibrium so that any deviations will

[10] If interest is not paid the expected value of the contract would depend on the nominal rate of interest which would adjust with inflationary expectations and the price level would not be tied down (Dowd, 1994, p. 830).

[11] The timing of the payment at the time of the contract distinguishes the quasi futures contract from a standard futures contract when payment is made on maturity, (Dowd, 1994, fn. 1). Note in addition that the contract is "cash settlement".

release corrective forces. Dowd (1994, p. 831) argues that: “In short, if (3) did not hold for some reason, arbitrage operations would take place that would tend to restore it.”

The stabilising forces work as follows. Suppose that the expected value of the price index, $E\$p_{t+1}$, exceeded the contract price, $\$p_t^c$, at which the central bank has committed itself to trade. Speculators would purchase the quasi futures contracts in anticipation of making a profit as $E\$p_{t+1} > \$p_t^c$. The value of the contract on expiry is equal to the value of the spot index at that date so traders anticipate a windfall gain when the contract is paid out on termination. The central bank would create the additional contracts to meet the demand to keep their price from rising. (Note that the ability of the central bank to create new contracts is central to the scheme and that traders must also be allowed the same facility.) As a consequence the money supply would fall as speculators reduce their base money holdings and increase their holdings of quasi futures contracts. The falling base money supply will then, in a quantity theory world, cause expected future prices to fall, ie., $E\$p_{t+1}$ would fall towards $\$p_t^c$ and the process would cease once approximate equality was achieved. The converse holds when the expected value of the price index falls below the contract price. In this case the bank buys quasi-futures contracts from traders who must be allowed to go “short”. When the contract expires if the lower expected price materialises those who have gone short will make a profit at the expense of the central bank. Traders who sold contracts at $\$p_t^c$, can close the contract at a lower price with the bank at expiry of the contract.

Assessment of quasi futures contracts

The QFC proposal like indirect convertibility would appear to be non operational. Cowen (1997) raises some pertinent questions concerning the rather naive use of the quantity theory and some technical issues that need to be addressed[12]. Here we concentrate on the naive use of the quantity theory.

Cowen (1997) raises some awkward questions about the operational feasibility of the scheme the most obvious of which arise from the existence of lags between changes in the money supply and changes on the CPI. The difficulties arises because the existence of variable lags means that it is inevitable that there will be periods of time during which the 'self-regulating' money supply cannot influence the CPI. If contracts expire before the change in the money supply can impact the CPI, traders may be exposed to unbounded losses. In that case any 'mistake' by the central bank may involve it in heavy losses. For example, if, given the lags involved, traders see that the CPI is going to come in below target they will have an unbounded demand for short positions. The resultant change in the money supply will have no impact on the CPI for the contract period (only later) and traders will make an unbounded profit at the expense of the central bank.

To avoid the possibility of such losses the central bank would have to suspend trading in contracts which applied to the period over which it could not influence the CPI. Cowen

(1997) describes this scenario as allowing the central bank to 'move last'[13]. However, he notes that such a step re-introduces discretion into a scheme that was motivated by the view that discretionary central banks are untrustworthy. The automatic feature of the proposal is lost as discretion re-enters. "CPI future targeting is motivated by the view that price level and money supply rules do not work well, but we cannot have it both ways. If such rules cannot halt discretion in normal circumstances they also cannot halt discretion when CPI futures trading is suspended." (Cowen, 1997, 282).

In short, Cowen argues that given the inevitable existence of variable lags, situations will arise under the proposed schemes for CPI targeting that will involve the central bank in losses. As these losses are potentially unbounded the scheme would collapse on first occasion at which traders outguess the central bank.

Cowen's critique of the scheme rests on the fact that the lags between changes in the money supply and changes in the CPI are *variable and unpredictable*. Hence they cannot be known by the central bank (or set of competitive banks) or the traders so 'mistakes' by the central bank are inevitable. For this reason Dowd's (1996, p. 362) claim that the existence of lags only complicates but does not undermine the analysis must be rejected. Dowd implicitly assumes that the lag lengths are known and does not address the question of losses incurred by the central bank.

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[12] For example, Cowen (1997, pp. 278-279) argues that if the scheme is successful no one can make a profit so there is little incentive to engage in the required trading!

[13] Allowing the Bank to move last adds an additional complication. Traders are unlikely to trade a contract with another party when the other party has the power to influence the outcome in its favour (Cowen, 1997).

QFC's, indirect convertibility and the naive quantity theory of money

In addition to the feasibility constraints on indirect convertibility and the QFC scheme they also suffer from the inherent limitation that has bedevilled the naive quantity theory of money since its inception. Outside of the mythical model of the gold standard and the current equally mythical models with exogenous money, the quantity of money in a modern financial system cannot be controlled in naive quantity theory fashion. This would be particularly evident in the *laissez faire* banking set-up imagined by Fischer Black (1970).

Black (1987, p. 1) imagines a financial system in which commercial banks and other financial institutions are free to offer and pay interest on a range of accounts on which no reserve requirement applies and in which all payments are made by electronic transfer. This system has both desirable and undesirable properties. The desirable property is that the payments mechanism is very efficient. The undesirable property is that the price level is indeterminate. This is evident once it is realised that the *laissez faire* world of electronic banking imagined by Black (1970) is the modern equivalent of Wicksell's (1898) imaginary pure credit economy. In a world of pure inside money the concept of exogenous money is not relevant.

Black appears to suggest this interpretation when he argues that in his imaginary world "... it would not be possible to give any reasonable definition of the quantity of money. The payments mechanism in such a world would be very efficient, but money *in the usual*

sense would not exist. Thus neither the quantity theory of money nor the liquidity preference theory of money would be applicable"[14].

Although we have some misgivings about his reasons we believe Black is correct to conclude that in such a world the quantity of money (a stock) is not a useful or relevant concept. If the modern financial system is driven by technology and market forces towards the state imagined by Wicksell and Black then it is futile to attempt to render the money supply exogenous by some form of direct control. Practical attempts to render the money supply exogenous would require a halt to technical progress and the imposition of something like a strictly enforced regime of 100 per cent reserve banking. Monetary history suggests that attempts to place quantitative constraints on the quantity of money have always been undermined by market forces to reduce costs and improve the efficiency of the payments system.

Hence, even if some means could be found to render both indirect convertibility and the QFCs scheme operational, market forces would be at work to undermine attempts to place quantitative controls on the quantity of money. In each of the scheme s assessed in this paper, control of the price level is based on the notion that the quantity of the MOE can be clearly defined and controlled. The history of money suggests that this is simply not possible. Attempts at quantitative control are not sustainable. Technological progress

[14] If, by *the usual sense*, Black means money defined as currency and deposits this statement is surely incorrect. In an electronic banking system deposits still exist. All that has happened when a system moves from currency or cheques to electronic transfer is a change in the form of the payments system. See also Rogers and Rymes (1997, ch. 19) for a discussion of Black's vision.

and market forces will undermine any attempt to identify and control the quantity of the MOE.

To illustrate the nature of the problem consider the relationship between the MOE and QFCs. In particular, traders are not permitted to use the QFC's as the MOE. In other words there is an implicit legal restriction in operation to differentiate the MOE from the MOR and/or the QFC's. Apart from the fact that this sits uneasily with a philosophy of *laissez faire*, historical experience suggests that if successfully introduced, QFCs would come to dominate the existing MOE and the money supply would become undefined once again leaving the price level undetermined. This is the age-old limitation of the quantity theory as a mechanism to maintain price level stability.

For the quantity theory to work there must be a clearly defined quantity of the MOE and it must be controllable. The inherent flaw in the quantity theory is that it is not possible to clearly delineate such a MOE. Schemes for automatic control of the price level which rely on the naive quantity theory of money always flounder on this limitation.

As both direct and indirect convertibility are not feasible the only practical alternative to price level control is for central banks' to use an interest rate instrument in an attempt to hit a price level or inflation target. McCallum (1981) and Edey (1989, 1990) provide a theoretical analysis of this approach. What is interesting is that inflation targeting provides a feasible mechanism for control over the price level in a world which closely approximates Black's imaginary world of electronic banking. Is technological progress

producing a monetary system in which influence over interest rates emerges as the only instrument in a largely discretionary approach to monetary policy?

Conclusion

An evaluation of the schemes for indirect convertibility proposed by Dowd and GWY suggest that they are not operational. Any attempt to implement them would cause the price of the MOR to explode. This is the paradox of indirect convertibility identified by Wicksell (1919).

The failure of the proposal occurs because both arms of the adjustment mechanism required by indirect convertibility are not operational in real time. A deviation of the *$* price of the commodity bundle from par automatically requires a wedge between the banks' redemption price of gold and the market price of gold. But in any sensible economy no such wedge between the two prices can occur. Hence there is no inducement for currency holders to convert currency into the MOR and back again into currency to compensate for the rise in the currency price of the commodity bundle. The is no reason why the quantity of MOE would change.

Dowd's second arm of the adjustment mechanism would not come into play. Even if the second arm could be brought into play it would require instantaneous adjustment of the price level to neutralise the non-operational nature of the first leg. As instantaneous adjustment of the price level is itself non-operational, indirect convertibility is simply not operational.

The GWY defence of indirect convertibility appears to concede the non-operational nature of indirect convertibility by suggesting that a broad definition of the commodity bundle is *sufficient* to ensure price level stability. The latter view places inordinate faith in the law of large numbers and appears to abandon indirect convertibility and the quantity theory of money.

In similar vein, schemes based on QFCs in the CPI are also intended to place the money supply on automatic pilot. As such they are based on a naive quantity theory view of the world. On closer inspection it turns out that these schemes would be prone to breakdown because lags between money supply changes and changes in the CPI cannot be eliminated. Variability in the lags is an acknowledged fact by exponents of the quantity theory. The existence of variable lags means either that the banking system will be inevitably exposed to unbounded losses or it must introduce an element of discretion by suspending trading when changes in the money supply can no longer influence the CPI.

Consequently, proposals to combine QFCs in the CPI with indirect convertibility as a basis for *laissez-faire* banking as suggested by Dowd (1996a, p.367; 1996b) would seem to combine a *pot pouri* of non-operational elements. As a corollary, there is no reason to believe that targeting CPI futures dominates the current discretionary practice of targeting the spot CPI.

Finally, even if these schemes were free of operational flaws they are based on the false notion that a definite quantity of the MOE can be identified and controlled. Monetary theory and history suggests otherwise.

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